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The Thinking, Behavior, and Clinical Perception in Emergency Medicine

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ACRFFONYMS

ABG:	arterial blood gas
AED:	automated external defibrillator
AHA:	American Heart Association
ALT:	alanine aminotransferase
ALTE:	pparent life-threatening events
ARDS:	acute respiratory distress syndrome
AST:	aspartate aminotransferase
AV:	arterovenous
AVPU:	alert, verbal, pain, unresponsive
BID:	bis in die (twice daily)
BP:	blood pressure
BPM:	beats per minute
BVM:	Bag-valve mask
Ca:	calcium
CHF:	congestive heart failure
CO:	cardiac output or carbon monoxide
CO2:	carbon dioxide
CNS:	central nervous system
COPD:	chronic obstructive pulmonary disease
CPR:	cardiopulmonary resuscitation
Cr:	creatinine
CT:	computer tomography
CVA:	costovertebral angle or cerebrovascular accident
CXR:	chest x-ray
DIC:	disseminated intravascular coagulation
DKA:	diabetic ketoacidosis
DVT:	deep venous thrombosis
EBV:	Epstein-Barr virus
ECG:	electrocardiogram
EM:	emergency medicine
ENT:	ear, nose and throat
FAST:	focused assessment with ultrasound in trauma
FBC:	full blood count
FFP:	fresh frozen plasma
FNA:	fine needle aspiration
GABHS:	Group A beta-hemolytic Streptococcus

GCS:	Glasgow coma score
GI:	gastrointestinal
GU:	genitourinary
HELLP:	Hemolysis, Elevated Liver enzymes, Low Platelets
Hg:	hemoglobin
HIV:	human immunodeficiency virus
HSP:	Henoch-Schonlein Purpura
HR:	heart rate
HSV:	herpes simplex virus
HUS:	hemolytic uremic syndrome
Hx:	history
IM:	intramuscular
INH:	Isoniazid
INR:	international normalized ratio
10:	intra-osseous
ITP:	idiopathic thrombocytopenia purpura
IV:	intravenous
IVC:	inferior vena cava
JVD:	jugular venous distention
LDH:	lactate dehydrogenase
LMWH:	low molecular weight heparin
LR:	Lactate Ringer's
MAP:	mean arterial pressure
MDI:	metered dose inhaler
mEq:	milliequivalents
ml:	milliliters
MI:	myocardial infarction
NAC:	N-Acetylcysteine
NG:	nasogastric
NIPPV:	non-invasive positive pressure ventilation
NS:	normal saline
OPD:	outpatient department
PA:	posterior-anterior
PBLS:	pediatric basic life support
PE:	pulmonary embolism
PEA:	pulseless electrical activity
PEEP:	positive end expiratory pressure
PALS:	Pediatric Advanced Life Support

PO: per os (oral administration)
PPV: positive pressure ventilation
PT: prothrombin time
PTT: partial thromboplastin time
PTX: pneumothorax
PUD: peptic ulcer disease
RBC: red blood cells
RR: respiratory rate
RTA: road traffic accident
RUG: retrograde urethrogram
RV: right ventricle
SAH: subarachnoid hemorrhage
SBP: systolic blood pressure
SJS: Stevens Johnson Syndrome
SL: sublingual
SSTI: Skin and soft tissue infections
STI: sexually-transmitted infection
SVT: supraventricular tachycardia
TBSA: total body surface area
TMP-SMZ: Trimethoprim/sulfamethoxazole
TEN: Toxic Epidermal Necrolysis
TIA: transient ischemic attack
TB: tuberculosis
TRALI: transfusion-related lung injury
TTP: thrombotic thrombocytopenic purpura
US: ultrasound
UTI: urinary tract infection
VT: ventricular tachycardia
XR: x-r

INTRODUCTION

"When Elisha reached the house, there was the boy lying dead on his couch. He went in, shut the door on the two of them and prayed to the LORD. Then he got on the bed and lay upon the boy, mouth to mouth, eyes to eyes, hands to hands. As he stretched himself out upon him, the boy's body grew warm. Elisha turned away and walked back and forth in the room and then got on the bed and stretched out upon him once more. The boy sneezed seven times and opened his eyes."

Kings B, Chapter 4, 32-35

Already in the first "publication" of children's CPR one can find elements of the modern life support. Elisha, the caregiver, lies on the patient with his mouth on the patient's mouth (mouth to mouth resuscitation) and the patient is saved.

Bringing back to life was only a wish until Kouwenhoven et al. showed that sufficient blood flow could be maintained by providing cardiac massage to patients who suffered from cardiac standstill, thus enabling a full life support treatment.

The special care approach in life support of adults, children and infants is under a constant process of changes and developments. The awareness that the life support treatment of children, babies and newborns is fundamentally different from that given to adults has resulted in the development of professional directives earmarked for this age group. A number of reasons have produced the separation between the life support directives regarding adults and those intended for children and babies:

1. Realizing that the factors of cardiopulmonary arrest among the pediatric age group are different from those relating to adults. Whereas a cardiac standstill in adults is an acute episode caused by a primary cardiac problem (acute myocardial infraction, arrhythmia), in children and infants the cardiac standstill is generally secondary to a continuous respiratory failure or shock.
2. Physiological processes, especially in a life support situation, are not necessarily identical with the two age groups as far as the order of episodes and the rate of their appearance are concerned.
3. Survival after a pediatric cardiac standstill is minimal (average of 5%). Therefore, the directives for the treatment of children and infants emphasize

the early detection of those situations and processes that could lead to cardiopulmonary arrest, and the provision of pretreatment accordingly.

A few years ago, this reality has already resulted in the separation of the training and professional literature systems regarding the life support of children and infants from those of adults, and in practice they were established as specific professional disciplines. A significant stage in the professional development is the operation of a curriculum of designated advanced study in the subject of pediatric life support with its three stages known as Pediatric Basic Life Support (PBLS), Pediatric Advanced Life Support (PALS) and Advanced Trauma Life Support (ATLS). This curriculum of advanced studies as well as pediatric life support courses, were developed jointly by the American Pediatric Medicine Academy and the American Association of Heart Diseases. PALS course have long become an integral part of the specialization program of pediatricians, the training program for nurses, paramedics and children's intensive care staffs throughout the USA and Canada. The theoretical material accompanying the courses is nowadays an official publication of these associations. Advanced studies in this standard are currently carried out in other countries worldwide.

In the US, courses for studying PALS and ATLS started in 1988. About six years ago, organized training of PALS and ATLS courses started in Israel according to the same guidelines with the backing and patronage of the American organizations.

Life support courses such as PALS and ATLS, which should be part of the curriculum of medical students, have been separated from the study program and became extra curricular. These courses provide the basis for treatment in emergency or stress situations encountered at work. We are convinced that studying and practicing these courses can significantly improve both the students' treatment and their handling of patients under stress and in emergency situations. It will also produce good and efficient results in the process of their thinking and making decisions.

The course described in this book is, therefore, an inseparable part of the studies of the sixth-year medical student, and its purpose is to complement all those subjects discussed in the courses only briefly. Therefore, the course is structured as a guidebook and includes the variety of problems facing caregivers while performing life support in adults, children and babies. We are convinced that studying the PALS and ATLS courses and training caregivers while performing life support in adults, children and babies will significantly improve the thinking process, the performance of life support in children and adults and the outcomes of the life support operations.

For a medical student one can define a stress situation as a situation where a person encounters environmental demands, which threaten his ability to face them and handle them and which compel him to change the process of his thinking, decision making and behavior. Stress situations are an integral part of our lives and require that we learn to handle them in new ways; but when stress situations become too burdensome their effects could cause emotional, cognitive or physiological difficulties. The major question in understanding stress situations during emergency is: what is the nature of the stressful situation or, in other words, what is the reason for the fact that certain stimulations become stressful.

In the course of their studies medical students learn and adopt strategies for making decisions and solving problems; such strategies enable them to implement the significant theoretical knowledge they have acquired while encountering various medical situations.

Thinking resembles swimming, riding a bicycle or driving a car. If we simulate intelligence to the engine of a car, then thinking is like the skill required for driving the car. As with all skills, the more they are practiced, the better become performances.

The process of education for thinking – theoretical and practical – which focuses on the development and fostering of students' thinking has become during recent decades a highly active and rich theoretical and practical area. Various factors such as fast changes in all spheres of life, teleprocessing technologies, general knowledge, new theories relating to learning and thinking, have created a suitable background for the growth of educational theories and practices that shift the emphasis from delivering a body of defined knowledge which is considered privileged, to the development of students' ability of thinking properly; from memorizing knowledge to thinking about knowledge and through it.

The requirement for education for thinking has emerged, inter alia, on the background of the phenomena called "knowledge explosion", namely knowledge multiplying itself within short periods of time. On this background it has been claimed that education must focus not on transfer of knowledge, as the latter quickly becomes obsolete and no one is capable of memorizing and understanding such vast amounts of knowledge, but rather on the development and nurturing of the ability to think properly. Such ability will enable people to acquire new knowledge efficiently, understand, criticize and create knowledge, make wise decisions, come up with suitable solutions, etc.

The medical profession emphasizes the acquisition of declared knowledge by way of a thorough theoretical studying of the disease-related subjects, compared to the emergency medicine subject where the emphasis is on the study of procedures and the exercise of skills required for performing life support processes.

The doctrine of emergency medicine evolved in the US during the 70s regarding an approach for treating wounded people (Advanced Trauma Life Support – ATLS), which was based on several basic assumptions. First – to distinguish it from other diseases where the customary approach is: receiving the anamnesis, conducting physical examination, performing diagnostic examinations and deciding as to the type of treatment – in trauma cases and emergency situations the order of actions changes. The ATLS doctrine stipulates that when approaching an injured person, the first things to be diagnosed and treated are the life-endangering problems. The lack of final accurate diagnosis should not delay the treatment of these problems. Secondly, a detailed anamnesis is not a precondition for starting the treatment of the injured and it is in fact not required during the first stages of treatment.

Different problems are likely to cause the death of the injured within different periods of time, which are characteristic for every type of injury. This way, for example, an unsolved airway problem will bring about the death of the injured faster than problems of ventilation or hemorrhaging. Therefore, an order of operations has been determined, which corresponds to the initial order of the English alphabet, according to which one should act when approaching an injured person for treatment: A – airway; B – breathing; C – circulation; D – disability; E – exposure.

It could be claimed that skilled doctors are authorized to perform life support and solve the patient's problem in a life support situation. On the other hand, medical students have little experience in life support in general and among children in particular. Therefore, the authors of the present work believe that they should undergo half a year of practical experience in treating adults and children at emergency units as well as study the PALS and ATLS courses prior to beginning their internship.

The **object** of the research is to examine processes of thinking and problem-solving including knowledge, behavior and dealing with emergency situations as well as the ability to diagnose cases by data collection, physical examination, the use of simulation means in order to reach a solution to the problem and making urgent and effective decisions during emergency situations. Groups of sixth-year medical students, fourth-year nurses and last-year paramedics have been chosen. They will take a knowledge test and thereafter will have to handle a given condition and simulation means of an emergency situation. Before, during and after that – in the course of thinking and solving the situation – a nurse will measure the autonomous signs and physical reaction of every student, since the object is to examine the influence of the stress situations during emergency on the autonomous signs, physical reaction, thinking process and solution of problems.

When dealing with well-defined problems, the procedural knowledge is very effective. In life support situations, the solver of such problems can identify a clear target, can understand the initial situation and the compulsions, and knows exactly what operations are required to assist the treatment while performing life support processes.

Handling emergency situations requires quick and safe clinical evaluations in everything regarding the severity of these situations, as well as carrying out quick actions by a highly qualified and skilled staff. Fortunately, there are well defined situations such as: myocardial infraction, arrhythmia, hypovolemia and acute asthma attack, which are considered as well defined problems where life support can be performed according to an algorithm. I.e. a skilled problem-solver can immediately identify the medical problem, the initial medical conditions, understand the medical situation compulsions, know exactly which medical treatments are permitted and which are prohibited, and quickly perform the correct procedure in order to effectively react to the emergency situation. It is expected that doctors will present the ability to make quick and safe clinical evaluations regarding the severity of the situation and that they will know how to handle it. In terms of problem-domain, doctors are expected to be able to accurately identify the initial situation, the target situation to be achieved and the possible medical action to be taken. In addition, doctors are expected to choose the most effective method of solving the problem. On the other hand, there are situations where the problem is not well defined such as poly-systemic injury where there is no special algorithm for solving the problem. Therefore, in a poly-systemic injury there are many algorithms for solving the problem and that requires combining of skilled medical and nursing staff to stabilize the patient. This is an exact thinking process for solving a problem with the assistance of considerable professional experience. In other words, contrary to well defined problems such as the puzzle problems, failure to choose the right way of treatment within the problem domain during a medical emergency situation could aggravate the situation and even lead to death.

It was found by many studies done in the field that the method of solving problems in emergency situations among nurses and paramedics was based on algorithm and among doctors – on heurism. It was also found that nurses and paramedics mastered skills of thinking, decision making, problem solving and diagnosing through simulation means better than doctors.

In this book we focused on the following **four major questions**:

1. Which physiological, physical, behavioral reactions can affect the decision-making and problem-solving processes among the three research groups?
2. Is the performance of doctors who have completed declarative-knowledge emphasis training different from the performance of paramedics and nurses who have completed procedural-knowledge emphasis training regarding an intervention in a well-defined medical situation of an acute asthma attack in a child?
3. Are the processes of decision making and problem solving by medical graduates in emergency situations well defined?
4. Do the methods in which medical students draw the visual information and verbal anamnesis, compared to nurses and paramedics, enable them to reach a quick problem solution process and make a decision regarding the treatment?

CHAPTER A

1. Thinking in a Historic Context

Each perception of thinking always occurs at a given time. Thinking was perceived differently in the tenth century and during the Renaissance. Different periods are characterized by unique thinking processes, and the current widespread thinking patterns reflect our era. This paper is one of the many attempts to project on the curriculum and teaching everything we know about thinking. Seventy years ago or even earlier, "the only direct way to improve the teaching and learning methods is by focusing on the circumstances producing thinking, advancing it and testing it." Similarly, in 1961 the National Education Association emphasized the significance of thinking and its improvement to education in America (Dewey, 1930; Dorner & scholkopf, 1991).

Therefore, in the general domain of developing the ability to think, there is room for further research. It is essential that those responsible for managing and determining the educational policy will recognize their commitment to expand the research and implement its conclusions. In this respect, the significant answers to issues such as technology in education, the length of the study year and the proper contents for teacher training should be looked for and provided.

Much like the interest educators have found in thinking for decades, the interest in thinking and its influence on human behavior is as ancient as the history of humanity. In the study of thinking, there are at least two very influential traditions which can be noticed: the philosophical and the psychological (de Bono, 1973;1975).

2. Psychology and philosophy of thinking

Teaching the philosophy and history of ideas instructs how the human mind operates, and perhaps how to conclude about some of the basic ideas of thinking there from. But the description of the course of thinking only slightly contributes to its development as an active skill. The fact that subjects such as philosophy "deal" with thinking does not necessarily mean they help teaching how to think (de Bono, 1973; 1975).

The philosopher is interested in the results of his thinking skills, whereas the psychologist is interested in the nature of the skills themselves. Psychologists specialize in descriptions. The process of thinking can be divided into observation, analysis, abstraction, building a model, expectations, motivations, etc. This description might be useful, but the elements of description cannot be taken and turned into tools. It is not possible to claim that "observation" is part of thinking and therefore we should practice observation. It is not possible to claim that since "motivations" are also a part of thinking we should practice "motivation". There is a big difference between a tool and a describing element. If we want someone to start a car, it is possible to explain to him what happens in an internal combustion engine such as the one found in his car, or he can be given exact instructions regarding the use of the ignition key. The operation tool in thinking is likely to be different from a psychological description of the thinking process. For example, "intuition" is a useful psychological description but it cannot be used as an operational tool. On the other hand, an artificial tool such as the word "Fooh" is psychologically meaningless but could serve as a practical operational tool in thinking (Belmont et al, 1982; Dewey, 1930; Dorner & Scholkopf, 1991).

Different kinds of attempts have been made in order to teach thinking on the basis of dividing the process into its psychological elements and parts. Such attempts are based on the erroneous assumption that if the describing elements are turned up side down, they become tools. They do not. Similarly, the understanding of a process does not mean that it provides a means for using it (Brown et al, 1989; Duncker, 1945; Dweck & Bempechat, 1980).

Studying the rules of thinking does not develop the practical thinking skills. Using thinking in specific situations ensures the existence of thinking skills in such situations, but not a transferable thinking skill. The nature of skill should be focused on the person rather than the subject. The problem is that usually one can teach only a subject-focused skill. A certain person is trained to behave in a certain way in a certain situation. The problem will be solved when we create situations which, in themselves, can be transferable. Such situations are called tools. A person is skilled with the tool situation. He studies how to handle the tool. The tool and the skill of using it can now be transferable to a new situation. It does not at all matter whether there is an explicit need for the tool. Even an unnecessary tool is still capable of functioning as a transferable tool (Ennis, 1987; Ennis, 1989).

3. Great Tradition

The ancient roots of the philosophical interest in thinking are found in the Classic Period. It is mentioned that in the Western World, philosophy preceded the growth of what is generally called today "science" by some 2,000 years. (Belmont et al, 1982).

Indeed, for centuries philosophy was considered the queen of sciences. In the opinion of early philosophers, the meaning of thinking or of presenting an argument was to hold the position of an objective spectator and unbiased thinker, and through this way reaching the truth. Plato described the philosopher-king as someone who is capable – by looking inwards – to identify the shapes and ideas beyond the external appearance of things. Aristotle described the process of finding the truth through rational thinking as understanding the plan or talus of the world. In The Book of Measurements According to Nikomachus, Aristotle mentions that the thought is what guides proper behavior: "It is not enough to know what excellence is: we have to aspire to it and act accordingly"

Inquiry is one of the main tools of the philosophers. According to Socrates, the philosopher holds constant discussions in order to "reach the core of things: he does not release his interlocutor until grasping – through the intellect – good itself" (Brown et al, 1989).

The spirit of inquiry has been present throughout the history of philosophy; it is the one shaping many of the modern perceptions of science. For example, in the 17th century, Descartes wrote that the first and foremost responsibility of the philosopher was to develop an accurate research method. As a mathematician Descartes strived to develop a method which would be close to analytic engineering. The democratic society must nurture its spirit, otherwise the society will decay and the energies of citizens will be destructively directed inwards (Ennis, 1987).

Philosophy, therefore, is strongly connected to the research of thinking. In addition to the great scholars mentioned here, many others have significantly influenced the way we think and the way we relate to thinking today. The current widespread interest in the teaching of thinking is, therefore, basically philosophical – but also psychological (Ennis, 1989).

4. A second great tradition: Psychology

Only in mid-19th century did scholars start considering the human brain as a "mechanism in action" the activity of which can be scientifically researched. Biologists noticed correlations between the development in animal behavior flexibility and an increase in the size of their brains. Soon enough more and more attention was dedicated to identifying the actions which make up thinking. Wandett and his disciples established in Leipzig the first psychological laboratory for studying the basic structure of the entire cognition which, in their opinion, was made of feelings and perceptions. Since the early days of psychology, the study of thinking has taken many forms among which one can find the gestalt, the behaviorist psychology, psychometrics and the information processing theory.

The psychology of gestalt, which is mainly engaged in perception, assumes that all creatures have an innate tendency to organize the information they receive from the environment. However, such organization must not be perceived as a simple accumulated collection of small independent parts. Rather, humans tend to organize the information into a comprehensive gestalt (structure, shape or configuration) which is different from the sum of its elements (Dweck & Bempechat, 1980).

While the Gestalt psychology mainly focuses on perception, the behaviorist psychology is engaged mainly in learning. According to behaviorist psychology, or the psychology of stimulation-reaction, the likelihood of the appearance of a certain reaction on the part of an organism directly stems from connection between the stimulation and the reaction: reactions more practiced – are likely to survive better. The emphasis of memorization, which is customary today in classes, originates from this principle (Dorner & sckolkopf, 1991).

Another important stream in the tradition of psychology is the psychometric approach. Psychometricians tend to focus more on the products of behavior than the implementation itself: therefore, test grades undergo sophisticated statistical analyses. According to this approach, the results of skill and intelligence tests are considered valid indexes of IQ. Early analyses of such tests indicated the existence of a general factor or general skill (g) which is vital for all forms of intelligence. Recently additional factors have been identified such as crystallized intelligence (information learnt from the culture) (Astington, 1990).

The most recent psychological approach for the study of thinking is the Information Processing approach. This approach focuses on the question how we acquire, deliver, store and change information. According to this method, many successful thinking analyses have been performed – this is how, for example, we have reached most of our knowledge about the limitations of human memory. The information processing theory made it possible to develop a simulation of human thinking through powerful computerized models generally called artificial intelligence (Collins, 1993).

Each of the two traditions – the philosophical and the psychological – which contributes to the study of thinking, presents an essential approach for nurturing thinking in class. The philosophical approach extensively deals with the nature of thinking, its quality and its role in human behavior. The psychological tradition explains the mechanisms of specific cognitive actions. Any development of a work frame for the teaching of thinking must take both approaches into account (De Bono, 1983).

The typical flaws of human thinking can be summarized into four major types. A flaw is something people fail in automatically unless they make an effort to act differently. Following are the general flaws by which our daily thinking is affected:

- **Impulsiveness.** We reach conclusions and take actions without enough thought and attention, sufficient for judgment standards. It is likely you have not dedicated enough time to a certain decision you have recently made (Dweck & Bempechat, 1980).
- **One-dimensionality.** Our thinking ignores different things. We do not examine the other side of the coin, the evidence, signs, the reference frameworks and alternative perspectives, the bolder options, etc. It could be that you have not looked for possibilities in a larger space thus missing a preferred option.
- **Vagueness.** Our ideas are not clear and our distinctions are not sharp: confusion prevails everywhere. It could be that you have not given a long penetrating look at your list of priorities; and since the most important thing to you was vague, you have made the wrong choice.
- **Absent-mindedness.** Our thinking is unorganized: it is scattered in all directions: does not get to the point. It could be that you were facing a complex decision and got lost in the maze of circumstances. Finally, you did something out of rage which, unfortunately, was not the right thing to do (Collins, 1989; Collins, 1993).

The concept of four thinking flaws gives rise to the challenge of education for thinking. In order to help students, handle the thinking flaws we must help them dedicate more time to thinking, emphasize their importance, try to clarify it, make it accurate and organize it methodically.

How? The natural tendency is to enable students experience and practice better thinking models. For the purpose of overcoming impulsiveness, we involve them in discussions and in writing which require more thinking time. For the purpose of expanding thinking we involve them in enlarging activity such as providing reasoning to an opposite opinion, or brainstorming. Such experiences are effective and commendable but do not do the whole work. One of the most productive discoveries of recent attempts to teach thinking has been that experience alone is not enough. Even the repeated practice of a special type of thinking does not assist students in improving that type of thinking. For example, the involvement of students in mere disputes does not necessarily improve their ability to to indulge in polemics or think in general terms (Chi e tal, 1981; Heyes, 1981; Glaser, 1984).

Furthermore, an experience which improves thinking activities within the context of a class lesson does not guarantee that such improved activities will be transferred and implemented in other contexts. For example, students who have learnt the importance of examining the two sides of a coin by practicing class argument, will not necessarily do it in other thinking situations. As aforesaid, practice alone is not enough.

Why? Because experiencing and practicing better thinking methods do not usually clarify the core or importance of such practices. They also do not provide students with means to remember the better practices, much like other things which are going on in class.

In our opinion, the solution to this problem is the use of thinking organizers for the purpose of reorganizing thinking (where a "thinking framework" can also be referred to). Thinking organizers are verbal or graphic symbols which remind us how to reorganize our thinking and distant ourselves from the four thinking flaws. Some of the different thinking-improvement approaches do not emphasize this means while others do.

A thinking organizer is a concrete verbal and/or graphic structure which guides the thinking. Later on examples will be given of extremely effective thinking organizers for the improvement of thinking in the course of teaching study subjects. Meanwhile we would like to explore the nature of thinking organizers in the framework of daily thinking. Following is a short list of thinking organizers in daily use:

- **Proverbs.** Proverbs and widespread sayings are an archive of thinking organizers. For example, proverbs like: "Think of the end before you begin" or "Haste makes waste" ("Fools rush in") operate against the flaw of impulsiveness. Sayings such as "Activate your imagination", "Let's take another stand" and "Put yourself in his shoes" operate against the flaw of one-dimensionality.

- **Analytical notions & terms.** Many notions and terms help us organize our thinking. For example, if you speak argumentatively you may ask someone or yourselves: "What is the claim here? What is the argument? Do you have evidence to support such generalization? How does the first rationale support the conclusion?"
- **Notions & terms indicating tendencies.** Quite a few people have indicated that good thinking is much more than just technique: it is a matter of spirit or, what is called in a more professional language, tendencies. Many notions and terms express commitment to thinking modes. We encourage people to be fair, honest, open or daring in their thinking. These terms do not have great analytical meaning, such as the terms: argument, evidence or support, but they are loaded with feelings. The terms mentioned above are connected, in some way or another, to multi-dimensional thinking (Newell, 1990).
- **Known strategies.** Some strategies have become part of our culture and they are known to all. For example, the brainstorming strategy with its simple rules which forbid criticizing or praising ideas of others, etc. Another strategy is the pros and cons list already mentioned. Another strategy is the attempt to find arguments for an exceptional position of somebody else instead of disqualifying it on the threshold.
- **Simple graphic organizers.** The pros and cons list is one simple thinking organizer. There are others, such as making a plan by a list of stages. The list enables to stop at each stage, look at the plan and change it, thus avoiding vague and scattered thinking. Another example: for the purpose of managing the budget or the purchasing, people use multiple-column tables divided according to departments, functions or people as needed. Such tables assist in clarifying thinking which otherwise would be vague or lost between different transactions and products (Ohlsson, 1990; Ohlsson, 1993).

If all these thinking organizers are part of our culture, why can't we think in a perfect way? Regrettably, most of the knowledge people have is "silent" or passive, unlike active knowledge. People know "about it" but do nothing "with it". This relates to thinking organizers as well as other types of knowledge. For example, most people are acquainted with terms such as claim, argument, support, evidence, etc. however they hardly use them in their daily thinking and contending (Gllis et al 1986).

5. Thinking Frameworks – David Perkins

In an era where there are too many things to know it seems that there are also too many ways to think. Those engaged in improving the thinking methods of students are overwhelmed by the multitude of diversified incoming tips from different directions: we are encouraged to raise the IQ of our students, teach them learning skills, encourage moral development, advance critical thinking, nurture the problem-solving ability, develop logical thinking, inspire creativity, teach easier reading & writing strategies, etc. We are pushed to undertake such tasks in a vast variety of ways: a series of exercises at ascending levels of difficulty, practicing thinking by thinking, diagnosis tests, one-on-one or one-on-some teaching, learning in small groups, courses which focus on teaching thinking skills, integration of thinking skills in connection with the study subjects, etc (De Bono, 1973; 1975).

6. How Do I Think?

There are differences among people in the way they use the knowledge they have acquired – how they process information and how they think. Some people are "gatherers" – i.e. frequently look for connections, ways to connect between things; others are "branchers" – i.e. every thought, idea or fact create plenty new directions in their mind. Others yet organize ideas, information and experiences in a sequential linear order; and some organize their thoughts in clusters or random models. Some think aloud – they express ideas in words as a means to their understanding; some concentrate inside themselves in understanding concepts and experiences. Some people think fast, spontaneously and impulsively; others are slower and more reflexive.

We meet such examples on a daily basis. It is possible that you once said to a person: "Why did you say that?" and then realized that that person was thinking about something in a completely different way than yours. The most important principle is that people perceive, acquire knowledge and deliver it in different ways. These differences create models which are unique to each person and influence his/her general behavior.

7. Five Thinking Dimensions

There are generally five thinking dimensions that we are going to describe in this chapter:

- Metacognition.
- Critical & creative thinking.
- Thinking processes.
- Basic thinking skills.
- The relation between knowledge in content areas and thinking (Anderson, 1983; Bone etal, 1992).

Identification of these dimensions is not considered classification. The dimensions are not distinct and do not have the same basis which enables comparison. Sometimes they overlap, and the relationships between them are not uniform Therefore they do not create a hierarchy. They are also not intended to serve as an objective in itself, and they have been chosen because they reflect the different thinking areas prevalent in the research (Astington, 1990).

Educators may consider this framework a resource through which curriculum requirements could be adjusted to students needs, without forgetting the fact of being assisted by a research paper which will continue to change the more research knowledge is accumulated (Glaser, 1984).

The first dimension, metacognition, relates to the awareness and control we have over our thinking. For example, opinions students have about themselves, or about subjects such as the importance of perseverance and the nature of work, will be significantly expressed in the motivation, attention and effort they will invest in task implementation.

Prominent subjects in the literature dealing with thinking are critical thinking and creative thinking. In this criterion we include these two ways of thinking, which are both different and related. If we disregard the processes or skills related to them, the thinking of any person can be described as more or less creative or more or less critical.

These four dimensions do not exist in vacuum. In the process of thinking, something is thought about, and the thinking contents are extremely affected by the way we think. For example, our ability to sort and organize data most probably depends on our acquaintance with the subject more than our control of classification and organization skills. The relation between knowledge and other dimensions is very complex and subtle.

A central characteristic of the dimensions is their concurrent emergence. One person can think in a metacognitive way (“Do I understand the word? It is important in order to continue?") while critically and creatively operating skills and processes ("How can the problem be represented? How to write a good essay?"). For example, in the course of writing a paper, a student may operate control over his/her tendencies such as the desire to go out and play ball instead of studying, while operation specific thinking skills such as summarization (Kuhn, 1991; Langer, 1993).

Another thinking dimension is: thinking processes, such as the formulation of concept, understanding, decision making and problem solving, while the access to skills like: data organization or sayings-accuracy verification, could be random. The cognitive processes are directed according to the circumstances. The understanding of a paragraph, solving of a problem or conducting scientific research are significant intellectual activities in themselves. We consider them actions more or less on the macro level which take place over time and at different predictable continuations of general skills (Ford & Profetto, 1994).

The actions more ascribed to the micro level we call basic thinking skills, which are best described as basic cognitive actions used in metacognitive thinking and thinking processes. Comparison and classification skills, for example, fill a central role in decision making and problem solving (Gllis etal, 1986).

8. What is thinking and what are thinking purposes?

There is a difference between the philosophical definition of thinking and the actual use of thinking. There is no point in asking children to philosophically define thinking, but they can be asked what they like to think about.

Most of the above-mentioned definitions determine that thinking occurs knowingly and that this is a conscious process. The other group of definitions involves the term of **goal**:

"Mental processes of rationalization. An attempt to come to a conclusion about certain things."

"The process of using the brain in an attempt to reach a conclusion regarding certain things."

"A creative process which deals with solving problems."

"Solving something while intellectually making use of reasoning."

"Following a certain idea towards a certain goal."

"Using the cognitive ability in order to solve problems, contrary to a situation where one is led by emotions."

Therefore, thinking is a matter of solving problems or an attempt to reach a certain purpose. Pleasures, fantasies, self indulgence with daydreaming - all these are also acceptable as purposes (Anderson, 1983; Brown & Clement, 1987; Bone et al, 1992).

Thinking purposes: When a group of medical students was asked to define thinking they almost exclusively perceived it as a process of **solving problems**.

"An activity which starts with a problem whose purpose is to solve the problem."

"Thinking is a process of organizing existing information in order to reach a solution."

"The processing of a given "material" in order to solve different kinds of problems."

"Using an ability (intelligence?) to obtain an answer to a certain problem."

"Thinking is examination of the existing possibilities to reach the solution of the problem."

"Thinking is a mental process aimed at solving problems."

"Examination of the facts according to personal experience in solving problems, or in clarifying the situation." (Astington, 1990).

It is possible that the term "problem" is used here in the general meaning of "obtaining a desirable situation". If this is the case, then *every thinking process resulting in a desirable outcome can be regarded as "problem solving"*. But in a more restricted meaning, solving problems does not include concepts such as "understanding" or "clarifying a situation". Often these processes are regarded as part of the perception, and thinking as a process of working on the perceptions for the purpose of solving problems. Thinking will be regarded in this paper a kind of insight, which we direct at the experience in order to examine, understand and enrich it. It is not intended here to deal with intentional processes of problem-solving such as in mathematics, logical mathematics, etc. Naturally, these have their own validity and use, but they can be used only after the first stage of thinking (perception) has occurred. In ordinary life, this first stage is usually the most important one.

There is no one sufficient definition of thinking; most definitions are adequate to a certain level. Defining thinking as a "mental activity" is a correct definition as it includes all the aspects, but it is not particularly effective. On the other hand, the definition of thinking as "logic and reasoning" is also correct though includes only one aspect. The definition we will use here is as follows: "Thinking is a conscious study of the experience for a certain purpose". The purpose could be *understanding, making a decision, planning, solving a problem, judging, taking action, etc.* (Baron, 1985a; Baron, 1985b).

Information based on the "education triangle" is: knowledge, intelligence and thinking. Intelligence is an innate characteristic, which is connected to genetics and early age developments, or a combination of the two. It is likely that one day we will discover that what we refer to as intelligence is just the speed of data processing within the brain, which provides the thinking person a larger review space in a given time frame. It could be that intelligence depends on the rate of destruction of a certain enzyme operating in a certain synaptic site within the network of neurons. Thinking is the skill of operating intelligence on the experience. A connection has been found regarding the relationship between thinking and intelligence. Knowledge or information is the basic substance thinking deals with (Collins, 1989; Collins, 1993).

It is true that on the one hand thinking would be impossible without some kind of knowledge in the relevant field. But on the other hand, a perfect knowledge would make thinking redundant. Information and thinking are required between these two extremes.

All too often it is assumed that where subjects studied at school are concerned, information is more important than thinking. Thinking is only known as an auxiliary for the absorption of information, its classification and its storage in the proper location. It is much easier to study information than thinking. Information can be tested objectively with the help of examinations. Seemingly, within a defined and closed subject, information can indeed replace thinking to such an extent, that thinking would seem as a mere guess (De Bono, 1983).

Some scholars are so proficient in their field they can be graded as brilliant. But outside the areas of their expertise their abilities are much more restricted as information can no longer replace thinking. The constant aspiration to obtain information is admirable, but waiting for the perfect information is impractical. In our world one should make decisions and act, and since knowledge is usually imperfect, it should be supplemented by good thinking (Ennis, 1987; Ceci, 1990).

The ratio between information and thinking can be referred to in two types of situations: the first type – there is a possibility of collecting a great deal of information; the second type – there is no possibility of collecting the proper amount of information. In situations where information can be collected, there is often a feeling that such collection is more important than thinking. As a result, science has almost been destroyed by the development of statistics as the producer of information. Statistics can apparently provide endless amounts of information – in direct proportion to the effort invested. This fact leads to the assumption that enough amount of information will eventually be collected so that a new idea will appear. The history of science proves otherwise. History shows that if one observes existing information in a different way, it will be possible to reach new concepts. The human mind cannot absorb pure facts. Such facts become information only when observing them through the spectacles of an idea. Einstein looked at facts, which had been discovered through Newton's idea and when observing them in a new way, he reached a different conclusion. The never-ending interaction between information and ideas cannot be ignored. Ideas are created by adjusting thinking to information. When we collect information, we collect facts which are formulated according to old ideas. In order to improve these ideas, we need thinking and not just additional information. Until recently it was thought that dinosaurs were extinct. Now it is believed that they evolved to become birds. This example illustrates the reciprocal influence between science and ideas. In other words, even when it seems that a certain subject should be supplemented by information it still does not annihilate the need for thinking (Feuerstein, 1980; Ericsson, 1991).

In situations of the second type it is not possible to complete the subject by supplementing information. Nearly in all situations where decisions, plans or actions are involved there is a need and thirst for more information. Nevertheless, such information either cannot be obtained or not obtained within the required time frame. In theoretical subjects such as science, history and literature it is possible to wait patiently for the discovery of information, but in practical situations such a condition is rare. Furthermore, in practical situations reference is usually made for the future: What will happen if I do so? How will people react to that? If I don't act, will the situation develop this or that way? In order to refer to the future, we must make an effort and turn the past experiences (the only experience we can have) worth using, and to formulate decisions and plans which are capable of dealing with a number of alternative situations. All this requires a significant amount of thinking (Chase et al, 1973; Chi et al, 1981; Heyes, 1981; Glaser, 1984).

The problems presented in study texts are generally closed problems, i.e. there is a predefined and known solution and all the required information is provided (or has been provided). Most real-life problems are open problems, i.e. there is no unequivocal solution and much of the required information is missing.

It is worth remembering that information is not a substitute for thinking, and thinking is not a substitute for information. They are both needed. (Dweck & Bempechat, 1980).

Eloquence and fluency often appear as thinking. Naturally, the ability to invent thoughts and put them together fluently requires certain knowledge of the skill of thinking but, by itself, it is no more than the skill of grammatically putting together a number of ideas. Language practice and a domestic environment of well-expressed people contribute to the development of lingual expertise. In many cases thinking is lacking because the thinking skills themselves are not as developed as the linguistic skills, and thoughts are forcedly spilled into the vacuum created by fluent expression. The skills of expression are no more than skills of expression (Kahncman, 1982; Herrnstein, 1986).

It will be a mistake to assume that a well-expressed person is also a good thinker, as it will be wrong to believe that a person who lacks the skill of verbal expression is also a bad thinker. We need language in order to enable other people to know what we are thinking about, but grammatical fluency by itself is not identical to thinking. It will be extremely difficult – and maybe even impossible – to evaluate a person who is not capable of properly expressing himself verbally, but it does not mean that such a person has deficiency in the skill of thinking. There were students whose verbal ability was so low that they were defined as retarded, but during thinking lessons they flourished as thinkers (Kuhn, 1991; Langer, 1993).

Language depends to a great extent on a person's background. It could be that thinking skills also depend on background but probably to a lesser extent. There is a collection of thousands of drawings painted by children of the 5-12 age groups. It has been found that there is significant difference between the visual expression (in drawings) and verbal expression (in the accompanying caption). A child who has poor lingual skills might express complex concepts through drawings. A child does not have extensive accessibility to words except for speaking with his (her) parents and the reading he (she) does, and he will develop the use of words only under the condition he has the possibility and the tendency for that. He has a greater chance of developing and examining the world around him visually – through television, picture books, etc. – since vision is not a studied skill as reading is (Leslie, 1988; Newell, 1990).

It used to be claimed that thinking could not be operated without a repertoire of language-based concepts; that language is the basis of thinking itself rather than merely a means of expression. Today this opinion is less supported as a result of research which shows that in underprivileged cultures thinking might be as effective as in advanced cultures, even if the way of expressing thinking might seem limited. Thinking does not have to occur in words. Concepts, too, are not limited to those words available for their description. Thinking could be comprised of very clear images and feelings, but shapeless as far as being described by words (Nickerson, 1985). It is essential to understand the ratio between speech and thinking due to the two dangers mentioned earlier: one is coming out of the assumption that a person who lacks speaking skills is bound to be lacking in thinking skills as well as lacking the ability to develop such skills; and the other is the mix up between fluent expression and skilled thinking. These two dangers are found in schools where a lot of emphasis is put on verbal expression, and justifiably so. That is the way it should be since communication is more important than anything else. Nevertheless, a verbal skill by itself is not enough. It is accustomed to identify the skills of writing and speech with the skills of thinking. An essay written clearly and fluently might testify verbal skills, but these skills themselves do not testify thinking skills. We must look beyond the verbal skills and try to develop thinking as a skill as well. We need both of them (Ohlsson, 1990; Ohlsson, 1993; Olson, 1993).

The epidemiology of cardiopulmonary arrest in children is different from that in adults. Primary cardiac standstill in young children is rare. Another reasons which can be defined is that the process or thinking and handling stress situations among doctors, nurses and paramedics is different because the difference starts with the patient's age that requires a different treatment and thinking process. It starts with babies who do not cooperate and panic by the mere sight of the nurse, paramedic and doctor, and that causes stress among the team and loss of the thinking process. Therefore, while treating a child, a lot must be invested in teaching medical students how to perform life support in babies, and even invest in the process of the birth of babies (i.e. start from the delivery room) to improve statistics of handling emergency situations associated with difficult births thus reducing mortality rate. This is a way of improving the process of thinking, making decisions and handling difficult situations.

Ventricular fibrillation was reported only in 10%-15% of the children under the age of 10 who experienced a no-pulse cardiac standstill outside the hospital. Tachycardia or ventricular fibrillation generally appears among children after the age of 10 as a result of drowning, or among children with complex heart defects or children who experience cardiac standstill while still in the hospital. Cases such as injury or disease, which cause respiratory failure or hemodynamic distress, are more common, and they develop to become heart-respiratory failure with hypoxemia and acidemia, up to asystole or no-pulse cardiac standstill. The chances of survival outside the hospital without damage as a result of pediatric cardiac standstill are extremely small. Most reports indicate survival chances of 10%, and many of the cases in which life support was performed, remained with irreversible neurological damage (Zariasky et al., 1987). Slightly higher survival chances were reported in cases where ventricular fibrillation appeared in the first electrocardiogram. On the other hand, in the case of apnea along (without cardiac standstill) the survival chances are higher than 50% if a quick life support is performed, and most patients survive without neurological damage (Gllis et al., 1986).

Moreover, pediatric basic life support (PBLS) and pediatric advanced life support (PALS), which were performed outside the hospital improved the results of treatment of drowning victims who suffered from no-pulse cardiac standstill. For the purpose of improving the results of pediatric life support, proper life support performances outside the hospital should be encouraged while emphasizing effective ventilation and oxidation for the prevention of cardiac standstill (Schoenfeld at al., 1993).

Cardiopulmonary arrest in children is more common before the age of one year as well as among adolescents. The most common reasons for cardiopulmonary arrest in babies are intentional damages, apparent life-threatening events (ALTE), airways diseases, airway obstruction (including inhalation of foreign body), drowning, sepsis, and neurological diseases. After the age of two, the most common causes of cardiopulmonary arrest outside the hospital are accidents (Lewis et al., 1983).

In 1966 and 1973 large-scale national conferences took place in the USA in the subject of basic and advance life support (PBLS, PALS and ATLS), but these conferences only dealt with adults' life support. The only reference to children and babies was in the list of drug doses. In order to rectify this, a workgroup convened in 1978 headed by Dr. Leon Chameides under the sponsorship of the American Heart Association (AHA) and the Subcommittee for Heart Treatment Issues. This group formulated basic pediatric life support standards and determined directives for the life support of infants.

Its recommendations were accepted by the American National Convention in 1979. In the 1985 convention three lecturers were requested to talk about life support among the pediatric population. In three designated meetings – Pediatric Basic Life Support (PBLS), Pediatric Advanced Life Support (PALS) and Infant Life Support, the directives and recommended were rearranged and rephrased. These determinations were later adopted by the American Academy for Pediatrics (AAP). In the following convention, in 1992, many pediatricians already took part from different pediatric specialties and subspecialties (Kouwenhoven, 1960; Kahneman et al, 1982).

In December 1983 an American National Convention took place on the subject of life support in children and infants, again headed by Dr. Leon Chameides and sponsored by the American Cardiac Medicine Association. Representatives from many American associations and organizations participated in this convention including: the Section of Pediatric Emergency Medicine, and the Newborn and Embryo Committee of the American Association of Pediatrics (AAP), the American Academy of Family, American Medical, American College of Surgeons, American College of Cardiology, Physicians National Prenatal, Canadian Heart Foundation, American Society of Anesthesiology, Nurses Association of the American College and the Association of Obstetricians and Gynecologists.

The convention raised the urgent need of a designated study of advanced life support in children, babies and newborns, and determined the general pattern for such professional advanced studies.

Three courses in this subject took place in 1988 as well as training and study classes, which trained pediatric life support guides. The responsibility for teaching basic and advances life support in children and babies in the US is in the hands of the American Heart Association (AHA). Teaching life support in newborns is the responsibility of the American Association of Pediatrics (AAP).

In 1994, In Israel, PALS courses started to take place in Schneider Hospital for Children as well as ATLS courses in Asaf Harofe Hospital. Three years later these courses were already taught in most hospitals in Israel, and this testifies the process of thinking relating to the previous deficient treatment of patients, because without those courses babies and children would lose their life.

Thinking is an action that occurs almost all the time. We think when we try to solve a problem that bothers us, when we wish to choose one of several courses of action facing us, when we consider disadvantages vs. advantages, when we plan our day or the coming vacation, and even when we summarize the events of the past day to ourselves or relive visions from our last holiday.

Thinking is every process that “takes place” in the mind, and “thought” is everything through which a person can relate to something, which does not form a direct part of the external environment. I.e. thinking, as I use this term is not just a description by the perception or remembering of something that exists but rather the use of information about an existing thing in order to reach something else.

Our thinking is not always aimed at a clear and defined goal. Often our thoughts just roll ahead as if by their own inertia, and sometimes we even find it hard to answer the question what we are thinking about as a certain moment.

As to the assumption raised here, same as regarding my general outlook, the existence of the world and the existence of causality are to me quite obvious. *One of the basic characteristics of thinking is its power to foresee outcomes*. This characteristic makes it extra-meaningful as far as adjustment and creativity are concerned. As a result, we are capable, for example, to plan and demonstrate a process of life support on a mannequin or a simulated patient while taking a sufficient safety coefficient regarding saving the patient’s life, instead of carrying out the life support process in a real situation and argue retroactively how he would hang on or collapse. We can also foresee the outcome of hidden physical or chemical processes whose theoretical value is sometimes greater than their practical value. In all these cases the process of thinking, when putting it in the simplest words, is as follows: a person watches some kind of an external event or external process and reaches some kind of a "conclusion" or "forecast", either verbal or numerical: these words or numbers express, describe or relate to some external event or external process, which would really happen had the reasoning of the person been correct. In the process of reasoning the person can benefit also from words and numbers.

The fields of interest of psychology as an investigating discipline moved back and forth between focusing on internal thinking processes and focusing on predictable behavior, and back to the research of thinking, etc. At the beginning of psychology as a science, Wilhelm Wundt and the Structural Trend focused on the attempt to understand how a person thinks and creates his knowledge about the environment while organizing his perception. Their research approach was based mainly on introspection: when people reported on this kind of observation, they described the thinking elements that contributed to the creation of perception. Another more objective research method of this trend was based on measuring the reaction time and was called "mental chronometry", i.e. mental time measurement: respondents were given various problems to solve, and the time required for that was measured. The time dimension provided information on the complexity of the problems.

The behaviorist approach, which opposed structuralism, claimed that the objective of psychology was to study only behavior, which could be directly observed, and therefore the psychological study of thinking was pointless, as it was undoubtedly an internal process, which could not be predicted directly. The behaviorist approach was indeed dominant in American psychology but did not find many followers in Europe where the Swiss psychologist Jean Piage was studying the development of thought among children since the 20s by way of original methods. Appearance of the first computers enhanced the interest in thinking and the method of solving human problems, since they were used as models for the development of computers. Under their influence the American psychologists went back to the study of thinking, and today their cognitive approach is widespread and tries to deal with understanding the ways of thinking in more complex and subtle ways than just internal observation. The term 'cognition', which is a basic term in this approach, includes all the cognitive aspects – attention, memory, thinking, imagination, planning, problem solving, decision making and communication.

Aristotle claimed that thinking is a process characterized by two principles:

Thinking is done with the help of **images**: it is not possible to think without images, and this supports my claim that life support carried out with mannequins requires a lot of imagination in order to get to the solution of the problem;

Thinking is a chain of **associations**: one thing leads to another, one thing is connected to the other, and this supports my claim that in the event of a multi-systemic resuscitation in the course of life support, there is a chain of associations where one depends on the other in order to get to the solution of the problem.

Thinking requires the ability to imagine objects and events that are not physically present when we teach doctors, nurses and paramedics to practice life support situations on a non-existent patient. We are required to imagine the patient and the different activities. We do it with the help of representing symbols.

9. The influence of stress situations on the process of thinking:

Stress among doctors, nurses and paramedics, in the process of life support or emergency situation has not been investigated, unlike the concept of "stress" being investigated for many years by various researchers who, each in its own way, tried to defined this concept and put it in a comprehensible framework.

In defining the term "stress", researchers are divided to two general schools: stress – as a biological approach, and stress – as a psychological approach. Linn (1985) in Lazarus & Folkman (1984) says that already in the 14^{th} century the term stress was defined as a general bad feeling of a person. Such a phenomenon is typical of the medical and nursing staff during life support situations. This is expressed by four reactions:

1. **Physical reactions** – during a life support situation in which the medical and nursing staff finds itself, the major physical reactions are: increase in heart rate, increase in blood pressure, increase in tonus, increased perspiration, increase in respiratory rate, change in the brain's electric activity and increased secretion of the adrenaline hormone. These signs and others indicate a condition of high excitation of the organism. The body uses a tremendous amount of energy even when the stressful situation does not require any physical activity. The changes in physical reaction could cause a change in the processes of thinking, making decisions and solving problems. Selye (1992), one of the founders of the stress research bases referred to the more continuous physical results of the exposure to the stress stimulus. He called the process occurring in the organism's body as a result of exposure to continuous stress, a General Adaptation Syndrome. According to his theory, this syndrome is composed of three stages: the first stage – the stage of alarm, occurs immediately upon exposure to the stimulus and is characterized by increased excitation of the autonomic nervous system; the second stage – that of resistance, is characterized by processes of confrontation and adaptation of the body to the stress stimulus. If the stimulus is removed or if the organism is incapable of reacting effectively, then starts the third stage – called the fatigue stage, which is

characterized by physical exhaustion and decrease in resistance, in the thinking ability and in the ability to solve problems and make decisions.

2. **Cognitive reactions** – in the cognitive functioning, at the time of stress in life support situations, thinking quite often becomes unorganized, unsystematic, rigid and dichotomic. There is a decrease in concentration, the memory is harmed, attention is narrowed down and serious, sometimes fatal, mistakes take place in the process of problem solving and decision making. Researches carried out with humans under pressure show that people tend to make decisions based just on a partial scanning of the alternatives at their disposal; that in the process of making decisions clinging to one alternative could be fatal. In the mental level, medical students feel embarrassed. In our opinion, the judgment processes are harmed, a fixation on one idea or one figure is discovered in the thinking process, the connection is limited and the medical student is incapable of reviewing the events. Instead he goes back to the same burdensome matter time and again. The person might think over and over again about the past, about other events preceding the event; relevant information, which could assist in handling the event, does not enter the mind. On the other hand, due to weakening, similar past situations where the person has failed come to mind freely, burden it and reduce the ability to analyze the situation and make an operative decision. During a life support situation, concentration, memory and thinking processes are influenced by stress situations. Exactly in such situations, where we need a good judgment ability in order to find ways to handle them, our thinking is disturbed. In stress situations our thinking method is somewhat influenced by the expected outcomes of the situation we are in. In stress situations, the lack of attentiveness leads to restlessness and nervousness. Naturally, the coping ability of the organism decreases in such situations. In stress situations there are sometimes memory disruptions. The reason for that is probably connected to difficulties in the transition from short-term memory to long-term memory. In stress situations our ability to rehearse weakens and the mix-up in thinking and memory causes inability to remember the exact priorities relating to emergency situations or to intensive stress (Selye, 1992).

3. **Emotional reactions** – in this category, emotional reactions are included such as: anger, anxiety, fear from what might happen, depression, jealousy, shame or guilt as a result of the death of a patient in the course of treatment. Sometime a single emotional reaction appears and sometimes a combination of several emotions together. The harm caused to judgment brings about the inability to cope with the event and as a result the person becomes stressed and frustrated and helpless. This situation awakens similar past failures, which strengthens the

inferiority feeling that further intensifies the inability to think rationally, and so on and so forth. (Selye, 1956-1974; Facione & Facione, 1996).

4. **Behavioral reactions** – another outcome of the mental stress is expresses by the external behavior of the individual. One of the prominent outcomes in this sense is the behavioral expression of the physiological fight-flight reaction (Selye, 1956, 1974).

In researches conducted by Schwats et al (1981) respondents were asked to think in the most vivid manner about experiences in their life when the felt happiness, stress. While thinking about such events the following physiological changes were measured in their body: heart rate, systolic and diastolic blood pressure – which in happiness remained unchanged and in stress testified an increase. There are additional factors, which influence the reactions to stress such as the intensity and length of the stress situation. Obviously, the greater the intensity and the longer the duration of stress – the stronger becomes their influence. On the other hand, additional medical support in emergency situations reduces the intensity of stress and makes the coping of other doctors easier.

Walter Cannon (1932) (in Lazarus, 1966) gave the concept "stress" a biological meaning and claimed that this is a situation which is inflicted on the person by external factors and which causes changes in his body such as cold, shivering, lack of oxygen, lack of concentration, defective thinking and a decrease in the level of sugar in the blood.

Scott et al (1980) claim that stress stems from interactions between the individual and the environment when the individual perceives a stimulus as harmful and threatening. The demands of the environment from an individual can be social, cultural, psychological and physiological where, basically, each represents a mismatch between the demand and the resources at the disposal of the individual for dealing with it.

Don Nevad (1979) (in Raviv, 1980) perceives stress as a factor which is operated by the external or the internal environment on the organism and disturbs its balance.

Selye (1956, 1974) relates to stress as a biologically-originated concept and defines it as a general unified reaction of the body when it is exposed to various types of stresses such as different diseases or a situation of mental conflict but without physical injury.

The approach of Lazarus (1966) to stress is psychological-cognitive. He defines stress as a special relation or connection between the person and the environment, which is estimated by the person as threatening his ability to cope or as being beyond his resources hence threatening his wellbeing (Ford & Profetto, 1994).

Lazarus & Folkman (1984) mention that psychologists have defined stress mainly as a stimulus. Their definitions focused on threatening events in the environment such as natural disasters, harmful conditions, diseases or life support situations.

Shiron (1982) says that the concept of stress refers to a threatening external factor, which presses the individual and exhausts his resources; a stressful situation could have a pathological impact on the individual

Glass (1977), in defining stress, refers to a stimulus, a reaction and the cognitive action mediating between them. Stress is a stimulus, which is perceived by the individual as threatening and as a result the individual makes efforts in order to remove or lessen it by direct or indirect actions. The estimation of threat depends on the stimulus itself and what it means to the individual as far as his intellectual resources and handling strategies are concerned.

Durkheim & Marx Weber (1973) (in Lazarus & Launier, 1978) write about stress as an abnormal situation, where a person cannot cope with the norms leading to achieving social goals, such as helplessness, lack of discipline and loneliness.
The source of stress or the stimulus causing it is called Stressor.

Benjamin et al (1987) and Lazarus (1966) indicate that the Stressor is perceived as the cause of stress regarding three main categories:

1. Stress as a reaction to demands required from the body.
2. Stress as a stimulus or event or a series of circumstances which require extraordinary reaction.
3. Stress-transaction – the result of a connection between the person and his environment, which threatens the wellbeing of the individual and requires him to invest resources. This is very typical in life support or emergency situations.

In this paper Lazarus's comprehensive definition, regarding a stress-transaction psychological-cognitive approach that perceives stress as a connection between a person and the environment, which is estimated by the person as threatening his wellbeing and requires him to invest resources, will be adopted. The said investment of resources is carried out by evaluation and coping. Evaluation and coping are a transactional-cognitive process through which an interaction between the person and the environment takes place. The cognitive evaluation and coping serve as mediators in the connection between the person and the environment.

The person's abilities to evaluate and cope with the environment are the factors that will determine the nature of connection between them and the future consequences of such connection.

According to Lazarus & Folkman (1984) three processes take place in the person's cognitive evaluation of the stress situation he is in:

- An initial evaluation where the individual evaluates his motives and needs, and asks himself: "What does it mean to me, am I in trouble?"
- A secondary evaluation where the person asks himself: "What can I do about it?" In other words, it means handling that includes behavioral and cognitive strategies. If, according to the initial evaluation, the situation has been defined as stressful, then at the stage of secondary evaluation an answer will be given to the question: "What can I do, if at all?"
- Re-evaluation – the secondary evaluations regarding the handling options and the initial evaluations regarding the event operate on each other in connection with defining the stress level and the intensity of emotional reaction. The stress level of a person (doctor, nurse, paramedic) who fees helplessness in dealing with a certain demand, will be relatively high. When the initial and secondary evaluations have been completed there is sometimes a change in the individual or the environment as a result of the coping and/or non-coping, so it is required to make a re-evaluation. This relates to a changing evaluation of the extent of the threat of challenge – based on new information from the environment. The process of evaluation is circular and continuous.

According to Lazarus & Folkman (1984) coping is a process by which the individual deals with demands from the person-environment connection. Such demands are estimated as causing stress and evoking emotional reactions. Coping is defined as cognitive and behavioral efforts that are constantly changing, efforts to deal with specific external and/or internal demands, which are estimated by the individual as being beyond the reach of his resources.

This definition has an orientation of a process rather than a characteristic as it is connected to what the person has actually thought or done in a specific context, and the changes occurring in such thoughts and actions at the time of emergency.

According to Billings & Moos (1984) Coping is a collection of perceptions and behaviors a person makes use of when evaluating Stressors, reducing the stressful circumstances and moderating the emotional awakening accompanying the experience of stress.

The researchers Atkinson et al (1987), Caplan (1976), Cohen & Lazarus (1973) and Billings & Moos (1984) and Gessner, (1989) differentiate between two types of activities when coping with stress situations:

1. Instrumental activity aimed at solving problems, influencing the event and canceling it or reducing its side effects.
2. Emotional activity – aimed at relieving the emotional stress and awakening caused as a result of the stress threat. This activity is not aimed at solving the problem.

The type of coping carried out by the instrumental activity is generally called "problem focused" and the type of coping carried out by the emotional activity is generally called "emotion focused".

Pearlin & Schooler (1978) and Lazarus & Folkman (1984) mention that it has been found that people tend to combine these types of coping and the amount of combination depends on the specific stress situation they encounter.

In situations where the coping aimed at the mission is likely to remove the Stressor, the problem-focused type of coping will be effective. On the other hand, in problems where the Stressor cannot be changed of reduced – the preferred mode of coping will be the emotion-focused one. Some situations require the use of both styles in order to handle the stress situation.

The problem-focused handling in a life support situation can involve several activities such as: definition of the problem, planning, trial activity, seeking help. This style could also be cognitive whereby the person changes something within himself instead of changing the environment, e.g. changing the level of aspirations or finding another source of satisfaction.

The problem-focused style relates more to situations of moderate pressure level where it is estimated as capable of being changed. The researchers Atkinson et al (1987) mention that the emotion-focused style appears when the person experiences a high level of stress and decides that nothing can be done to change it. The emotion-focused style does not change the situation but only the way the person perceives it.

In most cases, the problem-focused style is the most efficient and it has been found that this style is prevalent among the majority of people.

Pearlin & Schooler (1987) and Lazarus & Folkman (1984) mention that as not all problems can be solved, we are likely to also find the emotion-focused style whose purpose is to keep the hope, raise the morale and continue functioning.

The theoretical framework chosen for this paper perceives "stress" as a special connection between the person and the environment, which is evaluated by the person as threatening. This threat obligates the person to make an evaluation of his situation and try to find ways of coping with the threatening situation. The methods of coping the person has chosen are those which will determine the results of the threat situation, namely: the "stress". In this paper – the paramedics, medical and nursing staff are the person; the environment – is the stress situation in which they find themselves at a time of life support; and the connection between them is perceived as the stress situation which requires the paramedics, medical and nursing staff to perform a process of evaluation and coping, the results of which are likely to affect their reactions to hospitalization in the future (Gillis et al, 1986).

10. How threats and pressure influence thinking

The Hypocrites Oath stipulates that the first rule in medicine is not to harm the patients. This rule might as well apply to educators. Excess pressure and threats at med and health sciences schools are the major factor for poor academic achievements. This is a strong statement, but it no longer sounds unreasonable after noticing the many potential threats made to the students and the way the mind reacts to each of them. This chapter focuses on the negative effect of threats and high pressure on the mind, the behavior and the learning ability (Passmore, 1967; Paul, 1990).

Threats have always been used as a major weapon in directing the behavior of people. When studying in the medical school was a matter of choice, threats did not mean that much because an upset student could have just walked away. Today, on the other hand, students find themselves forced to deal with threats since their attendance at school is compelled by law (Hull, 1920; Perfetto, 1983; Perkins, 1986).

When we feel stressed our adrenal glands secrete a peptide called cortisol. Our body secretes cortisol every time it encounters some kind of danger – whether physical, environmental, academic or emotional. Thereafter a series of physical reactions is activated which include, inter alia, suppression of the immune system stretching of the big muscles, blood clotting and blood pressure increase. In fact, this is exactly the reaction that occurs when a dangerous predator unexpectedly appears, but in school such reaction could cause problems. Chronically high levels of cortisol cause the death of brain cells at the hippocampus – a situation significantly affecting the creation of specific memory (Salomon & Perkins, 1984; Perkins & Salomon, 1989).

These physical changes are meaningful. Robert Sapolsky, a scientist at the University of Stanford, found that the levels of hippocampus degeneration among Vietnamese who suffered post traumatic pressure disorders, ranged between 8 and 24 percent over an above the control group. Chronic stress also harms the ability of a student to distinguish between what is important and what is not (Polya, 1954; Polya, 1957; Perner, 1991).

Jacobs et al (1997) claim that thinking and memory are affected by stress, stress harms the short-term memory and it can create long-term memories (Salomon, 1989).

There are other problems as well. Chronic stress intensifies the susceptibility of students to diseases. One of the researches found a depressed immune system among students during test: they had lower levels of an important anti-infection antibody (Janis & Frick, 1943; Jeffress, 1951; Johnson & Steedman, 1987; Johnson, 1983). This could explain the academic vicious circle: more pressure as a result of tests causes more sickness, which result in missing more lessons, resulting in lower grades in tests. There are differences between a stressed neuron and a non-stressed neuron. The dendrites of the stressed neuron are fewer and shorter and as a result the communication with other dendrites is damaged. What causes such a dramatic difference? The social status changes both the attitude and the behavior. One of the reactions of the body and brain to such changes is that there are higher levels of serotonin as well as changes in the neural structure. This evidence indicates the potential value of leadership variations among class groups (Shiffrin & Schneider, 1977; Siegel, 1988).

A stressful physical environment affects the failure of students. Crowding, bad relationships among students and even lighting could have an effect here. The optometrist (Ray Gottlieb) says that pressure at school causes sight problems and consequently harms the academic achievements and self-esteem. He claims that a typical reaction of a child to stress includes reduction of breathing and change of the way it focuses its sight. This behavior pattern damages the learning ability – both in the short run and in the long one (Stocker, 1980; Swartz, 1988).

Under pressure the eyes become more alert to the peripheral visual field – a natural reaction intended at an early detection of predators. As a result, it is almost impossible to follow a printed page and focus on small areas. Is this the exceptional situation or the typical one?

In order to answer this question, the psychiatrist (Wayne London) replaced the lighting in three elementary school classes in Vermont. Regular fluorescent bulbs were installed in half of the classrooms, and in the other half there were bulbs simulating natural light (full-spectrum light) (Segal & Glaser, 1985). Students in the classes where full-spectrum light bulbs were installed missed study days due to sickness less than half the times the students of the other classes did. The explanation for this is that regular fluorescent lighting flickers and makes a weak buzzing noise. These phenomena are hard to trace but have significant influence. It seems that the brain reacts to the visual-audio stimulus by raising the levels of cortisol in the blood and by increased blinking – which are both signs of stress. In another research, elementary school kids who studied in classes with natural full-spectrum lighting missed fewer days and reported being in a better mood.

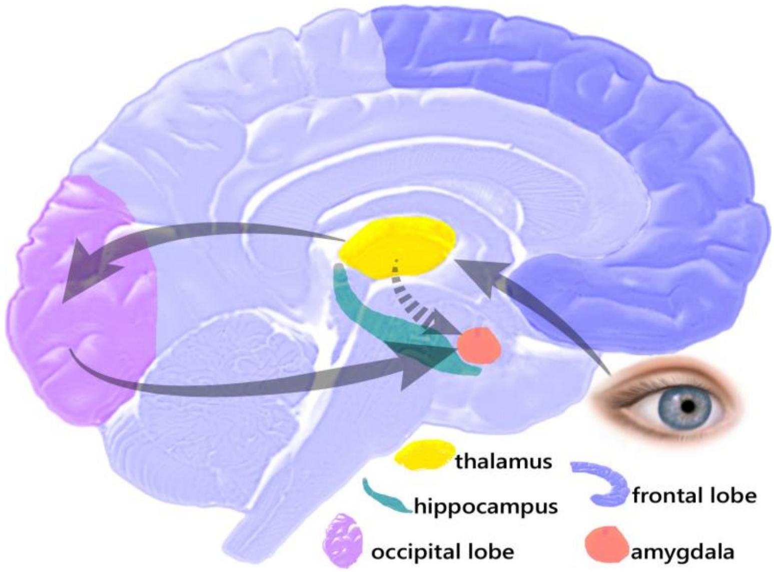


Fig. I Emotional thinking in stress and emergency situations

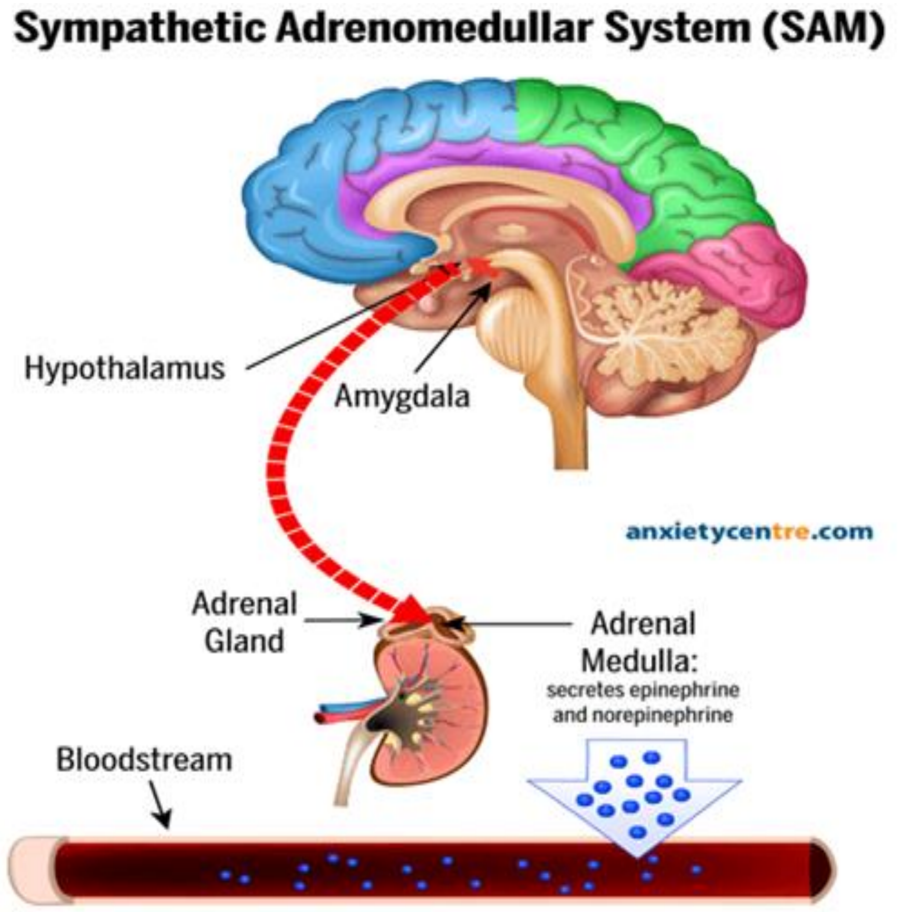


Fig.2 Symphathetic Adrenomedullar System

A visual signal passes first from the reticulum to the thalamus where it is translated to brain language. Most of the message passes to the cortex, and analyzed and evaluated there, in order to understand its meaning and create a decision on the correct reaction; if the reaction is emotional, the amygdala receives a signal to operate the emotional centers. However, a smaller part of the original signal passes directly from the thalamus to the amydgala by a quicker transmission, which enables a faster reaction (though less accurate). In this way, the amygdala is capable of causing an emotional reaction before the cortical centers have fully understood what exactly was going on.

The use of computers or video films in class could badly affect the eyes as well. This is problematic for all ages; however, it is problematic for other reasons when young pupils are concerned. The eyeballs of young pupils are very soft and could become distorted as a result of lengthy focusing on close objects – focusing which is much more difficult for the eyes compared to the long-range more relaxed vision. According to neurophysiologist (Dee Coulter) it is very hard to keep the eyes focused on a flat screen lighted from behind (Siegel, 1988). Many children spend as mush as five hours a day watching TV, video games or in front of the computer. As a result, says Coulter, adolescents and teenagers need glasses years before what used to be customary in the past (Sternberg et al., 1981; Sternberg, 1985).

Social situations can also create a source of stress. Stress hormones such as cortisol are typically released under stress, but the levels of serotonin are also influenced by such situations. Low levels of serotonin were connected in the past to violent and aggressive behaviors. For example, a student who is very dominant at home but only "one of many" at school will become more impulsive. Some of these students will flourish all a sudden if they are given the chance to stand at the head of a group. Researches indicate that the status in class and the social hierarchy could change the brain chemistry, and actually even do so. It seems, therefore, that it is important to change roles often in order to make sure that each of the students is given an opportunity to both lead and be led (Vygotsky, 1978; Stocker, 1980).

Another source of social pressure relates to the fact that our expectations are only rarely fulfilled. Among adults every day is filled with dissatisfaction as a result of noise, edgy drivers, malfunctioning photocopy machines, colleagues who forget their promises and computer failures. Such situation is no different when students are concerned. A typical day at school is full of expectations and disappointments, failed projects, lower-than-usual grades and classmates who do not act as expected. All these "mishaps" are likely to result in stress. What is the solution? To provide foreseeable situations through school and class rituals! Predicted events such as a paper returned on time or applause of friends could relax the tense mind (Wales & Stager, 1987; Wellman, 1985).

A small amount of pressure does not always harm the learning ability. (Seymore Levine) from Stanford University showed that young rats, which had been exposed to stressful experiences, functioned better in maturity than a control group which was not exposed to stressful situations (Wellman, 1993). But the rats were not required to write research papers. These researches remind us that the army is known for its creation of intentional stressful environments. Integration courses for intended pilots or sailors require numerous missions which have to be performed perfectly (Wertsch, 1978).

In order to force recruits to comply with the standards, they are exposed to threats of physical punishment (push-ups, running, additional duties). But all this intended pressure is for a good cause: the real fighting is both stressful and threatening. And more important – only rarely the recruits are required to think creatively, a skill that is badly affected by pressure. In short, under most learning conditions, low to medium levels of pressure are ideal. There is no place at school for high levels of pressure or threats.

It is worth mentioning that outwardly different people react differently to potential threats. Some disregard them and some happily meet the challenge. For others, threats are devastating. Nevertheless, the brain always reacts to threats in predicted ways. The moment the threat is located, the brain shifts to "high gear" (Brandt, 1984; Baron & Sternberg, 1986; Barman et al., 1989; Black & Black, 1990).

The amygdala is found at the center of all our fear and threat reactions (Costa, 1991a). It focuses our attention and receives direct and immediate messages from the thalamus, from the sensory cortex, from the hippocampus and from the frontal lobes. At this stage neural extensions (groups of fibers) from the amygdala operates the entire sympathetic system. Typically, it causes the secretion of adrenaline, vasopressin and cortisol, which immediate change the way we think, feel and behave (Costa, 1991b).

Alan Rozanski reported in the New England Journal of Medicine that even sharp remarks and sarcasm could cause irregularity in the operation of the heart among patients who have the tendency for that (Fogarty et al, 1991). New researches reveal that threatening environments can even inflict chemical imbalance. Serotonin is the ultimate regulator of our feelings and the behaviors stemming there from. When the serotonin levels drop, the levels of violence often rise. This imbalance is likely to cause not only an impulsive and aggressive behavior but also lead to a life of violence (Ennis, 1986).

Students who were regularly exposed during childhood to threats and high pressure, and mainly those coming from violent families, are exactly those whose attention is the most difficult to gain. Their vision and voice frequently change; they batter other students or beat them in order to establish their own status. This type of territorial behavior is the source of remarks certain children make to their peers: "Don't look at me this way!" The purpose of such behavior is to remove potential problems. The receptors in their brains have adjusted themselves to the behavior of survivability. Although this kind of behavior is frustrating for teachers it seems totally reasonable to a student who believes his life depends on it (Jones, et al., 1988-89; Fullan, 1991).

The list of possible threats on students is endless. They can take place at the student's home, on his way to school, in the corridors and in class. Threats can include an over-stressed parent who threatens with violence, deprivation of rights at school or at home, a boyfriend or girlfriend who threatens to break the connection or a bully who shouts in the corridor. In class they can appear in the shape of a rude student or an unaware teacher who threatens a student by humiliation, detention or contempt in front of his peers. Each of these events and thousands of others, are likely to make the mind become alert. It seems as if this cannot be emphasized enough: threats activate defense mechanisms and behaviors that are excellent for survival – but bad for learning.

Threats have an additional cost. When the brain senses a certain threat that inflicts helplessness, the person reacts with expected reflexive behaviors. Survival always receives priority over the location of patterns or solution of complex problems. The ability of students to understand connections or locate higher levels or organization diminishes. This fact has tremendous projection on learning, which becomes reduced to a level of memorizing isolated facts. Learners who are not stressed are capable of locating connections, understanding general theories and processing a wider and more diversified material. Therefore, in order to obtain optimal learning, pressure and threats must be removed from the environment, and the creation of feelings of helplessness among students must be avoided (Nickerson, 1985; McTighe et al., 1988; Mirman, 1988).

The research of Langer (1989) has a revolutionary importance regarding the understanding of the emotional life, as he has been the first to discover the neural sensory ways bypassing the neo-cortex. Among these senses, which move on a direct track through the amygdala, some of our most primitive and powerful feelings are included; this circle explains to a large extent the ability of emotion to overcome intellect.

The conventional outlook of the science of the brain claims that the eye, the ear and other sensory organs transmit signals to the thalamus and from there to the sensory information processing areas in the neo-cortex, where they become the signals of the object we perceive, and the signals are categorized accordingly.

A visual signal passes first from the retina to the thalamus where it is translated into the language of the brain. Most of the transmission passes to the visual cortex where it is analyzed and evaluated for the purpose of understanding its meaning and creating a decision as to the correct reaction; if the reaction is emotional, the amygdala receives a signal to activate the emotional centers. However, a smaller portion of the original signal passes directly from the thalamus to the amygdala in a faster transmission, which enables a quicker response (though less accurate). This way the amygdala can cause an emotional reaction even before the cortical centers have fully grasped what exactly has been going on (Jone & Brown, 1991).

11. Dealing with emotional stress situations

The concept of stress has many different definitions. Some look at stress as an event arising from the external environment (stress at work, stress as a result of competition, stress as a result of raising children). According to this approach, stress stems from external sources operating on the individual.

Another outlook refers stress to the person's internal forces, independently of the objective stress situation. This approach focuses only on the individual's reactions to the threatening situations ("He is stressed because he is a stressed individual", "That is his way of reacting to an event", etc.).

This chapter will refer to stress in accordance with the approach of Meichenbaum (1985), who claims that stress is not a stimulus or reaction but rather: an outcome resulting from the actions of a person to the environment. Such actions are influenced both by the person and his environment. I.e., we will refer to stress as cognition mediated by the brain and designed by the environment.

The concept of stress is a relative thing, which is determined as a result of the relationship prevailing between the person and the environment, he lives in. This relationship is influenced by the demands of the environment, the interpretation the person gives to such demands, his evaluation of the stress situation, the resources at his disposal for handling the stress and the concept of the state of danger such stress puts him in.

Stress situations surround us throughout our life, they cannot be prevented but it is possible to learn how to deal with them by using methods of self-control.

The processes of self-control are activated in situations where a reflexive or automatic action is impossible, or disturbed, or when there is a similar chance that activities different from one another will lead to the creation of a conflict.

Most psychological stress situations are the result of an interruption in the normal automatic order of action or thoughts of the person. The immediate result of the interruption is stimulation, which diverts the person's attention towards it. This attention brings about evaluation of the situation (is the stimulation pleasant or stressful). Glass (1977) claims that people under stress situations tend to be engaged in defeatist reactions, and such thoughts and emotions interfere with a normal functioning and create an emotional disturbance.

Benjamin (et al., 1987) claims that stressful people tend to make general and generalized judgments, interpret every event as being personally directed against them, and react in an exaggerated and extreme manner.

There are differences among people in their reaction to stressful situations, and such difference is mainly influenced by the confrontation reactions they operate.

Mirman & Tishman (1988) describes the process of confronting stress as an action composed of three stages: presentation of the stimulation, evaluation and taking action.

Presentation of the stimulation - this is the first stage, when the person experiences an emotional reaction which interrupts the continuation of his planned activity. For example: the husband who is used to finding his wife waiting for him at the end of the working day, will fee anxious and stressful if he returns from work and does not find his wife there.

Conscious evaluation - at this stage the person evaluates the meaning of the interference for him. He is engaged in an initial cognitive evaluation (whether the interruption is pleasant or threatening) and a secondary cognitive evaluation (whether there are ways of handling the interruption and does he have the skills required for such handling).

Taking action - this is the stage of handling the stress, of operating reactions in order to solve the problem.

Handling means to operate behavioral and cognitive capabilities in order to manage, control, reduce, tolerate or change the external and environmental requirements which raised the stress factors.

The importance of the subject of handling stress situations resulted in the development of intervention packages, intended at training a person to deal with these situations (stress inoculation). These packages deal with three central variables:

1. Keeping written record of unadjusted thoughts, imagination and behavior.
2. The skill of solving problems.
3. Training for the self-control of emotions. (Baron et al, 1989)

Meichenbaum (1985) found that a person acquiring these skills develops a learned resourcefulness, which enables him to handle stress more efficiently.

12. Types of thinking

For dozens of years psychologists have argued among themselves regarding the question whether we think in words or pictures and, as in many other disputes, it has become evident that in our thinking we use both words and pictures. In addition, we use abstract thinking, which includes neither pictures nor words. The different types of thinking will be discussed later.

a. Thinking and language

Speech is using the language. Language itself is a set of codes we have developed to communicate with the environment and with other people. Language provides us with useful concepts. It limits us to traditional concepts. Language provides us with handles with which we grasp the world. There is no wonder that linguistically or semantically the relationship between language and thinking has always been very close. The connection between them is so close that many still refer to thinking as a semantic action and to every error in thinking, as a semantic lack of organization. The close relationship between thinking and language stems from two reasons: cultural and physical (Passmore, 1967; Perkins & Martin, 1986; Perkins & Salomon, 1988; Perkins & Simmons, 1988; Perkins, 1991; Perkins, 1992).

Until not so long ago, all the sophisticated thinking was the domain of religious organizations and of semi-religious philosophers. Their method of thinking was known as the highest mode of thinking, as instead of dealing with practical daily matters they dealt with the meaning and purpose of life itself. In short, this manner of high thinking dealt with metaphysics. Since metaphysics does not describe anything but itself, a complex structure of linguistic concepts was created. The reciprocation between every two concepts created a third concept, etc. The only logic was the internal logic. The logical consistency of the structure was presented as proof of its value; in such a situation, logical consistency is identical to semantic consistency. A good illustration for that is the famous proof of Perkins (1984, 1985, 1986, 1992, 1993) of the existence of God: "God is perfect. Perfection must include 'existence'. Therefore, God exists." The transition from the concept of God to the concept of perfection is automatic, since the concept of God has been defined as including the concept of "perfection". In addition, we have created perfection as a concept which does not tolerate any lacking therefore it is not possible that a perfect being does not exist. This is an extreme example, but it demonstrates how the tradition of semantic thinking has been formulated. When words are no longer a means of observing something but the thing itself, thinking becomes nothing but a semantic exercise. Perkins's (1992) proof is not very different from the logic of a nine-year old child:

"Can God do everything?"

"Of course!"

"Can He make a stone?"

"Yes, and everything else."

"Can He make a heavy stone?"

"As heavy as He desires."

"Can He make a stone so heavy that God Himself cannot lift it?" (Polya, 1954; Pavio, 1971; Perkins, 1987; Perkins, 1989; Perkins, 1992).

Historically the Church and the Law were very close, and therefore there is no wonder that the legal system is based on semantic definitions. This is a practical system of legal procedures. It combines the system of precedents and the ruling of the jury in order to provide it with the required flexibility. But recently cracks are being created in this system because clear concepts such as guilt and responsibility sometimes correspond to situations of insanity or social deprivation (Polya, 1957; Salomon, 1983; Perkins et al, 1988; Perkins & Unger, 1989).

The second reason for the semantic influence on thinking is not social but physical. The mind receives an incessant stream of information from the environment. The structure of the mind enables the incoming information to organize into patterns, as described below. The patterns are ideas or concepts. The active-attention system in the mind is an integral part of the method of its function: it is not something being added to the system. As a result, the mind "packs" the environment (both internal and external) in defined packages, which can be identified and used: if we have a linguistic system, a word can connect to each of these packages and then we have a concept and its description; our thinking deals with these pre-organized packages that describe the environment. The packages are of defined size. Information is no longer liquid and independent. We are no longer capable of putting together pieces of information as we wish since we no longer need them. A significant part of our thinking is no longer aimed at the environment but towards the concepts themselves: we try to examine whether it is possible to collect knowledge from one concept and combine it with knowledge from another concept; to see whether the combined concept includes certain information which is required to us, or not (Salomon, 1989).

In our academic institutions the semantic thinking is given too much credit, perhaps because it has been established by the religious authorities. There is also a more practical cause for this admiration. A person who aims his thought at words rather than what they describe, will always feel under control. He does not need more information and it can never be proved that his information is wrong of lacking. Therefore, the scholar who sits in the high tower or the academic world does not feel the need to come down and examine the lack of clarity in the real world where perfect information is an impossible thing. Instead he checks the semantic consistency of the discussion, the words themselves rather than the thoughts they deliver in a manner which is not so perfect. All this will lead to the analysis of the logic, to hair splitting, to scratching the wounds and all the metaphysical exercise arising thereof. This is the easy way and that is how they act (Sternberg, 1985; Wellman, 1990).

If, despite it all, we could ever reach a point where we can imagine a complex industrial system with a feedback loop – from the production and sales to the investment and initiative – then we will be able to observe such a system, and it will not be considered exaggeration to name it: gain, initiative, energy, value reservoir, or anything else. In order to do so we will need a flexible and strong set of images, which is much less classified and separated than language. But, all this is still very far from us.

Once in a while we ought to look at our concepts, our perception and our language. Yet it will be a great mistake – for which our academic institutes are fully responsible – to identify semantic order with thinking skills. We need to observe the object of our thinking, and then think about it. We should not fight among ourselves on the modes of expression in order to gain some points in the discussion (Anderson, 1983; Baron, 1985; Barell, 1991).

b. Thinking and feelings

Recently it has been held by many that what really matters is the gut feeling and that thinking is nothing but a mixture of words. It is based on their experience which proves that thinking, which pretends to be logical, can be used to prove any point whatsoever. Logic and God are always on the side of each of the two debating parties. It all stems from our erroneous insistence that in order to be right it is sufficient to have logical validity. Due to the different initial concepts, logical thinking can lead to completely opposite conclusions. Therefore, we should not be surprised by this situation of disillusionment where stress is shifted from the operation of thinking in favor of gut feeling (Chi & Glaser, 1982).

In principle, feelings are the important thing. A feeling is what makes a person human. Eventually we organize our activities in order to satisfy our feelings and values. The importance of feelings is what makes thinking so essential. Feeling is too important to be used arbitrarily and capriciously, otherwise it will turn to a habit. The purpose of thinking is to prepare something so we can develop a feeling about it. Thinking arranges and rearranges the concept and experience, so we can see things more clearly. Thereafter, such clear vision stimulates our feelings. Without thinking, feeling is tyranny (Bereiter, 1985; Baron, 1987).

"A medical student was driving along a road in Malta and saw a woman who had been hit by a car, which passed there previously. It could have been a hit-and-run accident or maybe that driver was oblivious to what he had done. My friend stopped his car in order to help the woman. Another driver arrived at the scene, saw the parking car and the wounded woman, got out of his car, hit my friend and broke his jaw. Regrettably, his perception of the event was erroneous and misleading" (Bransford, 1989; Brown, 1989).

Feelings are a kind of making. The purpose of thinking is to prepare us for action in every situation. Thus, thoughts prepare us for feelings. Thinking is not the tiresome calculation regarding how many feelings are required, but an attempt to direct the attention and clarify the perception. Thinking should never direct the feelings. It should never try to replace feelings. The function of thinking is to clarify the perception. Then, feelings are the reaction to such clarified perception. Feelings can still be wrong, out of place or exaggerated, but this is a much smaller chance than the attempt to cancel the feelings (Brown, 1989).

In reality it is very difficult to think first and then feel. The dominant tendency is to feel first and then use thinking to support feelings. This tendency is so dominant that even highly intelligent pupils (and adults) express an immediate judgment which is based on feelings and then use their thinking to seek support for that in articles and discussions (Carey, 1985; Ceci, 1990).

The first step in learning how to think is to bypass this immediate judgment, by demanding from the thinker to direct his (her) attention to all the relevant and interesting aspects of the situation and then, in addition to his natural feelings, he also directs attention to the other aspects. A nine-year old girl was very upset due to the fact that, according to her wish, her long hair was cut. Out of fury she locked herself in her room. Much to her parents' surprise, the next morning she showed up happy and smiling. She explained that during a thinking lesson at school she had been taught to intentionally look at all positive and negative aspects, and she made use of that process in relation to her haircut. As a result, she found out it would be easier to swim in the pool and that there were many other advantages to short hair, and then she started being happy about her haircut. In this case, the method helped the girl observe the situation instead of being stuck with her first reaction. Feelings are likely to change as a result of a broader perspective.

We rely on our feelings because we fail to realize how they can be wrong. Feeling are indeed always right – but only within the framework of the world created by the perception we have at a certain time. Unfortunately, we find it hard to accept that our perception could be wrong. It is even harder to agree with the notion that our perception could be limited (Chipman & Glaser, 1985; Collins & Newman, 1989).

c. Thinking in words

Thinking, as aforesaid, can take many forms and sometimes it is verbal and resembles language. A person can "talk to himself" and prepare a shopping list in his mind: he thinks about what he should buy and mumbles to himself. As we have seen, Walse (1978, 1984) believed that psychology should focus solely on the investigation of behavior, but it was nevertheless clear to him that people think as well. He defined thinking as a motorial action, which could be investigated objectively. He claimed that when we think we "talk" to ourselves and such internal talk operates the vocal cords in an extremely weak but measurable way. A research carried out by Jacobson found that this assumption had a certain basis. Jacobson asked people to think about it when they were counting dates. With the help of highly sensitive electrodes he "caught" the movements of the lips, tongue and throat and found they were working while people were thinking. He called such activity "silent talk" (Jacobson, 1932). This idea served as the main subject of a novel written by the French author Andre Morgan (1970), the recipient of a Nobel Prize for Literature, about a mind-reading machine. Morgan describes in the novel an instrument, which is sensitive to the silent talk of other people thus capable of receiving thoughts. The novel is pessimistic since it ends with the decision to destroy the instrument as a result of bad thoughts received by it.

In experiments carried out with deaf people who use sign language, the motions of muscles responsible for the movements of hands and fingers were received (Max, 1937).

There is no doubt that we use silent talk when we think, but this is certainly not always the case. One of the most important researches demonstrating it was conducted by Smith et al. (1988), where he himself was the research object. Smith injected himself a substance paralyzing the muscles and in such state was artificially ventilated; he was asked questions and was requested to make calculations. When he came out of paralysis he reported that he had heard the questions and had made calculations. In this way he proved that thinking does not require motorial activity. Other researches showed that we are capable of solving problems even when the speech muscles are occupied with a totally different task such as humming a tune (Moss, 1977).

During life support, the doctors and nurses are found in a stress situation, think fast and talk fast and most of the time talk to themselves; and the nursing staff is under stress, they wish to know what the doctor wants because he is the one making the decision about the treatment; the responsibility for carrying out the instruction is of the nurse. A nurse who sees that the doctor is under stress will also be stressed because the doctor mumbles to himself; the staff around him does not understand his thoughts while being under stress and does not understand the decision making and problem-solving process for saving the patient's life.

d. Abstract thinking

Abstract thinking enables us to speak correctly and use grammatical rules even when we cannot think about such rules. This knowledge is internalized non-verbally and even non-visually. Abstract thinking enables us to identify a concept such as "table" when we hear it, run into it or see it in a picture. This thinking also helps us make a quick transition between three different verbal codes that indicate the same concept in three languages known to us.

During life support, the products of thinking facing us are standpoints, emotions, opinions and beliefs to which we come by thinking. There is hardly any field of psychology and health sciences, which does not deal with these or others products of thinking (Pea & Kurland, 1984; Palincsar & Brown, 1984).

Along with the growth of the behaviorist trend at the beginning of the 20th Century a question was raised whether psychology was "allowed" to deal with the study of thinking processes. Based on their attempt to turn psychology into an objective and observational science such as the natural sciences (or at least as these were perceived at the beginning of the Century), behaviorists did not deal with the processes of thinking (although they too, as shown below, had explanations to the questions how products of thinking were achieved). Moreover, they even vigorously criticized, sometimes scornfully, those few psychologists from other schools who dealt with this field, claiming that they were dealing with a non-scientific, "mystical" and "spiritual" area (McDermott, 1984).

This situation where the study of thinking was pushed aside changed considerably as of the 50s. The history of psychology mentions 1956 as the year of change. In that year several researches were published, which illustrated that it was possible to scientifically investigate thinking processes. These were, first and foremost, the book of Bruner, Goodnow & Auastin (1956) "A Study of Thinking", and the work of Newell & Simon (1972) who built a computer plan imitating human thinking processes. Following these works the study of thinking has become one of the central and most fertile subjects in the field of psychology.

What then was the source of the strong opposition to the engagement in the field of thinking in the framework of psychology? The main problem connected with the study of thinking processes is simple on the one hand but very hard to solve on the other, i.e. thinking is an internal action - which cannot be observed directly. There is no reliable method of following the thinking processes with our senses, and therefore there is also no way of writing, recording of filming them.

As far as psychologists and behaviorists were concerned, that situation involved great difficulty, as they demanded that psychology would willingly restrict itself to the study of phenomena, which can be directly observed and measured. For the study of thinking, such demand placed significant reservations: if we wish, for example, to examine how a person solves a problem then, according to the behaviorists, we can naturally observe his open behavior at the time period between the presentation of the problem up to hearing the solution (what does he do? does he roll his eyes, write things on a paper, chew the pencil, etc.), and measure the time interval between the stimulus and the reaction, but there is no way we can follow the thinking processes that take place inside his head.

Scribner (1981) called the mind and the various processes occurring in it the "black box". He claimed that whatever takes place inside it between the input (stimulus) and the output (reaction) in none of the business of psychology.

Contrary to the behaviorists, other schools claimed that research should not be restricted to the framework of direct observation and that there were ways - thought not perfect - of penetrating the "black box". The description of our mind in the "black box" is the classic description of the doctor and the nurse in a life support situation. It is difficult to directly ask the doctor and the nurse to solve the problem and describe the process of their thoughts and decision making in the process of treatment while they in the stress situation. The simplest way would be to ask the respondent to solve the problem, to describe the continuity of his thoughts from the moment of receiving the problem up to providing the answer. This is a possible solution, and indeed many researchers have made use of this method, called "loud thinking", to study thinking. But this method, too, is not obstacle-free. First of all, there is no way of knowing whether the description given by the respondent is actually a true description of the thoughts going on in his mind at the time of their occurrence. Even if the respondent sincerely and accurately tries to carry out the task (many researchers have used themselves as respondents), can he really voice all the thoughts coming up in his head? Can he concentrate on solving the problem and at the same time describe his thoughts while attempting to do so? Moreover, is a person aware of his own thinking processes at all? It well may be that important stages in the process of solving the problem take place out of the awareness, outside that range of thoughts that the respondent is aware of their existence and capable of reporting them. All these are real difficulties.

Physiology researchers have suggested to be assisted by the research of the physiological activity of the brain in order to understand the thinking processes. And sure enough, brain researchers have found a number of ways to record the different activities in the brain, whether with the help of tracing the brain's electrical activity or, lately, by following the blood stream in the brain. Although the development of psychology in general and cognitive psychology in particular depends to a great extent on the study of the brain, most researchers agree that there has not been any real movement in this field and that this or the other recording of the brain's activity does not yet form any breakthrough in the direction of "mind reading".

How then do researchers deal with this fundamental problem of studying the thinking processes? A lot of research thought and energy are invested in looking for ways that would allow a scientific investigation of this subject.

Target-aimed thinking - in the study of thinking there is a tendency to distinguish, among all activities defined as thinking, between target-aimed thinking and thinking which is not target-aimed. By referring to **target-aimed thinking** one means solving problems, making decisions and drawing conclusions. The "thinker" is faced with a target (e.g., to solve a certain problem) and the thinking processes are aimed, as far as possible, at achieving it. On the other hand, there are many **thinking processes which are not aimed** at a clear and defined **target**, such as hallucinations, associations and imaginations - a kind of "wandering thinking". It should not be inferred from this term that the latter processes should be considered as "idle thinking". Many of the most important and innovative ideas relevant to the solution of problems pop up suddenly in the very process of such idle thought or "wondering thinking" (Ross & Anderson, 1982; Wellman, 1990).

In this unit, focus will be mainly on the first type of processes – target-aimed thinking. Nevertheless, even if we have limited ourselves to these thinking processes, we are still found in an extremely wide area comprising a large variety of activities and products. Therefore, the approach taken by most researchers of thinking is not to try and deal with the wide term "thinking" and not even with the slightly less-wide term "target-aimed thinking", but rather choose a narrower and more defined area.

It should be borne in mind that the researcher of thinking usually approaches the area being guided by a psychological or philosophical theory about the essence of things he wishes to study. This is often an advantage as the theory directs him what to look at, but sometimes it can also be a disadvantage as it prevents him from seeing things he does not expect to see. We will present here three central theoretical approaches: the behaviorist approach, the gestalt approach and the data processing (or cognitive) approach; and sometimes the focus will be on the place and role that the relevant theory fills in directing the research.

For the purpose of discussion, the things mentioned at the beginning of this unit should be mentioned again, i.e. the behaviorists claimed, much like Wellman (1990) did, that the process of thinking cannot be investigated directly as it is hidden. But unlike Wellman (1990) who adopted the method of introspection in the research of internal processes, the behaviorists claimed that the legitimate object of research is only the **open behavior** which can be quantified and measured, i.e. psychology should suffice with the exploration of phenomena that can be **observed directly**. As mentioned, behavior was described by behaviorists in terms of a stimulus (external event) and reaction (behavioral event).

Another possibility was to be confined to studying the behavioral expressions of thinking that could be directly observed. Many behaviorists eventually chose that second option, among whom Watson himself was included. They wished to locate the behavioral expressions of thinking at some place in the body because if thinking is a behavioral action rather than a "mental event", it should find expressions somewhere in the human body. This related to two main approaches: one located such expressions in the **body's muscles** and the other - in the **brain**. The former was called the **peripheral approach** (or motorial approach) and the latter was called the **central approach**.

13. Tools for the instruction of thinking

a. The knowledge approach

You could get to know the city systematically; the way taxi drivers drive scooters through the city in order to get to know it prior to taking the "knowledge test". You could choose to study one region well and then proceed to the next region, or perhaps to get to know the city gradually - by learning about the main routes, then the narrower roads and so on, up to the alleys. It is possible to get to know the city by studying a map followed by self-examination, or by walking in an attempt to get from one place to the other. Maybe you will prefer not to study the city systematically but just live there and wait until the knowledge is developed by way of actual use. It is true that according to the latter system there are likely to be regions you will never get to know as you have never visited them, but you might feel it is insignificant since your knowledge should be suitable only for your required use (Feuerstein, 1980; Glaser, 1984; Herrnstein et al., 1986).

b. The "formula" approach

It can also be called the "specific activity" approach. Contrary to the knowledge approach, it is quick and very reliable. You do not make any effort in getting to know the city's streets and suburbs rather you invent or use a certain "formula" which is based on the public transportation in the city.

"Get on the no. 19 bus and get off near the big red store."

"Get on the Piccadilly underground line to Lester Square, switch to the "North" line. Get off at the third station" (Lakatos, 1965; Hinton, 1986).

With the help of such formula you will be able to quickly get to know effective routes and learn those sections of the city you generally use. The areas between them will remain completely unknown, but perhaps it is insignificant to you. All you have to remember is to get on the correct station, let the system take you along the expected route and get off at the right station (Langer, 1978; Langer, 1979; Laster, 1985; Linn, 1985; Leslie, 1988; Langer, 1989).

In other words, you can connect to the suitable formula, cling to it, and then look for results. This is similar to studying for exams. You study notes and models of answers. If you are asked the expected type of question, you get connected to the suitable list and write. It is also similar to the use of cooking recipes or algorithms in general (Lipman & Oscanyon, 1980).

c. <u>The general operations approach in thinking</u>

The knowledge approach is a thorough approach but costs a great deal of effort and time. Furthermore, until the knowledge becomes considerable and meaningful, it is already difficult to use it. If the city is not very interesting, it is hard to be enthusiastic about becoming familiar with one street after the other. You might reach a point where you accumulate more knowledge than you need for your purpose. Finally, the knowledge approach cannot be transferable, and when you move to another city - no matter how well you have known the previous one - such knowledge will not help you (McClelland & Rumelhardt, 1986).

The formula approach is fast and reliable, but there could be a situation where the formula or the transportation system is not easy. You tend to be limited to those areas where a formula can be found. You become slaves of the existing formulas. You cannot transfer the specific formula you have developed for a certain city to another city (McPeck, 1981; Newell, 1990).

The general operations approach is less accurate and less enjoyable than the former methods, but it is easy to learn and can be transferable to every new city. The method is composed of the development of a number of general operations, such as: learning how to ask for directions, learning how to use a map in order to get to know the main routes, marking unequivocal landmarks in every suburb and connecting them, quickly establishing "usage" areas and then deploying further away from them, etc. All these are general behavior patterns and can be used intentionally. The operation includes a mixture of approaches and there is a fairly big chance of failure (such as receiving unreliable or unclear instructions when you ask someone to show you the way); but the general operations also provide a framework for acquiring knowledge as well as a framework for the exploitation of little knowledge. In the general operations approach, activity and knowledge operate jointly. The general operations are the making of something definite instead of wandering and hoping that somehow, at a certain stage, knowledge will be accumulated (Nickerson, et al., 1985; Olson, 1988; Newell, 1990; Neill et al, 1997).

The knowledge approach regarding a certain subject is the content approach. You should study the subject sufficiently, and knowledge will already do the thinking for you. The formula approach is similar to the unequivocal formula situation where one becomes familiar with the situation accurately, and then it is possible to connect to the rights formula. This is a good method, but it is limited only to areas that can be dealt with through this method. In the general operations approach, which has been raised as a suggestion in the "Bit of Thinking" program, there is an attempt to develop and practice general operations that can be implemented in different thinking situations (Passmore, 1967).

d. The peripheral approach

When Watson (1930) eventually dealt with the term "thinking" he claimed that the thinking person actually speaks to himself, and therefore defined thinking as an internal talk, a talk without sound. Watson assumed that if thinking is indeed talk without sound, it must find expression in the muscles connected to speech and those muscles, which the action of thinking is aimed at. In a research conducted by Jacobson (1932) a connection was indeed found between thinking and muscular activity: while respondents were asked to think about lifting a heavy object with their left hand (without actually doing so), electric changes were registered in the muscles of their left arm; when they were asked by the researcher to visualize something, an enhanced electric activity was revealed in the muscles around their eyes. Another researcher, Louis William Max (Max, 1935, 1937) assumed that among deaf and dumb people who had learned to maintain communication with their hands, a muscular activity would appear in the muscles of the hands rather than the speech-connected muscles of the mouth. And indeed he found that while they were trying to solve a problem, even when dreaming, an enhanced electric activity appeared in the muscles of their hands. The experiments of Jacobson and Max proved, therefore, that in the process of thinking, the muscles in those parts of the body connected to the object of thinking were operated. But is it possible as a result to conclude that thinking itself is nothing but a muscular activity?

In the course of life support, the medical students and the doctor are caught in a situation where one encounters demands that threaten his (her) ability to face them and deal with them, and which require him to change his thinking and behavior.

Stress situations are an integral part of the life of the medical staff and compel them to learn how to cope in new ways. But when stress situations become too burdensome, their effects could cause emotional, cognitive or physiological difficulties.

The extent of scientific curiosity of the behaviorists will perhaps be testified by the fact that frightening experiments like that were actually conducted. In one of them (Smith et al., 1947) an anesthesiologist volunteered to serve as patient and solve a problem in a situation where no muscular movement was possible. With his consent, a paralyzing drug – Corara – was injected to his body. (This drug was used by Indians to paralyze their victims). The drug paralyzes **only** the motor nerves in the body (the nerves operating the muscles and glands) and **not** the sensor nerves (the nerves transferring sensations from the sense organs to the brain) and the central nervous system. The patient managed to grasp the problem and even solve it.

In an additional later experiment the volunteer – who was also totally paralyzed for the duration of the experiment – was presented with a series of simple inference problems. During the experiment the subject was naturally unable to answer the questions (it was even necessary to artificially ventilate him in the course of experiment), but immediately after the drug effect passed, he answered them. I.e., he managed to think in the course of the experiment. These experiments contradicted the assumption that muscular activity is a factor essential for the existence of thinking.

e. The gestalt approach

As mentioned, during the 20s the gestalt school developed in Germany whose most prominent representatives were the researchers Wertheimer, Kopka and Kohler (1959). One of the central research fields of the gestalt people was the research of perception. If behaviorists tended to perceive thinking as a kind of **learning**, the gestalt people wished to illuminate the principles common to thinking and **perception**.

These different points of origin significantly influenced the method of analysis of the two schools: the behaviorists tried, as already seen, to take the process of thinking apart into a series of behavioral actions (reactions), which were learnt in a process of trial and error. On the other hand, the gestalt people wished to avoid the dissolution of actions into elements. They were more interested in the wholeness or generality. As experts in the processes of perception they tried to prove that the way in which a problem is perceived by the thinking person's cognition was the one influencing the solution of the problem.

In other words, the behaviorists perceived the thinker as a passive reactor, a kind of "co-player". On the other hand, according to the gestalt approach (and the cognitive approach which followed) the solver of problems is the main actor, the one who “decides” how the problem looks and what the solution will be. He actually enforces his way of organization on the environment.

The different approach to thinking leads by itself to the difference between these two schools in explaining the mechanisms operating in the process of problem solving. According to the behaviorists, the main mechanism is trial and error: a random behavior that occurs as a result of the stimulation and eventually leads to finding the reaction which solves the problem. Contrarily, the main mechanism according to the gestalt school is intelligence, i.e. that inner insight which creates the most efficient organization of the problem elements.

14. Mapping the landscapes of thinking

Old maps are the fossils of research. Exactly as fossils of biological organisms reveal who our organic ancestors were, old maps reveal who were the ancestors of our geographic knowledge. They remind us how little we once knew (Perkins, 1986a, 1986b, 1986c, Perkins, 1987).

An old map of South America specifically presented geographic mysteries of the past. The east coast of South America was drawn in it with a profile similar to the one appearing on maps today. The west coast, on the other hand, appeared a bit left of the east coast, making the whole continent look like a long flat noodle. Obviously, whoever prepared that map did knot know what was in the west and did whatever was convenient for him - he drew the west coast just a little left of the east coast. That was a wild guess (Perkins, 1992).

In our world today which is abundant with projection maps, globes and satellite photos, we enjoy the luxury of knowing the face of planet Earth and forget that once people were not aware of its details. We forget that throughout most of the human history people did not have a clue about the lands and seas surrounding their world. We forget the importance of what one can call “the navigator’s wonder”, that very simple and tremendously important question of” “What is found where?”

A long history of research and technological development has indeed provided us with a fundamental answer to the navigator’s wonder as to everything regarding the face of the earth, but other wonders continue to exist in other fields - What is found where on planet Jupiter? Or at the outskirts of the universe? The navigator’s wonder forms a geographic analogy of our wondering about the structure of human intelligence. Looking at reflective intelligence as something comprised of thinking areas - such as decision making, problem solving and memory - means presenting a cognitive version of the navigator’s wonder. It is important to ask: “What is found where?” - What are the major areas of thinking, its so-called continents and sub-continents? Where are they located in relation to one another according to the criterion of the types of relationships that are meaningful for the thinking areas?

Here a key is found to the question: when do we think? We think when we do not know or when we do not trust what we know (Swartz, 1987). The riddle of the action of atoms, or the riddle of what is about to happen, they are what turn these subjects into appropriate candidates for thinking. In other words, thinking is a kind of reflection of what we do not know; a reflection of the mysteries of our life.

So far things are quite clear. Can the same principle apply also to additional types of thinking? Does every area of thinking reflect another type of lack of knowledge? Perhaps each area of thinking is the reflection of mystery, compensation and the hope for a certain unknown something?

In order to examine the logic of this, let us turn to a kind of fantasy (Swartz, 1989). If God is too wise and knowledgeable to demonstrate the thinking challenges, it would be reasonable to turn to someone less sublime and transcendent than He is. I am thinking about the pilgrim under siege in John Bunyan's book "The Pilgrim's Progress". Bunyan, a puritan preacher for the strengthening of faith, wrote in 1678 about the agonized progress of his hero from "the city of destruction" to "the heavenly city", while overcoming dangers such as the pits of despair, the vanity fair and the plain of tranquility. Not all of us are heading somewhere. All of us have long-term goals, sometimes elevated goals we wish to reach, and the path to such goals is unmarked and full of dangers.

Imagine, then, any pilgrim whatsoever roaming the world and striving to reach something valuable. He is not omnipotent neither is he all-knowing, but he is determined. He is going on his quest.

The pilgrim reaches a crossroad and wonders which way to choose in order to progress toward his distant goal. The pilgrim must face a decision. The world puts in front of us crossroads, junctions, situations where we can choose one possibility out of at least two. One can learn this or that profession, get this or that job, invest in this or that share, or not in shares at all, spend Thanksgiving with the in-laws or other relatives, work during weekends or not, accept this or that faith. "Where now?" – is a mystery found everywhere, and every pilgrim encounters it all the time. Around this mystery we create the boundary of decision making, through operation modes, beliefs-emotions and concepts which help us deal with it. Some of the decisions to be made will be of the heart as much as of logic. We will be familiar with these as in the domain of decision making while saving the life of a patient (Swartz, 1991a, 1991b; Swartz, 1992a, 1992b).

The philosophical discipline offers a useful way to discuss what can be seen as the motivational side of thinking: it offers the concept of thinking tendencies.

The tendencies have been incidentally mentioned before, but now will be focused on. In general, a psychological tendency is a trend to act in a certain way. Imagine a stranger who has lost his way and come to your doorstep on a hot summer day asking for directions. Will you treat him suspiciously and speak to him through the keyhole? Will you welcome him and offer him lemonade? You will probably do something in between these two extreme behaviors. Whatever your inclination may be, it testifies the existence of a tendency. Do you get up early on weekends or sleep late? What do you tend to do? I.e., what is your tendency?

Tendencies shape our lives. They lead us to one direction and not the other, within the freedom of action given to us. A thinking tendency is just the tendency to think in a certain way. For example, the person working next to you in the office, as you know well from random talks with him about children, health and office policy tends to be introvert, suspicious and embarrassed about new ideas as if they were strangers. Another person who works with you tends to be outgoing and cordial regarding new ideas. Openness and closeness are thinking tendencies, general trends appearing in people's thinking patterns (Swartz & Perkins, 1990).

Several philosophers and psychologists have emphasized the importance of thinking tendencies. Robert Ennis, a philosopher known for his work in the evaluation of thinking, emphasizes the importance of thinking tendencies alongside skills or abilities. The philosopher Richard Paul has something very "tended" in his mind when writing about the "strong sense" of critical thinking. If you think critically in a strong sense, you are really committed to openness and the kind of thinking that crosses many reference borders. A critical thinker in a "weak sense" reveals high technical skill in argumentation mechanisms but lacks commitment. The cognitive psychologist Jonathan Baron suggests an analysis of thinking which illuminates the concept of tendencies.

It is worthwhile to remind here again the four thinking short-comings: tendencies for reckless, one-dimensional, vague and absent-minded thinking. As the term "tendencies" reveals, each of these shortcomings is essentially a negative thinking inclination. When I recklessly tend to prefer one alternative over the other I behave less intelligently; when I am tempted - without paying attention to details - to reject my son's request to go on a weekend with his friends, I am wrong in practicing one-dimensional thinking and less intelligent behavior; when I listen to a commercial which states "No product has done better" and accept it without asking myself "And what if other products have done similarly well?", I give in to vague thinking and less intelligent behavior; when I am completely swept by a conversation about the acquisition of life insurance policies without meticulously preparing a table of the advantages and disadvantages of each of them, my absent-minded thinking makes me behave less intelligently.

The shortcomings of thinking - reckless, one-dimensional, vague and absent-minded thinking - are tendencies for all intents and purposes. These tendencies stem from the patterns of experienced intelligence, which is based on an accumulated life experience and on the creation of a double developmental connection, namely: thinking driven by patterns is effective to a certain point and often undermines the work of the reflective intelligence in situations where there is no novelty, complexity, deviation or risk. Additional sources of this quartet of negative thinking tendencies are defense mechanism, problems of short-term and limited memory and other whims of the cognition (Tishman, 1991).

Although strategic knowledge of thinking operations might help fight against negative thinking tendencies, the concept of tendencies implies that we need more than a technique. In fact, there is a need to operate one tendency in order to restrain another tendency. Since negative thinking tendencies bother us, we need positive thinking tendencies in order to neutralize them (Adamson, 1952; Baron, 1978; Baron, 1985a, 1985b).

15. The thinking scale

What is the difference between buying a birthday present and making a decision? Buying a birthday present is an individual case of making a decision. When you buy a birthday present you necessarily make a decision, whether you think so or not. Even when you buy exactly what the birthday person asked for, you make a decision - a decision to respond to his/her request.

The direct way to ask what the difference is between buying a birthday present and making a decision would be: What is the difference between the boundary of buying a birthday present and the boundary of making decisions? Buying a birthday present in particular and making decisions in general are areas found in very different levels of generality. I can be familiar with buying a birthday present as a specific thing, including the elements of choice which are required for effective choosing of presents, and not be well oriented in making decisions in general. Alternatively, I can be well familiar with making decisions generally and not be acquainted with the special nuances of the type of decision-making required for buying a birthday present. Nevertheless, if I am familiar with making decisions, such general knowledge will help me at least face the specific challenge of buying a birthday present, even if I have a lot more to learn about the refined art connected with this area (Belmont, 1982; Brainerd, 1983; Bloom, 1986).

All this brings us back to the navigator's wonder. He asks: What is found where? So far we have mainly focused on the "what" and emphasized the way in which thinking categories such as decision making and reasonable thinking form areas reflecting mysteries people encounter when they think and guide their thinking in useful directions. The "Where" aspect of the question deals with the relations between these categories. The relation between buying a birthday present and making a decision points at an initial organizing relationship which clarifies the amazing variety of thinking domains. This key relation is generality – uniqueness.

In practice, the many domains discussed so far can be organized in a kind of generality scale. At the top of the scale, at the most general level, the organization of principal thinking tendencies will appear. The bottom will be made of very unique domains of decision making or problem solving such as buying a used car. Between these two extremes the other domains will be positioned, according to the extent of their generality. The generality scale received will form a hierarchy of thinking domains, which answers both the "where" and the "what" aspects of the navigator's wonder.

The generality scale consists of 7 levels:

Level 1: The domains of tendencies (thinking tendencies)

Clear, wide, deep, balanced, inquisitive, strategic, aware.

Level 2: The domains of challenges (basic thinking challenges)

Making decisions, excuse, explanation, evaluation, memory, solving problems, finding problems, representation, forecast, planning, learning.

Level 3: The domains of tools (techniques supporting thinking)

Brainstorming, graphic organizers, lists of pros and cons, concept maps, step-by-step strategies, etc.

Level 4: Technical domains (technical resources of thinking)

Formal deduction, formation thinking, taxonomies, games theory, probability/statistics, etc.

Level 5: The domain of knowledge fields (thinking aimed at fields of knowledge and subjects)

Law and order, business, physics, mathematics, history, humanities, arts, etc.

Level 6: The domains of situations (unique thinking situations in a way)

Purchase decisions, solving conflicts, negotiations, designing a policy, handling emotions, etc.

Level 7: Connotation-dependent domains (unique thinking connotations)

Buying a used car, planning the house, choosing a career, negotiating an agreement, planning a trip, etc.

Every level of the generality scale deserves a few words of explanation. (Chase & Simon, 1973; Bransford & Stein, 1984; Chi et al, 1981; Case, 1984; Chipman et al, 1985; Costa, 1985).

Level 1. The domains of tendencies.

This relates to tendencies such as extended thinking or reasoned thinking which in general create fruitful thinking. As claimed earlier, such tendencies are areas that include, inter alia, operation formations, beliefs, emotions and concepts. Therefore, one can talk about tendencies or, more specifically, tendency domains. Seven general tendencies are suggested here as the main tendencies: tendencies for clear, wide, deep, reasoned, inquisitive, strategic and conscious thinking. Following is an expansion of the meaning of each tendency:

- **Clear.** The tendency for clear, coherent, accurate and well-organized thinking in every treatment, life support and emergency situation.
- **Wide.** The tendency for wide, adventurous, flexible and independent thinking, having respect and appreciation for other points of view based on tolerance, openness and empathy; a tendency to look for, and find, connections based on knowledge in stress and emergency situations, operation of proper discretion and correct decision making.
- **Deep.** The tendency to understand deeply, look for unified elements at the basis of things in the form of rules, theories, frameworks and principles, exploring the reasons and causes of things, ideas and events.
- **Reasoned.** The tendency for accurate, thorough, honest, updated and logical thinking which is well based on proof, concern about the truth, consideration, relevance and functionality (the latter in the solid pattern sense).
- **Inquisitive.** The tendency for thinking that includes the elements of curiosity, asking questions, inquiring and wondering, a tendency to learn about the nature of things and keep inquiring.
- **Strategic.** The tendency for thinking which is strategic and planning in nature, which uses thinking strategies, graphic organizers and additional means for its effective organization.
- **Conscious.** The tendency for meta-cognitive, self-aware thinking which is critical about its own patterns and progress, the tendency for the kind of thinking that arranges its own activities. This includes the awareness for the effective dimensions of thinking – signs provided by emotions, the way in which emotions are aroused or smother the course of thinking (de Bono, 1973-75; de Bono, 1083).

It is likely that more thinking tendencies could be added to this list. There is no doubt that sub-tendencies can be noticed where, for example, the tendency for wide thinking and the tendency for reasoned thinking would be divided into different meanings. Nevertheless, in our case it seems most beneficial to mention the relatively global tendencies. People whose thought reflects an alert presence of these tendencies are truly great thinkers (Feehrer et al, 1986).

However, it is worth mentioning that there is one peculiarity which characterizes this list of major tendencies, namely: sometimes it seems that these tendencies are not in line with each other. For example, during a wide, flexible and creative thinking it is sometimes preferable not to worry so much about its logical reasoning. How can we interpret this? The answer is that such recommendation is based on a well-known fact about the human cognition and a good management of thinking. When we say that every tendency is important it does not mean that they all should or could shape our thinking simultaneously, but rather that they all should be vibrant forces which are active in our thinking fabric.

This matter naturally leads to another question: Where on the thinking scale should we place our critical thinking and creative thinking? The thinking domains suggest a reasonable answer: critical thinking is more or less compatible to clear and reasoned thinking and creative thinking is compatible to deep and wide thinking – each with its own ABC (actions, beliefs-emotions and concepts) arrangements.

It is important to acknowledge that creative thinking and critical thinking are not completely independent. Good creative thinking always involves some amount of critical thinking otherwise it is silly; good critical thinking always involves some amount of creative thinking otherwise it is one-dimensional. These two need each other. Many thinkers have indicated this mutual dependency (Getzels & Czikszentmihaly, 1976).

And another word of caution: the concepts "critical thinking" and "creative thinking" are quite vague in their daily use. This is especially valid when critical thinking is concerned. Some look at critical thinking as something similar to clear and logical thinking (e.g. Matthew Lipmann, the author of the "Philosophy for Children" study program), and some perceive critical thinking as an extremely wide concept that includes creative thinking as an individual case. Critical thinking in its other more general sense means clear, wide, deep, reasoned, etc. thinking, i.e. thinking that includes all the thinking tendencies. Due to this vagueness of meaning of the concept "critical thinking" I will not use it much (Heyes, 1981; Howard, 1982; Glaser, 1984; Jensen, 1984).

Level 2. The domains of challenges.

These are very basic thinking domains which reflect widespread mysteries of a clear structural character in the framework of which people try to function in a balanced way – mysteries like those encountered by the pilgrim a few pages earlier. Every domain complies with a basic thinking challenge – making decisions, solving problems, memory, etc. – with the accompanying thinking product: decisions, solutions, memories, etc.

Like the major tendency domains mentioned above, these are also major domains having special significance to the development of thinking. Other domains can be added to the list but these are the most basic. Following is a short description of each domain with an emphasis on the mystery it reflects:

- **Making decisions.** Finding one's way around decision making; this is a thinking category which reflects the fact that people constantly encounter crossroads where they are required to choose between alternative courses of action and sometimes even find hidden alternatives, and such decisions should be critical to emergency or life support treatment.
- **Solving problems.** Finding one's way around reaching the solution of informal and/or formal (logical and mathematic) problems; this is a thinking category which is actually a reaction to the fact that people constantly encounter gaps, namely – situations where they wish to get from one point to the other but the path connecting these points is hidden and they are required to find it. This is appropriate to the subject of patients' life support and emergency.
- **Justification.** Finding one's way around the ability to come up with justifications to the trueness or falseness of statements; this is a thinking category which reflects the fact that the world does not state what is correct and what is not, and that in this matter it is easy to make a mistake. This is relevant to our matter because in the subject of life support the medical and nursing staff and paramedics are required to choose the short and correct way to handle the patient in order to save his life as well as treat him according to international standards.
- **Explanation.** Finding one's way around the ability to come up with explanations to things and events; this is a thinking category that respects the fact that the world does not easily reveal the order of things. In order to foresee events and understand wondrous phenomena one is required to make up theories, models and concepts that explain them. An explanation usually looks for reasons and causes, relations of functioning-compatible patterns (like the fins of a fish) and dominant rules (like Newton's rules).

- **Memory.** Finding one's way around memorizing and remembering; this is a thinking category which reflects the fact that the human memory does not operate as a tape recorder. If we do not pay attention to memorizing and remembering information, we will all too often forget it or mix it up.
- **Phrasing problems.** Finding one's way around the discovery and definition of informal and/or formal problems in a certain subject, challenging riddles, differences and opportunities and phrasing them in ways that encourage inquiry and invention.
- **Design.** Finding one's way around the design of physical objects as well as processes and other systems; this is a thinking category which reflects the fact that people need tools and means in order to carry out things in their world.
- **Planning.** Finding one's way around formulating plans about how to proceed or to carry out something; this is a thinking category which reflects the fact that we cannot just anchor ourselves in any making and be successful in it. We need to premeditate and foresee how things are likely to be and how they will be managed.
- **Evaluation.** Finding one's way around the assessment of things and ideas with the help of criteria and judgment; this is a thinking category which reflects the fact that the value of some thing within a given connotation is not always transparent.
- **Representation.** Finding one's way around the verbal description of things and events or their representation in different ways; this is a thinking category which reflects the fact that people cannot contain, preserve or transfer all the information required without the assistance of the representation of things.
- **Forecast.** Finding one's way around reaching well-established forecasts regarding what is about to happen; this is a thinking category which acknowledges the fact that while making decisions, solving problems and other similar situations, the possible outcomes of actions should be foreseen.
- **Learning.** Finding one's way around learning new information, concepts and skills. This matter is beyond memory as it deals with learning for the purpose of understanding by way of feedback and sufficient exercising of the learned skills, etc.

  (Brown, 1978; Brown et al, 1983; Brown & Clement, 1987; Bransford et al, 1989).

This review of the domains of challenges raises at least two "wonders". The first is: are these domains really separate? Sometimes in the middle of making a decision a person might be required to think about the forecast of something; for example, the consequences of one of the possibilities he has. And sometimes, in the middle of the process of forecasting, he will have to think about a decision; for example, to decide which of two possible forecasts is more probable. Therefore, it looks as if the basic thinking challenges are all interwoven!

The answer to this wonder is that the domains of challenges are distinct. Each of them comprises of ABC – Actions, Beliefs & emotions and Concepts characterizing it. For example, the concept of possibilities belongs in particular to the field of decision making. The ABC systems of the field of decision making lead the basic approach a person adopts when in this process.

Nevertheless, when a person is in the process of thinking it often happens that he encounters sub-problems which require a different process. At the time of making a decision it occurs, more than once, that one has to deal with a sub-problem of forecast; at the time of forecast one encounters, more than once, a sub-problem of making a decision. In fact, the basic thinking challenges need each other in order to solve sub-problems that emerge along their course.

The second "wonder": Is it really necessary to find one's way around a process such as memory or making decisions? Don't people remember or decide spontaneously, without making a fuss over it?

The answer to this is: Yes. Usually we remember or make decisions spontaneously. It also applied to other processes; for example, we solve many problems spontaneously and provide explanations or evaluations spontaneously. All this happens thanks to intelligence based on accumulated experience. This is what we have called "the ninety percent solution" since most of the time we remember, make decisions and carry out other thinking tasks in a very connotation-dependent and intuitive way, which bears good results. But "most of the time" is certainly not enough to prevent us from getting into trouble and to utilize our full human potential. All too often connotation-dependent and intuitive thinking which lacks reflective intelligence becomes a "victim" of the four thinking faults or other obstacles (Brumby, 1979; Brumby, 1984; Campione et al, 1991).

Level 3. The domains of tools.

These domains are connected to finding one's way around tools and strategies which support the kind of thinking required by the areas of tendency and challenge. There are numerous domains of tools and the list offered below does not pretend to be full. For the purpose of clarifying the idea, here are several domains of tools:

- **Brainstorming.** A basic technique for raising varied and imaginative ideas, it is beneficial for any kind of wide thinking.

- **Cons and pros lists.** Lists of cons and pros are a simple organizing tool for the assessment of a situation.
- **Step by step strategies.** Many types of thought are supported by step-by-step strategies which might include one to twelve steps (e.g. treating patients with asthma, heart attack, ventricular fibrillation, atrial fibrillation, etc.). Their orderly implementation – going one step at a time to make decisions, solving problems and more – cultivates a systematic approach, although this strategy does not exhaust the richness and subtleties of the domain.
- **Graphic organizers.** These are graphic layouts (e.g. the Wohn circle) which clarify relations between ideas and enable people to "think with a sheet of paper".
- **Concept charts.** This is a special style of graphic organization where ideas, which are telegraphically phrased, are joined by lines that indicate various logical relationships (Case, 1985).

Level 4. Technical domains.

These domains include technical types of thinking that make use of logical, mathematical, scientific or linguistic systems which are suitable for certain thinking challenges especially in technical domains. The variety of technical domains is, of course, infinite. The contrast between these domains and the domains of tools is vague: technical domains could be considered as domains of tools of a more technical orientation. The following is a number of examples:

- **Formal deduction.** This is a tool of deductive logic as used in mathematics and several philosophical, scientific and other implementations.
- **Taxonomies.** Taxonomies are formal description systems that wish to classify everything included in their domain in a general and special way, such as the taxonomy of plants and of animals.
- **Probability/statistics.** Thinking by way of probability is a powerful tool in many scientific, economic and political connotations. Statistics provides a set of theories for drawing trends and a theory of sampling for the purpose of basing general claims about such trends.
- **Systemic thinking.** This point of view enables the analysis of systems in trauma or in multi-system injury in life support or emergency situations. This type of injury is more suitable for children patients as their body volume is small. This point of view also enables the analysis of social, biological, electronic and other systems in terms of general formation characteristics such as output, input, feedback loop, the phenomenon of escalation & non-escalation, etc.

- **The theory of games.** This theory enables to analyze competition situations in terms of gain and probabilities, in order to better choose the actions, e.g.: exercising on simulation mannequins, patients in operation rooms, intensive care, etc. (Chi et al, 1981; Case, 1992).

Level 5. The domain of knowledge fields.

These domains deal with thinking within certain fields of knowledge or subjects such as law and order, business, mathematics, humanities and arts. These are areas of tendencies, of challenges and of other things that take more specialized forms in the framework of knowledge fields and subjects, and reflect their special requirements. In stead of describing them according to their fields it will be more beneficial to make several comparisons between the fields. While justification in a general area of thinking always involves a pattern of evidence and argumentation, different knowledge fields require special types of evidence and argumentation. For example, in mathematics the deductive-formal proof is central, but in physics the empirical proof is dominant. In the legal field the basis of evidence lies in information relating to the subject matter, in the written law and the historical precedents of its interpretation. In arts, understanding arises from subtle judgment of well-developed eyes and ears rather than a deductive proof or the findings of an experiment.

Similarly, the ways in which decisions are made, problems are solved, knowledge is presented and things are planned or explained change from one field of knowledge to the other despite the "family" resemblance between the different fields. For example, making a program in any field involves the creation of an organized schematic representation of something which is about to be materialized later (a building, a book, mentality), the required evaluation types (how comfortable or beautiful the building will be, how readable and educational the book will be, how fascinating and imaginative the dance will be) and the like – which change from one field to the other. If you are a good planner in general, this trait will help you organize the planning task in every field. But in order to do a real good job, you need to find your way around the thinking twists and turns unique for every field (Chi et al, 1982).

Level 6. The domains of situations.

These domains are somewhat connected to unique thinking situations that still recur and reappear in a variety of different connotations. For example, acquisition decisions start with humble personal shopping such as buying paperback books, continue with larger-scale purchases such as buying a car and reach business acquisitions such as purchasing a building or a commercial company. These are often specific cases of general domains – acquisition decisions, for instance, are examples of decision making but they have their own character and typical considerations.

- **Acquisition decisions.** Despite their variety, there are central mutual factors characterizing acquisition decisions: questions regarding the acquisition possibilities, good evaluation information, fair price, appropriate value received for the money, the quality of the supplied goods or services, the value of investment, etc.
- **Negotiation.** Many situations – personal, business, international – involve negotiation moves. Negotiation involves typical dilemmas of hard principle positions and an approach which is more competitive than cooperative.
- **Management of emotions.** Foresee your own emotions and of others, handle them, express them well and "read" them in others. This thinking domain often emerges at home, at work and in other places. The psychologists Peter Salovey and John Meyer call it "emotional intelligence". Sometimes it involves restraining emotions, e.g. the restraining of anger, and in other cases – nurturing emotions, e.g. finding a suitable good mood to support a certain effort such as an emergency situation, life support, the process of making decisions and solving problems.
- **Solving conflicts.** Finding solutions to conflicts is something that occurs in numerous circumstances in life and involves a variety of considerations, such as defining a complaint, neutralizing escalation, creating mutual respect and understanding.
- **Designing policy.** The design and implementation of a policy are significant factors in any government, in management in general and that of life support or emergency situation in particular, and even at home. The typical components of this domain relate to what policy strives to achieve, its ability to accumulate support, to be enforceable, etc. (Clement, 1982; Clement, 1987a, 1987b).

Level 7. Connotation-dependent domains.

These domains are deeply rooted in unique life connotations. They benefit from the domain of tendencies and from the domain of challenges, and at the same time contribute numerous of their own subtleties, which stem from their own special circumstances. Life comprises millions of connotation-dependent thinking domains. Following are several examples, accompanied by remarks, about the required types of special knowledge in order to emphasize that this does not relate merely to special cases of general types of thinking but to cases of independent nature. Connotation-dependent thinking domains are actually found on the borderline between reflective intelligence and experimental intelligence that is based on accumulated life experience.

They benefit from general reflective considerations, but they also involve an accumulation of knowledge that forms the special background of each of them.

- **The acquisition of a used vehicle.** This type of decision greatly benefits from knowledge about vehicles, prices and the behavior of salespersons.
- **Choosing a career.** This is also a type of decision-making and it is characterized by the special challenge concealed in the fact that usually people do not have real knowledge about the fields they choose to be engaged in.
- **Planning a trip.** This type of planning usually involves knowledge about various means of transportation and other needs connected to traveling, including people's personal priorities.
- **Planning a house.** This type of planning involves a wide range of technical knowledge about construction as well as functional and aesthetic configurations.
- **Conducting negotiation that leads to agreement.** This variation of problem solving in situations of emergency, life support and urgent situations of urgent medicine requires knowledge of the interests of others and their willingness to negotiate, a keen sense of politics and acknowledgement of the human dimensions in negotiation situations (Deadman & Kelly, 1978; Collins & Ferguson, 1993).

At the bottom of the generality scale, it is time to relate to the question regarding the unique case: as thinking always occurs within a specific connotation, why do we need more general domains? We always think about something specific: we want to buy a certain car, choose a certain career, plan a certain trip, etc. Why, then, do we need general thinking tendencies such as wide thinking and reasoned thinking, or general thinking types such as making decisions and solving problems?

This is an important question and it seems to have **three** important answers. The **first** is that although people always think in this or the other specific domain, they often do not know much about it. For example, someone chooses a first career or changes careers several times in his life. Nevertheless, if this person knows his way around making decisions – and also in other relevant general domains such as evaluation, forecast and planning – it will help him find my way around this specific and unfamiliar area. In short, the more general domains assist us when we face something new. It should be remembered that this is one of the main functions of the reflective intelligence.

The **second** answer is that even when we know the connotation-dependent area there is a chance that the circumstances will not be familiar to us. One could be a career counselor who knows well all the elements of inner struggle involved in choosing a career when other people are concerned. And suddenly he finds himself thinking about my situation in this area. Matters that are new to me suddenly emerge:

he is older than most of the people he gives advice to; he has a general experience in general and regarding humans in particular that they do not have; his potential is different than theirs. Although he gains something from my knowledge in planning a career, but he also finds himself going back to his general resources to make good thinking.

The **third** answer is that when we know a lot, our knowledge in the connotation-dependent areas could set us a trap. We act according to habits and rules without looking further away from the circumstances of our actions in order to see another, healthier approach. We become victims of the four thinking shortcomings: reckless, one-dimensional, vague and absent-minded.

People with great knowledge in a certain field are not necessarily those who have better thinking in that field. An excellent example is that of med students who acquire a lot of knowledge but no clinical experience in the field of urgent medicine, contrary to nurses and paramedics who have less knowledge but a lot of clinical experience in the field of urgent medicine. In order to better use our fields of knowledge in the connotation-dependent areas we must often regulate our thinking with the help of more general domains (Deadman, 1978; Dweck & Bempwchat, 1980, Dweck & Licht, 1980).

16. New thinking concepts from ontology to education

What is good thinking "made" of? Some researchers hold advanced views as to the nature of a good thinking. Some of them have indicated the importance of general thinking strategies (e.g. Hayes, 1981; Polya, 1954, 1957). Others have emphasized cognitive and meta-cognitive processes which can be improved by way of exercising and reorganization in emergency and life support situations (e.g. Feuerstein, 1983; Sternberg, 1985). Others still have written general researches which indicate the basic logic structure of thinking (e.g. Baron, 1985). In this special edition several additional researchers share with us their concepts regarding the structure of effective thinking. Their views do not contradict each other. As a matter of fact, it was claimed later on that these can generally be combined into one totality. Still, the clear differences between the concepts raise questions as to the true nature of the factors found at the basis of good thinking (Gardner, 1991).

The uncertainty regarding the nature of thinking indicates the need to give its components a general name. Let us talk about mindware. This term relates to processes which can be learnt, to authority, sensitivities, approaches and other components that design good thinking. It does not clarify what such components are but it enables us to ask **four** basic questions:

1. *What types of mindware exist?* This is basically an ontological question. It asks which basic types of things which can be learnt somehow, exist in our mind and develop good thinking.
2. *How are different types of mindware operated?* I.e. how does a certain situation stimulate the thinking?
3. *What do different types of mindware contribute?* I.e. how do mindware types improve the thinking?
4. *How does one acquire mindware?* I.e. what types of learning or developmental processes are suitable to different types of mindware? (Baron, 1985; Sternberg, 1985).

These four questions are used as a framework to the analysis appearing in this book. After dealing with the definition of a good thinking, we will present to the reader the dominant, though limited, view about the general processes and the answers it provides to the three raised questions. Later we will review a number of alternative analyses of thinking, which introduce the picture of the mindware and the method of operation of the thinking. Later still we will develop the source of the fourth question: How does one acquire mindware? In our opinion, the expanded picture of the thinking dictates an approach for teaching and learning, which will be totally different from that widely used by the various attempts to teach thinking; it dictates enculturation (Gruber, 1974; Gick & Holyoak, 1983; Gardner, 1991).

a. <u>The pragmatic approach of good thinking</u>

As a starting point our analysis requires the concept of good thinking which does not assume the obvious. For the purpose of the present work we adopt the pragmatic approach of Bron (1985) according to which good thinking is a thinking which achieves its goal (Hackling & Treagust, 1984).

Bron claims that thinking relates mainly to decisions, beliefs and goals – including decisions as to which beliefs should be adopted and which goals should be aimed at. For example, good thinking produces beliefs that function at the crossroad between the thinker and the world he lives in; decisions which advance the general goals of the thinker, etc. When a person faces problems that require critical judgment, good thinking means maximal utilization of what he knows for the purpose of good judgment. When a person faces problems that call for creativity, good thinking requires a flexible and imaginative investigation. Thinking in process could be evaluated in a similar manner to the way we would evaluate a carpenter's set of tools – according to their ability to take care of given tasks (Joshua & Dupin, 1987).

Bron's basic concept does not provide an answer to the open question that will be discovered as crucial later on in the paper, namely: the question about the uniqueness of the connotation. From his concept it can be perceived that good thinking is connotation-dependent, that changes from one situation to the other.

Nevertheless, many have indicated a number of general problems and challenges hindering good thinking. For example, Jungworth (1975), like many others, mentioned that people usually conduct a superficial search for possibilities, beliefs and goals and as a result miss important alternative. Several researchers have indicated dubious thinking patterns in the field of statistics probability (e.g., Kurland et al, 1986) whose effectiveness is questionable.

b. <u>The language of thinking</u>

The language of thinking comprises the daily life language terms that relate to mental processes and products. Thinking, believing, guessing, doubting, assumption, hypothesis, understanding, conceptualization – words like these create a vocabulary which is used for describing thinking. Such terms transfer information in matters such as the extent of certainty of the speaker (think about the difference between "think", "believe" and "know") or the level or knowledge required (compare between speculation and theory).

This language of thinking is more than a convenient set of labels. It involves conceptual development. Olson & Astington (1993) suggest that good thinking requires conceptual ability in order to know how to adopt beliefs and relate to statements. It involves acquiring conceptual categories that describe the thinking subtleties of the thinker himself; e.g. to make an assumption vs. create a hypothesis. A rich thinking language provides the thinkers with sophisticated meta-cognition and in addition enables him to understand the verbal meaning which the words of others are based on.

What does the concept of the language of thinking contribute to the current discussion? Let us return to the three questions: What types of mindware exist, how are they operated and how do they contribute to good thinking?

- **Type:** the language of thinking is made of terms (and their accompanying terms) for mental processes and products. It requires a wider range of references than in the case of strategies which, as mentioned, are process dictations.
- **Operation:** the language of thinking is operated by situations that "invite" thinking or communication, which are mediated by words and directed at thinking processes or products. Here, too, the variety of situations is much larger than the variety of strategy stimulating situations.

- **Contribution:** the language of thinking contributes to thinking management and expression just as the vocabulary of a field of expertise contributes to that field, namely: by inventing terms and concepts that identify important categories and meaningful observations. Here, again, this relates to a much larger extent than that of strategies (Larkin et al, 1980; Laster, 1985; Lin, 1985).

c. Thinking tendencies

The term "mindfulness" described by Langer (1993) can be seen as a "super tendency" for handling activities out of thought and attention. Langer showed, through many experiments, that people often function in a way which she called "lack of rationale" – they miss significant changes. Prior to dealing with everything understood from this triple-component analysis of tendencies as far as the existing cognitive theory and research are concerned, we will expand the suggested model by a detailed description of the seven key tendencies required for good thinking (Mayer, 1994).

d. The seven key tendencies of good thinking

The "trinity" urge-sensitivity-ability provides the basis for an inclinational analysis of the cognition in general. However, how does this trinity shed light on thinking in general and good thinking in particular? In other words, what are thinking tendencies?

Several tendencies, such as the tendency to take into account wide perspectives or look for evidence, are especially cognitive and influence the thinking directly (McDermott, 1984). On the other hand, more general tendencies such as perseverance can often be an advantage in matters which are not typically connected just to thinking, e.g. regarding a diet. Therefore, thinking tendencies can be defined as tendencies for patterns of intellectual activity, which condition and direct cognitive behavior in a particular way. Nevertheless, as some thinking tendencies can act against good thinking such as a quick waiver as a result of mix up and embarrassment, we stipulate that we have a special interest in tendencies that contribute to good thinking (Matz, 1982; Minstrell, 1982; Mintzes, 1984).

After this generalized definition of thinking tendencies, the next step is crucial: Can one identify tendencies that are particularly beneficial to good thinking? The question is whether the nature of good thinking, in the daily context presented earlier, can be expressed in terms of several tendencies?

We believe that the answer is yes. Moreover, we would like to raise the following daring claim: Good thinking can be characterized as reflecting seven wide thinking tendencies (this characterization is comprehensive from a normative point of view but partial from a theoretical point of view). The tendencies are:

1. for expanded horizons and adventurousness;
2. for continuous intellectual curiosity;
3. for clarification and strive for understanding;
4. for planning and strategic thinking;
5. for intellectual cautiousness;
6. for the search of causes or reasons and their evaluation;
7. for meta-cognition.

We claim that the ideal thinker tends towards all these thinking behaviors and appropriately exhibits one or more of them, according to the thinking opportunity. The less perfect thinker (but still a good one) tends to most of them in appropriate opportunities but in a less uniform and more partial manner (Ohlsson, 1993).

The following is a description of the ***seven tendencies of good thinking***. According to our previous analysis of tendencies as an explanatory concept, we characterize every tendency as a trinity of urge, sensitivity and ability (Perkins, 1992; Perkins, 1993).

1. The tendency for expanded horizons and adventurousness.

Key urges: an urge for mind openness and seeing beyond the given; an urge to examine assumptions and check alternative view points; a desire to play with limits and indulge in new ideas; an urge to make speculations, think about many options and inquire about different interpretations.

Key sensitivities: being aware of dichotomies, dogmatism, wide generalities, narrow thinking, narrow mindedness and cases where alternative viewpoints are neglected.

Key abilities: the ability to identify speculations, to examine things from different points of view, to raise and examine many possibilities; brainstorming; empathic thinking; flexible thinking (Perkins et al, 1993).

2. The tendency for continuous intellectual curiosity.

Key urges: interest and urge to check and examine; an urge to find and raise problems; an urge to wonder, ask, clarify.

Key sensitivities: being aware of non-raised questions, of anomalism, of hidden aspects; finding gaps in knowledge or understanding; paying attention to what is unknown or unclear.

Key abilities: the ability to watch carefully, to identify assumptions and contest them, to formulate and examine provocative questions; to focus on a certain investigation course and see it through (Perkins & Simmons, 1988).

3. The tendency to clarify and strive for understanding.

Key urges: the aspiration to understand things clearly; an urge to firmly base ideas on experience and look for connections to previous knowledge; an urge to sharpen concepts and examples; a desire to understand things deeply.

Key sensitivities: being aware of ambiguity and having a sense of discomfort about vagueness; being aware of superficiality; identification of cases that require sharper focusing; becoming interested in difficult questions.

Key abilities: the ability to present sharp questions and build complex conceptualizations; the ability to implement and demonstrate ideas, to make analogies and comparisons, to identify and classify details (Perkins & Salomon, 1988).

4. The tendency for planning and strategic thinking.

Key urges: an urge to set goals, to make plans and implement them; an urge to approach things in a calculated and/or step-by-step manner; a desire to think ahead.

Key sensitivities: being aware of aimlessness and lack of direction; being aware of random and absent-minded thinking.

Key abilities: the ability to formulate goals and evaluate alternative access ways; the ability to make plans and carry them out and to anticipate possible outcomes (Perkins & Simmons, 1988).

5. The tendency for intellectual cautiousness.

Key urges: strive for accurateness; desire for mental order and organization; aspiration for thoroughness.

Key sensitivities: being aware of the possibility or error and disorganization; being aware of the constant possibility of lack of accurateness and inconsistency.

Key abilities: the ability to process information accurately, to recognize intellectual criteria and apply them, to make order out of chaos.

6. The tendency to look for causes or reasons and evaluate them.

Key urges: an urge for healthy skepticism; an urge to doubt the given, to check and examine widespread assumption and biased opinions; an urge to seek and require justification; an urge to discover the bases and sources of beliefs.

Key sensitivities: being aware of evidence bases; noticing superficiality and over generalization; being cautious about knowledge gaps.

Key abilities: the ability to distinguish between cause and effect; the ability to identify a logical structure; the ability to make an inductive claim; the ability to weigh and evaluate reasons and causes (Perkins & Martin, 1986).

7. The tendency to be meta-cognitive.

Key urges: an urge to have self awareness and to control your own stream of thinking; an urge to meditate backwards and give account to yourself; a strong desire to challenge yourself.

Key sensitivities: being aware of a loss of control in your thinking; identifying complex thinking situations that require self control; acknowledging the need to examine thinking events retroactively.

Key abilities: the ability to activate operational control over mental processes, to perceive thinking as an interpretive activity, to be able to evaluate yourself and think about previous thinking (Kipman & Wiser, 1988).

As to make a conclusion to what was said about we could state that this chapter deals with the research objective and questions and the relation to the subject. It opens with the question what good thinking is made of or, in our terminology, what kinds of mindware exist. Also added to the research are the methods of operating different types of thinking, how they contribute to good thinking, and how they are acquired. The processes supported by these skills and strategies – thinking philosophy and psychology – are operated by stimulation arising from a situation and by a process-start call. The mindware contributes to good thinking by skills and strategies which organize and channel processes, and is acquired by transferring thinking instructions and exercising the processes of problem-solving and decision-making under stress and emergency situations (Voss & Post, 1988).

The expertise outlook relating to medical, nursing and paramedical practice answers the questions differently: mindware is mainly made of knowledge and processes depending of a specific connotation. It is operated by connotation subtleties, contributes to good thinking by specific connotation-dependent knowledge and expertise and is acquired by situation-dependent learning.

The combined outlook proposed here wishes to settle expertise dimensions: the influence of stress and emergency situations on the processes of thinking and decision-making and on handling mental stress situations; thinking processes, solving problems, making decisions under stress and emergency situations, skills of perceiving the general processes, as well as other types of mindware such as the scales of thinking, thinking language, structures of abstract concepts and tendencies. This expanded ontology leads to more diversified answers to the questions how mindware is operated, how it contributes and how it is acquired. The true story of thinking can be described as becoming united; a story according to which a given situation stimulates certain types of thinking, which approach different types of mindware in flexible ways which are suitable to the situation (Voss & Post, 1988).

All the above requires teaching skills and designing perception tendencies, as well as a more correct and rich thinking of the way good thinking should be taught. Culture in general reflects the indisputably complex structure of social organization. Based on such observation the thinking-teaching culture approach is read. This approach offers a powerful work frame for organizing the thinking-teaching education, and respects the complex ontology and combined organization of good and correct thinking processes, problem solving, thinking skills and decision making under stress and emergency situations.

CHAPTER B

1. Strategies and stages of problem-solving

Researchers of the data processing school naturally took interest in different strategies for solving problems - whether algorithmic or heuristic ways. But prior to presenting some of these strategies we will examine how members of this school defined the terms "problem" and "problem solving".

Newell & Simon defined 'problem' in the following way: "A person faces a problem when he wants something and does not immediately know what is the sequence of actions, he can take in order to achieve it".

The way Newell & Simon (1972) perceived the solution of a problem as a search in a metaphorical space gave medical students inspiration in their analysis of processes when coming to solve problems connected to life support situations. According to their theory, the representation of a problem is comprised of four types of factors: description of the initial situation where the solution to the problem starts; description of the intended future situation to be achieved; the series of activities or acts which can be carried out and which serve to change the present state of the problem; and outlining compulsions that create additional conditions on a successful road that leads to a solution.

The problem space comprises the organization of all those situations that can be potentially achieved by implementing the available actions.

A solution is the series of actions which can turn the initial situation into the target situation in coordination with compulsions along the way. The search metaphor seems most suitable when the problem solver can identify a clear target, can understand the initial situation and the compulsions, and knows which actions could be useful in solving the problem. These cases are considered as problems well defined.

Hayes (1981) defined the solution to a problem in a simple and clear way: "Solving a problem means finding a suitable way to bridge the gap (between an existing situation and a desirable situation)". A person faces a problem when he stands on a riverbank and wishes to get to the other side and does not know how; when he is required to fill in an income tax form and does not understand the instructions; when he has to write a letter and does not know exactly how to gently say "no we do not want you to come and stay with us for a month". Every time there is a gap between the situation you are in, and the situation you wish to be in, and you do not know how to bridge it, you have a problem.

In order to solve a problem, the solver must undergo several stages (which will be elaborated later), as follows: define the problem and its characteristics, give it some kind of an internal representation, look for a solution and carry it out, and finally - evaluate the solution. Each of the above four stages is not necessarily performed just once: sometimes it is required to repeat one or more of the stages in the framework of solving the problem.

With every problem one starts with a given situation and aspires to reach a solution. The process of solving a problem is finding the way from the given situation up to the solution. Psychologists try to comprehend the process of solving problems through the reports of people about what happens to them while solving a problem: the thoughts that come up to their mind, trial and error, etc. The verbal reporting while solving problems is not simple because the difficulty to translate abstract thinking into words takes something away from the process. Nevertheless, this technique has contributed to a better understanding of the thinking processes we use in solving problems, and this is what enables the distinction between two types of thinking strategies: **algorithmic** and **heuristic**.

Algorithm is a mode of thinking according to which a person tries all the existing possibilities in order to solve a certain problem. This kind of thinking ensures the finding of a right solution, but the method is most tiresome. With this method, paramedics, doctors and nurses are taught and trained in the process of life support. But this method is more useful for paramedics because every life support situation has a problem-solving algorithm. The main advantage of the algorithmic methods stems, of course, from the certainty they provide about reaching the solution. In addition, after a certain algorithmic method has been chosen, there is no need for further actual thinking.

Heurism is a method whereby previous experience and known rules are used. The other possibility raised by behaviorists regarding the location of thinking is closer than what most of us use to assume about thinking being carried out in the brain. This is, of course, the option accepted today. But we think the research of the brain has not enabled so far anything more than the deduction of fairly rough conclusions regarding the connection between brain-activity and thinking processes.

According to this method doctors and nurses are taught and trained, because in life support doctors make use of previous experience and researches they have published.

2. Stages in problem-solving

Dozens of models of stages that people use to solve problems have been suggested by psychologists (Seifert et al., 1986). The factor common to the suggested models is presented by the description of four stages:

1. **Understanding the data**. At this stage the person refers to two aspects of a problem: the information at his disposal and the information he needs. In life support the doctor focuses on the family anamnesis and the description of the process of the event when a person has been present at the scene of the event.
2. **Planning**. At this stage the thinker organizes the data in order to be able to complete missing information. If the problem is complex, he uses sub-events. If the problem is simple, he considers whether to use the algorithmic or the heuristic approach.
3. **Implementation**. When the data have been understood and the modes of operation have been planned, an attempt is made to carry out the stages on which it was decided, in the shortest and most efficient way.
4. **Examination**. At this stage it is checked whether the solution reached is correct. Finding a proper solution also enriches us in such a way that a method, which has been proved efficient, can serve as a model of solving similar problems in the future.

These four stages are general stages and it should be remembered that the extent of experience and efficiency of the problem solver would lead him to those organization and implementation that are unique to him. It resembles a mishap in life support: an inexperienced person does not know how to approach the problem in order to solve it. The lack of experience would lead him to a lengthy process of examination. By way of the algorithm he could try and check different life support processes. A doctor who specializes in life support, however, will immediately approach the core of the problem and choose a fast and efficient solution known to him. The same applies to a doctor we come to with a stomachache; he will know how to organize the problem by asking target-aimed and relevant questions, which will lead him to a correct diagnosis and enable him to instruct on the most effective treatment method.

The reliance on previous experience in solving problems could be of great help but it could also become an obstacle.

3. Solving problems vs. identifying problems

People tend to concentrate effort in finding solutions. When they are presented with a problem that requires common sense, they immediately start thinking about possible solutions without going deeper into the problem itself. Sometimes this process works well but often running after a solution reveals itself as a trap. The solutions that come to mind reflect hidden assumptions regarding the nature of the problem and exclude the possibility of other- better solutions. However, a research on creative artists and scientists exposes the fact that they are aware of such natural trap in the human thinking. They tend to be problem identifiers who meditate how to define and present a problem in a totally different way, and even consider whether it is worth solving at all (Schoenfeld, 1985 - 1990; Schwartz et al, 1989; White, 1993).

Problem-solving skills: the ability to solve problems is an essential skill for every person so that he could function in a way which is efficient for him. The difficulty to make a decision is a nuisance for the person, which creates negative feelings both regarding the present helplessness and regarding the influence on his belief in his ability to solve problems in the future.

People who find it difficult to solve problems are people who suffer from a lack of cognitive processes, they have an impulsive style and the process of their self-reference is lacking.

The process of solving problems is defined by (Hayes, 1981) as an external or cognitive behavioral process enabling a wide range of alternative reactions, which are effective for the problematic situation, and increasing the chance that that person will know how to choose the most effective reaction for him.

The process of solving problems includes the ability to plan, define problems, assess alternatives, predict results.

The ability to carry out an intentional and planned behavior forms a central part in self-control programs and actually forms the basis for the development of self-control by way of using self observation, evaluation and reinforcement.

4. Preparation and education for thinking processes and problem-solving under stress and emergency situations

This dimension identifies a number of thinking processes – designing concepts, designing principles, understanding, solving problems, making decisions, conducting research, adding and conversing. Some of them form an acceptable connotation to practicing creative thinking – solving problems, research and adding. Steve's experience with the credit card, for example, is naturally classified to the category of solving problems. It can be easily understood that the other categories as well form opportunities worthy of creative thinking. As has just been emphasized in our discussion of critical thinking, when a person makes a decision he often acts properly when he challenges acceptable assumptions by changing perspective and carrying out additional operations in a creative spirit. The other example – Abigail's experience with the "storeroom of angers" is a case of understanding contrary to the anticipation. In the same manner, an established design of a concept could require full exhaustion of the creativity resources in order to reorganize given information.

The same way it is possible to perform different thinking processes in a more or less creative way, so these processes also appear routinely in cases of creative thinking. For example, the writing of an innovative novel includes not only the organization of the text but also making decisions regarding the development of the plot in different points, the design of concepts in order to create different characters, understanding in order to develop the science-fictional world of the novel, the drives of the characters, etc. All in all, creative thinking makes an important contribution to identified thinking processes and it is even their customer…

The rate of survival among adults and children following life support in cardiac standstill episodes outside hospital is extremely low. Still, it is unclear whether the improvement in the pre-hospital stage treatment can improve this sad outcome. In Israel, as in the US, medics and paramedics are the first to treat injured adults and children or those critically ill, even in the most difficult situations (Kataoka – Yahiro & Saylor, 1994).

Nevertheless, the level of training of paramedics for urgent pediatric situations is limited, they have only little experience, and the equipment earmarked for children at their disposal is often deficient. Basic level medics in the US receive 100 training hours, but only a very small part of this time is dedicated to the treatment of children. Similarly, only few of the 1,000 training hours given in paramedic courses are dedicated to treating children (Seidel et al., 1991). In the US, only about 10% of those requesting urgent medical assistance services (in the city and in the country) are children below the age of 14. Trauma is the main reason for applying among children aged 5-14. The main reason for applying for children under the age of 5 is illness. Applications regarding serious illnesses, including cardiopulmonary arrest, are more common among children not yet two. Therefore, it is vital that the urgent medical assistance services (the Red Shield of David - MDA) are experienced in assessing, stabilizing and treating adults, children and infants (Kurland et al,1986). If such an experience cannot be obtained and preserved at a field level, it is recommended to organize for these teams, clinical experiences in the framework of the emergency departments, the intensive care units and the children's operation rooms as well as PALS courses, and ATLS courses regarding adults. This training is essential for teams handling children and it is also recommended for care givers at the pre-hospital stage who are not related to the MDA framework. Still, the best method of acquiring skills, which are required in the field, has not yet been clarified. For example, intubation is studied in 97% of the programs in the US, but the method of training changes from place to place. In some of the trainings they use dolls and in others, experience is obtained through animals or adults and children who need anesthesia in ORs. But as the OR conditions or the use of training dolls are not identical to the field conditions, a combination of the two exercising methods is required as well as an additional research to determine what is the best method of teaching skills and actions that take place under field conditions (ATLS, 1998).

The effect of carrying out the vital life support activities at the scene of event on the outcomes of the CPR has not yet been determined, and a research is required in this subject (Schnaper, 1975; Scribner & Cole, 1981). A study conducted in the State of Washington found that the performance of intubation at the scene of episode among children, who had cardiac standstill after drowning, improved the results. But other researches did not find any difference in survival between children who were ventilated with a mask and bellows (ambo) and those treated with intubation. According to another study the rate of success of field intubation was only 64%. In addition, the high rate of complications involved in the performance of intubation at the pre-hospital phase, was alarming (Bone et al., 1992).

The survival of an injured or sick child in a critical condition is influenced by the availability and quality of the urgent medical treatment that child receives. Such treatment includes a variety of services rendered at different phases: a) The phase of identifying the problem; b) the pre-hospital phase; c) the hospital phase; the rehabilitation phase. Therefore, the Emergency Medical Services for Children (EMS-C) should be integrated (Gorelick et al., 1993) in the framework of the Emergency Medical Services (EMS) at the national, regional and local levels. The emergency medical services in Israel are given through the Red Shield of David (MDA) for adults and children together. In the US, the special needs of children for such services have been recognized following an informatory effort of the community of pediatrics and doctors of pediatric emergency medical services, with the financing of American national entities (Gillis et al, 1986; Gessner, 1989; Guyer & Ellers, 1990).

The current decade is characterized by an increasing awareness to the importance of assessment in designing study programs and teaching methods, the processes of thinking, solving problems and studying, as well as the wide variety of assessment methods in courses of life support of adults and children.

In the assessment of learners' thinking achievements, two assessment cultures can generally be characterized: the traditional assessment culture, which is based on examination – the **Testing Culture**, and an assessment culture which is focused and based on a continuous and consistent assessment, a performance profile – the **Assessment Culture**. The modern emphasis of the assessment is based on combining assessment and thinking in teaching: "… no longer an examination, which is detached from the specific teaching process in class, but a test that nourishes and leads the processes of thinking, teaching and studying…". The responsibility of the student in the process of assessment and thinking is active. "He becomes an active partner, who takes part in the determination of assessment criteria and the assessment itself … he is required to perform self reflection, i.e. awareness to his own thinking and studying process, he maintains a constant dialogue with the teacher on the subject of assessment and participates in the assessment of his friends' achievements as well" (Baron et al, 1989; Birenbaum, in Chen, 1995).

The modern changes in the approach to assessment form a part of an innovative construction of the roles of education whose object is ¨to develop a learner with self thinking and regulation, and turn the learning and thinking process into an experience more meaningful for the learner." This kind of assessment is called **alternative assessment** (Baron et al, 1989; Birenbaum, in Chen, 1995).

5. Test CIP - comprehensive integrative puzzle

This paper describes a novel tool for assessment in medical education, the comprehensive integrative puzzle (CIP). The dual scoring system of the puzzle stresses the integrative elements of diagnostic thinking and clinical reasoning, while preserving the ability to discern proficiency in various disciplinary elements. The CIP has the format of an 'extended matching' crossword puzzle. Its answer sheet is a grid comprising rows and columns. The left-hand column contains diagnoses or brief clinical vignettes. To complete the cells of the grid the student is required to match, stepwise, the various 'disciplinary investigations' to the diagnoses or clinical vignettes. When the puzzle is completed each horizontal row reflects a coherent medical case. The completed horizontal rows reflect integrative ability (diagnostic thinking and clinical reasoning) and the vertical columns measure the student's proficiency in interpreting medical history data, physical examination findings, laboratory test results, ECG, imaging, special tests, pathology and pharmacology. The CIP has been well accepted by teachers and students during the last seven years at the Bruce Rappaport Faculty of Medicine in

Haifa, and it has favorably affected both student assessment and teaching. The reliability of the test and its validity will be reported separately.

This session was run as a mini-workshop in a library resource center where the participants were seated in front of PC computers, where they opened the URL: tx.technion.ac.il/~webcip/ and followed the instructions for building and solving a web CIP (the computer version of the conventional paper CIP addressed in the reprint handouts) – while addressing the importance of matching the assessment method to the objectives of pre-clinical – clinical integration. The participants agreed that assessment drives the curriculum, and that innovative teaching techniques that retain conventional MCQ testing give the learners the message that nothing has really changed.

The importance of team work in constructing the CIP was discussed, as well as the contribution of this assessment method to teaching in an integrative manner, as opposed to juxtaposing pre-clinical and clinical material.

The advantages of the CIP scoring method – where the horizontal scoring reflects integrative ability, (and hopefully also clinical reasoning and diagnostic thinking), while the vertical scoring enables differentiation of proficiency in various disciplines, was greatly appreciated, mainly by the pre-clinical participants of the session.

The "hierarchy of advising" was discussed and is defined below as the pathway that start doctor should follow when discussing course and clerkship issues:

Course/Clerkship Director --> Chairperson --> Assistant or Associate Dean for Medical Education or Student and Academic Affairs --> Dean of the College --> Formal Grievance Procedure

When start doctor does not follow the proper chain of command problems generally ensue.

The legal issues attendant medical student-advising were discussed. The importance of annotating advising sessions was emphasized, especially when discussing unprofessional student behavior. Annotation is also important when students present with serious personal issues. It was suggested that annotations from such meetings be saved, but not placed in a medical student's permanent file until warranted. Annotations of meetings with start doctor can be very helpful if the student seeks a leave of absence later.

Confidentiality was also discussed. There are times however when an advisor is duty-bound, and in some cases legally bound to break a confidence. Such situations include when a student threatens to harm themselves or others.

The issue of advising start doctor using email was discussed. It was suggested that hardcopies of communications with students be maintained due to the potential legal implications of email student advising.

6. Introduction to WebCIP

The CIP is designed to assess a student's ability to "think like a clinician". However, due to his/her limited diagnostic ability at this stage, she/he WILL BE PRESENTED WITH 6 POSSIBLE DIAGNOSES (and the left-hand column of the CIP SOLUTION TABLE grid contains a list of these 6 possible diagnoses).

A possible puzzle (e.g. Cardiovascular) will have the following format:

Table.1 Possible puzzle format

Data Diagnosis	Column I HY	Column II PE	Column III LAB	Column IV IMG	Column V PATH	Column VI TRT
Case A						
Case B						
Case C						
Case D						
Case E						
Case F						

where:

Column I and 1st feature relate to the medical history (HY)
Column II and 2nd feature relate to the physical examination (PE)
Column III and 3rd feature relate to imaging (IMG)
Column IV and 4th feature relate to laboratory and other tests (LAB)
Column V and 5th feature relate to treatment (TRT)
Column VI and 6th feature relate to pathology (PATH) macro or micro

This CIP is comprised of six features, corresponding to the number of columns in the solution table. In each feature students will find numbered options.

There are many ways to complete a puzzle, however clinical medicine begins with the medical history and this is where students are suggested to begin, by matching the items in feature I (HY), to the diagnoses. Their selections are automatically transferred to the CIP puzzle table.

Now students proceed to feature II (PE), and match the items corresponding to the physical examination findings that they would expect to match the diagnoses, which they formerly chose on the basis of the medical histories. If not, all are suitable, students go back to check their initial choice of diagnoses.

Students proceed to section III, and select the suitable sets of images that match the clinical pictures. Once again, if they think they have a mismatch student go back and check their former choices.

And so on, until they have complete coherent pictures corresponding to the diagnoses.

Students should now have a completed puzzle.

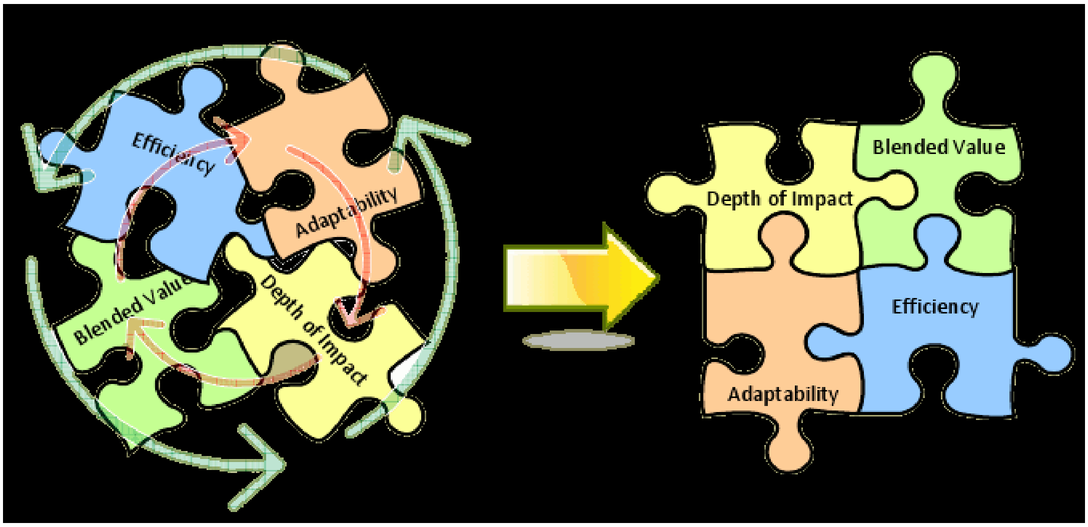


Fig. 3 Example of the puzzle

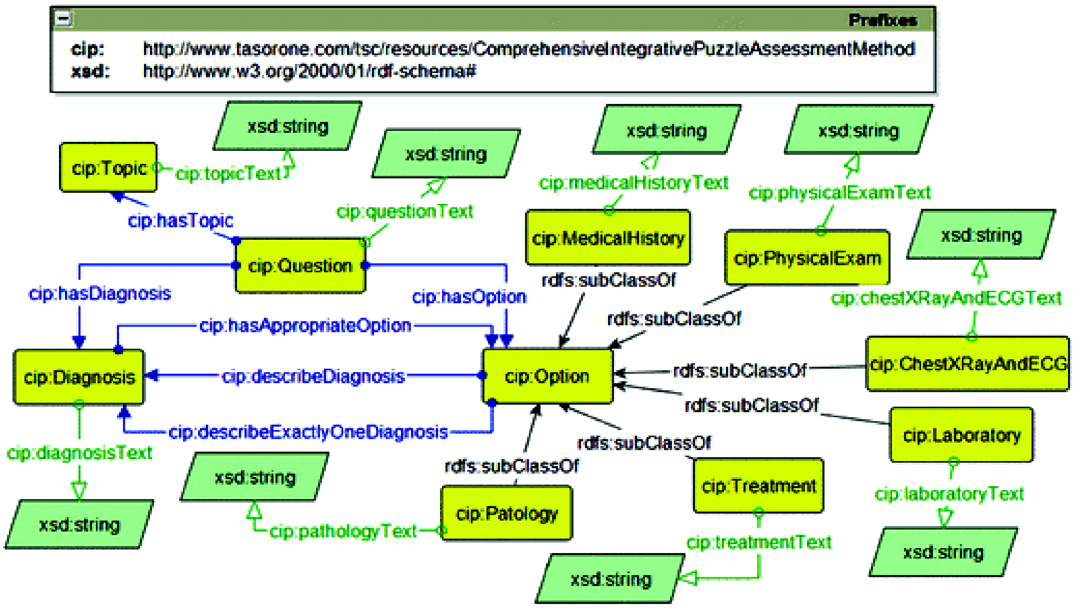


Fig. 4 Comprehensive Integrative Puzzle Assessment Method

7. Test: Objective structured clinical examination

The **OSCE examination** for testing the students is an Objective Structured Clinical Examination test which examines the faults of clinical evaluation, of examination ability and of judgment. A method is described of a designed clinical test where the students go around and make stops at fixed stations in which their ability is tested in performing physical examination, collecting anamnesis or solving diagnostic and nursing problems. In every such station there is a "mute" examiner who evaluates the performance of the task according to a preset list of points. The patient the subject of the examination is sometimes a pseudo patient whose illness "story" has been prepared in advanced and sometimes a real patient who tells the story of his illness. Hence, of the three variables comprising the test, i.e. examined, examiner and patient, two are determined in advance so that the results of the test actually reflect the student's ability. As the test imitates a clinical situation, it examines the teaching targets. From our experience we have learnt that such examination can be implemented in small groups of 4-6 people and it is effective for the evaluation of study groups in the department or even in internship exams.

Evaluating the clinical ability and judgment among med students is a difficult problem. This ability is generally examined by an oral test. The basis for this examination is generally a certain patient regarding whose case a team of examiners directs questions and expands the issue with additional questions. The oral test is intended to examine complex skills.

The use of a pseudo patient has been found most effective and relatively easy to exercise and perform. It mainly relates to providing anamnesis or to physical examination where skills are checked rather than the raising of pathological findings. It is especially important regarding patients where anamneses that include questions of significant emotional involvement are concerned. The pseudo patient can also provide an objective evaluation about the approach of the examined student.

The examination is of content validity as it imitates known clinical situations. It examines relevant clinical skills and forms a challenge and a study experience for the examined persons. In addition, it is effective from the point of view of time investment. It has been found that the discussion after solving the case is most fruitful and instructive.

The disadvantage of this test is that the evaluation as it is carried out by the "mute" examiner on the basis of a semi-detailed list, is still subjective and the number of examiners and examined is limited.

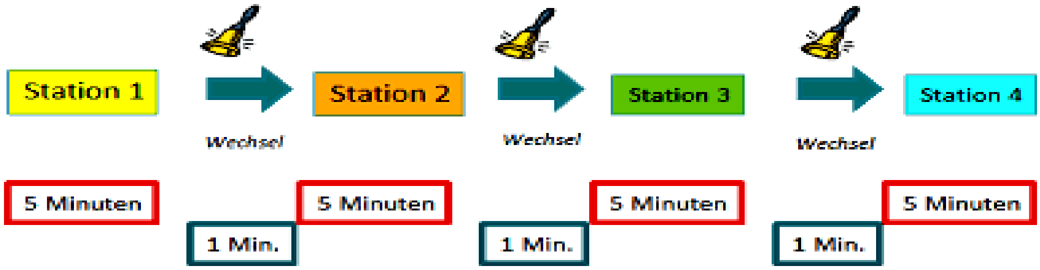


Fig. 5 The situations exercised in the OSCE test

The objective structured clinical examination (OSCE) fulfils most of the above criteria. It is a method of assessing a student`s clinical competence which is objective rather than subjective, and in which the areas tested are carefully planned by the examiners. The clinical competence to be tested is broken down into its various components, e.g. taking a history, auscultation of the heart, interpretation of an ECG or coming to a conclusion on the basis of the findings. Each component is assessed in turn and is the objective of one of the stations in the examination. The student, during the examination, rotates round a number of stations, usually about twenty, spending a specified time at each station. On a signal (usually a bell) the student moves on to the next station. The time allowed is the same for all the stations and the stations must be designed with this in mind. Experience has shown that 4.5 minutes is a convenient length of time to allow at each station. A further 30 seconds should be allowed for the student to move to the next station and for the examiner to complete any final comments on the previous student`s performance. Where there is some distance between two stations, e.g. if the examination is held in two wards, then a rest station can be placed between the last station in one ward and the first station in the next ward.

Fig 6. Types of stations

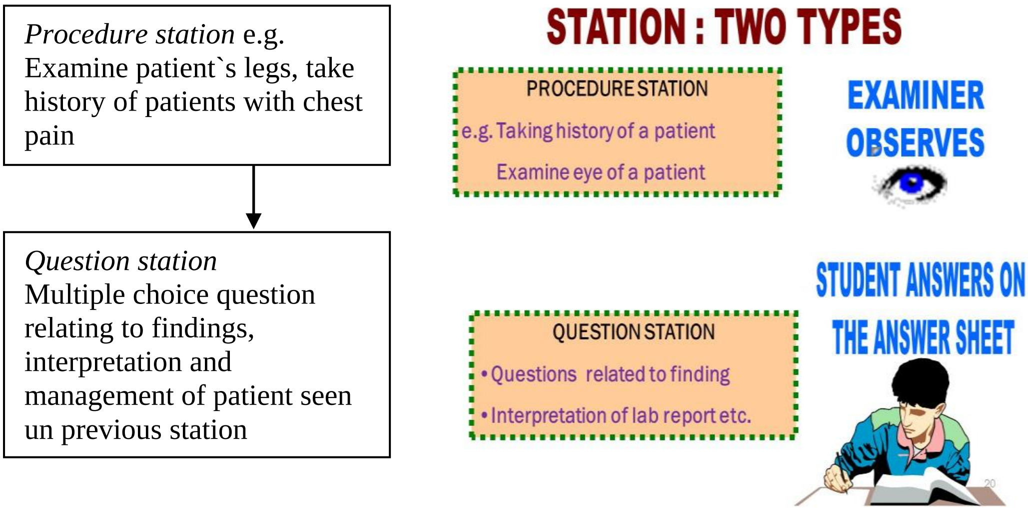


Fig.7 clinical examination for doctor Start

Stations can be classified into two types (Fig. 6). Firstly, procedure stations, where the student has a task to perform, such as examine the abdomen, and question stations, where the student has to answer questions, usually on the basis of information he has obtained at the previous station. All Starts rotate through the same stations. The stations in an example clinical examination for doctor Start in their first clinical year is shown in Fig.7. The content of the stations will depend on the experience of the Starts and on the nature of the assessment – is it an integrated examination covering a number of subjects or restricted to one specialty? If the Starts are junior the emphasis may be on techniques of history taking and examination and less on the findings and their interpretation.

At procedure stations where the student`s technique in history taking or examining a patient is to be assessed, an examiner is present. The examiner uses a check list to record the performance of the Starts as they pass through the station. At other procedure stations, such as where the student has to examine an X-ray associated with the summary of a patient`s history no examiner is present. At the question stations, the student is asked about his findings at the previous station and their interpretation. He may be given some additional information about the patient and asked about the management of the patient. To improve objectivity and facilitate marking, multiple choice questions of the multiple true/fals type may be used, the student carrying with him throughout the examination a standard answer sheet on which he notes his responses (Lever et al., 1970). At the end of the examination the examiners` checklists and the Starts` multiple choice answer sheets are marked according to a previously agreed scheme.

With twenty-five-minute stations, the duration of an examination will be 1 hour 40 minutes, and two diets of the examination can be held in one morning using the same station. If the number of Starts is sufficiently large, the examination can be duplicated in other wards.

The examination may be held in a hospital ward and in the ward side-rooms, or it may be held in other accommodations.

Assessment of Inspection. The student`s observation and ability to recognize and interpret patterns and to record the findings as an accurate case record may be tested. The student may be asked, for example: inspect the face of this patient and inspect the hands of this patient.

A coloured picture or slide of the patient can be displayed using a projector with built – in back projection screen as an alternative to a real patient. This may be more convenient and just as effective in some situations. The student is encouraged to make notes and is asked questions about his findings at the next station. Two or four patients can be included in the 4-5 minute period.

Assessment of Interpretation of Patients Charts or Laboratory Investigations. The student may be asked at a station to examine a patient`s chart or a laboratory report. The following are examples of some charts or laboratory investigations which the student could be asked to examine:

Patient`s drug record, patient`s temperature record, patient`s BP chart, ECG, chest X-ray, biochemical report, hematology report, respiratory function report

A summary of the patient`s history may be presented with the chart or investigations. The following summary accompanied a thyroid isotope scan which showed a "cold" area in the left lobe. H. W., a 34-year-old clerk gave a 3-month history of a painless lump in the left side of the neck, which had been slowly increasing in size. There was a single nodule about 3 cm diameter in the left lobe of the thyroid. He appeared to be euthyroid.

The student may be asked questions at the same station or at the next station. These are most easily marked if they are of the objective type and the Starts can use the same answer sheet they use for the questions relating to the history taking and physical examination stations. One advantage of asking the questions at the next stations is that the questions themselves do not prompt the answers. For example, if the student is asked of an X-ray "has the patient a pneumothorax?" different answers may be obtained, depending on whether the student still has the X-ray in front of him or not. If the question s are at the next station the student should be reminded that he can make notes while examining the chart or report but that he will not be able to see the chart or report itself when answering the questions later.

Depending on the complexity of the problem and whether questions and or a summary are presented, one, two or four charts or investigations may be shown investigations may be shown in the 4-5-minute period.

Assessment of Other Aspects of Competence. Other aspects of competence can be tested in the objective structured clinical examination. Examples include the following.

(a) Patient education. The student is asked to explain to the patient, e.g. a new diabetic, how to give himself an insulin injection or is asked to explain to a patient with abdominal pain why he should have a barium meal examination and what is involved.

(b) Interpersonal skills. The student is asked to explain to a wife that her husband has just had a myocardial infarction.

(c) Surgical or clinical instruments. The student examines instruments used for simple surgical or clinical procedures, e.g. needles for suturing equipment for lumbar puncture and is asked questions about them and their use.

(d) Examination of specimens. Specimens of urine, faeces or sputum may be presented to the student.

(e) Assessment of aspects of physical examination which are difficult to assess in normal clinical examination. Examples include use of plastic models to assess vaginal and rectal examination (Penta & Koffman, 1973).

(f) Practical procedure. Starts are asked to carry out a procedure, e.g. testing a sample of urine. Models may be used to test ward procedures, e.g. lumbar puncture.

(g) Examination of fundi. The use of the ophthalmoscope can be assessed at a procedure station and the findings questioned at the following station. Alternatively, the student can be asked questions about slides or coloured photographs of the retina presented to him.

8. Advantages and disadvantages of OSCE

Advantages of the OSCE. The OSCE provides a more valid examination than the traditional approach to clinical examinations. The examiners can decide in advance what is to be tested and can then design the examination to test these competencies. The examiners can control not only the content but also the complexities of the examination – more straightforward cases for junior Starts, more advanced cases for senior Starts. The emphasis can be moved away from testing factual knowledge to testing a wide range of skills, including history taking. Minor specialties such as otolaryngology can be included.

The examination is not only more valid but also more reliable. The variables of the examiner and the patient are to a large extent removed. The use of a checklist by the examiners and the use of multiple-choice questions results in a more objective examination. A further advantage of the OSCE is that with the number of stations a larger sample of the student`s skills is tested.

Finally, the OSCE has the advantage that it can be used with large numbers of Starts. In one surgical final examination in Dundee for example, Starts were tested in one morning. The examiner is used efficiently in that he is used only for those parts of the examination, such as observing a student taking a history or examining a patient, where there can be no substitute.

The fact that there is a clear bried for examiners and each examiner has a checklist makes it possible to use more junior examiners.

With the OSCE the criteria for a pass can be specified in advance and following the examination feedback can be given to the staff and to the Starts.

Disadvantages of the OSCE. In the OSCE the student`s knowledge and skills are tested in compartments and he is not tested on his ability to look at the patient as a whole. However, assessment of the student`s competence need not be confined to the OSCE, which can be combined with the more traditional type of "long case", where his ability to handle a complete case can be assessed, or by an assessment of his work in the ward through tutor's reports.

The OSCE may be demanding for both examiners and patients. The examiners are required to pay close attention to Starts repeating the same task on a number of occasions. It may help if the examiners change stations halfway through the examination, but this may decrease the consistency of the examination. Patients must be selected carefully and the instructions to Starts designed to minimize any disturbance to them. Where a technique is being assessed – for example, testing the visual fields – each examiner may have up to their patients, so that each patient is examined only by every third student. The use of simulated patients also helps.

As with many educational advances, the benefits are achieved by increased effort. The time involved in setting up the examination is greater than for the traditional examination. For the most part, however, the effort takes place before the examination. With succeeding examinations less time is required and both time and effort can be reduced if a bank of objective test items and checklists is maintained.

9. Uses of an OSCE.

The objective structured clinical examination can be used in any situation where one has to assess a student`s clinical competence.

(a) Stage of student. The OSCE may be used with undergraduates as a final end of course examination or as a method of in-course assessment. Starts in Dundee are awarded grades for their clinical competence at the end of the Autumn, Spring and Summer terms in the third and fourth years of the course. These grades are taken into account by the examiners in the final assessment at the end of the fifth year. The OSCE may also be appropriate in postgraduate examinations, where the problems of assessment of clinical competence have been described

(b) Purpose of assessment. An OSCE is particularly suited to criterion – referenced examinations, where a pass/fail decision has to be taken and where a decision has to be made as to whether a student has reached a prescribed standard and is able to graduate or pass on to the next part of the course. The OSCE can also be used to indicate in which areas the student is deficient and the student may be required to acquire further skills in these areas. The OSCE is also useful when used as a method of providing feedback to student during a course. The OSCE can also be designed so that it selects Starts with particular skills or abilities, and where one is attempting to identify those with greater than average ability as has been claimed in the MRCP examination.

(c) Relation to other assessments. The OSCE may be used as the sole assessment of clinical competence or may be combined with a "long case" or some other form of assessment, such as the Starts" clerking of cases in the wards.

10. Organization of an OSCE.

The organization of an objective structured clinical examination has many features in common with the organization of the traditional clinical examination. However, in common with other forms of objective examination, more time is required in its preparation. This extra time is spent in deciding what is to be examined and, having done so, in preparing the checklists and questions that will be used. It should be remembered, however, that once the checklists and questions are prepared, they can be used in future examinations and a bank of them can be setup, as is the case with written objective questions.

The stages in the setting up of an objective structured clinical examination are considered under four headings, given below.

(1) Advance planning.
(2) Organization on the day before the examination.
(3) The day of the examination.
(4) After the examination.

(1) Advance planning. To allow insufficient time for the preparation of an OSCE is to court disaster and if the examination id to be successful advanced planning is essential. This is even more important than with the conventional form of examination. Eight weeks is a not unreasonable length of time to allow for this phase but, ideally, for a major examination, planning should start six months in advance. During this phase the following must be planned for:

(a) The examiners have to decide what is to be examined, the weightings to be attached to the different components of the examination and the minimum standard required to pass.
(b) The examiners and staff concerned with the examination have to be briefed.
(c) The ward and ward staff have to be prepared.
(d) Patients have to be selected and briefed.
(e) The necessary documentation for the examination has to be prepared, including checklists, instruction to examiners and questions.

One of the first decisions to be taken relates to the scope of the examination. Whatever the specialty to be assessed, the competencies can be divided into the knowledge, skills and attitudes required to: (i) collect information about the patient, including history taking and physical examination; (ii) interpret the information and come to conclusions as to the most likely diagnosis; and (iii) decide on the subsequent management of the patient.

The content of the examination can be plotted on a matrix to ensure that the examination is representative of the range of competencies that should be tested in the examination.

Once the content of the examination has been decided, a marking scheme has to be devised and marks allocated to each section and each section part. It might be decided, for example, to allocate marks as follows.

History taking stations	30%
Physical examination stations	30%
Laboratory investigation stations	20%
Interpretation stations	20%

Thus, if there are four history taking stations in the examination, each would contribute 10% to the final mark.

Marks can be allocated to each item on a checklist, and to the MCQs, in such a way that when they are totaled the result is a mark for the whole examination. Alternatively, mark can be allocated for each station independently and then later weighted when they are computed as part of the total mark for the examination. The latter approach is preferred, since the former procedure places some constraints on the examiner and tends to distort the balance of marks. A final mark can be computed using a programmable calculator and, in addition to the total mark, a subtotal for each section and a mean and sad. for the class for each section can be produced. For the MCQs a standard answer sheet can be used (Lever et al., 1970) or, alternatively, a computer readable card.

(2) The day before the examination. On the day before the examination a final check should be made of the preparation and arrangements in the ward, and the final documentation should be given to each examiner.

(3) The day of the examination. The examination organizer or coordinator should arrive at least one hour before the examination is due to start and should check that all the beds, patients and equipment are in their correct positions. While a member of staff briefs the student, the organizer of the examination should check that all examiners have are arrived and are at their correct stations.

(4) After the examination. Following the examination, the Starts should be given feedback as to their performance. The checklist, scored and annotated by the examiner during the examination, can be returned to them.

In order to make a short conclusion, we can say that in this chapter we have investigated the way a person solves problems, the information processing school, different problem-solving strategies, stages in problem-solving, skills for solving problems, preparations and education relating to thinking processes in stress and emergency situations.

The intervention during life support carries great promise because at that time the medical and nursing team is ready and open to accept influence and guidance from around it more than every other time. Such conceptualization is the core of the technique of crisis intervention and this is the reason why those studying the method of intervention during crisis are aware of the fact that a minimal intervention at a stressful time can bear optimal results in saving the patient's life.

The ability to handle life support situations is subject to an early preparation. Whatever is not done prior to the creation of a life support situation, can hardly be changed or cannot at all be changed at the time of life support. The verse of our wise ancestors: ¨No pain no gain¨ indicates the need for all the teams (medical, paramedical, nursing) to prepare themselves in time for emergency situations and not rely on miracles.

Life support situations of every kind, at the time of peace as in war, require immediate action. The medical and nursing teams usually do not have time to dedicate to thinking prior to taking action. It is, therefore, extremely important to make preparations – those things prepared by the team in advance for life support situations, and to get ready – knowing in advance what should be done. Being prepared and being ready are the two ways by which someone can increase his/her ability to handle life support situations, if and when he/she are faced with them, a fact that could save the life of the patient lying in front of he/she.

CHAPTER C

1. Research on doctors, nurses and paramedics

- Can physiological, physical, behavioral reactions influence the process of decision making and problem solving?
- Do the respondents identify the problem in emergency situations?
- Do the research participants carry out the required actions and take into consideration the actions to be taken for saving the patient's life in the emergency situations?
- Are the processes of decision making and problem solving well defined in the curriculum for the three research groups?
- What are the difficulties discovered by the respondents in the course of treating the patients in emergency situations?
- Do the physiological and autonomous characteristics and physical reactions testify stress situations during an emergency situation?
- Are the performances of doctors who have completed their training with an emphasis on declarative knowledge different from the performances of paramedics and nurses who have completed their training with an emphasis of procedural knowledge regarding an emergency situation intervention?

As the test imitates a clinical situation, it examines the teaching targets. From our experience we have learnt that such examination can be implemented in small groups of 4-6 people and it is effective for the evaluation of study groups in the department or even in internship exams.

The situations for exercise were as follows:

1. *Respiratory failure*
   - ❖ A one-year-old baby was accepted at noon at the emergency. The fever of the baby during examination is 39.5. The child is alert but irritable. He has marble skin, cold limbs, heart rate 189 per minute, respiratory rate 52 per minute, blood pressure 78/38, pH 7.4 in arterial blood. What is the immediate treatment?
   - ❖ A 16-month old child, cough and runny nose for four days, on examination he responds only to pain, blue, breathing 70 per minute with intercostals

retractions, paradoxal breathing, heart rate 170 per minute, capillary filling more than 5 seconds.

- ❖ A 4-year old girl artificially ventilated through tracheostomy for three days, suddenly she turns blue, bradycardiac; it is hard to ventilate her with ambo through the tracheostomy and it is impossible to perform suction. What should you do?

2. *Shock situations*
   - ❖ A three years old boy is brought to the emergency room due to diarrhea, the child is pale and apathetic, respirations 48 per minute, no signs of distress, pulse 166 per minute, capillary filling time 5 seconds, thready peripheral pulses, he receives 100% oxygen and infused through the left hand. What is the immediate treatment?
   - ❖ A 3 kg baby is brought to the emergency room due to vomiting and diarrhea. On examination he hardly responds. Cold periphery with capillary filling time of more than 5 seconds and thready femoral pulses after inserting infusion to the right hand. Received 200cc/N.S/kg. While giving the fluids the infusion got out of place, the baby's blood pressure decreased and he stopped breathing for 20 seconds.
3. *Burns*
   - ❖ A 3-year old boy was accepted at the surgical ward. He was burnt in a closed vehicle, a third degree burn in the neck, mouth, chest, back and upper limbs areas. On acceptance the boy seemed suffering and irritable. Vitality signs: blood pressure 60/40, pulse 150, breathing 45 stridor, peripheral cold, percent of burn 56%.
   - ❖ A 16-year old boy was burnt by boiling water when a pot fell on him while cooking. On examination, first and second-degree burns were observed in the areas of: lower abdomen, upper limbs, chest, percent of burn is 36%. What is the immediate treatment he will receive if we assume he weighs 40 kg?
4. *Guarding the airway*
   - ❖ A 7-year old boy woke up in the middle of the night with high fever, stridor, shortness of breath. Was referred to the emergency by the Israeli "Red Cross" service. On examination he was seen sitting with his head down, fever by touch, drooling, hoarseness, running nose, pale and irritable, respiratory rate 40 per minute, pulse 185 per minute, thready peripheral pulses, capillary filling time 5 seconds and blood pressure 60/29.

5. *Inhaling a foreign body*

❖ A one-year old boy arrives at noon to the emergency with a cough, stridor, fever of 38 for over four hours, responds to pain stimulus only, respiratory rate 49 per minute, heart rate 180 per minute, thready peripheral pulses and cold limbs. According to the mother he ate sausages in the morning and has been feeling bad since then.

❖ A 4-year old girl was accepted at the emergency. Has breathing difficulties but is unable to swallow due to hoarseness. She does not seem toxic and on listening to the lungs there is a decline in air coming into the right lung. Her parents report that she was playing with her brother in blowing balloons.

6. *Chest injuries*

❖ An 18-year old guy was accepted at emergency after a road accident with head, chest and abdomen injuries. Vitality signs on acceptance: pulse 96, stortion 95, blood pressure 110/60. The young man was sent to a head, chest and abdomen CT test. During the test a respiratory decline occurred, the stortion dropped to 86, the blood pressure to 85/40, the pulse increased to 112. The patient was ventilated. On a CT examination DAI head, CT chest lung contusions on the right, CT abdomen a small amount of fluid. While in emergency an additional deterioration occurred, his stortion dropped to 82, blood pressure 89/38, pulse 50 and ventilation through the tracheal tube with ambo started. The stortion increased to 85, pulse 49, blood pressure 80/30 and was again attached to a ventilation machine where the oxygen percent was increased to 100% as well as the TV. After increasing these two parameters there was no improvement in his situation, on the contrary there was a worsening. Vitality signs: stortion 73, pulse 43 and blood pressure 76/35.

7. *Cervical spine injury*

❖ A 21-year old guy drowned after jumping into the water. Two friends rescued him. He was found unconscious, ventilated with ambo by the lifeguard, was brought to the hospital ventilated, with a collar. Vitality signs on acceptance: pulse 51, blood pressure 80/40, paradoxal breathing, temperature 35. Stortion throughout the transfer to the hospital between 85 and 92.

8. *Arrhythmia*

❖ A 6-month old baby, apathetic, cold limbs, capillary filling more than 5 seconds, lentiginous liver 3 cm below the rib cage, heart rate 250 per minute, thready peripheral pulses and the ECG shows narrow complex.

A peripheral infusion was attached to the right hand. When fluids were given, the infusion got out of place.

- ❖ A 23-year old guy. A swimmer. Was found on the beach with a pulse of 44, 8 breaths per minute, color: pale, cold, capillary filling more than 5 seconds.

9. *Birth heart defects*
   - ❖ A one-year old boy, hospitalized in Children Ward A as suffering from tetralogy of fallot. Came for a routine check up at the children's cardiology clinic. During the check up he started breathing heavily and his color turned to deeper blue than his usual dusk.
   - ❖ A twelve-year old boy, hospitalized in Children Ward B. Weighs 35 kg. Has a history of a birth heart defect which was corrected by surgery? Has been found without a pulse and does not breathe. What is the immediate treatment?
   - ❖ A 51-year old man who is usually healthy. While working in the garden he started complaining about chest pains which radiate to the left arm. It is expressed by sweating and difficulty in breathing.

10. *Intraosseous transfusion*
    - ❖ A 5-month old baby is brought to the emergency by an MDA team which ventilates him, perform infant cardiac massage, no pulse, an intraosseous transfusion was attached and an intubation was carried out. In the ambulance he received 0.01 mg adrenaline through the intraosseous 4 minutes ago in addition to oxygen. What is the medication to be given?

11. *Convulsions*
    - ❖ A 5-year old boy is hospitalized in Children Ward A. Was found unconscious after he was seen having convulsions in his hospital bed. What is the right way for an initial opening of the airway?

12. *Treatment in artificial ventilation situations*
    - ❖ A 5-year old boy is hospitalized in Children Ward B, artificially ventilated. Suddenly he turns blue and bardycardiac. On manual ventilation with ambo, normal breathing sounds, equal on both sides and the chest rises symmetrically. A half an hour after re-attachment to the ventilation machine, the boy reduced stortion to 80, pulse 157, blood pressure 85/45. On listening to the lungs, reduced air coming into the left lung. The boy was again attached to the ventilation machine and 10 minutes thereafter a significant deterioration occurred: he reduced the pulse to 60, stortion 40, blood pressure 60/30. On listening to the lungs no air was heard entering the left lung.

The field of thinking education is divided into three main approaches: the skills approach, the tendencies approach and the understanding approach, where each approach is equipped by a "central approach".

The skills will be treated as strategies of "thinking frameworks", or "thinking organizers". The term "thinking skills" is common but those who use it carefully do not mean motorial-perceptual skills trained by a person in order to be more fluent and agile. Empirical experience and findings teach us that better thinking requires reorganization, which is more than turning patterns into something more fluent. Better thinking should, for example, learn to see the other side of a claim or look for hidden possibilities in a state of decision making, rather than do whatever it has done so far more fluently. Naturally, we also wish to be reasonably fluent in implementing strategies of new thinking frameworks, but reorganization is more vital than practice.

As to the relationships between the categories: the "skills", "tendencies" and "understanding" categories are all, widely speaking, "windows" to the manner in which we think and learn. It is, anyway, beneficial to perceive them as such. we would like to add that the categories are not found on the same level. The tendencies theory of the "learnt intelligence" which has been developed includes skills. It leaves space for strategies and perceives them as an important component. Of course, a tendency as it is customary to characterize, is not a strategy, but the theory of tendencies allocates a space for it. The perception of thinking tendencies (which includes tendencies and skills) and the "perception of performances of understanding" according to which understanding is a matter of flexible performance ability – are parallel perceptions. How do they relate to each other? Well, the one does not give in to the other. They should be distinguished along these lines: understanding does not always involve thinking in the conventional meaning. A more reflective understanding better characterizes doctors (the understanding of something – historical events, scientific theories, art creations, etc.) and requires thinking. On the other hand, a more operational understanding and thinking better characterizes paramedics and nurses – the understanding how to perform something flexibly. Understanding that is somewhat analogical to "knowing how" might require thinking and might not require thinking in the conventional sense, depending on the field. For example, a person who is skilled with skiing "understands" how to handle a series of ski situations flexibly and even creatively. Such operations are, no doubt, cognitively demanding but do not necessarily depend on much thinking in the conventional sense. A good doctor, on the other hand, surely must think in the conventional sense in order to do his job properly – to examine, diagnose, provide a solution to the problem and decide.

Good thinking always involves a certain degree of understanding, but thinking does not always focus on achieving understanding. Naturally, a person cannot think properly about something unless he understands it to a certain extent and on a certain level. Nevertheless, thinking is not always aimed at acquiring understanding. For example, large amount of thinking is aimed at questions of verification and receiving a lot of information about the patient in order to reach a diagnosis. Do smokers tend to have more cancer than non-smokers? This question is easily understood as it is a question of evidence. It could be that finding evidence is one type of "understanding performances" – but, again, it is only one type, and this type is not so central to what we call "understanding", unlike understanding performances such as providing an explanation, giving examples or implementing ideas in new situations.

In real educational connotations it is generally impossible to focus simultaneously on understanding and tendencies (which include strategies). One of the most important lessons learnt from the practical work at the med school and other institutions is that the teachers or lecturers (not to mention students) cannot operate different programs simultaneously (e.g. theory and clinics). It will be difficult and futile for teachers to each at the same time how to operate in the framework of "teaching for understanding" and in the framework of designing tendencies. Some teachers of a suitable background and teaching commitment might succeed, but most would fail. Under different conditions and in the long-term there is great possibility to combine the two approaches.

These points explain why we do not simply bind the education for understanding and the education for thinking together, or treat them as one, although from many points of view they interface.

Trends in education are subject to pendulum oscillations and mainly the movement between the progressive education and the conservative education, i.e. an education that puts the learner in the center vs. an education that puts the curriculum in the center.

Howard (1982) is today a known spokesman of the progressive ideology, which is more suitable to the nurses' curriculum. Hayes (1981) is a follower of the traditional disciplines and today is a known spokesman of the conservative ideology of the doctors' curriculum, although he does not perceive the control of knowledge as an objective for itself but as part of the course of intensifying the individual.

It is useful to distinguish between the methods dimension and the contents dimension of the progressive/conservative tension although in real life the two dimensions certainly co-operate. Some contents could be more or less progressive and some methods could be more or less progressive. Regarding the methods dimension – if we imagine a "scale of methods" which begins with extreme conservatism and ends with extreme progressiveness – the authors of the book are probably found at the area of 7/10 from the beginning of the scale.

There are downsizes about any type of extremity: it tends to be ideological. In education, of course, there is an inevitable element of ideology. But education is also a design science. As a design science the major question it asks is: "How can one carry out this work?" According to every point of view, the basic object of education includes thinking, remembering knowledge, understanding it and undergoing active clinical experience of it.

Does the educational pendulum have to move forever only because education is ideological by nature (as known, ideologies cannot be refuted)? Or is it possible that the pendulum will stop one day because education has a meditational and scientific dimension as well and some findings might support one aspect (e.g. constructivist findings about learning which support the progressive aspect)?

We believe that the dimension of the progressive/conservative **content** is a matter of eternal tension – it reflects what people value, and people in different cultures and times will continue being different from the point of view of what they value. On the other hand, the disputes around the dimension of the progressive/conservative **method** will gradually diminish as they relate to the question of the effectiveness of means. We gradually accumulate decisive knowledge as to what works the best way regarding different goals in emergency situations (life support) and at the same time also acknowledge that more than one method is likely to serve a certain purpose in a certain situation, and that additional renovations are always possible. Teaching how to read is a good example for this matter: the ideological dispute between the phonetic method followers and the holistic method followers is gradually dissolved into arguments about subtleties regarding the way in which children learn to read and different ways of teaching how to read.

The main problem connected with the study of thinking processes is simple but also very hard to solve: thinking is an internal action which cannot be directly observed. There is no reliable way to follow the thinking processes with our senses and therefore there is also no way to register them, record or film them. Still there are ways, although not perfect, to penetrate the 'black box'. The simplest way is to ask the respondent – the problem solver – to describe the continuity of his thoughts, from the moment of getting the problem up to providing the answer. This is a possible solution and many researchers have indeed used this method called 'thinking aloud' to study thinking. But this method is not without difficulties. First of all, no one knows if the description given by the respondent is indeed a true description of the thoughts going through his mind at the time of their occurrence. Even if the respondent tries his best to carry out the task sincerely and accurately (many researchers have used themselves as respondents), can he utter all the thoughts coming up to his head? Can he at the same time concentrate on solving the problem and describe his thoughts while making the attempt? Moreover, is the person generally aware of his own thinking processes? It could be that important stages in the process of solving the problem take place outside the awareness, outside that range of thoughts that the respondent is aware of and capable of reporting. All these are real difficulties. Therefore, we have chosen to examine the thinking processes through several indices:

2. Lateral Thinking and the CoRT Program

2.a Lateral thinking vs. vertical thinking

The thinking program developed is most clearly characterized by looking up the term "lateral thinking". This term clarifies the distinction between two types of thinking: the first type is "vertical thinking" and the second type is "lateral thinking".

The vertical thinking is analytical logical thinking characterized by organized stages. The vertical thinking is limited because of two main reasons: the first is that the thinker has a compelling need to be right in each of the thinking stages.

The second reason is connected with the necessity to rigidly define every term forming the object of thinking, because the need to formalize and verbally express thoughts and ideas which have not yet matured is likely to hinder the natural flow and development course of such thoughts.

The "lateral thinking" does not necessarily have organized stages, it cannot be predicted and it is unusual. Lateral thinking creates the ideas which the vertical thinking develops, and therefore is engaged in looking at reality from new directions.

From a top-down perspective, we use lateral thinking (out-of the-box thinking) for our strategic planning activity (creativity) and parallel thinking for our business planning (do it now mode) processes.

Lateral thinking is commonly referred to as out-of-the-box (OTB) thinking. Coined by Edward de Bono, founder of the Cognitive Institute Trust in Cambridge in 1969, his instruction is sought by leading companies such as IBM, Shell, Unilever and Du Pont.

Lateral thinking is different from the traditional logical process that Edward de Bono (1973 – 75) calls vertical thinking. Lateral thinking is most useful in generating new ideas and concepts. This is why it is valuable in generating strategic business plans. It is not Kaizen, the on-going process of incremental improvement, but tied very closely to its ability to assist developing global performance and acceptance.

Lateral thinking must be learned, not taught. It is a process to explore different ways of looking at an issue as opposed to accepting the most promising and proceeding. To be global, one must expansive, view a larger picture.

Lateral thing is chaos as opposed to procedure - vertical thinking - structure. Compare the two as building blocks. Stacked blocks are vertical. Scattered blocks are lateral period. This comparison shows that global planning, like building blocks, is best served with blocks scattered about (chaos) where a pattern may emerge as a more useful vertical structure.

<u>2.b CoRT Program Layout:</u>

In order to teach skills of both lateral and vertical thinking, the CoRT (Cognitive Research Trust) thinking program will be taught. The program consists of sixty lessons organized in six clusters. The objective of each lesson is to teach a specific thinking tool to be at the disposal of the student in the future. The lessons include five stages: **Introduction** which describes the tool studied in that lesson plus an example demonstrating the use of the tool; **Practice** where the use of the tool is practiced by the students while working in small groups and then reporting the ideas raised in each group to the whole class; **Process** where the entire class discusses the tool; **Principles** where discussion is held, again, in small groups, but this time on the principles related to the tool; and **Project** where the tool is practiced with the help of additional examples. The pace of the lesson is very fast and the transition from one stage to another is done within minutes.

The ideal examination should fulfil three criteria:

a) Is it valid? Does it measure what it is supposed to measure? Is there evidence for what the examiners think they have seen? Can the examiners generalize from what they have seen?
b) Is it reliable? Is the examination an objective assessment? Are the results accurate and consistent? Would other assessors agree with the examiner`s interpretation of the student`s behavior? As Rowntree (1977) notes: There is an assumption rampant in talk of academic standards, that all qualified assessors feel, understand and judge in much the same way when confronted with the work of a particular student. It is presumed that they would notice and value the same skills and qualities and would broadly agree in their assessments. Abundant evidence attests to the falsity of such assumptions.
c) Is it practical? Can the requirements for staff and accommodation be met? Can it cope with sufficient numbers of Starts?

   <u>Validity.</u> A valid clinical examination should assess the components of clinical competence, including the ability to: (a) obtain from the patient a detailed and

relevant history; (b) carry out a physical examination of the patient; (c) identify the patient`s problems from the information obtained and reach a differential diagnosis; (d) identify the appropriate investigations; (e) interpret the results of the investigations; and (f) recommend and undertake appropriate management, including patient education.

Many of these abilities are to a greater or lesser extent ignored in standard procedures used to assess clinical competence. Frequently in the examination attention is paid to the detection of abnormal physical findings while no attempt is made to watch the student taking a history from a patient. We are all anxious, wrote Matthews (1978), because we have to test history taking and know that we are not doing this well. As Stokes (1974) has described: The confrontation between examiner and examinee often degenerates into a theoretical discussion.

A further problem is the choice of patients. These frequently are atypical of the problems likely to be encountered in practice. They usually represent chronic rather than acute or emergency situations, and specialities such as ophthalmology, dermatology or otolaryngology are excluded or under-represented.

Reliability. In a clinical examination there are four variables – the Starts, the examiners and the patients. In a reliable assessment procedure, the variability due to the patient and the examiner should be removed.

In assessing clinical competence, marks awarded by one examiner often vary considerably from those awarded by another examiner for the same performance (Wilson et al. 1969). Moreover, the same examiner may vary in the marks he awards on different occasions. In the clinical examination, wherever possible, a subjective approach to marking should be replaced by a more objective one. Starts should see a number of examiners and the examination should be so organized that variations between examiners are kept to a minimum.

Unreliability in the clinical examination results from the fact that different Starts are usually examined on different patients. In addition, one may occasionally come across patients who play havoc with an examination by helping some Starts, and obstructing others. An ideal solution would be that in any given examination all of the Starts would examine all of the patients. Such a solution, however, is in most cases impracticable.

Practicability. The ideal examination should take into account the following: (a) The number of Starts to be assessed. An assessment procedure appropriate for twenty Starts may not be practical where 100-200 have to be assessed. (b) The number of staff available and their status and specialties. (c) The patients available. (d) The space or accommodation available. (e) The use to be made of the results, e.g. to pass or fail a student, to identify borderline Starts or to identify areas of competence in which Starts are deficient.

3. Blood pressure examination in the process of thinking and making decisions under stress and emergency situations

The blood pressure examination is carried out with an instrument that automatically measures blood pressure, pulse and tonus. 1-4 minutes from the start of the presentation of the emergency event the instrument registers the results of the measurements in a special typing instrument.

The examination is carried out in the course of routine activity and during an emergency situation.

The interpretation of the results relates to several data. The important data in interpreting the data are:

- The average diastole and systole pressure throughout the routine and emergency activity.
- Blood pressure load, i.e.: the percentage of measurements where the blood pressure is found to be pathological (systole – over 140 mm mercury and diastole – over 90 mm mercury throughout the life support situation activity, and systole – over 120 mm mercury and diastole – over 80 mm mercury throughout the routine activity).
- The measurement of pulse with ECG electrodes throughout the routine and non-routine life support activity.
- Tonus – this index provides the respondent with information about the tonus level. The striated muscles (the skeleton muscles) are operated by a complex pattern of electric pulses originated in the central nervous system. The electric pulse passes from the brain through the spine to a nerve that ends at the muscle fiber. The muscle contracts as a result of an enhanced activity of motor nerves and relaxes as a result of the fading of neural activity therein. Hence, the tonus is a direct index of the level of electric activity in the muscle. The measurements are carried out by electrodes attached to the body. This method, which is called electro-myogram, enables to measure the intensity of electric activity of the body muscles. Every movement in the muscle can be electronically detected and this information is presented to the person by visual (e.g. graph) or audio (e.g. a sound going up and down) means. The electrodes were attached to the shoulders and hands, in order to receive a wider estimate of the contraction of muscles in stress and life support situation.
- Measurement of skin temperature. Fluctuations in skin temperature (the peripheral temperature) are affected by stricture of the peripheral blood vessels and their expansion. These roles are regulated by the activity of the cardio-vascular system which is controlled by the sympathetic and endocrinal system.

Stimulation of the sympathetic system causes the contraction of the smooth muscles around the blood vessels, which causes the narrowing of the peripheral blood vessels, limitation of the blood flow and a decrease in the peripheral temperature. Similarly, a decrease in the sympathetic activity causes expansion of the peripheral blood capillaries, the blood flow increases, and the skin temperature rises. It seems that the measurement of temperature at the tips of the limbs (e.g. the fingers of the hand) can be used as an indirect index for the stimulation of the sympathetic system. A variety of psychological causes such as pressure or anxiety situations, influence the stimulation of the sympathetic system. The skin temperature is measured by a sensor, which sensitive to temperature changes, attached to the skin surface in such a way that it does not interfere with the blood flow and does not block it in the measured area. In most cases the measurement is carried out on the back external surface. Rising of the body temperature reflects the fading of sympathetic stimulation and serves as a positive empiric mark to the respondent who exercises a life support and stress situation.

- Measurement of respiratory rate. This index reflects the situation of the nervous system but also forms a direct means of influencing it, as the respiratory action is subject to both autonomous control and voluntary regulation. The method of measuring the number of breaths during life support is by putting an electrode over the diaphragm area, which measures the number of breaths in the course of routine and non-routine activity, which could indicate a stress situation during the life support treatment.

4. Knowledge test (prior to the experiment)

A test was carried out to examine theoretical knowledge comprising the variety of problems facing the attendants while performing life support in adults, children and babies by the three research groups. The test was one hour long and included 50 multiple-choice (4 possible answers) questions. The test included subjects of: respiratory failure and shock, basic life support in adults and children, airways and respiration, insertion of artery line and venous line, fluid treatment and medication, arrhythmias, trauma.

According to the above data it can be seen that the success rate in the knowledge test was higher according to the grading – nurses, paramedics and doctors. The doctors' focusing on solving the knowledge questions was more in depth compared to the paramedics and nurses. The solution of the question was according to the primary need at the time of life support or emergency situation (according to A, B, C, D, E). The knowledge test results received by the three research groups showed that the doctors focused more on the deep solution of the problems (the root of the problem) and did not think about the primary need, compared to the groups of nurses and paramedics who focused on solving the questions according to the most essential and urgent need (i.e. A, B, C, D, E).

5. Physiological reactions to stress in emergency situations

It is possible to describe interrelations between stress and physical reactions. The human body reacts by a series of innate reactions whose function is to prepare the individual for effective and immediate handling of situations that are perceived as dangerous. A person who is terror-stricken facing a truck coming wildly at him feels the physiological expressions of a sense of stress. These include, inter alia, known physical reactions such as increased heart rate or dryness of mouth, and this matches the physiological and behavioral reactions of doctors, nurses and paramedics in a life support or emergency situation. The chain of physical changes occurring in stress prepares the organism to act in one of two ways: defense by way of attack or running away from the cause of danger. This coping pattern is called by the general name of "fight or flight" reaction. The fact that the organism is "programmed" for a sequence of changes that improve its operation ability in emergency situations, increases its chances of survival under dangerous conditions and provides it with an evolutional advantage.

The totality of changes that take place as a result of stress situations is controlled by the central nervous system or, more accurately, by a small "structure" located above the brain stem called hypothalamus. The activity of the hypothalamus is connected with maintaining the homeostasis (normal level of functioning such as keeping a fixed body temperature) and controlling various functions such as: sexual behavior, eating, the activity of internal secretion glands (the endocrinal system) and the autonomic nervous system.

At the center of our interest stands the role of the hypothalamus as the "supervisor" or the body's reaction to frightening situations, pain or excitement. In order to prepare the body for an acute reaction that requires "recruiting" immediate resources, the hypothalamus operates in two channels: influence on the autonomic nervous system and influence on the endocrinal system (which controls the secretion of hormones) in stress and life support situations.

This neural and hormonal activity operates a chain of physical reactions which are intended at discharging energy to be used by the organism for an immediate intense action such as during injury or illness. These changes include mainly increase of heart beat, increase of blood pressure, increase of the level of sugar in the blood and increased production of red oxygen-bearing blood cells and of leukocytes for fighting infections. The breathing rate increases and the secretion of mucus and saliva decreases which improves the passage of air into the lungs. At the same time the body decreases the activity of systems less vital in stress functioning, e.g. the blood flow is diverted from peripheral areas (skin surface) or from internal organs such as the stomach, to the brain and the skeleton muscles. These conditions enable maximum utilization of oxygen supply and available energy substances to the body's cells in general and to the muscles in particular. The skeleton muscles are alert and ready for action.

How then does the cerebral system operate to create the pattern of reactions described above? The hypothalamus sends neural messages to the autonomic nervous system, which is divided into the sympathetic section whose function is to excite and enhance activity and the parasympathetic section that controls the slowing down of activity and the decrease in various systems in the body.

In stress situations the hypothalamus urges the sympathetic system to operate directly on muscles and various body organs (such as to increase the heart rate) and to stimulate the adrenal gland to release into the blood the hormones adrenaline (epinephrine) and noradrenaline (norepinephrine) which are also known as the "stress hormones". Adrenaline affects the body organs in a similar way to that of the sympathetic system, e.g. the increase of heart rate. Noradrenaline stimulates a chain of reactions the purpose of which is to release sugar from the liver in order to supply the body with energy for a quick action.

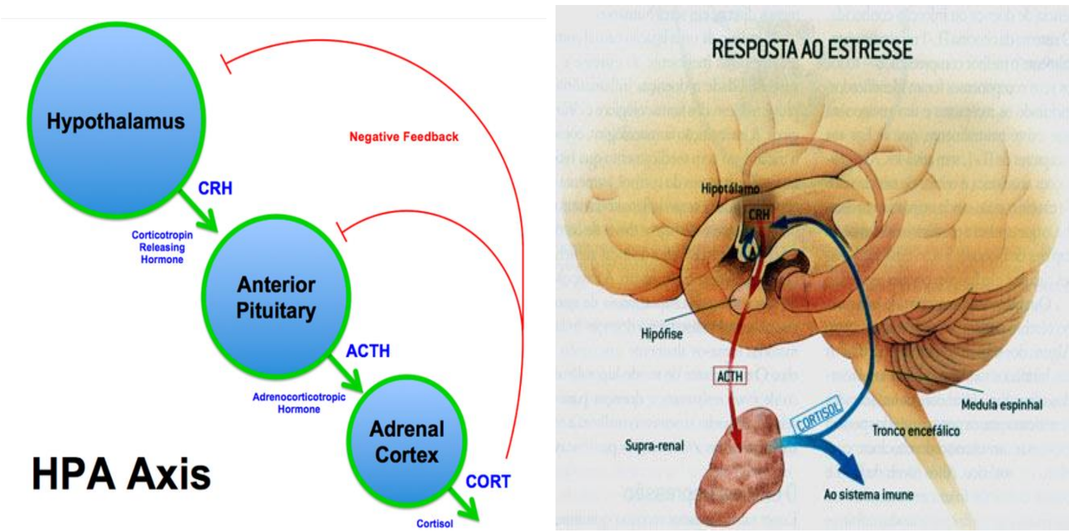
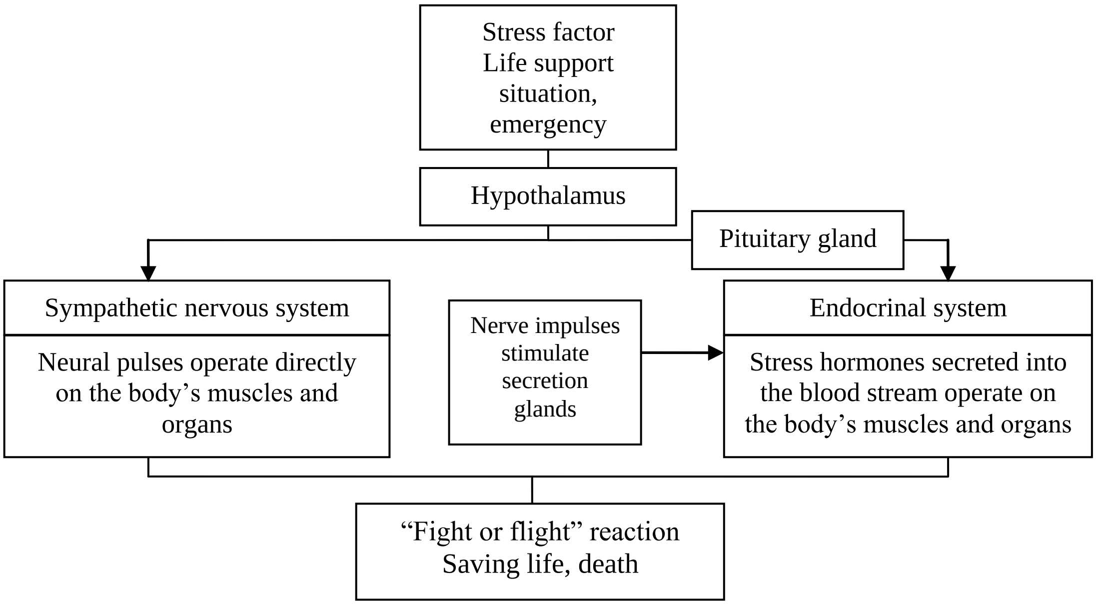


Fig. 8 HPA Axis

Table 2:

Influence of the stress factor on the hypothalamus in life support or emergency situations



Regarding the cerebral operation control over the patterns of reaction to stress situations, the hypothalamus stimulates – except in the neural operation channel – the flowing of "stress hormones" to the blood from internal secretion glands by affecting the pituitary gland located under it. The pituitary gland releases the ACTH hormone into the blood. This hormone affects other glands in the body, which release hormones that regulate the levels of sugar and vital minerals in the blood according to the special needs of the emergency situation. For example, ACTH will affect the adrenal gland to secrete adrenaline and noradrenalin.

What then is the advantage of the double action in two channels – the neural and the hormonal? Unlike chemical-neural messages (neurotransmitters) which operate in an instant and local manner, chemical-hormonal messages are carried with the blood stream and operate in a slower manner, but their operation is effective in the long-term and can affect distant parts of the body.

It is important to understand that the described physical processes are also connected to stress situations in the daily modern-world life. For example, upon the entering of an inspector to his office a person can react with perspiration or blushing, which are actually expressions of the same survival mechanisms in reaction to a threat. Despite its adaptive advantage from an evolutionary point of view, over stimulation as a reaction to stress is likely to cause mental and physical fatigue in the long run, and this is a situation better characterizing trauma and intensive care teams. In the short run it is likely to cause damage to the thinking process and impair problem solving thus leading to difficulty in treating the patient and in making decisions as to the continuation of treatment.

Many of the disturbances treated by biofeedback stem from the person being in stress and high prolonged physiological excitation. For example, a disturbance of hypertension could be caused by chronic stimulation of the sympathetic system. Mental problems also become sometimes more acute or "enhanced" by physiological changes. Researchers indicate that diminishing the physiological excitation is likely to reduce the (subjective) sense of anxiety the individual experiences even in the absence of a real external change (i.e., being exposed to the same reality which stimulated anxiety in the past).

The philosophy of life from which the biofeedback treatment is derived looks at a person and the different disturbances he suffers from out of an observation that emphasizes the interrelations between the physical and the mental processes. Psychological stress leaves a physiological impression, whereas the physiological functioning affects the quality of the mental experience. The psycho-physiological treatment is aimed at regulating the irregular action of autonomous physiological functions. In order to understand the method of its operation, physiology researchers offered to be assisted by the research of the brain's physiological activities to understand the thinking processes. And sure enough, brain researchers found a number of ways to record the various brain activities whether with the help of a follow up of the brain electrical activity or, recently, also by following the blood flow into the brain. Although the development of psychology in general and cognitive psychology in particular greatly depends on the research of the brain, most researchers agree that there has not been any real progress in this area and that this or the other recording of brain activity does not form a breakthrough in the direction of mind reading (and as individuals who wish to maintain the privacy of our thoughts – it is probably better this way).

How then does one deal with this fundamental problem of the study of thinking processes? A lot of research thought energy is invested in looking for ways that will enable a scientific examination of this subject.

First we will review the practical aspects of the stress reactions of the three research groups:

The stress reactions can be divided to four main groups which occurred during the research between doctors and nurses, doctors and paramedics:

Physical reactions – the physical stress reactions are the result of an enhanced excitation of the autonomous nervous system and they appear immediately after the exposure to the threatening stimulations, or close to it. These reactions reflect enhanced "call-up" of the individual's physical systems when facing danger or threat. The well-known physiologist, Canon, named them "Fight or Flight Responses", from which we learn that at the time of stress the organism can deal with the threat by either confronting it (fight) or refraining from it (flight). The main physical stress responses are: increased heart rate, increased blood pressure (both systole and diastole), increased tonus, increased perspiration, increased breathing rate, change in the brain's electric activity and increased secretion of the adrenaline hormone.

Selye (1974), one of the founders of the study of stress, referred to the more lengthy physical results of exposure to the stimulus of stress. He called the process taking place in the body of the organism as a result to exposure to prolonged stress "General Adaptation Syndrome". According to his theory this syndrome comprises of three stages: the first stage, the stage of alarm, takes place immediately upon exposure to the stress stimulations and is characterized by enhanced excitation of the autonomous nervous system; the second stage, resistance, is characterized by processes of the body's coping and adaptation to the stress stimulations. If the stress stimulus is not removed or if the organism is incapable of reacting effectively then the third stage, called the fatigue stage, begins. This stage is characterized by physical exhaustion, a decline in the ability to resist disease, physical damages and in extreme cases it ends with death.

Physical reactions appeared among the three research groups: doctors, nurses and paramedics. In life support situations far more physical reactions appeared among doctors than among paramedics and nurses. Physical reactions were expressed more among doctors than nurses and more among paramedics than nurses.

A study of the curve shows that in situations where pressure is low, the quality of performance is also low. The latter improves continuously as the presses increases – but only up to a given optimal point. From that point onward the quality of performance declines with the increase of pressure.

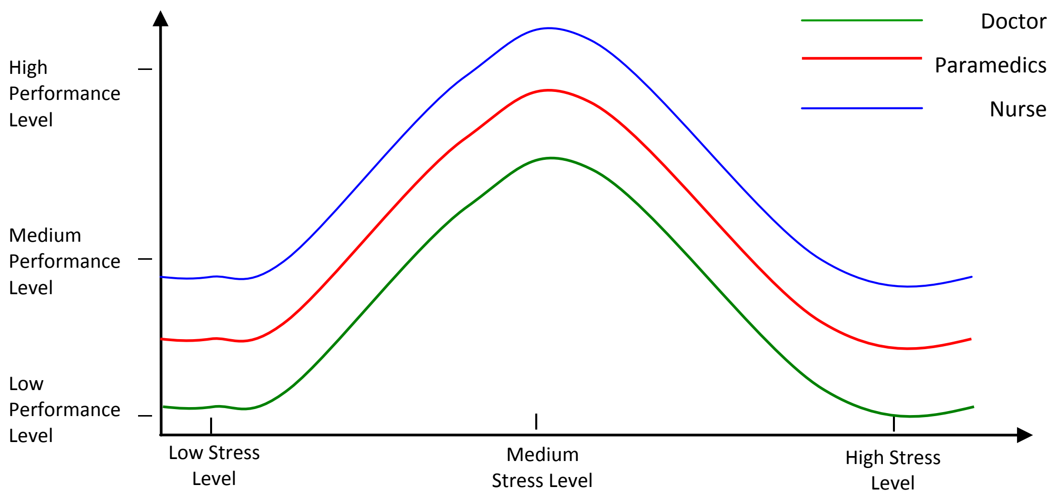


Fig 9: Effect of the stress level on the performance level

The connection between stress and performance among med students, paramedics and nurses shows that the curriculum in most of the Western medical schools does not include exercising primary-medicine and emergency-medicine skills under personal supervision, out of the assumption that the med students will acquire these skills while making rounds at hospital wards. As a result of the lack of proper exposure, graduates of medical schools in Israel find it difficult to approach common clinical situation (Newellet al, 1957; Lakoff & Turner, 1989).

6. Comparison: med students vs. nursing students vs. first aid students – the processes of making decisions in handling a medical emergency

This study focuses on the differences between first aid students and nursing students and between med students regarding the process of solving problems while facing emergency situations.

For the purpose of these studies experts and beginners differ from one another by the number of years of experience they have accumulated in one field of expertise. In our case we wish to compare between students of the same field but from different trainings while being required to solve an identical medical problem. The three groups differ in the way they have received their training with which they are familiar when approaching the solution of a problem rather than the number years of experience they have accumulated. In both fields of training the learners are intended to treat patients and save lives. While doctors are supposed to face a wide variety of medical problems and treat them, first aid students and nurses are trained to stabilize the condition of patients, or injured in the field, and transfer them as quickly as possible to a hospital for a continuation of treatment. In the course of studies they learn and develop themselves the ability to make decisions and use strategies to solve problems, which enable them to implement tremendous amounts of theoretical knowledge to the medical situations facing them. The thinking process doctors are taught is cognitive reorganization or operation of knowledge, both from the external environment and from that kept in memory. On the other hand, the emphasis put in the paramedics' curriculum is on training the learners and developing their skills to act quickly and implement the proper treatment at the right time during emergency situations. The thinking process among paramedics and nurses is organization of the studied material, creation, operation and acquisition of symbols and ideas in the process of solving problems and making decisions, which is more defined and target-aimed. In order to understand the differences between paramedics and doctors, they could be compared to the differences between “declared knowledge” (or: “knowing what”) and practical knowledge (or: “knowing how”). Declared knowledge means knowing about a certain subject only on the declarative level, which is an aspect of supportive knowledge (Polya, 1957; Kuhn, 1991). Procedural knowledge, on the other hand, means “knowing how” and it relates to the ability to carry out skill activities such as riding a bike or playing a piano, or inserting airway transfusion, intraosseous transfusion, etc. (Newell & Simon, 1972).

The foundation of all professions is based on declarative knowledge and procedural knowledge, but we understand that different professions differ in the amount and dosage of declarative knowledge and procedural knowledge involved in them (e.g. engineers vs. technicians). While medical studies put a stress on acquiring declarative knowledge while memorizing a lot of theoretical material of health-related subjects, the paramedical profession emphasizes learning procedures and training the required skills which will enable implementation of the procedures (Barrows & Feltovich, 1987).

For the purpose of this research we have defined the doctors’ curriculum as having a declarative emphasis and the curriculum of paramedics and nurses as having a procedural emphasis (Wass et al, 2001). Procedural knowledge is especially effective when dealing with well-defined situations. In such situations the problem solver can identify a clear target, is capable of understanding the primary conditions and the constraints and knows exactly what to use in order to solve the problem. Handling emergency situations requires the skill of rational clinical judgment regarding the severity of the problem and the quick implementation by a qualified and skilled team. Fortunately, emergency situations such as an attack of acute asthma or myocardial infraction are considered well-defined problems. In other words, a person qualified to provide treatment can immediately identify the medical problem, know what treatment is required and what is not, and quickly implement the correct procedure in order to save a life. This demonstrates the importance of procedural knowledge and acquiring the required skills in order to operate effectively in emergency situations. We believe that both doctors and paramedics and nurses should be trained how to effectively handle emergency situations (Miller, 1990).

In the current research we compare and examine the performances of doctors who have completed training with an emphasis on declarative knowledge vs. the performances of paramedics and nurses who have completed a training program with an emphasis on procedural knowledge – regarding an intervention in a well defined medical situation of an acute asthma attack in a child. In order to examine this target we will observe the following things: (a) are there differences between doctors, nurses and paramedics in identifying the severity of the problem presented to them? (b) Are there differences between the medical interventions applied by the three groups? (c) Are there differences in the students' knowledge regarding the constraints of interventions they decide to implement, and which actions are redundant or should be avoided? (d) Are there differences among the three groups in the order of procedures?

The research approach is qualitative and has been chosen in order to enable the participants to exhibit their skills and in order to make use of the actions of the participants as data.

Participants: the participants in this research were:

(a) 50 graduate students who completed their sixth final year at the med school prior to going into internship. In the course of their studies the students have gained experience in working with real patients. During the fifth and sixth years the students work in rotations at the hospital's different wards. In addition, during the sixth year they gain experience at the emergency medicine wards.

(b) 25 students who are graduates of the second and last year of the paramedic course. The studies include a 15-week rotation at different hospital wards as well as 80 eight-hour units in an ambulance.

(c) 30 student nurses, graduates of the fourth year, with 4-month intensive care training.

Procedure:

The participants were presented with a case of a 6-year old boy who suffers from an acute asthma attack and does not respond to an initial bronchidultors treatment at home, and were given a 15-minute time limit to treat the case. The location of the event included the following things: (1) prior to entering the emergency room the students received an initial written description which included a short background review of the patient, the location (the hospital's emergency room) and the medical problem. (2) A boy with an arrhythmia simulator was put in an emergency room bed. (3) Vital emergency equipment including oxygen, monitor, suction, medicines and life support equipment. (4) Only at the doctors' station a nurse was present in order to supply medicines and equipment at the student's request. The purpose here was to imitate a real situation where the doctor is assisted by an additional team, compared to paramedics who function by themselves. (5) A doctor was present on the spot to provide additional medical information at the student's request, to operate the simulator and to respond to the therapeutic means taken by the student. Every case developed according to the steps taken by the participant: if the correct treatment was given at a "reasonable" time frame and according to the required order of steps, the child's condition "improved". If incorrect measures were taken and vital steps were left out, the child's condition deteriorated to hypoxemia, respiratory failure and finally apnea and CPR. (6) An observation of every student and the steps he took was carried out by a registered nurse who specializes in intensive care, who kept record of all the actions – whether relevant or not – on a suitable form according to the sequence of events.

The events were documented word for word and an analysis of inductions was carried out where behavior modes, motives and actions were taken from the records. The analysis process was based on:

1. All texts were read and reread individually in order to create some sort of understanding and make meaningful claims about the students and their knowledge regarding the actions taken by them.
2. On additional readings an attempt was made to find confirmation or negation to the temporary claims we reached.
3. After reading the texts individually and making temporary claims, the first author and the third author read the texts as a group for the purpose of making a contextual analysis. The reading was interrupted every time one of the authors thought that a meaningful event had taken place and then all the texts were checked again, when necessary, so that every claim would be examined thoroughly by the researchers. In the course of this process of constant comparison – as part of the confirmation method – the initial claims raised were corrected.
4. When temporary claims were raised, the texts were examined in order to find additional operators which support or negate these claims and that led to corrected claims.

<u>Results</u>:

a. *Interventions which were used:*

1) All paramedics and nurses implemented most of the necessary procedures whereas only 53% of the doctors did so.
2) All paramedics and nurses gave oxygen as required whereas one third of the doctors did not. In addition, the paramedics and nurses knew the proper dosages/oxygen flow they should give whereas 40% of the doctors giving oxygen did not know.

3) All the paramedics and nurses, except one, measured oxygen stortions in order to evaluate the child's condition and match the treatment whereas only 60% of the doctors did so.
4) 100% of the paramedics and nurses gave inhalations compared to 80% of the doctors.
5) 76% of the paramedics and nurses gave hypodermic adrenaline after oxygen and inhalations. On the other hand 53% of the doctors gave IM and 47% hypodermic. Moreover, whereas all the paramedics except one gave adrenaline as required due to acute asthma attack, 47% of the doctors did it incorrectly. They chose intravenous injection instead of hypodermic. They also gave the medicine incorrectly, as it should be given intravenously.
6) 48% of the doctors decided to intubate the child almost immediately. This step was completely unjustified according to the initial clinical symptoms, and they should have used it later on as a "last resort". Unlike the doctors, the paramedics and nurses did not consider intubating the child.

b. *Proceedings in emergency situations:*
1) Whereas the paramedics and nurses started immediately with giving oxygen and inhalations, many doctors started the intervention by asking diagnostic and family history questions.
2) The paramedics and nurses reacted quicker than the doctors. While the average response time among the doctors was 19.3 minutes, the average time among the paramedics stood at 7.1 minutes, and among nurses – 7.6 minutes.
3) The number and scope of questions: the paramedics tended to ask fewer questions – the average number of their questions stood at 5.56, compared to 18.9 by doctors and 5.61 by nurses. The number of questions asked by paramedics ranged between 0-13, compared to 0-36 by doctors and 0-12 by nurses. Doctors tended to be more "diagnostic" in nature (e.g. does anyone else at home suffer from asthma? Is he sensitive to any chemical substance, medicine, food, dust?), compared to the paramedics whose queries were aimed at clarifying the physical state of the child (e.g. has the condition of the child improved after giving inhalation? How does the child seem to you now – has his condition become worse, the same or better?).
4) The paramedics' function was identical whereas that of the doctors differed from one another. The following table demonstrates an example of the observation on three students. Observation A shows a typical paramedic. Observation B1 and B2 demonstrates an example of two doctors and

observation C demonstrates a nurse. It demonstrates how the student was asking consecutive questions prior to performing any medical action. An observation on student A1 shows the medical functioning of another student. It can be seen that the student's questions and the actions taken by him were carried out one after the other – both medical actions, diagnostic questions, actions again and diagnostic questions again. Student B2 starts with asking diagnostic questions, giving treatment and back to asking questions for the purpose of receiving anamnesis. Here it can be seen that regarding the two students, B1 and B2 there is no order in treating the emergency situation and no reference according to ABC. This example demonstrates the different approach of the two groups of students. The two students in the examples tended to ask thorough questions, compared to the paramedic and the nurse who took action. The only question the latter asked was meant to clarify the condition of the boy after the intervention.

Table 3:

Conduct, functioning, treatment and question-asking among the three research groups during stress and emergency situations

Med student B2	Med student B1	Paramedic – A
1. Did he receive inhalations with Bricalin at home? 2. Giving oxygen, stortion check, examining vital signs. 3. Stortion 93%. 4. Pulse 120 per minute. 5. Number of breathings 46 per minute. 6. Listens to the lungs. 7. Blown breathing sounds. 8. Installs inhalation with Ventolin. 9. How many attacks a year does he have? 10. How many? 11. Does he take steroids at home? No. 12. Does he have attacks at night?	1. Does he breathe: yes. 2. Did he receive medicines at home? 3. Yes. Inhalations. 4. Did he receive steroids? 5. Yes, Budicort. 6. Did you try to give him something at home? 7. Yes, none helped. 8. Has he made any physical effort lately: No. 9. Is there anyone else at home who is sick? 10. Did he have an attack in the past? 11. Yes, he was hospitalized twice.	1. Giving 5lit oxygen. 2. Checking vital signs. 3. Preparing infusion. 4. Listens to chest lungs, listens to back lungs. 5. Giving inhalation with 0.5cc adrenaline. 6. Solumedrol infusion, giving steroids intravenously. 7. What is the condition of the boy? 8. Considers giving adrenaline. 9. Stortion falls below 80%. 10. The boy develops bradicardia. 11. The paramedic ventilates him with mask and ambo.

13. Not lately. 14. When did he arrive at the emergency room? We have just arrived. Listens to the lungs again. 15. Prepares infusion. 16. Gives steroids in infusion. 17. Gives adrenaline. 18. What is his condition? 19. Does he suffer from allergy? Unknown. 20. Does he suffer from allergy-causing medicines? Unknown. 21. Pulse 49. 22. Breathing difficulty. 23. Considers intubation. 24. Asks for help when required. 25. The condition is stabilized. 26. Since when has the boy been suffering from asthma? 27. Does anyone at home have asthma except mother? 28. Has he made any strenuous physical effort lately? 29. Has the boy swallowed something? 30. What medicines is he given at home? 31. The boy is instable, reduced pulse, lips turned blue, difficulty breathing. 32. Giving 2lit oxygen with a mask. 33. Giving Bricalin inhalation.	12. Has he had an attack recently? 13. This is the first attack in the recent period. 14. Did he receive medication through the infusion? No. 15. Has he been ventilated in the past? No. 16. Is he allergic to medicines? No. 17. Is he allergic to chemical substances, flowers? No. 18. How long has he been suffering? Since the age of 2. 19. Does anyone else have asthma in the family? Yes, my wife. 20. Are there other illnesses? 21. Does he have difficulty breathing? 22. Oxygen tube is given near the boy's mouth of a quantity of 1lit. 23. Adds inhalations with Bricalin. 24. Examines breathing – 52 per minute. 25. Examines pulse – 127 per minute. 26. Examines blood pressure – 135/78. 27. Listens to the lungs – weak sounds, wheezes during expiration. 28. Prepares infusion.	12. Examines the boy's condition. 13. The boy is getting better. 14. The paramedic puts back the 5lit mask for one minute. 15. The student has completed the task. **Nurse – C** ------------ 1. Is he conscious? Yes. 2. How long has he been suffering from asthma? For a year. 3. When did he last receive inhalation? 5 hours ago. 4. What does he usually receive? Ventolin inhalation. 5. The nurse gives 3lit oxygen with a mask in the mother's arms. 6. Listens to back and chest lungs in the mother's arms. Wheezing and lengthy expiration. 7. Will receive Ventolin inhalation every half hour. 8. Giving Ethylchloride at the infusion insertion area and opening peripheral infusion (for pain killing). 9. Giving Budicart inhalation. 10. Giving Dexacorit with the infusion. 11. Listening to the lungs –

34. Cardiopulmonary arrest. 35. Ventilation with ambo and mask.	29. Gives adrenaline through the muscle. 30. Gives steroids. 31. Measures respiratory rate. 32. The condition does not improve but deteriorates. 33. Gets ready for intubation. 34. Bradicardia (60), shallow breathing. 35. Ventilation with ambo and mask.	less and less wheezing. 12. Measuring vital signs: pulse (103), sat (99%), blood pressure (99/53). The boy is panting less, feels well. The nurse has completed the task.

Teaching during the clinical year and the fifth and sixth study years is based on demonstrations and personal experience under supervision. It focuses on identifying the clinical problems, their analysis and the construction of a clarification and treatment program. The student is expected to be able to absorb anamnesis and examine a patient within a limited time frame, to carry out special diagnostic operations (punctures and treatment of samples received as coloring as well as microscopic examination) and treatment operations (stitching cuts, casting and draining abscesses). In addition, he should be capable of starting advance life support and provide first aid at a combat medical aidman level. The use of simulation methods and diagnostic means is demonstrated such as x-ray, CT, echocardiograph, determining lung functioning, ultrasound examination – while comparing the findings to those of a physical examination. The student exercises access to the common clinical emergency room situations such as fractures and bruises, complex injuries, myocardial infraction, pulmonary edema, diarrhea, bronchial asthma and intoxications.

For that purpose, the students stay at the emergency room in groups of 1-2 students for one week out of the 6-week internal medicine ward round during the sixth study year, or for a period of voluntary 1-3 weeks out of the voluntary period. They are required to accept patients, collect anamnesis, identify physical findings and problems, offer clarification and treatment methods. The student is required to summarize the anamnesis data and the physical findings, to formulate the patient's list of problems and to briefly answer the questions: "What have you found?" "What in your opinion does the patient suffer from?" and "What do you suggest to do?"

According to the workload at the emergency room a discussion is held about the differential diagnosis, the means for clarification and initial treatment, as well as definition of the urgency of clarification and treatment and the framework in which they were carried out. The student is encouraged to do some reading and, when needed, literary references are presented. He experiences, as much as possible, various activities and the use of medical instruments at the emergency room, under control. The round of students from the internal medicine ward both during the fourth and the fifth years enables to follow up, in the course of hospitalization, the acute problem discovered at the emergency room. Throughout the period of staying at the emergency room the student continues to participate in the teaching activity of the internal medicine ward. Chosen chapters in the field of internal and urgent medicine are transferred with the various diagnostic and treatment activities (diagnostic punctures, life support, treating a simple injury) and students acquire the ability to work under time limitations and workload conditions. Emphasis is put on individual thinking, clinical judgment and the development of skills in building relationships with the patient and his family members. The interns stay at the emergency room for about a month. The teaching pattern is similar to that given to sixth-year students while permitting greater autonomy in the initial clarification of the patient's situation until he is presented to the doctor. The need to closely supervise the intern's activities, and verify his findings and training limits the number of interns trained at the emergency room to one per each doctor.

7. Decision making processes among students at the time of managing emergency situations in children

Newell & Simons (1972) and their perception of problem solving as a search in a metaphorical space have become a source of inspiration to the process of solving problems and analysis among students facing emergency situations. According to their theory, the representation of the problem is based on 4 elementary types: describing the initial situation where the process of solving the problems starts; describing the target to be reached; a list of operators or actions to be carried out which are intended at changing the present situation of the problem; and constraints encountered which impose additional conditions along the way to a successful solution. The problem's space is based on a list of all the potential situations one can reach by implementing the available actions. A solution is a sequence of actions which can turn the initial situation into a target according to the constraints along the way. The search metaphor seems suitable when the solver is able to identify a clear problem, can understand the initial situation and the constraints and knows exactly which actions could assist him in reaching the solution. Such cases are considered well-defined problems (Arocha et al, 1993).

Medical problems in general are almost never defined. Not only there is a lot of irrelevant information, but relevant information is missing and does not emerge until after the process of solving the problem has begun. In such cases it is hard to accurately define the position from which it is possible to start identifying the suitable actions or even identify the target to be reached. In other words, many medical problems are not sufficiently defined, so that the representation of one or more of the basic elements – the goal, the initial situation, the action or the constraints – is the outcome of compromises (Barrows & Feltovich, 1987).

Nevertheless, we expect from the doctor to look at the medical emergency situation such as acute asthma attack or dehydration as a result of diarrhea or foreign body, as a well-defined problem. As a result, we expect the doctor to exhibit the ability to make clinical decisions out of consideration regarding the severity of the situation, and to know how to handle it. Regarding the problem space theory, we expect from the doctor to accurately identify the initial situation, the state to be reached (target) and the medical actions to be taken. We also expect from the doctor to be able to choose the most effective way within the space of the problem. Contrary to other well-defined problems such as crossword puzzles, not choosing the right way through the problem space in order to deal with an emergency situation could escalate the situation or even cause death (Bowen et al, 1999; Elstein et al, 1978).

Recently a lot has been invested in developing an "understanding pedagogy", concepts of general understanding and a "performance concept" which connect between thinking concepts and knowledge concepts, and the concept of decision-making process. There is a tendency to make an excluding distinction between knowledge and thinking – "knowledge for thinking is like food for eating". The current trend in education is to disregard knowledge in the name of "the development of thinking". Can we shed more light in this matter on the connection between knowledge and thinking?

We suspect that the connection is more complex than that between food and eating. Part of the issue is what we think about knowledge, not even knowledge in the acceptable philosophical sense – "real justified belief". We operate it, organize it, deduct from it, etc. (Jordan & Henderson, 1995).

In addition, sometimes we think with the help of questions that are not yet considered knowledge (questions asked which are irrelevant to a treatment situation in an emergency prolong the treatment time and cause damage to the patient), although question always assume certain knowledge, and certain knowledge always carries along thinking modes (e.g. the concept of assumption and related concepts). We might think about these concepts but also think with them…

In addition, when we think while we are writing a song or drawing, we do not think about knowledge in the acceptable sense. We do not think whether the song or the drawing is correct or how we will find out if it is correct. We think how to make it, how to make this "impossible" song or drawing, work. Of course, we have artistic knowledge which updates us regarding our work but we do not think about this knowledge but rather with it. On the other hand, the doctor, the paramedic and the nurse use knowledge to save lives, and the knowledge should be used correctly in emergency or life support situations in the process of making decisions and solving the problem in order to save the patient's health (Miller, 1989; Miller, 1990).

The interrupted thought can be summarized as follows:

- When we think, we sometimes think about knowledge (e.g. what is true, what do we want to discover, what are the priorities, etc.), and sometimes we think about other things (e.g. which question should be asked in order to quickly get to the solution of the problem, or how should the song look and how to make it look like that, etc.). These "thoughts" generally come up integrated with each other (Voss & Post, 1988).
- Thinking creates knowledge, so we cannot think this knowledge already at the starting point (Wass, 2001).
- When we think, we always think with knowledge – background knowledge, artistic knowledge, declarative knowledge, procedural knowledge, etc.
- Sometimes we think with knowledge which is a special knowledge about thinking – e.g. knowledge of the method of examining an assumption (Patel & Groen, 1986, 1991).

In other words, the relations between knowledge and thinking are complex and have many facets. Why can't things be simpler…!? Well, if they were simpler, people like us wouldn't have worked in the field of medicine.

The following are several characteristics of **prototypical thinking** in the process of making decisions and solving problems facing the doctor, paramedic and nurse, which will assist us in distinguishing it from other types of mental activity:

- It relates to the decision what to believe in, what to do or how to understanding something (unlike, for example immediate and routine thinking while managing emergency situation and regular situation) (Newell & Simon, 1972).

- It studies and evaluates alternatives (unlike thinking in a single track, treatments, use of different approaches).
- It is wide and deliberative (unlike hastily reaching an intuitive conclusion – priorities, CPR time, continuation of treatment, to live or not to live).
- It is active, focused, target-aimed (unlike that which is lazily floating such as in daydreaming – treating patients in life support situation).
- It involves operation of words and conscious images (unlike unconscious process such as the identification of faces or regular understanding of verbal expressions, evaluation of the treatment situation according to clinics, the external look of the patient, respiratory distress, hemodynamic state, sepsis, etc. (Patton, 1990; Roth, 1995).

The mental activity which includes the above characteristics is almost certainly thinking. When a mental activity is drawn away from these characteristics and similar ones, it is "less" thinking in the prototypical sense of the concept. We may or may not call it thinking – it depends on its distance from these characteristics and other factors that relate to the special connotations in which it is carried out.

These characteristics do not reveal anything unusual about thinking. They verify our notion about thinking. They tell us that we should trust the natural language and our intuitions regarding what it is and what it isn't. They tell us we should expect levels and borderline cases – the natural lot of concepts such as "chair" or "thinking". Our work as researchers, doctors, paramedics, nurses, teachers and learners relates less to the question what is prototypical thinking and more to the question what is good prototypical thinking and how to teach it together with its various expressions – solving problems, finding problems, making decisions, conducting research, etc.

The present research has examined processes of solving problems by med school graduates of a well-defined emergency situation. Specifically, the target of the research is to test the student's knowledge, decision making processes and behavior while performing intervention in an acute asthma attack. When evaluating decision-making processes among doctors upon graduation, it is expected that several targets will be achieved:

a. Knowledge: relates to knowing the basic facts required to carry out professional functions and having the relevant skills to treat a patient.
b. Knowing how: relates to the cognitive ability to make use of the knowledge and implement it in a theoretical medical situation.
c. Showing how: relates to the behavioral functioning that involves practical performances.
d. Doing: relates to what the doctor actually does in the work environment. We assume that students, who show how and really know how, naturally have

control over the basic facts. As we deal with potential doctors who are not yet doctors, a thorough analysis of problem-solving processes should focus on the level of: showing how in order to test the students' knowledge, process of solving problems and behavior in the course of a well-defined emergency situation such as an acute asthma attack.

To evaluate these abilities, we present the following research questions:

1) Does the student properly interpret presented data and identify the initial situation? For example, does he notice the severity of the situation?
2) Does the student take the correct actions? For example, are the correct interventions made use of?
3) Does the student understand the constraints of the actions chosen? For example, does he know which actions should be avoided?
4) Is the method of operation chosen within the problem space effective, and will it lead to the target? For example, was the order to actions taken proper?

Methods:

In order to examine the process of making decisions by the students, the sequence of events and a full description of their performances should be recorded. Therefore, a qualitative approach was chosen to assist the participants to exhibit their abilities and use the operations of the participants as data. The research included observation of the students' performances at one of the 14 stations called Objective Structured Clinical Examination (OSCE) in the course of the final examination. The observations were carried out by a registered nurse authorized for teaching, who is experienced in life support treatments, and she documented the activities of all the students, whether relevant or not, and recorded the activities of all students, whether relevant or not, on a printed form according to the sequence of events. The OSCE checking list does not include the sequence of events and does not document unnecessary operations carried out by the students and therefore the method of checking list is unsuitable for the purposes of the present research.

Participants: the participants were 50 med students, graduates of the sixth year of med school, just before entering internship, all of whom successfully passed Pediatric Advanced Life Support (PALS) course three months prior to the exam.

Course of exam:

The participants were presented with a case of a 7-year old boy who arrived at the emergency room with acute respiratory distress, and who did not respond to a bronchodilutors treatment at home. They were given a 15-minute time period to handle the case. The case scenario included the following elements:

1) Prior to entering the exam room the students were given brief written description which included a short history and the current medical situation of the boy.
2) A well-equipped intensive care station with a monitor, oxygen, suction, life support medication and life support equipment.
3) A person's doll with an arrhythmia simulator lying on an emergency room bed.
4) A nurse present at the station to provide assistance when needed.
5) A doctor was present in order to provide additional medical information, to respond and handle the case according to the steps taken by the student. Every case developed according to the steps taken by the examinee: if the actions were correct and carried out at the right order within a reasonable period of time, the boy's condition "improved". If incorrect actions were taken or vital actions were omitted, the patient's condition deteriorated to hypoxemia, respiratory failure and eventual apnea, which required life support and CPR.

The observations were documented word for word and an inductive analysis was carried where actions, subjects and activities which were taken out of the data were sampled. The analysis process included the following steps:

1) All the texts were read independently by two examiners in order to create temporary insight and construct meaningful arguments in connection with the students' knowledge and the actions they chose to carry out.
2) Upon additional readings there was an attempt to confirm or negate the temporary arguments.
3) Following the independent analysis, the same two examiners performed an interactive analysis. They read the texts and interrupted the reading when one of them found that a meaningful event was taking place, and then the texts were reviewed according to the need, so that every argument would be examined by the writers as required.
4) When a temporary argument was raised, the texts were reviewed in order to find addition operators which support or negate these arguments, and that process led to the phrasing of amended arguments.

<u>Results</u>:

Our analysis showed that only 26 out of 50 (52%) properly implemented most of the necessary procedures. The low results in the problem-solving processes of the remaining 24 students (48%) can be classified into 3 groups:

1) Failure in taking the suitable actions.

2) Failure in choosing the correct way towards finding a solution in the problem space.
3) The tendency to carry out actions in clusters.

Although these arguments overlap, they provide insights as to the processes of solving problems, as detailed below.

1) Failure in taking the suitable actions: students failed to implement the following vital medical interventions when handling an emergency situation:

a) 53% of the students did not give oxygen at all.
b) 70% of those giving oxygen did not know the necessary amount.
c) 50% of the students did not measure stortion in order to evaluate the boy's breathing and the continuation of treatment.
d) 30% of the students did not give inhalations of bronchodilutors.
e) 56% of the students did not give hypodermic adrenaline after giving oxygen and inhalations.
f) 70% of the students failed to give adrenaline as it should be during an acute asthma attack: they chose to inject it intravenously instead of hypodermically.
g) 39% of the students decided to intubate the boy almost immediately. That was totally unjustified according to the initial medical condition, and they should have used it at a much later stage after the conventional interventions had failed.
h) 21% of the students carried out unnecessary actions. For example, one student examined meningoal signs, state of consciousness, meningismus, fondus check, inserted urine catheter, and another gave steroids through the muscle.
i) 78% of the med students failed to intubate the boy during life support situation.

2) Failure in choosing the correct way towards finding a solution in the problem space. Naturally, if students fail in taking the correct actions, they will also fail in choosing the right way. But our results show that even those students who knew which actions should be taken and how to implement them, failed in applying them in the most efficient order that would lead to the solution of the problem.

a) The total number of actions taken by students hence the length of way and time towards solving – or non-solving – the problem varied from one student to the other: the average number of actions taken was 16.6 ranging between 7 and 30 per student. The number of questions ranged between 2 and 35 (average number of questions = 17.5). The number of interventions ranged between 4 and 16 (average number of interventions = 8).
b) 40% of the students giving oxygen (except those who did not give oxygen at all) did not give it soon enough and did not give sufficient oxygen. These students asked many irrelevant questions or took inefficient actions prior to giving oxygen.

c) 20% of the students measured stortion relatively late.
d) As mentioned before the number of actions taken by the students varied among them (e.g. 10% of the students took unnecessary actions), which indicates that the length of "route" towards solving or non-solving the problem varied from one student to the other. Choosing the longest way caused unnecessary postponement of the performance of relevant actions.
e) 27% of the students were made to stop their activity after 25 minutes (as the time allocated was 15 minutes).

3) The tendency to carry out actions in clusters: the questions asked or the actions taken were usually carried out in clusters, i.e. a group of questions or actions one after the other by the student. For example, it could be seen that the questions of student B and the actions carried out by him were in clusters, representing one cluster of questions after the other as well as a cluster of medical actions. We found that while several students (40%) asked a cluster of questions at the beginning (e.g. student B), others (54%) took the necessary actions and then moved to asking a cluster of questions.

Table 4 presents an example of 3 observations on 3 students. This table relates to the actions of students, the doctor's reaction. Observation A shows the actions of a student who took action quite slowly. The observation on student B shows that his approach was based on a cluster of questions asked one after the other, prior to taking any action. Although one can claim that the questions are very important in non-urgent situations, they do not contribute anything at this point as far as treating the patient is concerned. This approach shows that the student did not interpret correctly the information given and failed in identifying the severity of the problem at the initial stage. Only after the operator of the simulator mentioned that "the boy finds it hard to breath", the student took the suitable actions by giving oxygen. In addition, the student gave 1ltr oxygen which is too little when treating severe hypoxemia.

The observation on student C showed good performances. This student immediately identified the severity of the situation and gave the boy the suitable treatment.

Table 4:

Conduct, functioning, treatment and question-asking among the three research groups during stress and emergency situations

Med student = B	Med student = A	Student = C
1. Does he do inhalations at home? Yes. 2. Gives 10lit oxygen, examines SAT vital signs. 3. Stortion 93%, pulse 132, breathing 58. 4. Listens to back lungs. 5. Reduced sounds. 6. Gives trubaline inhalations. 7. How many seizures does he have a year? 8. Several. 9. Does he receive steroids at home? No. 10. Does he have seizures at night? No. 11. Has he had a seizure recently? No. 12. The boy is unstable, reduces pulse. 13. Has he ever been hospitalized at the emergency? Yes. 14. Prepares for infusion. 15. Gives 1lit oxygen. 16. Inserts peripheral infusion. 17. Gives hypodermic adrenaline. 18. Gives steroids through the muscle. 19. Pulse 53, stortion 81%. 20. Prepares for	1. Is he breathing? Yes. 2. Did he receive medication at home? Yes, inhalation. 3. Does he receive steroids? Yes, Budicort. 4. Did you try to give him something at home? Yes, nothing helped. 5. Has he done any exceptional physical activity lately? No. 6. Is there anyone else sick at home? No. 7. Has he had additional attacks previously? Yes, he was hospitalized twice. 8. Has he had an attack lately? This is the first attack in the recent period. 9. Was he given medications by infusion? No. 10. How long has he been suffering? Since the age of 2. 11. Does anyone else in the family suffer from asthma? My wife. 12. Are there other diseases in the family? Level 1? Level 2? 13. The boy has difficulty breathing, turns blue. 14. Received 15lit oxygen with a mask. 15. Gives inhalation with bricalin. 16. Measures breathing rate 45/min.	1. Is he conscious? Yes. 2. Is the boy breathing? Yes, 45 breaths per minute, with signs of respiratory distress. 3. Checks consciousness. They boy is conscious. 4. How long has he been like this? It started a short time ago, and we brought him immediately to the hospital. 5. Did he receive medication at home? Yes, inhalations. 6. Listens to the lungs. Weak sounds, wheezing. 7. Prepares infusion. 8. Intubates the boy. 9. Checks vital signs, blood pressure, pulse, stortion. 10. Gives adrenaline inhalation. 11. CPR. 12. Massage and ambo ventilation. 13. Constant monitoring for vital signs.

intubation. 21. Asks for help. 22. Ventilation by ambo mask. 23. The situation is stabilized, SAT (95%), pulse 122 per minute. 24. Since when has the boy suffered from asthma? 25. Is there anyone sick at home? 26. Has he made any intensive activity lately? 27. Has he swallowed anything? 28. Which medicines does the boy receive?	17. Measures pulse and blood pressure. 18. Pulse 120/min, blood pressure 140/80. 19. Listens to the lungs. 20. Prepares infusion. 21. Gives adrenaline I.V. 22. Gives steroids I.M. 23. What is the breathing rate? 24. After the steroids shot? The breathing rate increases, the blood pressure increases, hyperventilation. 25. Condition deteriorates, doesn't improve. 26. Prolonged experium. 27. Arterial blood gas test. 28. Prepares for intubation. 29. CPR. 30. Cardiac standstill. 31. Message, ventilation with ambo and mask. 32. Intubation. 33. Transfer to IC children.	

Second case received by a doctor, a nurse and a paramedic.

A one-year boy arrives at noon to the emergency room with cough, stridor, fever 38 for more than four hours, reacts to pain stimulus only, breathing rate 49 per minute, heart rate 180 per minute, weak peripheral pulses, cold limbs. According to the mother he ate sausages in the morning and has been feeling bad since then.

The doctor's reaction: started with anamnesis – since when has he got fever, stridor, breathing difficulty, are there other sick kids at home, inserting infusion, giving fluids, giving oxygen, giving antibiotics, ventilation with ambo mask, intubation.

The paramedic's reaction: suspicion of a foreign body, giving oxygen, five pats on the back and five presses on the chest, performing the action three times. The foreign body came out, inserting peripheral infusion, giving fluids.

The nurse's reaction: suspicion of a foreign body, sepsis, giving oxygen, looking into the mouth, pats on the back and chest, performing the action five times, the foreign body partly came out, infusion, intubation, ventilation, performing bronchoscopy at the emergency room to extract the foreign body; ventilation, giving antibiotics for a week.

This example demonstrates the different approach exercised by the three research groups. The paramedic and the nurse reached a diagnosis quickly and treated the boy quickly – compared to the doctor who focused more on thorough anamnesis and asking family history question, with the boy eventually ending up with intubation and ventilation. The nurse and the paramedic reached a quick solution of the problem and treated the patient according to high standards as well as according to proper emergency situation management (A,B,C,…).

Third case: a three-year old infant is brought to the emergency room as a result of diarrhea, the boy is pale, apathetic, breathing 48 per minute, no distress signs, pulse 169, capillary filling time 5 seconds, weak peripheral pulses.

The doctor's reaction: 6-minute attempt to insert peripheral infusion, managing to insert peripheral into the right leg, giving 15cc/kg fluids for half an hour, clinic deterioration, tachycardia, tachypnea, dyspnea, blood gas picture, metabolic acidosis with metabolic compensation, cold and closed periphery, pale, ventilation.

The nurse's reaction: giving oxygen through a hood, 90 seconds attempt to insert peripheral infusion without success, inserting intra-osseous infusion, giving 20cc/kg fluids within 5 minutes, giving second round of 20cc/kg fluids, pulse reduced to 135 per minute, blood pressure increased, less pale, less tachypnea and dyspnea, received third round of 20cc/gk fluids. The infant's condition improved, vital signs SAT 98, temperature 37.2, pulse 129, blood pressure 65/31. The infant is receiving oxygen through the hood.

The paramedic's reaction: 90 seconds attempt to insert peripheral infusion without success. 3-minute attempt to insert intra-osseous infusion without success, another attempt to insert peripheral infusion with success, giving 20cc/kg fluids, two rounds. Vital signs SAT 95, pulse 140, breathing 50, dyspnea, paradixal breathing, ventilation attempt without success. Ventilation with mask and ambo. SAT 100, pulse 155, blood pressure 68/32.

The third example: demonstrates the nurse's control in treating the situation, her list of priorities and her success in treating the baby, compared to less control demonstrated by the doctor and his severe failure of treatment, compared to the paramedic who had control over the list of priorities without succeeding in the treatment.

The two examples demonstrate that the doctor's discretion, making decisions and solving problem processes are incorrect and are not implemented according to the A, B, C, D, E as taught in life support courses. On the other hand, the process of solving problems and making decisions is clearer and more concrete with the nurse and paramedic as well as their success in treatment.

In the two situations it can be seen that the medical staff has a lot of medical knowledge but does not know how to use it clinically in urgent cases. On the other hand, the nurses and paramedics are more specific and relevant in treating the patient and better focus on the problem in order to solve it and reach the proper decision much quicker.

From the above examples it can be seen that doctors do not know how to utilize the knowledge at their disposal. Half of the doctors evaluate that they are incapable of confidently handling the problems of organization and treating several casualties concurrently. They do not know who has the responsibility for the initial categorization, and their lack of confidence is noticeable in the process of making decisions at times of mass terror attacks. About one third to 48% of the doctors does not believe that the knowledge they acquired is enough to safely handle the problems related to an injured person in respiratory distress. They do not know under which circumstances an endotracheal tube should be inserted into an unconscious insured person in the field prior to his evacuation, should an airway be inserted to the mouth and pharynx of a conscious injured who suffers from breathing difficulties, and what comes first – inserting a tube to the stomach or to the windpipe?

Half of the respondents have not heard of the customary rule regarding a mass terrorist act that when treating many injured persons, every suspicion of an injury should be treated as if it exists.

About half of the doctors are not sure of their ability to treat a bleeding injured in shock and they do not know whether there is a need to add to the treatment, after intravenous sprinkling, 2000 ml fluids when the injured does not urinate.

Experience in performing emergency actions such as: mouth to mouth resuscitation, opening a blocked airway, inserting an endotracheal tube, giving closed cardiac massage, central vein catheterization, stopping wound hemorrhaging, etc.: when examining the practical experience accumulated by the graduates during their clinical studies and internship in actions required for life support, it was found that 62% of them completed the med school and internship year without even once performing endotracheal intubation, and additional 10% of them carried out this action only once. About one-fifth of the doctors never performed a closed cardiac massage, and only about one-third of them inserted an intercostal trochar and this generally only once. These actions require great skill and fast operation.

About 2/3 of the doctors never saw another doctor inserting an intercostals trochar, about one-third of them never inserted central vein infusion and 15% of them inserted such infusion only once. Only about 10-15% of them accumulated any experience in venisection, 70% of the respondents never fixed a femur break and they do not know how to use the Thomas stocks. About half of the survey participants never experienced stopping an external hemorrhage, and only very few of them (about 5%) knew the principles of using mast as shock treatment.

As to the routine treatments which are used daily in hospitals but have importance when treating an injured person we found that 10-15% of the graduates never carried out one or more of the following actions: inserting probe to the stomach, inserting catheter to the urethra, treating a skin cut, quick sprinkling of medicines to the vein, inserting peripheral infusion, etc.

8. Differences between sixth-year med students, nurses and paramedics relating to the use of anamnesis and visible information received from patients in processes of thinking, problem-solving and decision-making under stress and emergency situations

In many diseases the external look of the patient can provide valuable clues as to the nature of the disease it suffers from. The external look can be clear and greatly assist in the diagnosis, such as the presence of a specific sign (e.g. butterfly rash when lupus is concerned) or a more implied one (e.g. the presence of risk factors such as age and obesity in the case of heart diseases). Students learn quickly the diagnostic value of these signs (e.g. moon-shape face, the Cushing disease, or exophtalmos and hyperthyroidism (Vygotsky, 1978; Alexander & Giguer, 1996).

Despite the critical value of many of these overt signs in the diagnostic process only very little is known about the method in which doctors integrate this information into their diagnoses. Norman conducted researchers about "enabling situations", which were widely defined in order to include everything starting from risk factors (as defined above) to relevant medical history. The information can be presented verbally or included in the patient's photograph. He found that doctors made wide use of these enabling situations, compared to students, while being required to reach a diagnosis; but a lack of clear distinction between visual information and verbal information makes it difficult to provide appropriate interpretation in the current context (Greeno & Simon, 1986; Voss & Post, 1988).

Ross & Anderson (1982) examined the relative uses of the verbal and visual information (history) used by doctors in the emergency room in the process of diagnosing myocardial infraction. He found that verbal information and visual information contributed equally to the process of diagnosis. An initial research on the effect of visual information conducted on students alone, has recently reported and shown that while students discovered external signs of a disease by the patient's photograph, the ability to interpret the picture raised the accuracy of diagnosis by 20%.

These researches show that external signs have an important role in the diagnosis process, but although students are aware of their great significance and are able to identify signs of lupus, pancreatitis, or the Cushing disease, there is no certainty that they will practically be able to identify these signs when a real flesh and blood patient is presented to them.

The objective of the present research was to examine the ways in which med students, nurses and paramedics use visual information and anamnesis by heart. A critical element in planning the research was that the information was provided initially with no interpretation (visual) in the shape of the patient's head, chest, abdomen, hands and shoulders x-ray, and afterwards with interpretation accompanied by explanation given to the patient. The research had several assumptions. We expected that doctors would be superior in all fields also as far as the material validity confirmation was concerned. A more critical assumption was that doctors would manage to extract more information from the non-interpreted visual information than nurses and paramedics, and the added value of the verbal information interpretation would significantly contribute to the accuracy of the doctors' diagnosis and less to that of the nurses and paramedics. Finally, in the course of the experiment, we made changes in the research structure in order to examine the assumption that the diagnosis process is interactive and that the diagnostic assumption is likely to affect the interpretation of the signs.

The research **assumptions** were as follows:

1) The connection between information from anamnesis and a photograph, and between the accuracy of the diagnosis:
   a) The addition of visual information to a brief anamnesis of the patient will result in an improvement of the accuracy of diagnoses.
   b) A descriptive addition to the visual signs will result in an additional accuracy, in diagnosis, problem solution and decision making.
2) The influence of expertise among doctors, nurses and paramedics:
   a) Among doctors there will be greater accuracy in all levels compared to nurses and paramedics.
   b) Doctors will extract more information from external signs than nurses, and more information from the interpretation of signs than paramedics and nurses.
3) The influence of diagnosis on the interpretation of signs:
   a) The addition of a tentative diagnosis will increase the probability of discovering the relevant external signs.

Method:

Materials: the stimulators were based on a series of photographs (of identical size) of 15 patients each was accompanied by a brief 1-2 lines anamnesis. About three quarters of the photos were copied from study books relating to the diseases. The rest were taken from photo catalogs (slides) which were kept by academician doctors. The anamneses were given by the doctors and underwent changes based on prior testing with other doctors. We especially tried to obtain for every situation a condition where the anamnesis and the visual information would contribute to the diagnosis equally. Based on these early tests, the initial choice of about 60 situations was reduced to 15.

Every medical situation focused on a familiar physical sign. Several examples of external key signs and diagnoses are: yellow skin for hepatitis, delayed blinking for myasthenia gravis and butterfly rash for lupus, pulmonary edema, foreign body, pleural fluid, pneumonia, pulmonary collapse, pneumatorax, free intestine air.

The method of choosing the pictures from the study books was done in such a way that there would be no lack of clarity as to the presence of the appropriate signs. This choice was approved through early tests and direct questions to doctors, nurses and paramedics.

Participants:

The initial participants were Unit Six students of the University medical, nursing and paramedical schools. This is the last preclinical unit. Students of that level were chosen as they officially completed the premedical studies and were already familiar with the relations between signs and symptoms and diagnoses but had relatively little clinical experience. The research took place about 6 weeks prior to experiencing. The students were sent a letter and then contacted personally. The students were given a payment of $10 for their participation. The final sampling included 24 participants: 12 med students, 6 nurses and 6 paramedics.

The cases were presented to the participants individually in a fixed succession. During the first presentation they were provided with a brief medical history (e.g. a young man comes to the emergency room complaining of double vision and dysphagic), and were asked to reach a differential diagnosis. Thus it was carried out in all other cases. During the second presentation the medical history was repeated while they were looking at the patient's pictures (e.g. the picture of a young man with pathosis). This time too they were asked to reach a differential diagnosis and identify clinical signs in the pictures. Finally, during the third presentation, for those who had not diagnosed correctly, the participants looked at the pictures while the medical history and the clinical signs were being read to them (e.g. here is a picture of a 27-

year old man who arrives as the emergency room complaining of double vision and dysphagic, and a physical examination reveals a two-sided pathosis). Then the participants were requested to give a secondary diagnosis. In a fourth presentation the picture showed a 52-year old patient who was received at the emergency with hands and feet edema, together with chest and abdomen x-ray. Here med students, nurses and paramedics were asked to give an initial and differential diagnosis.

<u>Analysis</u>:

Every case was marked with points: 0 points if the differential diagnosis was incorrect and 1 point if a correct diagnosis was given. A repository of 15 marks (0 or 1) was received for each of the three experiment-stages undergone by the participants. The reactions were analyzed by ANOVA recurrent measurements with attribution according to groups (students, nurses and paramedics) and two experiment factors (case: between 1 and 15) and presentation (between 1 and 3). The secondary analysis examined the connection between the diagnosis given by the researchers and interpretation of the signs by examining the number of signs identified by the six nurses after the second presentation, and the number of signs identified by the six paramedics after providing them with the diagnosis during the third presentation, by using ANOVA recurrent measurements and with one attribution factor (the first sextet and the second sextet) and one experiment factor.

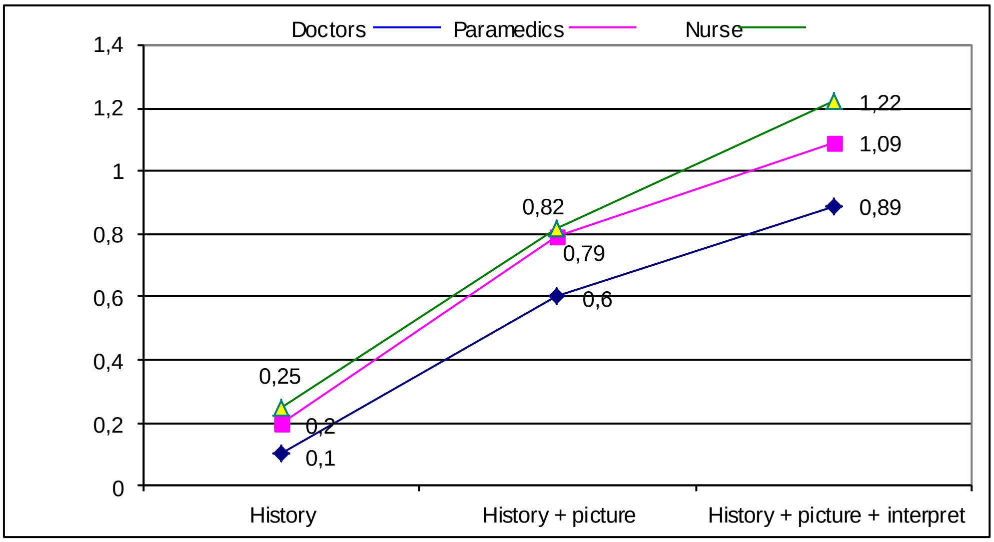


Fig. 10. Average percentage of the correct scoring results in each medical situation among the three research groups

Results:

The average percents of the correct scoring results of every presentation (medical condition) are presented in Chart 7 (only the scoring of the 12 nurses and paramedics was included). Clearly both regarding the med students and regarding the nurses and paramedics a sharp increase, almost exactly linear, was found along the three situations, where the accuracy from anamnesis alone increased by 10% among med students, by 19% among paramedics and by 23% among nurses – up to an accuracy following verbal interpretation that increased by 60% among med students, by 79% among paramedics and by 83% among nurses. These results were verified by ANOVA producing a significant result according to presentation (hypothesis 1), a significant result according to nurses and paramedics (hypothesis 2a), and a much more significant result according to nurses (hypothesis 3). There was also a significant result according to case, but it was not relevant to the research assumptions.

The most interesting differences were at the level of accuracy between med students, paramedics and nurses after receiving the visual information (hypothesis 2b). There was an indication to the fact that nurses and paramedics extracted more from the visual information than med students (48% compared to 28%, respectively), which creates a connection between nurses & paramedics and presentation, when only the first and second presentations are taken into account (hypothesis 2b). This was verified by an additional ANOVA which included all 12 med students and which led to a less meaningful result regarding the nurses and paramedics, a meaningful result regarding the presentation, and confirmed the connection made between nurses & paramedics and presentation. However, both groups of nurses and paramedics gained from the interpretation of visual information (paramedics 29%, nurses 30%), as confirmed by ANOVA in presentations 2 and 3 where the central effect was meaningful (but also without a meaningful connection), compared to med students where a significant connection was found that they gained from the interpretation of the visual information by 18%.

Finally, the analysis of the three groups regarding the analysis of signs with or without diagnostic interpretation showed that med students who did not manage to reach a diagnosis identified 0.89 of the signs per case; paramedics who reached a diagnosis identified 1.09 signs per case and nurses who reached a diagnosis identified 1.22 signs per case. The difference in results between med students, nurses and paramedics is significant.

It is time to summarize by an example the work of the three research groups: The chances of a chess master to become an insightful political and military consultant. In this golden era of general thinking skills many would say: “One should try!” and add several warnings. After the fall many would say: “No way!” so, what shall we say now? (This example demonstrates that the doctor should have the ability to collect data as well as the ability to be a clinician, problem solver and decision maker).

It seems that the correct answer is that first and foremost we should collect more data about this chess master (collecting data from the patient). Does he already have several general principles ("rule the center – any center whatsoever") rather than just totally connotation-dependent principles ("rule the central squares of the chess board")? To which extent is his thinking about the chess game and other activities in life meta-cognitive? Does he have a tendency to do what a superior transfer requires – to take principles, in a calculated manner, out of their domain hold? Or to the contrary: Is he an intuitive and talented chess player who has a tremendous repository of experience but with only little tendency for thinking and generalization? According to the answers to these questions we can foresee his chances, starting from "No way!" and ending with "There is hope" (clinics, diagnosis, solution of a medical problem and decision making). Despite the awareness to the importance of a multiple-year experience in the field, the last option is far from being a safe bet.

If there is at all a safe bet – after the conflict between general knowledge and specific knowledge has reposed – then it lies in our willingness to learn much more about the reciprocity of general knowledge and specific knowledge in the human cognition. This is an important issue in order to focus our knowledge on the emergency situation rather than "spreading the knowledge thin". Therefore, in life support and emergency situations one should act according to A, B,C,D,E and apply the required knowledge. We could, of course, make use of this understanding in educational connotations. We predict that wider-scale efforts to combine the teaching of the profession with the teaching of thinking, solving problems, making decisions, etc. will be one of the most exciting stories in research and novelty in the next decade regarding emergency and life support situations among med students, interns, nurses and paramedics.

To sum up, chapter C deals with the course of research and statistic data of all the conducted tests, namely:

1. The OSCE test.
2. Measurement of blood pressure in the process of thinking and decision-making under stress and emergency situations.
3. Knowledge test for med students, nurses and paramedics prior to the experiment.
4. Checking physiological reactions, physical reactions, cognitive reactions, emotional reactions, behavioral reactions, in the process of thinking and decision-making under stress and emergency situations.

The research also compared between med students, nurses and paramedics in the process of thinking, decision-making, conduct of life support and handling stress and emergency situations, as well as the way they were making use of anamnesis and medical information in the process of thinking and making decisions to solve stress and emergency situations.

Chapter C deals with the research objective, research question, research population, research method and research tools (knowledge test, using a Holter machine for measuring blood pressure, pulse, number of breaths, stortion, tonus, perspiration), using visual information through medical history (x-rays and disease signs) and the OSCE test – providing real-life situations for exercising and learning.

CHAPTER D

1. OSCE - an acronym for Objective Structured Clinical Examinations.

OSCE is an acronym for Objective Structured Clinical Examinations. This type of exam is a multi-station test similar to anatomy practicals. Each OSCE is aimed to test students' ability to obtain an adequate history or perform an ample physical exam. There is one OSCE for the history and one for the physical. Rather than performing a complete exam on just one patient, students will demonstrate the ability to perform pertinent focused histories or physicals on various patients.

OSCE is a form of multi – station examination for clinical subjects first described by Harden et al from Dundee (1975). It was first reported from Dundee and Glasgow (Harden and Gleeson, 1979). It was firstly adopted in North America in a widespread manner. Then widely adopted in the UK in the 90s.The principle method for clinical skills assessment in medical schools and licensure bodies across USA, Canada, UK, Australia, New Zealand and other countries, is now the OSCE.

Each clinical situation is selected from a variety of common problems that are seen in primary care. These are listed on students' ICM Clinical Performance Card. Students should be prepared to ask questions related to these problems. It is especially important for them to be familiar with the Review of Systems questions and ask those questions appropriate to the patient's chief complaint and present illness.

There are multiple stations during each OSCE. Following each patient station, there is be a writing station. A write-up may consist of writing out the history or physical as directed or may be a computer generated bubble sheet with multiple choice questions. Periodic rest stations are used for refreshments or restroom stops.

Each station tests specific knowledge and has its own instruction sheet. Students are given a set amount of time to interview or examine each patient. The time is limited; therefore, students are asked to follow the instructions carefully. They are expected to write only the components indicated on the instruction sheet. For example, History of Present Illness and Social History may be the only areas covered at one station, whereas Past Medical History and Family History may be covered at another station. Key components of the history and physical may be covered one or more times. Students may also be asked to generate a simple problem list.

Each OSCE standardized patient rates students' technique. In addition to purely medical issues, students are assessed on their "bedside manner" and their ability to obtain information from the patient.

When taking the exam, it is important to dress appropriately, wear a lab coat, display proper identification and carry a clipboard. Any other medical equipment which students do not normally carry will be available in the exam room.

In order to qualify to take the OSCEs, all mandatory H&P write-ups, all required group sessions (including the immersion experiences) and all Proficiency Checklists must be complete and submitted by the qualifying deadlines in candidate's schedule. Those students, who have not completed their write-ups and have not attended the necessary sessions, will not be allowed to take these qualifying exams. They will receive a grade of "zero" for the missed exam and the exam given during the week of make-ups, in June, will be considered their second attempt.

2. <u>Features of the Objective Structured Clinical Examination (OSCEs)</u>

The features of OSCEs are the following:

- Stations are short
- Stations are numerous
- Stations are highly focused, candidates are given very specific instructions
- A pre-set structured mark scheme is used hence.
- A reduced examiner input and discretion

Emphasis on:

- What candidates can do rather than what they know
- The application of knowledge rather than the recall of knowledge

Typically:

- 5 minutes most common (3-20 minutes)
- (minimum) 18-20 stations / 2 hours for adequate reliability
- Written answer sheets or observer assessed using checklists
- Mix of station types / competences tested
- Examination hall is a hospital ward
- Atmosphere active and busy

Additional options:

- Double or triple length stations
- Linked stations
- Preparatory stations
- "Must pass" stations
- Rest stations

Examination grade**:** Each student is evaluated on the basis of their written responses and feedback about student performance from the standardized patients. The student must attain a score equal to, or greater than, the MPL to pass the OSCE. Grounds for an automatic fail (regardless of the actual score) include activities during the exam that would potentially endanger, harm, or injure a patient, as well as cheating or lying on the examination. Those students failing or not completing either OSCE will be given remedial work and assigned a repeat exam.

Only one makeup exam date will be offered and this will be during the make-up sessions in June, regardless of the reason the student did not take or pass these qualifying exams (including excused absences).

Additional feedback: Students will receive feedback regarding their performance at each station, a summary of their performance, and other pertinent comments.

<u>The aim</u> of the OSCE is to test students clinical and communication skills. It is designed so that an examiner can observe the candidate putting these skills in to practice.

<u>Overall format.</u> When a student enters the examination room, he/she finds a series of booths, known as "stations". Each station requires student to undertake a particular task. Some tasks involve talking to or examining patients, some involve demonstrating a procedure on an anatomical model and others involve watching a video clip and recognizing clinical phenomena.

There may also be one to two rest stations in the circuit. At some tests one of these two stations will contain instructions asking the student to perform certain tasks as if he/she was at a real station. These are pilot stations and the results will not count towards students overall OSCE grades.

Students are required to perform all tasks. They are told the number of the station at which they should begin when they enter the examination room. Each task lasts seven minutes.

Students' instructions are posted outside the station. He/she should read these instructions carefully to ensure that he/she follows them exactly. An example might be:

"Mr. Mckenzie has been referred to you in a psychiatric outpatient clinic because of problems with his memory. Please conduct a cognitive assessment in order to establish the most likely differential diagnosis".

Students are allowed to enter the station only after they hear the sound of the bell. There is an examiner in each station. In general, students are not required to have any sort of conversations with the examiner. They can only direct their remarks to him or her if the instructions specifically ask them to do so. Students should undertake the task as instructed. The bell rings again after six minutes to warn the student that he/she are nearly out of time. Another bell rings when the seven minutes are up. At this point, students must stop immediately and go and wait outside the next station. If one finishes before the end, he/she must wait inside the station but without speaking to the examiner or to the patient during this time.

Then the student waits outside the next station for one minute. During this time, student is asked to read the instructions for the task in this station. After one minute a bell rings. At this moment, the student then enters the station and undertakes the task as instructed.

The student continues in this way until he/she have completed all of the tasks. He/she will then have finished the OSCE.

<u>Content of the stations.</u> Each station consists of a scenario. An examiner will be present and will observe each student at work.

The scenario could be drawn from general adult or old age psychiatry appropriate to a Senior House Officer (SHO).

Although the tasks the candidate will be instructed to do will involve a number of skills, one skill will predominate.

The skills to be tested are set out on a paper. They will not necessarily be tested in the order given on the sheet. Under each skill area some examples are provided. But the student doesn't have to forget that they ae only examples and that other topics will be tested in the exam.

<u>History taking.</u> Each candidate's instructions will set the scene. The student is asked to take a history from an actor pretending to be a patient (a simulated patient). The actor will have been given all the necessary information to be able to answer candidate's questions accurately. The student has to treat him or her just as he or she would be a real patient.

Examples: depression, anxiety, panic, memory difficulty, and drinking problem.

<u>Examination skills:</u> The student is asked to examine a particular part of the body. He/she may have to examine a simulated or real patient or perform the examination on an anatomical model. Although the candidate can talk to the patient as she/she would to a patient in real life, the candidate should only

take a history or give a diagnosis if the instructions require him/her to do so. The student may be asked to explain his/her actions to the examiner as he/she go along.

Examples: examination of cranial nerves, examination of motor system, fundal examination

Practical skills/use of equipment This is to assess some of the practical skills an SHO needs. The stations concerned will normally involve anatomical models rather than patients.

Examples: application of ECT electrodes, application of ECG leads, etc.

Emergency management. These stations test whether the student knows what to do in an emergency situation. The student may have to explain what he/she is doing to the patient or to the examiner. The student's instructions will make this clear.

Examples: resuscitation

Communication skills. There is a communication skill element in most stations. However, in some stations this skill is the principal skill tested. Areas tested may include interviewing (including appropriate questioning, active listening, explaining clearly, checking understanding) and building rapport (including showing empathy and respect, sensitivity to others` emotions and coping with strong emotions in others).

Examples: instructions for discharge from hospital, explaining treatment, consent for ECT and explaining prognosis.

Procedure:

The participants were presented with a case of a 8-year old boy who suffers from an acute asthma attack and does not respond to an initial bronchidultors treatment at home, and were given a 15-minute time limit to treat the case. The location of the event included the following things: (1) prior to entering the emergency room the students received an initial written description which included a short background review of the patient, the location (the hospital's emergency room) and the medical problem. (2) A boy with an arrhythmia simulator was put in an emergency room bed. (3) Vital emergency equipment including oxygen, monitor, suction, medicines and life support equipment. (4) Only at the Medical' station a nurse was present in order to supply medicines and equipment at the student's request. The purpose here was to imitate a real situation where the doctor is assisted by an additional team, compared to paramedics who function by themselves. (5) A doctor was present on the spot to provide additional medical information at the student's request, to operate the simulator and to respond to the therapeutic means taken by the student. Every case developed according to the steps taken by the participant: if the correct treatment was given at a "reasonable" time frame and according to the required order of steps, the child's condition "improved". If incorrect measures were taken and vital steps were left out, the child's condition deteriorated to hypoxemia, respiratory failure and finally apnea and CPR. (6) An observation of every student and the steps he took was carried out by a registered nurse who specializes in intensive care, who kept record of all the actions – whether relevant or not – on a suitable form according to the sequence of events.

The events were documented word for word and an analysis of inductions was carried out where behavior modes, motives and actions were taken from the records. The analysis process was based on:

1. All texts were read and reread individually in order to create some sort of understanding and make meaningful claims about the students and their knowledge regarding the actions taken by them.
2. On additional readings an attempt was made to find confirmation or negation to the temporary claims we reached.
3. After reading the texts individually and making temporary claims, the first author and the third author read the texts as a group for the purpose of making a contextual analysis. The reading was interrupted every time one of the authors thought that a meaningful event had taken place and then all the texts were checked again, when necessary, so that every claim would be examined thoroughly by the researchers. In the course of this process of constant comparison – as part of the confirmation method – the initial claims raised were corrected.
4. When temporary claims were raised, the texts were examined in order to find additional operators which support or negate these claims and that led to corrected claims.

<u>Post test Results</u>:

a. *Interventions which were used:*

1) All paramedics and nurses only 81% implemented most of the necessary procedures whereas only 93% of the Medical did so.
2) All paramedics and nurses gave oxygen as required whereas one 3% of the Medical did not. In addition, the paramedics and nurses knew the proper dosages/oxygen flow they should give whereas 9% of the Medical giving oxygen did not know.

3) All the paramedics and nurses, measured oxygen stortions in order to evaluate the child's condition and match the treatment whereas only 98% of the Medical did so.
4) 100% of the paramedics and nurses gave inhalations compared to 99% of the Medical.
5) 89% of the paramedics and nurses gave hypodermic adrenaline after oxygen and inhalations. On the other hand, 87% of the Medical gave IM and 84% hypodermic. Moreover, whereas all the paramedics except one gave adrenaline as required due to acute asthma attack, 12% of the Medical did it incorrectly. They chose intravenous injection instead of hypodermic. They also gave the medicine incorrectly, as it should be given intravenously.
6) 6% of the Medical decided to intubate the child almost immediately. This step was completely unjustified according to the initial clinical symptoms, and they should have used it later on as a "last resort". Unlike the Medical, the paramedics and nurses did not consider intubating the child.

b. *Proceedings in emergency situations:*

1) Whereas the paramedics and nurses 97% started immediately with giving oxygen and inhalations, 2% Few Medical started the intervention by asking diagnostic and family history questions.
2) The paramedics and nurses reacted quicker than the Medical. While the average response time among the Medical was 8.2 minutes, the average time among the paramedics stood at 7.1 minutes, and among nurses – 7.3 minutes.
3) The number and scope of questions: the paramedics tended to ask fewer questions – the average number of their questions stood at 4.52, compared to 6.7 by Medical and 4.59 by nurses. The number of questions asked by paramedics ranged between 0-13, compared to 0-14 by Medical and 0-12 by nurses. Medical tended to be more "diagnostic" in nature (e.g. does anyone else at home suffer from asthma? Is he sensitive to any chemical substance, medicine, food, dust?), compared to the paramedics whose queries were aimed at clarifying the physical state of the child (e.g. has the condition of the child improved after giving inhalation? How does the child seem to you now – has his condition become worse, the same or better?).
4) The paramedics' function was identical whereas that of the Medical Identical from one another.

3. Decision making processes among students at the time of managing emergency situations in children

Nevertheless, we expect from the doctor to look at the medical emergency situation such as acute asthma attack or dehydration as a result of diarrhea or foreign body, as a well-defined problem. As a result, we expect the doctor to exhibit the ability to make clinical decisions out of consideration regarding the severity of the situation, and to know how to handle it. Regarding the problem space theory, we expect from the doctor to accurately identify the initial situation, the state to be reached (target) and the medical actions to be taken. We also expect from the doctor to be able to choose the most effective way within the space of the problem. Contrary to other well-defined problems such as crossword puzzles, not choosing the right way through the problem space in order to deal with an emergency situation could escalate the situation or even cause death (Bowen et al, 1999; Elstein et al, 1978).

Recently a lot has been invested in developing an "understanding pedagogy", concepts of general understanding and a "performance concept" which connect between thinking concepts and knowledge concepts, and the concept of decision-making process. There is a tendency to make an excluding distinction between knowledge and thinking – "knowledge for thinking is like food for eating". The current trend in education is to disregard knowledge in the name of "the development of thinking". Can we shed more light in this matter on the connection between knowledge and thinking?

We suspect that the connection is more complex than that between food and eating. Part of the issue is what we think about knowledge, not even knowledge in the acceptable philosophical sense – "real justified belief". We operate it, organize it, deduct from it, etc. (Jordan & Henderson, 1995).

In addition, sometimes we think with the help of questions that are not yet considered knowledge (questions asked which are irrelevant to a treatment situation in an emergency prolong the treatment time and cause damage to the patient), although question always assume certain knowledge, and certain knowledge always carries along thinking modes (e.g. the concept of assumption and related concepts). We might think about these concepts but also think with them…

Plus, when we think while we are writing a song or drawing, we do not think about knowledge in the acceptable sense. We do not think whether the song or the drawing is correct or how we will find out if it is correct. We think how to make it, how to make this "impossible" song or drawing, work. Of course, we have artistic knowledge which updates us regarding our work but we do not think about this knowledge but rather with it. On the other hand, the doctor, the paramedic and the nurse use knowledge to save lives, and the knowledge should be used correctly in emergency or life support situations in the process of making decisions and solving the problem in order to save the patient's health (Miller, 1989; Miller, 1990).

The interrupted thought can be summarized as follows:

- When we think, we sometimes think about knowledge (e.g. what is true, what do we want to discover, what are the priorities, etc.), and sometimes we think about other things (e.g. which question should be asked in order to quickly get to the solution of the problem, or how should the song look and how to make it look like that, etc.). These "thoughts" generally come up integrated with each other (Voss & Post, 1988).
- Thinking creates knowledge, so we cannot think this knowledge already at the starting point (Wass, 2001).
- When we think, we always think with knowledge – background knowledge, artistic knowledge, declarative knowledge, procedural knowledge, etc.
- Sometimes we think with knowledge which is a special knowledge about thinking – e.g. knowledge of the method of examining an assumption (Patel & Groen, 1986, 1991).

In other words, the relations between knowledge and thinking are complex and have many facets. Why can't things be simpler…!? Well, if they were simpler, people like us wouldn't have worked in the field of medicine.

The following are several characteristics of **prototypical thinking** in the process of making decisions and solving problems facing the doctor, paramedic and nurse, which will assist us in distinguishing it from other types of mental activity:

- It relates to the decision what to believe in, what to do or how to understanding something (unlike, for example immediate and routine thinking while managing emergency situation and regular situation) (Newell & Simon, 1972).
- It studies and evaluates alternatives (unlike thinking in a single track, treatments, use of different approaches).
- It is wide and deliberative (unlike hastily reaching an intuitive conclusion – priorities, CPR time, continuation of treatment, to live or not to live).
- It is active, focused, target-aimed (unlike that which is lazily floating such as in daydreaming – treating patients in life support situation).
- It involves operation of words and conscious images (unlike unconscious process such as the identification of faces or regular understanding of verbal expressions, evaluation of the treatment situation according to clinics, the external look of the patient, respiratory distress, hemodynamic state, sepsis, etc. (Patto, 1990; Roth, 1995).

The mental activity which includes the above characteristics is almost certainly thinking. When a mental activity is drawn away from these characteristics and similar ones, it is "less" thinking in the prototypical sense of the concept. We may or may not call it thinking – it depends on its distance from these characteristics and other factors that relate to the special connotations in which it is carried out.

These characteristics do not reveal anything unusual about thinking. They verify our notion about thinking. They tell us that we should trust the natural language and our intuitions regarding what it is and what it isn't. They tell us we should expect levels and borderline cases – the natural lot of concepts such as "chair" or "thinking". Our work as researchers, Medical, paramedics, nurses, teachers and learners relate less to the question what is prototypical thinking and more to the question what is good prototypical thinking and how to teach it together with its various expressions – solving problems, finding problems, making decisions, conducting research, etc.

The present research has examined processes of solving problems by med school graduates of a well-defined emergency situation. Specifically, the target of the research is to test the student's knowledge, decision making processes and behavior while performing intervention in an acute asthma attack. When evaluating decision-making processes among Medical upon graduation, it is expected that several targets will be achieved:

a. Knowledge: relates to knowing the basic facts required to carry out professional functions and having the relevant skills to treat a patient.
b. Knowing how: relates to the cognitive ability to make use of the knowledge and implement it in a theoretical medical situation.
c. Showing how: relates to the behavioral functioning that involves practical performances.
d. Doing: relates to what the doctor actually does in the work environment. We assume that students, who show how and really know how, naturally have control over the basic facts. As we deal with potential Medical who are not yet Medical, a thorough analysis of problem-solving processes should focus on the level of: showing how in order to test the students' knowledge, process of solving problems and behavior in the course of a well-defined emergency situation such as an acute asthma attack.

To evaluate these abilities, we present the following research questions:

1) Does the student properly interpret presented data and identify the initial situation? For example, does he notice the severity of the situation?
2) Does the student take the correct actions? For example, are the correct interventions made use of?

3) Does the student understand the constraints of the actions chosen? For example, does he know which actions should be avoided?
4) Is the method of operation chosen within the problem space effective, and will it lead to the target? For example, was the order to actions taken proper?

Methods:

In order to examine the process of making decisions by the students, the sequence of events and a full description of their performances should be recorded. Therefore, a qualitative approach was chosen to assist the participants to exhibit their abilities and use the operations of the participants as data. The research included observation of the students' performances at one of the 14 stations called Objective Structured Clinical Examination (OSCE) in the course of the final examination. The observations were carried out by a registered nurse authorized for teaching, who is experienced in life support treatments, and she documented the activities of all the students, whether relevant or not, and recorded the activities of all students, whether relevant or not, on a printed form according to the sequence of events. The OSCE checking list does not include the sequence of events and does not document unnecessary operations carried out by the students and therefore the method of checking list is unsuitable for the purposes of the present research.

Participants: the participants were 36 med students, graduates of the sixth year of med school, just before entering internship, all of whom successfully passed Pediatric Advanced Life Support (PALS) course three months prior to the exam.

Course of exam:

The participants were presented with a case of a 7-year old boy who arrived at the emergency room with acute respiratory distress, and who did not respond to a bronchodilutors treatment at home. They were given a 15-minute time period to handle the case. The case scenario included the following elements:

1) Prior to entering the exam room the students were given brief written description which included a short history and the current medical situation of the boy.
2) A well-equipped intensive care station with a monitor, oxygen, suction, life support medication and life support equipment.
3) A person's doll with an arrhythmia simulator lying on an emergency room bed.
4) A nurse present at the station to provide assistance when needed.
5) A doctor was present in order to provide additional medical information, to respond and handle the case according to the steps taken by the student.

Every case developed according to the steps taken by the examinee: if the actions were correct and carried out at the right order within a reasonable period of time, the boy's condition "improved". If incorrect actions were taken or vital actions were omitted, the patient's condition deteriorated to hypoxemia, respiratory failure and eventual apnea, which required life support and CPR.

The observations were documented word for word and an inductive analysis was carried where actions, subjects and activities which were taken out of the data were sampled. The analysis process included the following steps:

1) All the texts were read independently by two examiners in order to create temporary insight and construct meaningful arguments in connection with the students' knowledge and the actions they chose to carry out.
2) Upon additional readings there was an attempt to confirm or negate the temporary arguments.
3) Following the independent analysis, the same two examiners performed an interactive analysis. They read the texts and interrupted the reading when one of them found that a meaningful event was taking place, and then the texts were reviewed according to the need, so that every argument would be examined by the writers as required.
4) When a temporary argument was raised, the texts were reviewed in order to find addition operators which support or negate these arguments, and that process led to the phrasing of amended arguments.

Results:

Our analysis showed that only 34 out of 40 (89%) properly implemented most of the necessary procedures. The low results in the problem-solving processes of the remaining 9 students (18%) can be classified into 3 groups:

1) Failure in taking the suitable actions.
2) Failure in choosing the correct way towards finding a solution in the problem space.
3) The tendency to carry out actions in clusters.

Although these arguments overlap, they provide insights as to the processes of solving problems, as detailed below.

1) Failure in taking the suitable actions: students failed to implement the following vital medical interventions when handling an emergency situation:

a) 8% of the students did not give oxygen at all.
b) 6% of those giving oxygen did not know the necessary amount.

c) 3% of the students did not measure stortion in order to evaluate the boy's breathing and the continuation of treatment.
d) 4% of the students did not give inhalations of bronchodilutors.
e) 3% of the students did not give hypodermic adrenaline after giving oxygen and inhalations.
f) 1% of the students failed to give adrenaline as it should be during an acute asthma attack: they chose to inject it intravenously instead of hypodermically.
g) 3% of the students decided to intubate the boy almost immediately. That was totally unjustified according to the initial medical condition, and they should have used it at a much later stage after the conventional interventions had failed.
h) 2% of the students carried out unnecessary actions. For example, one student examined meningoal signs, state of consciousness, meningismus, fondus check, inserted urine catheter, and another gave steroids through the muscle.
i) 2% of the med students failed to intubate the boy during life support situation.

2) Failure in choosing the correct way towards finding a solution in the problem space. Naturally, if students fail in taking the correct actions, they will also fail in choosing the right way. But our results show that even those students who knew which actions should be taken and how to implement them, failed in applying them in the most efficient order that would lead to the solution of the problem.

a) The total number of actions taken by students hence the length of way and time towards solving – or non-solving – the problem varied from one student to the other: the average number of actions taken was 9.1 ranging between 7 and 15 per student. The number of questions ranged between 2 and 17 (average number of questions = 8.9). The number of interventions ranged between 4 and 11 (average number of interventions = 5.4).
b) 9% of the students giving oxygen (except those who did not give oxygen at all) did not give it soon enough and did not give sufficient oxygen. These students asked many irrelevant questions or took inefficient actions prior to giving oxygen.
c) 5% of the students measured stortion relatively late.
d) As mentioned before the number of actions taken by the students varied among them (e.g. 2% of the students took unnecessary actions), which indicates that the length of "route" towards solving or non-solving the problem varied from one student to the other. Choosing the longest way caused unnecessary postponement of the performance of relevant actions.
e) 2% of the students were made to stop their activity after 19 minutes (as the time allocated was 15 minutes).

3) The tendency to carry out actions in clusters: the questions asked or the actions taken were usually carried out in clusters, i.e. a group of questions or actions one after the other by the student.

About one third to 48% of the Medical does not believe that the knowledge frame of the instruction faculty of medicine they acquired is enough to safely handle the problems related to an injured person in respiratory distress. They do not know under which circumstances an endotracheal tube should be inserted into an unconscious insured person in the field prior to his evacuation, should an airway be inserted to the mouth and pharynx of a conscious injured who suffers from breathing difficulties, and what comes first – inserting a tube to the stomach or to the windpipe?

Half of the respondents have not heard of the customary rule regarding a mass terrorist act that when treating many injured persons, every suspicion of an injury should be treated as if it exists.

About half of the Medical are not sure of their ability to treat a bleeding injured in shock and they do not know whether there is a need to add to the treatment, after intravenous sprinkling, 2000 ml fluids when the injured does not urinate.

Experience in performing emergency actions such as: mouth to mouth resuscitation, opening a blocked airway, inserting an endotracheal tube, giving closed cardiac massage, central vein catheterization, stopping wound hemorrhaging, etc.: when examining the practical experience accumulated by the graduates during their clinical studies and internship in actions required for life support, it was found that 62% of them completed the med school and internship year without even once performing endotracheal intubation, and additional 10% of them carried out this action only once. About one-fifth of the Medical never performed a closed cardiac massage, and only about one-third of them inserted an intercostal trochar and this generally only once. These actions require great skill and fast operation.

About 2/3 of the Medical frame of the instruction faculty of medicine never saw another doctor inserting an intercostals trochar, about one-third of them never inserted central vein infusion and 15% of them inserted such infusion only once. Only about 10-15% of them accumulated any experience in venisection, 70% of the respondents never fixed a femur break and they do not know how to use the Thomas stocks. About half of the survey participants never experienced stopping an external hemorrhage, and only very few of them (about 5%) knew the principles of using mast as shock treatment.

As to the routine treatments which are used daily in hospitals but have importance when treating an injured person we found that 10-15% of the graduates never carried out one or more of the following actions: inserting probe to the stomach, inserting catheter to the urethra, treating a skin cut, quick sprinkling of medicines to the vein, inserting peripheral infusion, etc.

After a transmission of the syllabus and instruction PALS, ACLS, ATLS occurs hated of with respect to the results to the favor of students to the medicine

The research results have significant implications on the study of clinical medicine. It is obvious that both med students and nurses & paramedics obtained considerable information from visual signs, although the nurses and paramedics extracted more from the visual information than the med students. Surprisingly, med students as well found it hard to identify common clinical signs from pictures, as became evident from the rise in accuracy at the rate of 20% when identification of the clinical signs was provided. It is important to emphasize that those interpretation errors were not the result of signs which could have been mixed or vague; the signs were chosen from study books and their authors classified them as classical examples of the signs. That fact was verified by analysis of the identified signs carried out by nurses and paramedics before and after giving the diagnosis, which showed improvement in the identification capability after the diagnosis was given. The signs were available and identifiable but became clearer when the diagnosis was available.

The research has limitations and it is based on relatively small samples, but the differences discovered had great meaning. One can criticize the use of students at the pre-clinical stage, but that was an intentional strategy – to choose that cohort which would exhibit the deepest gaps between participants regarding medical knowledge and medical experience. In this sense, med students have less clinical exposure than nurses and paramedics, but in general the differences between the students are based on knowledge, data collection, problem solving and decision making. Med students excelled in receiving anamnesis and presenting the medical problem, but nurses and paramedics had more experience and clinical knowledge and found it easier to solve the problem and make decisions.

We believe that the simplest and most efficient way to teach emergency medicine is to integrate it with the existing curriculum of clinical studies. Each of the teaching clinical departments should be obligated to relate to the emergency medicine at its area. Similarly to the way teaching is carried out at the internal departments regarding the immediate treatment of pulmonary edema and the quick balancing of diabetic acidosis, so should the treatment of injured and life support be taught. The surgical departments, the intensive care and anaesthetization departments must teach the initial treatment of injured and the basic analytical actions related to life support.

In each of the taught subjects the following should be specifically emphasized: quick evaluation of the injured person, the initial treatment, the use of simple means to support life, to stabilize the injured and prepare him for transportation. Special emphasis should be put on teaching actions and providing basic life support skills, this way the teaching of skills can be controlled by a list of mandatory skills to be obtained. Every student and intern will receive an “activities card” in which every action he has performed and in which he has accumulated experienced will be mentioned and approved by the trainer’s signature. This procedure is required to be determined as condition for receiving the degree of graduate in medicine.

One of the difficulties in teaching emergency medicine and immediate actions is that actual cases of injury are required to illustrate the problems. Cases of injury are not common and the arriving of an injured person to the hospital is not coincidental with the regular study hours. Therefore, the use of teaching, illustration and exercise aids is extremely important. Training aids such as video films, exercise dolls, specialized library and self-teaching pamphlets should be concentrated by the teaching departments. Computers have also been introduced lately for the purpose of illustration and self-teaching. From our experience we have found that exercising at the hospital’s animal lab is extremely valuable for the training of activities such as venisection, hemostasis, intercostals drainage and tracheostomy. Training on anaesthetized dogs and on live bleeding tissues provides a sense of reality and adds to the experience and self confidence of the student and intern.

The research indicates a continuous deficiency in teaching emergency medicine and the teaching of basic life support skills in Israeli med schools. We call for an urgent action to rectify this deficiency.

The participants were presented with a case of a 7-year old boy who arrived at the emergency room with acute respiratory distress, and who did not respond to a bronchodilators treatment at home. They were given a 15-minute time period to handle the case.

The case scenario included the following elements:

1) Prior to entering the exam room the students were given brief written description which included a short history and the current medical situation of the boy.
2) A well-equipped intensive care station with a monitor, oxygen, suction, life support medication and life support equipment.
3) A person's doll with an arrhythmia simulator lying on an emergency room bed.
4) A nurse present at the station to provide assistance when needed.
5) A doctor was present in order to provide additional medical information, to respond and handle the case according to the steps taken by the student. Every case developed according to the steps taken by the examinee: if the

actions were correct and carried out at the right order within a reasonable period of time, the boy's condition "improved". If incorrect actions were taken or vital actions were omitted, the patient's condition deteriorated to hypoxemia, respiratory failure and eventual apnea, which required life support and CPR.

The observations were documented word for word and an inductive analysis was carried where actions, subjects and activities which were taken out of the data were sampled. The analysis process included the following steps:

1) All the texts were read independently by two examiners in order to create temporary insight and construct meaningful arguments in connection with the students' knowledge and the actions they chose to carry out.
2) Upon additional readings there was an attempt to confirm or negate the temporary arguments.
3) Following the independent analysis, the same two examiners performed an interactive analysis. They read the texts and interrupted the reading when one of them found that a meaningful event was taking place, and then the texts were reviewed according to the need, so that every argument would be examined by the writers as required.
4) When a temporary argument was raised, the texts were reviewed in order to find addition operators which support or negate these arguments, and that process led to the phrasing of amended arguments.

Course of exam: OSCE

The participants were presented with a case of a 7 – year old boy who arrived at the emergency room with acute respiratory distress, and who did not respond to a bronchodilator's treatment at home. They were given a 15 – minute time period to handle the case. The case scenario included the following elements: test OSCE average number 7 questions and time, includes three groups paramedics (EMT). Nurses and Medical.

4. Conduct, functioning, treatment and question-asking

Table 5.

Conduct, functioning, treatment and question-asking among the three research groups during stress and emergency situations (observation post test OSCE)

Observation Paramedics (EMT) A	Observation of student nurses B:	Observation of student Medical C:
EMT: Administer Oxygen 5. lt EMT Monitors vital Signs EMT Prepares an i.v line EMT Ausctates lungs EMT Auscultates lungs EMT administers Inhalation with 0.5 cc Ventolin EMT Solumedrol (steroids) I.V EMT What is the Child`s condition EMT Contemplates Giving Andrenalin P: the saturation is Getting lower. The child is in bradycardia. EMT Oxygenates the child with an ambo device EMT Checks child`s condition P: the child is improving EMT Returns oxygen mask Student finished task	1. Is he conscious? Yes 2. The child is having Trouble breathing 3. How long has he been suffering from asthma? - for a year. 4. When did he last receive ihalation? - 5 hours ago. 5. What does he usuallyrceive? - Bricalin inhalation. 6. The nurse gives 3 lit oxygen with a mask in the mother`s arms. 7. Listens to back and chest lungs in the mother`s arms. Wheezing and lengthy expiration. 8. Will receive bricalin inalation every half hour. 9. Giving Ethylchoride at the infusion insertion area and opening peripheral infusion (for pain killing). 10. Giving Budicart and ventolin inhalation. 11. Giving Dexacorit with the infusion. 12. Listening to the lungs – less and less wheezing. 13. Measuring vital signs: pulse	1. Is the boy breathing? Yes, 45 breaths per minute, with Signs of respiratory distress 2. Checks consciousness. They boy is conscious. 3. How long has he been like this? Is started a short time ago, and we brought him immediately to the hospital. 4. Did he receive medication at home? Yes, inhalations. 5. Listens to the lungs. Weak sounds, wheezing Rt lung > Lt lung. 6. Decreased inspiratory souds. 7. Administers inhalation with ventolin. 8. Prepares infusion. 9. Intubates the boy. 10. Checks vital signs, blood Pressure, (49/28) pulse (132), stortion (47% - 49%). 11. Gives adrenaline. inhalation (0.1mg/kg). 12. CPR. 13. Massage and ambo ventilation. 14. Constant monitoring for Vital signs blood pressure (107/58), pulse (91) sat

	(108), sat (97%), blood pressure (97/52) checks respirations (47/min) 14. The boy is panting less, feels well. The nurse has completed the task.	(98%) 15. The situation stabilized Student finished task.
A Average time pre = 7.1min post = 7.1min Average number questions Pre = 0-13 Post = 0-13 Average Pre = 5.56% Post = 4.52% SD Pre = 6.7 SD Post = 6.6	**B** Average time Pre = 7.6min Post = 7.3min Average number questions Pre = 0 – 12 Post = 0 – 13 Average Pre = 5.61% Post = 4.59% SD Pre = 6.8 SD Post = 6.7	**C** Average time Pre = 19.3min Post = 8.2min Average number questions Pre = 0 – 36 Post = 0 – 14 Average Pre = 18.9% Post = 6.7% SD Pre = 13.6 SD Post = 6.9

The difference between a three of groups of the study: With respect to the time in order to arrive at the process of decision making in the state of emergencies. With respect to the time in order to arrive at the solution of the problem not changed. With respect to number of the questions in order to arrive at diagnose and solution of the problem not changed also at the Nurses almost never changed.

But at students to the medicine see Hated of shnoi discern to arrive at the solution of the problem and number of the questions descended order to arrive at diagnose her quickly in the allotted time. And this after learned how to solve problems in the state of emergencies according to a method of test OSCE.

Process of the thinking at the Medical started to be organization of the material we will teach creation, operation and acquisition of symbols. The Medical after test will be concluded started to work according to a method of to act firstly instead of to ask firstly. Emphasize at students to the doctor started in the practical knowledge instead of ostensible knowledge.

Medical who just completed the sixth and last year of the med school were considered in this research as having declarative knowledge, compared to paramedics and nurses who just completed the fourth and last year and were considered as having practical knowledge.

The method of solving emergency situation problems in the curriculum of paramedics and nurses is based on an **Algorithm**. This is a method of thinking according to which the person tries all the existing possibilities in order to solve a certain problem. This type of thinking ensures the finding of a quick and correct solution. On the other hand, Medical make use of a **Heuristic** plan to solve emergency situation problems. According to this method one is assisted by previous experience and rules known in advance. The skill of wide thinking among paramedics and nurses such as when exercising life support, knowing what to do, when to do, how to do, which tools to use, what the consequences will be, which factors to take into consideration – is much more than knowing the rules of reason and refraining from making logical mistakes which will eventually cause the patient's death. The thinking skill of Medical is largely engaged in concepts and directing attention. It relates here to the matter of investigating the accumulated experience and utilizing the knowledge: knowing how to handle situations, with your own ideas and the thoughts of others. Anamnesis should be drawn. This subject involves planning, making decisions, looking for evidence, guessing, being creative, and many other very different aspects of thinking. Regarding the group of paramedics and nurses in this research, the thinking lessons acquired in their curriculum might pave a way to some skill in expanding the concept. The intention is to encourage the students to look at life support situations from a wider perspective instead of thinking about them in selfish of immediate terms only. These situations assist the students to think in a wider manner. While med students who are not trained in thinking make initial judgment and thereafter look for points to support their judgment, med students who are trained in thinking are capable of finding points that contradict their opinion as well as those supporting it. The objective is to create thinking which is "detached" from the ego so that the thinker will be able to utilize it in the most effective way. A thinker should be able to say: "My thinking in this field is not particularly good", or: "My thinking performances in this field are poor", without his ego being threatened. This feeling must be shared by all Medical, nurses and paramedics in order to benefit from their work in saving the patient's life.

We understand from this that a curriculum with practical emphasis is more suitable for preparing the learners to deal with emergency situations. An additional complementary explanation is that in the course of their studies paramedics and

Medical develop different strategies for solving problems. Medical develop problem-solving strategies that are more suitable for handling most of the medical situations. They learn that drawing anamnesis is the first step of intervention and therefore they first ask diagnostic questions – usually one after the other – and then carry out the clinical examination. But this method "doesn't hold" in emergency situations. For example, although it is important to ask diagnostic questions, in emergency situations the severity of the problem should be identified in the quickest possible manner and intervention should be made before it is too late. We believe that the way the students learns in class how to handle non-urgent problems has a tremendous implication. The student who is "bound" by this method does not manage to "break himself free" of the "questioning first" method and move to a state of "acting first", and this fact postpones and interferes with the intervention required for saving life in emergency situations. Nurses and paramedics, on the other hand, learn to "act first" and implement the required intervention at the right time instead of "asking first". We conclude thereof that Medical are not trained enough to handle emergency situations,

Think to point out that can see hated of by the results yes there is an improvement with regard to the Medical is average asked is asked time to the solution of the receipt of decisions with regard to the event compared with the nurses of easy improvement to the favor of the event and skills and in contrast with paramedics not hated of more the important he hated of at the Medical before compared with after test will be concluded OSCE.

After instruction of students in the study program to the medicine of course PALS, ATLS, ACLS of use by the dolls of practice, training of students to the doctor in the process of thinking, dexterities of thinking at the time resuscitation from crosshairs to the perception and attention, the receipt of decisions, solution of problems, similarity and practice of thinking in the conditions of stress on dolls. Saw after the test will be concluded at the Medical of planning, the receipt of decisions, search for, visibility, right guess, creativeness looks quarrel very and different of thinking.

<u>Course of exam: OSCE</u>

The participants were presented with a case of a 7 – year old boy who arrived at the emergency room with acute respiratory distress, and who did not respond to a bronchodilutors treatment at home. They were given a 15 – minute time period to handle the case. The case scenario included the following elements: test OSCE average number 7 questions and time, includes three groups paramedics (EMT). Nurses and doctors.

Table 6.

Conduct, functioning, treatment and question-asking among the three research groups during stress and emergency situations (observation post test osce)

Observation Paramedics (EMT) A	**Observation of student nurses B:**	**Observation of student doctors C:**
EMT: Administer Oxygen 5. It EMT Monitors vital Signs EMT Prepares an i.v line EMT Auscltates lungs EMT Auscultates lungs EMT administers Inhalation with 0.5 cc Ventolin EMT Solumedrol (steroids) I.V EMT What is the Child`s condition EMT Contemplates Giving Andrenalin P: the saturation is getting lower. The child is in bradycardia. EMT Oxygenates the child with an ambo device	1. Is he conscious? Yes 2. The child is having trouble breathing 3. How long has he been suffering from asthma? - for a year. 4. When did he last receive ihalation? - 5 hours ago. 5. What does he usually rceive?- Bricalin inhalation. 6. The nurse gives 3 lit oxygen with a mask in the mother`s arms.  7. Listens to back and chest lungs in the mother`s arms. Wheezing and lengthy expiration. 8. Will receive bricalin inalation every half hour. 9. Giving Ethylchoride at the infusion insertion area and opening peripheral infusion (for pain killing). 10. Giving Budicart and ventolin inhalation.	1. Is the boy breathing? Yes, 45 breaths per minute, with Signs of respiratory distress. 2. Checks consciousness. They boy is conscious. 3. How long has he been like this? Is started a short time ago, and we brought him immediately to the hospital. 4. Did he receive medication at home? Yes, inhalations. 5. Listens to the lungs. Weak sounds, wheezing Rt lung > Lt lung. 6. Decreased inspiratory souds. 7. Administers inhalation with ventolin. 8. Prepares infusion. 9. Intubates the boy. 10. Checks vital signs, blood Pressure, (49/28) pulse (132), stortion (47% - 49%). 11. Gives adrenaline.

EMT Checks child`s condition P: the child is improving EMT Returns oxygen mask Student finished task	11. Giving Dexacorit with the infusion. 12. Listening to the lungs – less and less wheezing. 13. Measuring vital signs: pulse (108), sat (97%), blood pressure (97/52) checks respirations (47/min) 14. The boy is panting less, feels well. The nurse has completed the task.	inhalation (0.1mg/kg). 12. CPR. 13. Massage and ambo ventilation. 14. Constant monitoring forVital signs blood pressure (107/58), pulse (91) sat (98%) 15. The situation stabilized Student finished task.
A Average time pre = 7.1min post = 7.1min Average number questions Pre = 0-13 Post = 0-13 Average Pre = 5.56% Post = 4.52% SD Pre = 6.7 SD Post = 6.6	**B** Average time Pre = 7.6min Post = 7.3min Average number questions Pre = 0 – 12 Post = 0 – 13 Average Pre = 5.61% Post = 4.59% SD Pre = 6.8 SD Post = 6.7	**C** Average time Pre = 19.3min Post = 8.2min Average number questions Pre = 0 – 36 Post = 0 – 14 Average Pre = 18.9% Post = 6.7% SD Pre = 13.6 SD Post = 6.9

Think to point out that can see hated of by the results yes there is an improvement with regard to the Doctors is average asked is asked time to the solution of the receipt of decisions with regard to the event compared with the nurses of easy improvement to the favor of the event and skills and in contrast with paramedics not hated of more the important he hated of at the doctors before compared with after test will be concluded OSCE.

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CHAPTER E

1. <u>Cases Study OSCE, CORT and CIP</u>

<u>CASE 1</u>

The mother of a 16-month old child, named Jenny Jones, has made an urgent appointment to see you because her child has a fever. Jenny's usual family practitioner is on vacation, and you are the covering physician. The vital signs in your office reveal:

Respiratory rate: 34 breaths per minute
Temperature: 101.6° F rectally
Heart rate: 142 beats per minute

Upon entering the examination room, you observe a nervous young mother holding a child who is quietly drinking milk.

You have fifteen minutes to speak to the mother and evaluate the child. Please limit yourself to the time provided.

<u>Checklist:</u>

- History of Present Illness. The Examinee:
- Physical Examination. The Examinee:
- Communication Skills. The Examinee:

<u>Checklist for Jenny Jones</u>

History of Present Illness. The Examinee:

1. asked about the onset of fever ("It started 3 days ago.")
2. asked about maximum temperature elevation ("It was 101.5° F rectally this morning).
3. asked if the child had a cough ("none.")
4. asked if the child had cold symptoms ("Yes. She has had a runny nose for a week.")
5. asked if the child was vomiting ("No.")
6. asked if the child had diarrhea ("No.")
7. asked about malodorous urine ("No.")
8. asked if the child has any rashes ("No.")
9. asked if the child was lethargic or drowsy ("Just more quiet than usual.")
10. asked of the child was playful ("Yes.")

11. asked if the child was taking juice or water ("Yes, she seems to be drinking 8 ounces every 4 hours.")
12. asked about previous illnesses in the child ("No. Shed has never been ill before.")
13. asked about any allergies the child may have ("None known.")
14. asked about ill contacts ("None.")
15. asked if immunizations were up to date ("Yes.")

Physical Examination. The Examinee:

16. looked in the child's throat (after examinee performs this task, SP should give card with results: mild erythematic of pharynx).
17. looked in the child's ears with a horoscope (after examinee performs this task, SP should give card with results: erythematic and bulging of the tympanic membrane).
18. performed insufflations through the horoscope (after examinee performs this task, SP should give card with results: no movement of tympanic membrane with insufflations).
19. checked the child's neck for stiffness (none).
20. listened to the child's lungs in at least 4 places (normal examination).
21. palpated gently on the child's abdomen (no pain with palpation).

Communication Skills. The Examinee:

22. palpated gently on the child's abdomen (no pain with palpation).
23. explained the side effects of antibiotics.
24. advised me to increase child's fluid intake during the illness.
25. advised me to call for any new problem or worsening symptoms.
26. told me I should follow-up with private doctor.

If you preformed 19 of these 27 tasks, you passed this test station.

Learning objective for Jenny Jones:

Evaluate a child with fever:

Fourteen-month old Jenny Jones presents to your family medicine practice with a two-day history of fever. It is mandatory to perform a thorough history and physical examination on any child with fever and attempt to identify the cause of the illness. It is also important to determine whether the child has a change in personality or behavior (Jenny Jones is quiet but playful and smiling) and if hydration is adequate (oral intake should be quantified if possible).

The mother denies any infectious etiology for the fever except for a mild upper respiratory tract infection of one week's duration. The child has no vomiting or diarrhea. The urine is not malodorous and the child has no cough.

There is no history of viral exanthemas or rashes, (especially petechiae) and the mother is diligent about immunizations. Meningitis is unlikely with no history of lethargy, focal neurologic deficits, or exposure to ill contacts.

The child has no past medical history. Noninfectious etiologies which may cause fever include tumor and collagen vascular disease but these are unlikely in this patient.

On physical examination, there is mild evidence of pharyngitis but lung examination is unremarkable for pneumonia. Meningitis is unlikely since there is no neck stiffness or neurologic deficit (Kernig's and Brudzinski's sign my not be evident in children under eighteen months of age). Abdominal examination including suprapubic palpation for bladder infection is unremarkable.

On examination of the middle ear, it becomes clear that the child has an otitis media. The tympanic membrane is erythematous and bulging. When insufflation is attempted, the membrane is immobile due to the collection of fluid.

The most common complication of an upper respiratory tract infection in children to ear infections. The most common pathogens responsible for otitis media are Streptococcus pneumoniae, non-typeable Haemophilus influenzae, and Moaraxella catarrhalis. Antibiotics are often prescribed for the infection. Children, however, may improve without the use of medication. Parents should be advised to increase the child's fluid intake during the febrile illness.

Complications of otitis media include hearing loss, perforation, mastoiditis, facial palsy, meningitis, and bacteremia. The infant with bacteremia will be lethargic and irritable and will require hospital admission for further work-up and treatment. All children treated for otitis media require follow-up to document improvement and identify any complications.

Physical Examination Pearl: Try to examine a child while he/she is sitting on the parent's lap face to face hugging the parent, legs around the parent's waist. The parent can then hold the child's head with one hand while the doctor examines the ear.

Patient Note Pearl: Ear pain in children may be due to infection (otitis media, otitis externa, sinusitis, mastoiditis, lymphadentitis, dental abscess, and peritonsillar abscess), trauma (instrumentation and foreign body), serous otitis media, and temporomandibular joint dysfunction.

CASE 2

You are the consulting physician for the senior citizen community center and are asked by the social worker to evaluate Mrs. Mildred MacDonald who is 63 years old. Although in the past Mrs. MacDonald was extremely social and extroverted, the social worker now feels that he has become withdrawn and quiet.

The other senior citizens at the center have noticed the difference and are concerned about the change in their fried as well. Please interview Mrs. MacDonald in fifteen minutes. A physical examination is not required at this test station.

SP checklist for Mrs. Mildred MacDonald

History of present illness. The examinee:

1. asked why I stopped participating in activities ("I don't have the energy anymore; I'm tired of those people in the center; I would rather stay in bed.")
2. asked how long I've had a lack of energy (Oh, I don't know; for a while now, I guess.")
3. asked about weight loss ("Oh, I'm the same weight as always I guess; I really don't know.")
4. asked about loss of appetite ("Yes, I guess so; I really don't know; I don't feed much like cooking or eating.")
5. asked about difficulty sleeping ("I'm in bed all day; I sleep all day. If I could, I would be in bed right now.")
6. asked about difficulty concentrating ("I can't even concentrate on reading a newspaper or watching a television show.")
7. asked if I was feeling sad ("Well, I've been happier. I guess I'm sad.")
8. asked if I felt like I was worthless ("Oh, I don't know; I guess I am worthless.")
9. asked if I had feelings of hopelessness ("I am a hopeless case, I guess that would be a good way of putting it.") (SP becomes very tearful at this time.)
10. asked if anything recently brought on these feelings of sadness ("My husband of 35 years walked out on me 2 months ago; he fell in love with another woman; he has filed for divorce.")
11. asked if I felt guilty or shameful about the divorce ("I should have been a better wife, I suppose. I guess it was all my fault. I should have been a better wife. I don't want anyone to know.")
12. asked about any other support system like children ("We don't have any children; we had a son who drowned when he was 3 years old but that was a very long time ago.")
13. asked about a previous history of mood disorder i.e., psychiatric history ("I needed to be hospitalized for a week or so when by baby drowned but that was over 30 years ago.")

14. asked about any alcohol use ("None.)
15. asked about any thoughts of suicide ("Oh, I don't know; I just don't know.")
16. asked about previous attempts at suicide ("Well, when my baby drowned, I did take some pills but I don't think I really meant to kill myself that time.")
17. asked if I had a plan for suicide now ("Oh, I don't know. Well I do have an old bottle of sleeping pills.")

Communication Skills. The examinee:

18. Discussed initial impression with me (plausible diagnosis is depression).
19. discuss initial impression with me (bloodwork, hospitalization, medications.)
20. was able to draw out the information from me effectively.
21. responded to my nonverbal clues (tearfulness).
22. inquired about my feelings regarding the hospitalization ("I really don't care anymore. Do whatever you want, Doctor.")
23. did not become impatient or frustrated with my paucity of speech.

If you performed 17 of these 23 tasks, you passed this test station.

Learning objective for Mrs. MacDonald:

Diagnose depression and screen for suicidal ideation

Mrs. MacDonald had a previous psychiatric hospital admission significant for a suicide attempt and depression after the drowning death of her infant son over thirty years ago. Now, the patient is expressing feelings of sadness, worthlessness, and hopelessness since her husband of thirty-five years left her for another woman and liked for divorce.

Mrs. MacDonald feels a great deal of shame and guilt about the divorce and feels somewhat responsible for her husband's actions. Feelings of shame and guilt often accompany depression.

The patient is fatigued and is staying in bed most of the day. She has withdrawn from activities with her friends at the community center. She is anorexic and lacks the concentration to watch a television show or read a newspaper. When she responds to questions, she is irritable and indifferent. The astute physician will realize that Mrs. MacDonald is, most likely, experiencing a major depressive episode.

The patient with depression may present to the physician's office with a vague complaint such as headache or with severe vegetative signs. Anxiety is present in most depressive disorders. It is not uncommon to observe psychomotor agitation or retardation. Past psychiatric history may reveal a previous history of a depressive episode.

The physician must screen every depressed patient for suicidal ideation by inquiring about thoughts and plans for suicide. Alcohol use, drug use, male gender, an older age group, a complete lack of interest in life, or p previous history of a suicide attempt are a few of the factors which make a patient a high risk for suicide, Although Mrs. MacDonald does not drink alcohol, she has several other identifiable factors for suicide and should be hospitalized for inpatient management of her depression. She will benefit from anti-depressant medications and psychotherapy. A thorough discussion regarding the side effects of medication use and the length of treatment should take place before Mrs. MacDonald is discharged form the hospital.

History-Taking Pearl: An easy mnemonic used to screen for depression is **"SIG E CAPS":**

S	=	sleep problems
I	=	interest in life
G	=	guilt feelings
E	=	energy level
C	=	concentration
A	=	appetite
P	=	psychomotor retardation or agitation, and
S	=	suicide.

CASE 3

Mr. Jenkins is a 40-year old man who presents to the emergency room complaining of abdominal pain. His vital signs reveal the following:

Blood pressure	91/61 mm Hg with orthostatic changes
Heart rate	111 beats per minute
Respiratory rate	24 breaths per minutes
Temperature	103.5° F

Upon entering the examination room, you notice a well-developed man in a hospital gown lying still on a stretcher in the fetal position. Please evaluate Mr. Jenkins in fifteen minutes. Do a focused history and physical examination. Please limit yourself to the time provided.

The Checklist

- History of Present Illness. The Examinee:
- Physical Examination. The Examinee:
- Communication Skills. The Examinee:

SP checklist for Mr. Jenkins

History of Present Illness. The Examinee:

1. asked about the onset of symptoms ("This has been going on for 2 days.")
2. asked about the location of my pain ("It hurts in the middle of my abdomen.")

3. asked about the quality of my pain ("It's sharp like a knife going through me.")
4. asked about the radiation of the pain ("It goes all the way through to my back.")
5. asked about the severity of the pain ("On a scale of 1 to 10 where 10 is the worst, it a 10.")
6. asked about any association with nausea or vomiting ("I cannot stop vomiting.")
7. asked about a change in bowel movements ("No diarrhea or constipation.")
8. asked about any blood in my stools i.e., tarry stools or bright red blood ("None.")
9. asked about any alleviating factors ("Lying on my side helps a little.")
10. asked about any aggravating factors ("Anything I try to eat or drink will worsen the pain.")
11. asked about alcohol use ("Yes, I drink 10 beers every day.")
12. asked about previous medical problems ("I had an attack of pancreatitis from drinking 2 years ago.")
13. asked about any mediation use ("None.")

Physical Examination. The Examinee:

14. asked about the onset of the area of periumbilical ecchymosis i.e., Cullen's sign ("I woke up with it this morning.")
15. listened with a stethoscope in at least 3 places over my abdomen (after examinee performs this task, SP should give the card with results: bowel sounds decreased throughout the abdomen).
16. palpated gently throughout my abdomen (SP will complain of mild midepigastric pain).
17. palpated deeply throughout the abdomen (SP will complain of severe midepigastric pain).
18. elicited rebound tenderness by pressing my abdomen then letting go (SP will complain of severe rebound tenderness).
19. asked to perform a rectal examination (after examinee asks to perform this task, SP should give a card with results: brown stool, fecal blood negative, no masses, no tenderness).

Communication Skills. The Examinee:

20. seemed to care about my discomfort and pain.
21. was gentle in eliciting rebound tenderness and during palpation of my abdomen.
22. kept me draped as much as possible during the examination.
23. explained the physical findings to me.

24. explained the diagnosis to me (narcotizing pancreatitis, complicated pancreatitis).
25. explained that the alcohol use was a risk factor for the disease.
26. explained the work-up for the problem (admission to hospital, bloodwork, radiographic studies, surgical consult).
27. explained prognosis (this is a serious condition).

If you performed 19 of these 27 tasks, you passed this test station.

Learning objective for Mr. Jenkins:

Diagnose necrotizing pancreatitis as complication of acute pancreatitis

Mr. Jenkins is an alcoholic patient with a past medical history significant for acute pancreatitis. He presents with severe abdominal pain that radiates to his back and is associated with vomiting. His temperature on arrival to the emergency room is elevated and he is in severe abdominal distress. He seems to have some relief when lying in the fetal position. The patient is hypotensive, tachypneic, and tacycardic with orthostatic changes.

The difference diagnosis in this patient includes acute pancreatitis, acute cholecystitis, and perforated viscous. Pancreatitis is the most plausible diagnosis since the patient still drinks alcohol and has a history of a previous episode of pancreatitis causing similar symptoms.

Risk factors for pancreatitis, other than alcoholism, include medication use, trauma, hyperlipidemia, penetrating ulcer, and biliary disease such as gallstones. These etiologies are less likely but should still be considered in this patient.

When the patient is undraped for the physical examination, periumbilical discoloration (Cullen's sign) can be seen. There is no flank discoloration or Turner's sign. These findings suggest hemoperitoneum. The patient has rebound tenderness and severe epigastric toneum. The patient has rebound tenderness and severe epigastric tenderness with palpation. These physical findings, along with the history, are consistent with the diagnosis of necrotizing pancreatitis.

The patient will require bloodwork for hematologic studies, electrolyte abnormalities, amylase, and lipase. These studies will identify other complications of pancreatitis that may exist in this patient, namely infection, hypocalcemia, acidosis, and renal dysfunction. Chest and abdominal radiographs may identify a pleural effusion, ascites, or free peritoneal air. Computed tomography may be ordered to evaluate the extent of pancreatic necrosis. Vigorous hydration, antibiotics, and other supportive measures are necessary in this patient. The surgical service should be consulted for possible removal of necrotic tissue.

Mr. Jenkins should be informed that he has a life-threatening complication of pancreatitis. The patient will require a great deal of empathy, support and reassurance.

Interstation Pearls: You should be familiar with Ranson's criteria. Prognosis in pancreatitis is worse in patients older than 55 years old and in patients with elevations in leukocyte count, glucose, blood urea nitrogen, LHD, and AST. Fluid sequestration, acidemia, hypoxemia, hypocalcemia, and decreased hematocrit also worsen mortality.

You may see a chest radiograph with a pleural effusion, atelectasis, or with free air under the diaphragm. Abdominal radiographs may show free air, a sentinel loop (air-filled small intestine in the left upper quadrant), colon cut-off sign transverse colon with air), or the calcifications of chronic pancreatitis.

Patien Note Pearl: the differential diagnosis for this patient includes acute pancreatitis, perforated viscus, and cholecystitis. The diagnostic work-up may include CBC, electrolytes, amylase, lipase, CXR, KUB, and CT scan of the abdomen.

CASE 4

A 32-year old man named Markie Mackey was assaulted outside his home. He was hit several times in the stomach with a baseball bat. Although he stated he was feeling fine, the paramedics insisted he come to the emergency room. His vital signs on arrival to the trauma center are the following:

Blood pressure	101/71 mm Hg
Heart rate	111 beats per minute
Respiratory rate	21 breaths per minute
Temperature	97.7° F

You have 10 minutes to perform a focused history and physical examination on this assault victim.

Checklist

- History of Present Illness. The Examinee:
- Physical Examination. The Examinee:
- Communication Skills. The Examinee:

SP Checklist for Mr. Markie Machey

History of Present Illness. The Examinee:

1. asked my if I was having any pain ("My stomach is a little sore.")
2. asked me if the pain radiated ("It seems to be going up to my left shoulder for some reason.")
3. asked me if I felt nauseated ("A little nauseated").
4. asked me about any past medical history ("Never ill before.")

5. asked me about any medication use ("None.")
6. asked me about any allergies ("None.")

Physical Examination. The Examinee:

7. Checked for orthostatic changes (after examinee performs this task, SP should give card with results: systolic blood pressure decreases by 20 mm Hg and heart rate increases by 20 beats per minute with standing or with legs dangling off the side of the bed.)
8. Listened to my lungs in at least 4 places (normal lung examination: no evidence of pneumothorax.)
9. palpated my ribs (tenderness over ninth and tenth ribs on the left side.)
10. listened over my abdomen with a stethoscope (noram bowel ligns audible).
11. tapped over the left upper side of my abdomen (after SP performs this task, SP should give a card with results: increased dullness over the splenic area).
12. pressed gently throughout my abdomen (mild tenderness on palpation over the left side).
13. pressed deeply throughout my abdomen (mild tenderness over the left upper side).
14. attempt to elicit rebound tenderness (no rebound tenderness).
15. asked to perform a rectal examination (after examinee asks to perrom this *task,* SP should give card with results: no tenderness, heme negaive stools).

Physical Examination. The Examinee:

16. explained to me that I may have some internal bleeding.
17. explained that I may have ruptured my spleen.
18. explain the work-up to me (bloodwork, radiographs, vigorous intravenous hydration, transfusions).
19. told me I would need a needle in my abdomen to check for blood.
20. explained I would need surgery.
21. explained I would probably keep most of my spleen.
22. addressed my concerns.
23. demonstrated empathy.

If you performed 16 of these 23 tasks, you passed this test station.

Learning Objective for Mr. Markie Machey:

Diagnose splenic rupture from blunt trauma infury

Mr. Makie was assaulted several times in the abdomen with a blunt instrument. Although he feels minimum discomfort, the paramedics were correct in insisting that he come to the emergency room. The patient is tachycardic and hypotensive with orthostatic changes.

On inspection of the abdomen, there is no distension. The ribs over the spleen are tender to palpation and are most likely fractured. The area of dullness in the left upper quadrant is a sign of splenic enlagement from bleeding. There is mild abdominal tenderness on palpation but no rebound. These subtle physical findings can be seen with splenic rupture.

Occasionally, a splenic rupture may present with a palpable mass in the left upper quadrant accompanied by clear signs of peritonitis.

Abdominal radiographs in this patient may show the fractured ribs or an enlarged spleen. In the stabilized patient, computed tomography can better evaluate the extent of the splenic injury.

The hematocrit on this patient may fall rapidly requiring blood transfusions and vigorous hydration for stabilization. A diagnostic peritoneal lavage (DPL) will demonstrate blood in the abdomen (not organ specific however) and the patient will require a laparotomy. A good surgeon will make every effort to preserve as much spleen as possible (splenorrhaphy).

History-Taking Pearl: A simple mnemonic for all trauma patients is AMPLE:

A = Allergies
M = current Medications
P = Past medical history
L = Last meal
E = Events before the accident

Physical Examination Pearl: Left shoulder-strap pain is often a classic finding in splenic rupture. This is called Kehr's sign.

Interstation Pearl: Be able to identify the fractured ribs on the radiograph. A DPL is considered positive when there are > 100,000 RBC/mm3 or >500 WBC/mm3 or the presence of bile, bacteria or amylase.

Patient Note Pearl: The differential diagnosis for this patient includes splenic rupture or liver laceration (can occur with blunt trauma; the liver establishes hemostasis quickly and may stop bleeding on its own without surgical intervention). The diagnostic work-up includes CBC, DPL, urinalysis (for hematuria) and, possibly, a CT scan of the abdomen.

CASE 5

Tommy Trucker is a 36-year old tractor trailer drover who presents to the emergency room complaining of severe left sided back pain. You are the resident physician in emergency room and are on your way to the cafeteria when the nurse informs you about the patient.

The patient will not lie down on the stretcher and is demanding pain medication. His blood pressure is 136/81 mm Hg and his heart rate is 100 beats per minute. He is afebrile.

You enter the examination room and find a patient pacing in the room. He is tilted to one side. He sees you and immediately asks for pain medications. He is threatening you to go to another hospital if pain medications continue to be withheld. He is 6 feet tall and weights approximately 250 pounds. He has snake tattoos on his arms and left cheek. Please evaluate Mr. Trucker in fifteen minutes. Perform the appropriate history and physical examination on this patient.

Checklist

- History of Present Illness. The Examinee:
- Physical Examination. The Examinee:
- Communication Skills. The Examinee:

SP checklist for Mr. Tommy Trucker

History of Present Illness. The examinee:

1. asked about the location of the pain ("The entire left part of my back and side.")
2. asked about the onset of the pain ("It started about 3 hours ago.")
3. asked about the quality of the pain ("It is like someone is punching me in the side.")
4. asked about the progression of the pain ("It is getting worse; I need pain medications.")
5. asked about any radiation of the pain ("It seems to be going into my left groin area.")
6. asked about any association with nausea or vomiting ("No.")
7. asked about any change in my bower movements ("No.")
8. asked about any blood in my stool ("None.")
9. asked about any urinary complaints i.e., dysuria, frequency ("None.")
10. asked about any blood in my urine ("None.")
11. asked about any trauma to the area ("No.")
12. asked if this pain has ever happened before ("No.")
13. asked about any alcohol use ("Maybe a couple of beers a day.")
14. asked about any drug use ("Just some marijuana now and then.")

Physical Examination. The Examinee:

15. Listened to my abdomen with a stethoscope (normal bowel sounds)>
16. Pressed deeply over my abdomen (No pain is elicited).
17. tapped on the left side of my back for any costovertebal angle tenderness (SP will jump off the examination table in pain).

18. asked to examine my inguinal area (after examinee asks to perform this task, SP will give card with results: normal inguinal examination).
19. asked to perform a rectal examination (after examinee asks to perform this task, SP will give card with results: normal rectal examination; fecal occult blood negative).
20. performed a musculoskeletal examination of my back i.e., range of motion, straight leg raising (normal examination of back; SP can bend in all directions easily).

Communication Skills. The Examinee:

21. acknowledged my distress and discomfort.
22. sis not become frustrated or angry with me.
23. discussed my diagnosis with me (probable kidney stone).
24. explained the importance of a urine sample to check for blood in the urine.
25. explained the work-up to me (bloodwork, abdominal radiograph, urology consultation).
26. told me I will receive pain medications.

If you performed 18 of these 26 tasks, you passed this test station.

Learning objective for Mr. Tommy Trucker:

Diagnose kidney stones (Nephrolithiasis)

Mr. Trucker presents with severe left-sided flank pain that radiates to his back and groin area. He has no other associated complaints. He denies a history of trauma to the area or back injury. He is demanding pain medications and the emergency room staff suspects that the patient is drug-seeking.

You are asked to evaluate the patient and realize that his symptomatology is consistent with kidney stones even though the patient denies previous painful episodes (kidney stones are recurrent). He denies any gastrointestinal and urinary complaints. The abdominal and inguinal examinations are normal. There is no evidence of an acute abdomen, testicular torsion, or epididymitis. There is. However, left costovertebral angle tenderness which is consistent with pyelonephritis or a kidney stone. Examination of the back reveals no musculoskeletal physical findings.

The urinalysis of this patient will reveal microscopic hematuria without nitrites or leukocytes. The abdominal radiograph will show two kidney stones in the left ureter. The patient will receive vigorous hydration and analgesics. His renal function tests will be followed closely and a work-up for the etiology of his stones will be initiated (stones may contain calcium oxalate (35%), calcium apatite (35%), magnesium ammonium phosphate or struvite (20%), uric acid (5%). Or cystine (2-3%). Most kidney stones will pass spontaneously.

You should be open-minded and nonjudgemental when evaluating this patient. You should elicit the appropriate history and perform the necessary physical examination on this demanding patient to arrive at the correct diagnosis.

History-Taking Pearl: Henatyrua us a common chief complaint. If your doctor does not know the mnemonic for hematuria, "**Switch G.P.**s" (switch general practitioners):

S	=	stones, sickle cell disease, sickle cell trait, scleroderma, SLE, schistosomiasis, and sulfonamides
W	=	Wegener's granulomatosis
I	=	infection, instrumentation, iatrogenic (analgesics, anticoagulants, and cyclophosphamide), interstitial nephritis
T	=	trauma, TB, tubulointerstitial disease, tumor, and TTP
C	=	cryoglobulinemia
H	=	hemolytic-uremic syndrome, hypercalciuria, himophilia, and Henoch-Schonlein purpura
G	=	Goodpasture's disease, glomerulonephritis
P	=	paplillary necrosis, polycystic kidney disease, and polyarteritis nodosa
S	=	sponge disease (medullary sponge disease)

Interstation Pearl: An abdominal radiograph will be positive for several kidney stones. Keep in mind, however, that the size of a stone does not correlate with the severity of symptoms.

Patient Note Pearl: the differential diagnosis for this patient includes kidney stones, pyelonephritis, testicular torsion, ephididymitis, and musculoskeletal pain. The diagnostic work-up would include a genital examination, CBC, urinalysis, and a plain film of the abdomen. All first time kidney stone patients should have bloodwork sent for electrolytes, calcium, phosphate, and uric acid levels. Twenty-four-hour urine collections for calcium, uric acid, phosphate, oxalate, and citrate are requested in patients with recurrent stones or with a positive family history.

CASE 6

Nineteen-month old Baby Jane is brought to the emergency room by her nervous parents. The baby was in the playpen when she had a seizure which lasted approximately 5 minutes. The parents immediately rushed the child to the emergency room. They are concerned that the baby may have meningitis.

Vital signs reveal a temperature of 104.7° F, rectally. Heart rate is 147 beats per minute. The blood pressure and respiratory rate are normal. You have 15 minutes to examine the child and speak to the parents.

Checklist

- History of Present Illness. The Examinee:
- Physical Examination. The Examinee:
- Communication Skills. The Examinee:

SP Checklist for baby Jane

History of Present Illness. The Examinee:

1. asked me to describe the seizure ("The entire body was shaking for 5 minutes.")
2. asked about incontinence of the bladder or bowel ("Yes, she wet herself during the seizure.")
3. asked what the baby was doing before the seizure i.e., choking risks like eating, playing with a toy ("The baby was sleeping.")
4. asked if the baby was acting unusual after the seizure i.e., postical ("She seemed very different after the seizure; she seemed confused and agitated.")
5. asked if the baby has a past medical history i.e., retardation, neurologic problems, cerebral palsy ("No.")
6. asked about any fever ("I didn't know she had a fever until now.")
7. asked about any recent cough ("No.")
8. asked about any gastrointestinal symptoms i.e., vomiting or diarrhea ("No.")
9. asked about any malodorous urine ("No.")
10. asked about any recent rashes ("None.")
11. asked if the baby had been irritable lately ("A little cranky for the last two days.")
12. asked about the baby's appetite ("Not really eating very much lately.")
13. asked about any recent immunization ("Immunizations are up to date; none recently.")
14. asked about a family history of seizures ("No.")
15. asked about ill contacts ("My other daughter had a cold recently but she is better now.")
16. asked about any recent history of trauma, falls, or ingestions ("No.")

Physical Examination. The Examinee:

17. looked in the baby's ears with an horoscope (normal examination).
18. looked inside the baby's mouth (no evidence of pharyngitis).
19. checked the neck for range of motion and stiffness (normal examination.
20. listened to the lungs in 4 places (normal examination).
21. pressed gently on the baby's abdomen (no pain on palpation).
22. examined reflexes in the arms and legs (normal reflexes).

Communication Skills. The Examinee:

23. made sure the baby was comfortable during the examination discussed the diagnosis (most likely febrile seizure which is common in childhood).
24. discussed the diagnosis (most likely febrile seizure which is common in childhood).
25. explained that this was not epilepsy.
26. discussed the work-up (bloodwork, urinalysis, observation).
27. discussed the prognosis (very good).
28. explained etiology is most likely viral or an early bacterial infection.
29. addressed our emotional concerns.

If you performed 21 of these 30 tasks, you passed this test station.

Learning objective for baby Jane:

Evaluate a child with a febrile seizure

Baby Jane presents to the emergency room after experiencing a single tonic clonic seizure lasting five minutes while sleeping in her playpen. The parents' description of the episode confirms the seizure diagnosis. Disorders that mimic seizures include *breath-holding, narcolepsy, syncope, and shaking chills. "Simple" febrile seizures usually last less than ten minutes and are following by a postictal period. These seizures should be distinguished from complex febrile seizures which reoccur over several hours or days and are focal and prolonged in duration.

There is no previous history of seizure in this child and the family history is unremarkable for seizures. The child has no existing predisposing condition for seizure such as cerebral palsy, neurofibromatosis, or brain tumor. The incident was not preceded by cyanosis or choking. The family denies trauma or accidental ingestion.

The temperature of 104.7° F, rectally, and the change in the child's personality (irritable with loss of appetite) should concern the pediatrician. A source for the fever and possible bacteremia requires a thorough interview and physical examination.

The family denies any localizing symptoms to explain the fever like cough, vomiting or diarrhea. There are no rashes or skin lesions consistent with a bacterial infection, viral exanthem, or other disease such as neurofibronatosis (café-au-lait spots). There are no recent immunizations which could have caused the fever. A sibling recently recovered from a viral upper respiratory tract infection and should be considered an ill contact.

There are no signs of pharyngitis or obits media and the abdominal examination is benign. Meningitis is less likely without irritability, neck stiffness, or neurologic deficit.

The child requires observation and antipyretics. Routine CT scan of the head is not indicated. Lumbar puncture is indicated in children with signs of meningitis or who present with complex febrile seizures but an LP has a low yield (<1%) in children with no signs of meningitis who present with simple febrile seizures.

The parents should be reassured by the physician that the fever causing the seizure is either viral in origin or an early sign of a bacterial infection such as a pharyngitis or obits media. The work-up for this patient includes leukocyte count and blood and urine cultures to search for occult bacteremia.

Inform the parents that febrile seizures are common in childhood and rarely lead to epilepsy (less than 1% lead to epilepsy which is the same as the general population). The parents should be aware that seizures may recur in up to one third of children usually within 2 years of the first episode. Anticonvulsants are not appropriate in uncomplicated febrile seizures.

Patient Note Pearl: The differential diagnosis for seizure in a child includes febrile seizure, infection (meningitis, encephalitis), electrolyte imbalance (hyponatremia), metabolic disorder (hypoglycemia), cyanosis from choking, heavy metal poisoning (lead), accidental ingestion of medication (theophylline, antihistamines, phenothiazines), other accidental ingestion, head trauma, and tumor. Seizure must be differentiated from shaking chills, breath-holding, syncope, and narcolepsy. The diagnostic work-up may include CBC, electrolytes, serum glucose level, and, in selected patients, blood cultures, CT scan of the head, and lumbar puncture.

CASE 7

The paramedics rush a four-year old boy to the emergency room because of respiratory distress. You have 15 minutes to speak to the mother and perform a focused physical examination on Billy Walker. The vital signs are as follows:

Blood pressure	92/62 mm Hg
Heart rate	137 beats per minute
Respiratory rate	31 breaths per minute
Temperature	104.8° F
Pulse oximeter	96%

Upon entering the examination room, you observe a child in moderate distress. He is sitting still with his neck extended. You notice the child is drooling. The mother is attempting to comfort the child but she is obviously distraught. You hear stridor as you approach the child.

Checklist

- History of Present Illness. The Examinee:
- Physical Examination. The Examinee:

- Communication Skills. The Examinee:

SP checklist for Billy Walker

History of Present Illness. The examinee:

1. asked about the onset of the breathing difficulty (“It started about 30 minutes ago.”)
2. asked if the child could have choked on food or a tory (“No.”)
3. asked how long the child had fever (“Since yesterday.”)
4. asked about any cough (“No.”)
5. asked about any voice change (“Yes, this morning he woke up huarese.”)
6. asked about any sore throat (“Yes, he complained of sore throat yesterday.”)
7. asked about any difficulty swallowing (“Yes, he could not eat yesterday.”)
8. asked about any past medical history (Never ill before.”)
9. asked about a history of allergies (No.”)
10. asked about immunization against Haemophilus influenzae type b (“No.”)

Physical Examination. The Examinee:

11. did not attempt to look in the mouth with a tongue depressor.
12. examined the neck externally for any obstructive lesions (none palpable).
13. listened to the lungs in at least 4 places (normal breath sounds).

Communication Skills. The Examinee:

14. explained the initial impression to me (plausible diagnosis is epiglottitis).
15. explained the next step in the plan (intravenous antibiotics, admission to the intensive care unit).
16. explained that the child would need examination of the airway in the operating room to make the diagnosis.
17. explained the complications of epiglottitis (airway obstuction).
18. explained that the child would require intubation for a short time.
19. discussed the prognosis with me.
20. used terms that were understandable to me.
21. acknowledged my distress.
22. addressed my concerns.
23. put me at ease.

If you performed 17 of these 23 tasks, you passed this test station.

Learning Objective for Billy Walker:

Diagnosis epiglottitis in a child

Epiglottitis is a pediatric emergency. With sidespread immunization against Haemophilus influenzae type b, the disease is being seen less frequently (other pathogens include Streptococcus pneumoniae, Staphylococcus aureus, and Groups A and C beta-hemolytic Streptococcus). The constellation of symptoms including voice change, dysphagia, difficulty breathing, drooling, sore throat, and high fever must be addressed emergently. The child is leaning for ward with his head extended ("sniffing position") in an attempt to alleviate the airway obstruction. If stridor is audible, airway obstruction and respiratory arrest is imminent.

The differential diagnosis of epiglottitis includes other infections problems such as pneumonia or croup. The patient did not have a cough and lung examination was normal. Obstruction by foreign body aspiration may lead to stridor but the mother denies and antecedent choking incident and the child's high fever is more consistent with an infectious process. In noncritical situations, neck radiologic studies are diagnostic for epiglottitis and will reveal the classic "thumbprint" sign of the inflamed epiglottis.

Billy Walker presents with the symptoms of severe epiglottitis and requires immediate intubation for airway protection. No further manipulation of the airway should be attempted. The patient should be left in the position of most comfort (usually sitting on the mother's lap). An attempt to lie the child down may cause a gravity induced change in epiglottis position and sudden airway obstruction.

Airway protection is best accomplished by an anesthesiologist in the controlled environment of an operating room. There should be no attempt to examine the rhtoat with a tongue depressor since this manipulation may induce laryngospasm. During intubation, the epiglottis is visualized to be enlarged and erytgenatiys and the diagnosis is confirmed. Parents should be reassured that intubation and admission to the intensive care unit is short term until the inflammation of epiglottitis subsides with several days of antibiotic therapy.

Interstation Pearl: Be prepared to see the lateral neck radiograph demonstrating the classic "thumbprint" sign of epiglottitis.

Patient Nore Pearl: the differential diagnosis for stridor includes epiglottitis, croup, angioedema, and foreign body aspiration. The diagnostic work-up may include a CBC (for leukocytosis) and oxygen saturation. If the child is stable, lateral neck radiographs may be ordered. Direct laryngoscopy with possible intubation is the safest method for evaluation of the airway.

CHAPTER F

1. General Approach to Emergencies

The delivery of emergency medical care is dictated by what is found on patient assessment. The emergency care provider must employ an assessment system that rapidly identifies and addresses critical illness or injury first and foremost. This initial system needs to be systematic and simple to quickly and efficiently perform, but also effective and robust to not miss anything life-threatening.

ABCs and Beyond: Initial Approach to the Patient in Emergency Medicine

The delivery of emergency medical care is dictated by what is found on patient assessment. The emergency care provider must employ an assessment system that rapidly identifies and addresses critical illness or injury first and foremost. This initial system needs to be systematic and simple to quickly and efficiently perform, but also effective and robust to not miss anything life-threatening.

<u>Primary Survey (ABCD):</u> First 5 minutes of patient encounter

- Focused history and physical exam
- Critical diagnostic tests
  - o Vital signs, bedside glycemia, oxygen saturation
- Immediate treatment
  - o Airway repositioning, oxygen, glucose, CPR, consider cervical collar

This initial cycle constitutes the ABCs, or primary survey. Once these critical problems are addressed, the provider then moves through another and deeper cycle of assessment and treatment known as the secondary survey.

<u>Secondary Survey:</u> First 15 minutes of patient encounter

- More in-depth history
- Complaint-specific physical exam
  - o Include bedside ultrasound assessment here
- Other time-sensitive interventions
  - o Chest drain, anti- seizure medications, etc.

Both the primary and secondary survey should be completed in less than 20 minutes, correcting problems along the way. Providers do not move on to the secondary survey until problems with the primary survey have been addressed.

The ABCs provide a framework for the evaluation and treatment of severely ill patients. This process is also known as the primary survey.

"A" is for Airway

Definition: Ensuring the airway is open so a patient can breathe. In any critically ill patient, management of the patient's airway is a priority.

Initial approach to assessment and management

Assess for evidence of airway obstruction:

- Are there abnormal breathing noises?
- Is the patient unable to speak normally?
- Is there swelling, excessive secretions or a foreign body in the oropharynx causing obstruction?
- Is there neck or facial trauma/burns or a compressive mass?
- Is the patient choking?

Management

If the patient is choking, but is awake and responsive, follow these instructions:

- Call for help
- If they can move some air (partial obstruction), encourage them to expel the object by coughing
- If they can't move air, perform the Heimlich maneuver (figure 11)

If the patient is unresponsive, position and clear the airway:

- If there is no pulse, start CPR
- Open the airway using a jaw thrust or head-tilt-chin-lift maneuver (consider spinal precautions in trauma patients) (see figure 12)
- Use suction to remove excessive airway fluids
- Remove any foreign body with forceps

After above steps complete, reassess airway and attempt rescue breath if patient is not breathing. If airway remains obstructed:

- Place an oropharyngeal and/or a nasopharyngeal airway device and attempt several breaths with a Bag-valve-mask (BVM) device. Ensure an adequate mask and face seal. Two-person BVM usually provides better oxygen delivery than one-person BVM (see figure 12).

If the patient remains obstructed, you must proceed to an advanced airway device:

- Place a laryngeal mask airway (if available in the district hospital) or proceed directly to endotracheal intubation (if trained to do so)

Fig. 11: Heimlich Maneuver

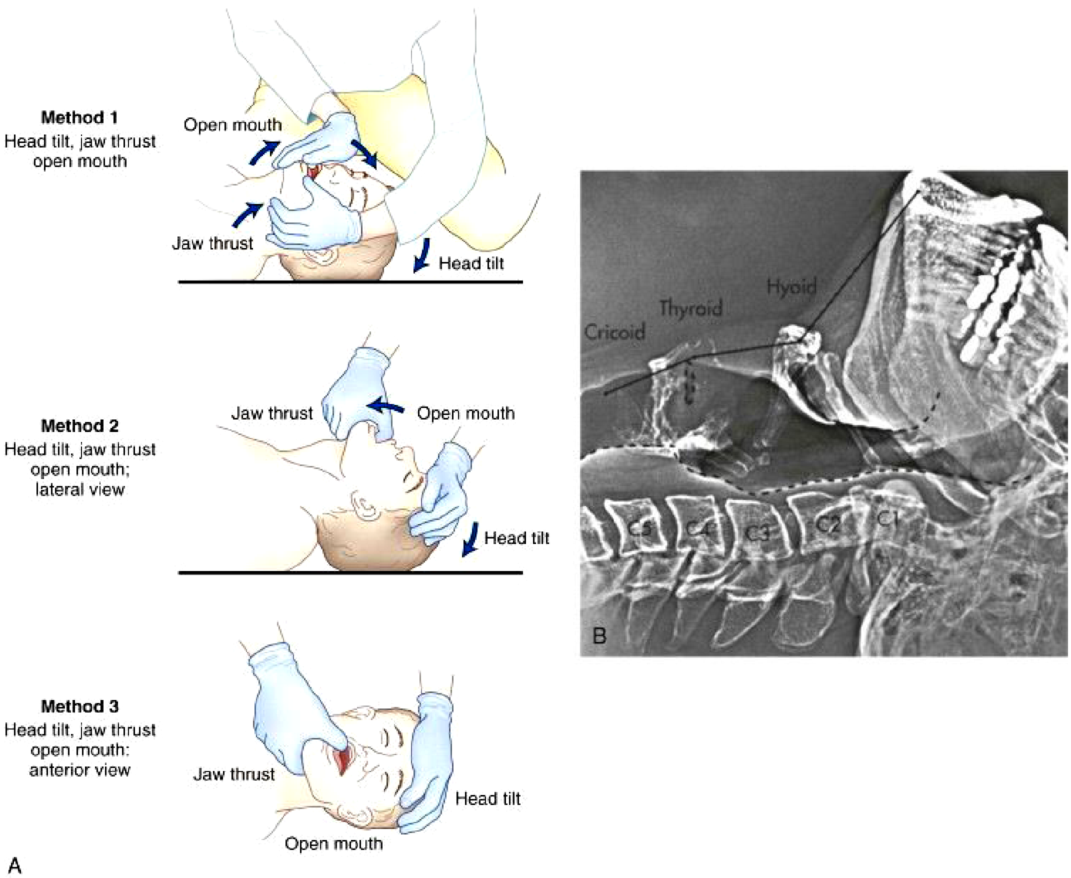


Fig.12. Jaw thrust. The fingers are lifting up from under the angle of the jaw

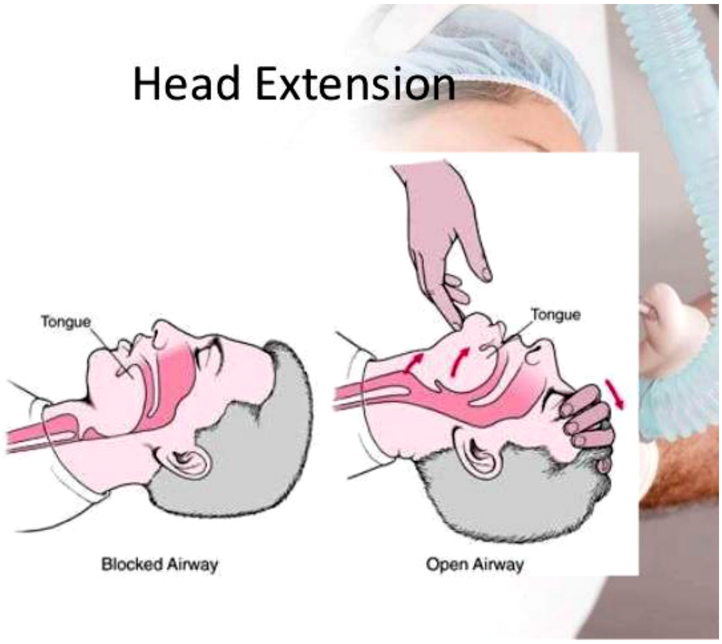


Fig. 13 Chin lift

Fig. 14 One-person BVM.

Note the thumb and index digits apply pressure to maintain a seal on patient's face, while the third, fourth and fifth fingers LIFT the jaw UP into the mask. This is a KEY skill to master.

Fig. 15 Two-person BVM.

The primary EM provider applies the mask and focuses on bringing the patient's jaw up into the mask. A second provider squeezes the bag. Two-person BVM is usually best.

"B" is for Breathing: Resuscitative Breathing Management

Definition: The resuscitation efforts of breathing focus on delivering oxygen to the lungs. Though breathing assessment and management should only proceed after any airway issues have been addressed, airway and breathing are often dealt with simultaneously. In many cases the patient will be suffering from a problem of BOTH airway and breathing. Emergency care providers must be efficient and effective in the almost simultaneous management of airway and breathing problems.

Initial approach to assessment and management

Is the patient breathing?

- Look for symmetrical chest rise and accessory muscle use
- Listen to the chest and determine if there is bilateral good air entry
- Determine the respiratory rate

Is the breathing effort adequate?

- Check for hypoxia and signs of respiratory distress
- Tachypnea (RR>25/min) or bradypnea (RR<12/min]
- Increased work of breathing - accessory muscle use (suprasternal, subcostal, intercostal in-drawing), nasal flaring, pursed lip breathing, asymmetrical percussion noted, decreased or abnormal breath sounds
- Altered mental status (agitation, confusion, coma]
    - Evidence of associated chest, neck, head or facial trauma
- Low oxygen saturation (<94%) on room air

Differential diagnosis

There are many causes of respiratory distress. Develop a clear approach to organize all of the information gathered from often limited history and physical exam. In acutely unwell patients with breathing problems, treatment must be started at the same time that a differential diagnosis is being generated. In the sick patient, consider:

- Pneumonia - bacterial, viral or fungal
- Pulmonary edema - heart failure, intoxication (e.g.: organophosphate poisoning), infection
- Tension pneumothorax
- Hemopneumothorax
- Pericardial tamponade
- Massive pleural effusion
    - Asthma or COPD exacerbation
- Pulmonary embolism

Management

Provide supplemental oxygen to all patients with breathing problems. In the hypoxic or tachypneic patient, provide as much oxygen as possible initially.

- Non-rebreather mask (face mask with a reservoir) at a flow rate of 10-15L/min
- Put patient in a semi- sitting position

If the patient is not breathing, or respiratory rate is less than 12, use a bag-valve mask (BVM) with to provide positive pressure ventilation.

- BVM usually requires two people to do effectively.
    - One person uses both hands to provide an excellent seal between the patients face and the mask while adequately opening the patient's airway with a jaw thrust and chin lift maneuver

"C" is for Circulation

Definition: Assessment of the cardiovascular system.

Initial approach to assessment and management

Feel for a carotid or femoral pulse for 10 seconds. Ask the following questions:

❖ Is the pulse absent?

- ➢ If absent
    - Start CPR and assess the rhythm with AED or defibrillator
- ➢ If rhythm on monitor is shockable (ventricular fibrillation, pulseless VT)
    - Defibrillate and continue CPR
- ➢ If rhythm on monitor is not shockable (PEA, asystole)
    - Continue excellent CPR and look for a reversible cause

- Hyperkalemia (is there a history of renal failure)?
  - Give Calcium gluconate IV
- Hypoxemia (is there adequate oxygenation?)
  - Ensure supplemental oxygen
- Hypovolemia (is there shock or bleeding?)
  - Place IV and give IV fluids
- Hypothermia (was the patient sleeping on the street in the rain?)
  - Check temperature, warm the patient
- Hydrogen ions (acidosis like DKA or septic shock?)
  - Consider sodium bicarbonate IV
- Tamponade (blood around the heart?)
- Thrombosis (pulmonary embolus or coronary)
- Toxins
- Tension pneumothorax (no lung sounds on one side?)
  - Place emergent chest tube

❖ If a pulse is present, ask:
- Is the pulse weak and very rapid or very slow?
- Are there signs and symptoms of profound hypotension (slow capillary refill, altered mental status, tachypnea)?
  - Place TWO large IV lines
  - Give a 2L bolus of fluid (NS or LR) quickly
    - Reassess pulse and blood pressure after fluid
    - Consider placement of foley catheter to monitor urine Output

"D" is for Disability

Definition: Rapid assessment of neurological system

Initial approach to assessment and management

- Assess the level of consciousness by calculating Glasgow Coma Score (GCS) OR the AVPU scale.
- Look for any focal neurological deficit including limb motor function, rectal tone, and pupil responses.
- Check bedside glycemia for any patient with an abnormal mental status: confusion, agitation, coma
  - Correct hypoglycaemia immediately and reassess GCS and mentation once glycemia is normal

"E" is for Exposure/Environment:

Definition: Identify any other immediate dangers by fully undressing the patient.

Initial approach to assessment and management

■ Are there other injuries? Are there environmental threats/exposures to the patient and staff (e.g. chemical exposure, hypothermia, etc)?

- How to assess exposure: If recent trauma, remove all of patient's clothing to examine head to toe.
- It is also important to remove all clothing in patients with fever and confusion. Look for rashes under clothing, bed sores, GU redness/swelling, or other missed areas of possible infection.

1.a Acute Respiratory Failure

Definition: Respiratory failure is an inadequate gas exchange (adequate 02 intake and/or C02 elimination). Can be caused by decreased alveolar ventilation or oxygenation or decreased tissue gas exchange.

Causes

- Central
  - Head injury, stroke, or toxins can damage central respiratory centers, leading to hypoventilation
- Upper airway
  - Obstruction of upper airways leads to inability to ventilate or oxygenate
    - Upper airway burns
    - Neck hematomas
    - Epiglottitis
    - Angioedema
    - Tongue will often obstruct airway in obtunded patients
- Lungs
  - Alveolar collapse/ obstruction with fluid
    - Pneumothorax
    - Pneumonia
    - Tuberculosis
    - Pulmonary edema (cardiogenic and non cardiogenic)
    - Hemothorax
    - Lung contusion
    - Aspiration (common in setting of low GCS)
  - Lower airway obstruction
    - Chronic obstructive pulmonary disease (COPD)
    - Asthma

- Neuromuscular
    - o Weakness of respiratory muscles leads to ineffective ventilation
        - ■ Gillian-Barre
        - ■ Myasthenia gravis
        - ■ Poliomyelitis
        - ■ Organophosphate poisoning
        - ■ Tetanus
- Thoracic wall abnormalities
    - o Flail chest
    - o Abdominal distension that prevents diaphragmatic excursion
    - o Ruptured diaphragm
    - o Circumferential burns
- Metabolic
    - ○ Sepsis leading to poor delivery of oxygen to tissues
    - ○ Anemia leading to poor oxygen delivery to tissues

<u>Signs and symptoms</u>

- History
    - o Regardless of cause, most acute respiratory failure will present with abnormal breathing (either too fast or too slow) and/ or signs of upper airway obstruction
    - o Ask about recent trauma, any possible ingestions o Ask about timing of onset (minutes, hours or over days) o Ask about co-morbidities such as heart failure, immunosuppression, COPD/ asthma, renal failure o Associated symptoms may include chest pain, fever, cough, hemoptysis, wheezing
- Exam
    - o Airway:
        - ■ Can the patient speak clearly?
            - If yes, then upper airway obstruction is not cause of respiratory failure
        - ■ Stridor, gurgling, hoarse voice indicate obstruction
        - ■ Coma with GCS < 8 generally means patient is not protecting the airway from obstruction by the tongue and/or from aspiration of secretions and gastric contents
        - ■ Facial or inhalational burns, angioedema or neck hematomas can all rapidly worsen leading to complete airway obstruction
    - o Breathing:
        - ■ Are the breath sounds present, normal and equal?
        - ■ Is the respiratory rate too fast or too slow?

        - Accessory muscle use?
        - Is the oxygen saturation normal?
    - Circulation
        - Signs of concomitant shock seen in many cases of respiratory failure such as pneumonia with sepsis, tension pneumothorax, or traumatic brain or lung injury with hemorrhagic shock
    - Disability
        - Patients with respiratory failure will develop a change in mental status
            - Agitation common in hypoxia
            - Obtundation/coma common in hypercapnea
    - Other findings- Is there:
        - Crepitus or deformity of chest wall or neck?
        - Obvious facial or neck trauma?
        - Pallor? (severe anemia can cause respiratory distress)
        - Muscle weakness?
        - Murmur?
        - Abdominal distension?
        - Edema or signs of fluid overload?
- Bedside Tests
    - Bedside ultrasound
        - Heart: Evaluate ejection fraction (EF), presence of mitral stenosis, evidence of RV strain?
        - Lungs: Pneumothorax, effusions, consolidations?
        - IVC: Fluid overloaded or depleted?
        - Abdomen: Free fluid?

<u>Differential diagnosis</u>

- Tachypnea can be a sign of a non-respiratory problem
    - Expect oxygen saturation to be normal, CO2 to be low
    - Most commonly seen in academic states in which the patient is trying to get CO2 out of the body (e.g. diabetic ketoacidosis, sepsis, aspirin/aspergillis poisoning)
    - Can also be caused by anxiety but is a diagnosis of exclusion

<u>Investigations</u>

- Labs: renal labs (urea, creatinine), FBC, AST, ALT, consider ABG
- Imaging:
    - Chest X-ray: look for cardiomegaly, interstitial edema, enlarged pulmonary artery, pleural effusions, pneumothorax
    - Chest CT scan: if indicated

Management: General goal is to start by stabilizing the ABCs. All patients in respiratory distress or failure need to be on a monitor, if available, or have vital signs taken every 15min until stable. They need supplemental oxygen (use high flow, non re-breather mask turned all the way up to deliver most oxygen possible) and two large IVs.

- Airway
  - Chin lift to pull tongue off of back of oropharynx
    - Use jaw thrust in patients with trauma and concern for cervical spine injury
  - Only place oral airways in patients *without* a gag reflex (GCS <8)-placing an oral airway in an awake patient will cause vomiting and aspiration
  - Heimlich maneuver if suspect foreign body aspiration
  - Bag mask ventilation
    - If patient has respiratory arrest or severe hypoventilation
- Breathing
  - Needle decompression followed by chest tube for tension pneumothorax
  - Chest tube for large effusion or hemothorax
  - Positive pressure ventilation
    - Useful for most causes of hypoxic respiratory failure
    - Exclude pneumothorax prior to initiating
    - Can be done non-invasively in spontaneously breathing patient who can protect his airway
      - Attach PEEP valve to bag valve mask
      - Attach patient to a ventilator on a non invasive setting
      - Intubation (to be performed only by trained, experienced providers)
  - Indications:
    - Improve oxygenation
    - Improve ventilation
    - Protect the airway
    - Anticipated course
  - **Should only be performed by experienced providers** as intubation done by untrained providers will cause harm and possibly death.
    - SAFE intubators MUST:
      - Understand the importance of preoxygnation and other techniques to avoid critical hypoxia during the procedure
      - Be able to anticipate a difficult airway and prepare accordingly
        - Beware especially of using paralytics if not an experienced intubator

- Ensure access to appropriate post intubation care to prevent traumatic extubation, ventilator associated pneumonia, etc.
- Anticipate need for ventilator in patients who are being intubated for respiratory failure.
    - T piece alone is only appropriate when the sole reason for intubation was for airway protection

Recommendations

- Respiratory failure is a common presentation in Rwanda and can be caused by many etiologies.
- Bedside ultrasound can be very helpful in distinguishing among the different causes
- Oxygen is an essential medication. Make sure that there is ALWAYS a full back up tank of oxygen if the oxygen system fails.
- Recognize the capabilities of your facility. If you are not able to ventilate or intubate and a patient is in severe respiratory distress, consider early transfer *before* respiratory failure occurs.
    - Even at the most basic facility, every patient can have stabilization with two IV lines, full monitoring of vital signs, and supplemental oxygen.

1.b Shock

Definition: Shock is a state in which there is inadequate blood flow to the tissues to meet the demands of the body; it is a state of generalized hypoperfusion. Although shock and hypotension often coexist, hypotension *need notbe* present, and a normal blood pressure does NOT exclude the diagnosis of shock.

Causes

1. Hypovolemic shock: due to a loss of intravascular volume
2. Cardiogenic shock: due to cardiac pump failure
3. Obstructive shock: due to obstruction to cardiac filling or emptying
4. Distributive shock: due to exaggerated peripheral vascular dilatation

Table 7.

Signs and symptoms of shock

Signs and symptoms	History	Signs	Bedside Tests
Hypovolemic shock	• Blood loss (trauma, ruptured ectopic, GI bleeding) • Third spacing (peritonitis, burns, bowel obstruction) • Renal losses (DKA)	Tachycardia, decreased JVD, cold extremities	• Hb level • Pregnancy test in all females • Abdominal US (collapsed IVC and/or free fluid)
Cardiogenic shock	• Difficulty breathing • Orthopnea • Chest pain • Chest trauma	Tachycardia, increased JVD, cold extremities, crackles in lungs, heart murmur	• Heart US (decreased contractility) • IVC US (increased or full) Chest XR (cardiomegaly)
Distributive shock	• Anaphylaxis (swollen lips, hives) • Sepsis	Tachycardia, decreased JVD, warm extremities, short capillary refill time	• IVC US (decreased or collapsing)
Obstructive shock	• Shortness of breath (ptx, PE) • Chest pain (tamponade)	Tension ptx: Unilateral decreased breath sounds, hypoxemia, decreased JVD, hypotension Cardiac tamponade: hypotension, tachycardia, muffled	• Lung US (look for ptx) • Heart US (fluid around the heart) • Chest XR (enlarged heart, ptx)

Investigations

Labs

- FBC, glycemia, renal function test, liver function tests, coagulation tests (PT, PTT) and lactate level if available

Imaging

- Chest X-Ray, Extended FAST exam

Management:

General goal is to stabilize patient first while simultaneously trying to determine type of shock. Recognition of an unstable patient is critical in emergency care. Transfer early any patient that doesn't respond to initial resuscitation efforts, especially if cause of shock is unclear.

Hypovolemic shock

- o Obtain full set of vital signs, place on monitor, if available, place TWO large IVs (18g or larger in an adult), give supplemental oxygen to maintain saturation >93%
- o Give IV fluids (NS or LR)
  - ■ Bolus 500-1000 ml and then evaluate
  - ■ Repeat if needed
- o If patient is losing blood (recent trauma, GI bleeding), transfuse early
  - ■ If patient remains with low blood pressure or tachycardia despite 2L fluid bolus
  - ■ If patient is actively bleeding with hypotension or tachycardia or cold extremities
  - ■ If Hb<7 and actively bleeding
- o Bedside abdominal US (FAST exam) is a very good tool to assess the patient with abdominal trauma o EVERY woman of a child bearing age requires a pregnancy test

Cardiogenic shock

- o Obtain full set of vital signs, place on monitor, if available, place TWO large IVs (18g or larger in an adult), give supplemental oxygen to maintain saturation >93%
- o Give fluid in small boluses (100 ml of crystalloids)
  - ■ Check urine output, feel if extremities are still cold, check IVC to see if it is full (volume overloaded) or collapsing (dehydrated), and check creatinine
    - •If there is NO increase in the blood pressure, or patient isn't making urine, or extremities remain cold, or patient is in renal failure, STOP all fluids and start a dopamine infusion
      - ■ Dopamine drip/infusion- usual dose range - 5-20 mcg/kg/min
      - ■ Mix 200mg in 500mL of NS (concentration 400mcg/ml)
      - ■ Vasopressor infusions should be started at the lowest possible dose and moved up every 10-20min to reach a blood pressure goal of MAP>65 orSBP>100.

        Once goal is reached, the infusions should be lowered slowly as blood pressure tolerates (do not turn off completely at once).
- o If the cause of shock is valvular heart disease, the prognosis is very poor in the absence of valve replacement or repair; involve cardiologist, if available.

Distributive shock

- o Obtain full set of vital signs, place on monitor, if available, place TWO large IVs, give supplemental oxygen to maintain saturation >93%
- o If the cause is **sepsis,** give broad-spectrum antibiotics as soon as possible, ideally in the first hour. If you think malaria is a possible cause, start treatment
  - ■ Give 3-4L of IV fluids bolus
  - ■ Place Foley catheter to watch urine output
- o Check for a source of infection and see if there is a need of a surgical procedure to control it: abscess, empyema, peritonitis, etc.
- o If the source is **anaphylaxis,** and you hear wheezing or stridor (loud sounds with breathing), or the patient has swelling of the tongue or back of throat or patient is hypotensive, give Adrenaline
  - ■ Adrenaline 0.5mg IM (to be repeated every 1-2hr as needed for recurrence of above symptoms)
    - • Give fluid boluses for hypotension or tachycardia
    - • Hives, rashes, or itching alone is NOT an indication for adrenaline
    - • Patient should be on a heart monitor, if available

Obstructive shock (address the cause)

- o Obtain full set of vital signs, place on monitor, if available, place TWO large IVs, give supplemental oxygen to maintain saturation >93%
- o **Tension pneumothorax:** immediate needle decompression followed by chest tube
- o **Massive pulmonary embolism:** IV heparin, if available OR Lovenox (enoxaparin) injection
- o **Pericardial tamponade:** pericardiocentesis

<u>Recommendations</u>

- • One of the most difficult tasks to determine what type of shock a patient is in. However, regardless the cause of shock, every patient will display signs of end organ hypoperfusion: confusion, decreased urinary output (<0.5 ml/kg/h), a capillary refill time that will be prolonged (>3 seconds)
- • Every patient with signs of shock needs TWO large IVs (18g or larger in an adult), a Foley catheter, regular vital sign checks (or on a monitor), and close nursing care
- • How do you know when to stop giving fluids to a patient in shock? Your therapeutic end-points are the following:
  - o MAP > 65 mmHg

- o Urinary output > 0.5ml/kg/h
  - o Resolution of tachycardia
- When to transfer to referral center:
  - o When a patient in hemorrhagic shock needs an acute intervention (laparotomy) that cannot be safely performed in the district
  - o When a patient has a correctable, reversible cause such as tension pneumothorax (after needle decompression!), pericardial tamponade, peritonitis, ectopic pregnancy.
  - o Patient continues to be in shock (hypotension, tachycardia, end renal failure, confusion) despite appropriate initial steps to reverse shock.

1.c Volume Resuscitation in Children

Definition: Children in hypovolemic shock are in urgent need of fluid replacement. To prevent further morbidity, it is important to not under or over volume resuscitate the pediatric patient. The key to providing appropriate hydration is early recognition of volume depletion, correcting the underlying cause, and providing IV rehydration in a stepwise and controlled manner.

Causes of Low Volume

- Blood loss
- Sepsis
- Fluid losses from burns, vomiting, or diarrhea
- Inadequate intake, malnutrition
- Cardiogenic

Signs/Symptoms

- Obtain vital signs, including heart rate, oxygen saturation, blood pressure and body weight in kilograms
- Ask the following questions during your exam of the child:
  - o Is the child tachycardie?
  - o Is the blood pressure low?
  - o Is the capillary refill time more than 2 seconds?
  - o Are the peripheries cool and mottled?
  - o Is there evidence of end-organ poor perfusion
  - o Confusion, decreased urine output
- Use the pediatric assessment triangle (figure) to evaluate the child
- Signs and symptoms of hypovolemic shock on the pediatric assessment triangle are:
  - o Appearance: weak, pale, lethargic
  - o Work of breathing: tachypnea without increased work of breathing

- o Circulation: pale, mottled, decreased capillary refill, weak or absent peripheral pulses, tachycardia, cool extremities, sunken eyes, dry mucous membranes, hypotension (a late finding)

Investigations

Labs

- o Check for the glycemia upon arrival for any child that is ill-appearing o FBC, renal function, lactic acid (if available) o Blood cultures, malaria smear, urinalysis

Imaging

- o Chest XR if sepsis is in differential

Management

General

- Establish IV or 10 access
  - o Before and after every fluid bolus check the inferior border of the liver, breath sounds, jugular veins to ensure no evidence of fluid overload

Children that are only mildly dehydrated can be treated with oral and/or enteral hydration strategies

Initial Phase (the first 30 minutes)

- Frequent reassessment of cardio-respiratory status and patient response to fluid boluses is essential
  - o Give 10-20ml/kg NS or RL IV, reassess and repeat boluses of 10-20ml/kg until perfusion has improved
  - o If blood loss is suspected as the primary cause, start blood transfusion as soon as possible
  - o If fluid loss is from a burn injury, start the Parkland formula
  - o If there is evidence or great clinical concern for heart failure, start with fluid boluses of 5-10ml/kg and reassess patient's cardio-respiratory status more frequently

Rehydration Phase (the next 4 to 24 hours)

- If there are no contraindications, most children > 3months of age should be rehydrated over the next four hours
  - o Use ORS (oral rehydrating solution) by NG tube

OR

- IV D5% + 1/2NS with 20mEq KC1 at 10-20ml/kg/hr
  - o How to make D5%+1/2NS with KC1
    - ■ Take out 250cc from 500cc NS bottle. Discard fluid
    - ■ Add 250cc D5% solution to the NS bottle to create a 500cc bottle of 50/50 mix

- Add 20 mEq of potassium (check how much potassium is in local ampule as it varies by manufacturer) to the 500cc bottle of mixed solution
- Drip combination formula into IV over four hours

- Children with contraindications should be rehydrated over 24 hrs
- Contraindications to 4 hour rehydration strategies include:
  - Infants <3 months of age
  - Severe acute malnutrition
  - Significant cardio-respiratory co-morbidity
  - Neurological co-morbidity
  - Hypernatremia or hyponatremia

Maintenance Phase (as required until able to eat and drink normally)

- "4,2,1 Rule"
  - Give 4mls/kg/hr for first 10kg of body weight, 2mls/kg/hr for next 10 kg of body weight and lml/kg/hr for any additional kgs
  - Example: Fluids for a 40kg child would be
    - 4mLs x 10kg + 2mL x 10kg + lmL x 20kg = 40+20+20 = 80mLs/hr

Fluid Choice

- Infants and children: D5%+1/2NS
- Adolescents D5%+NS Potassium

Supplementation

- If child is producing urine and there is no laboratory evidence of hyperkalemia, 20mEq KCL may be added to maintenance IV fluids (Tintinalli et al, 2012 ; Wallis et al , 2013).

2. <u>Trauma</u>

<u>2.a. General Approach to the Trauma Patient:</u>

<u>Definition:</u> A systematic approach is the key to the management of the trauma patient. Objectives of the initial evaluation are to identify and manage injuries that can threaten the patient's life.

<u>Causes</u>

- Mechanisms considered to be high risk of critical injury:
  - High speed road traffic accidents (RTA)
  - Pedestrian struck by vehicle
  - Fall from greater than 3 meters
  - Explosions
  - Penetrating injuries

- Limb amputations
- Crush injuries
- Burns
- Ejection from vehicle

Signs and symptoms

- History
  - Ask about timing of injury, mechanism of injury and any symptoms related to injury
    - Head injury: Headaches, loss of consciousness and neck pain, vomiting
    - Chest injury: shortness of breath, chest pain
    - Abdominal injury: abdominal pain
- Exam
  - Examine every trauma patient in the same manner: primary survey, bedside ultrasound, secondary survey (see Management below for details)

Differential diagnosis

- Intracranial: hemorrhage, diffuse axonal injury, contusions
- Thoracic: pneumothorax, hemothorax, sucking chest wound, tamponade, flail chest
- Intra-abdominal injuries or pelvic fractures
- Orthopedic injuries
- Spinal injuries

Investigations

Labs
  - FBC, type and cross for blood if hypotensive or tachycardic

Bedside testing
  - Extended Focused Assessment with Sonography in Trauma (e-FAST)
  - Glycaemia if altered mental status

Imaging
  - Trauma series: C-spine, CXR, pelvis X-ray are standard x-rays ordered in all major trauma patients
  - Additional X-rays and CT as indicated

Initial approach to assessment and management of the trauma patient

- Place two large bore IV lines, ensure oxygen supply, obtain vital signs, place on cardiac monitor, if available.
- Primary Survey (ABCDE evaluation)
  - Airway: Ensure that the airway is patent

    - Signs of airway obstruction include: change in voice, use of accessory muscles, cyanosis, hypoxia, visible vomit or blood in the mouth, stridor, visible foreign body
    - Intervention: Clear and appropriately position the airway, suction, possible endotracheal intubation
    - Stabilize cervical spine
        - Place hard collar or blanket rolls secured with tape to stabilize C-spine.
        - Maintain in-line immobilization when managing airway.
- Breathing: ensure adequate airway movement to lungs
    - Signs of ventilation compromise: asymmetric rise and fall of chest wall, hypoxia, sucking chest wounds, deviation of the trachea
    - Intervention: Administer high flow 02 to keep saturation >93%, needle decompression in tension pneumothorax, or immediate chest tube placement
- Circulation: ensure adequate perfusion, identify and treat shock
    - Signs of circulation compromise: tachycardia (first sign), hypotension (late finding)
    - Intervention: Place TWO large bore IV lines, give 2L NS or RL bolus, control external hemorrhage (compressive wrap)
        - If patient remains tachycardic or hypotensive after a 2L bolus of fluids, order blood for transfusion
- Disability: assess neurologic status

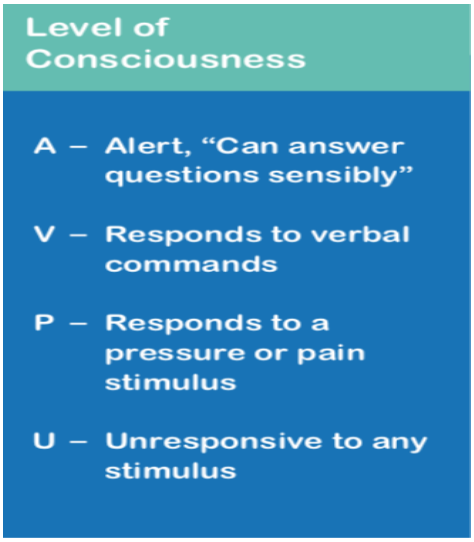


Fig. 16 Level of consciousness

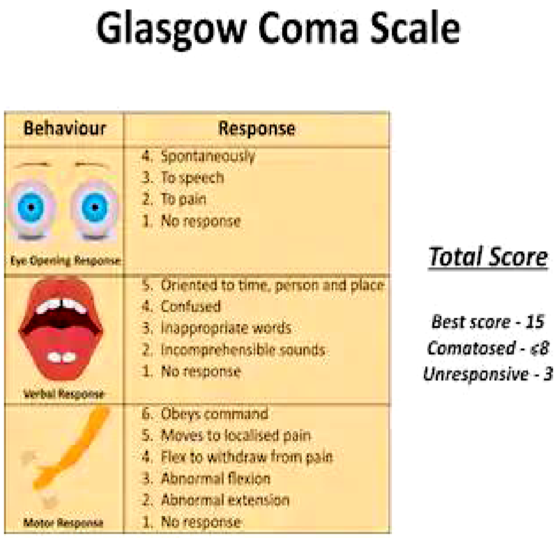


Fig. 17 Glasgow Coma Scale

- Consider neurogenic shock if there is persistent hypotension after adequate resuscitation in patient with severe spinal injury
- Exposure: expose the whole body (remove all clothing), note obvious deformities/hemorrhage, avoid hypothermia by putting sheet/blanket over patient

- eFAST exam (bedside Ultrasound
  - A positive FAST is indication for immediate intervention and possible surgery; these patients will likely need to be transferred to a referral hospital
- Secondary Survey
  - Head to toe examination and set priorities for care
    - Examination includes head, neck, chest, abdomen, pelvis stability and limbs
  - If patient is awake, can possibly clear c-spine and remove collar at this point
    - Nexus Criteria- Cervical collar can removed from patient if:
      - No focal neurological deficit present (moving all limbs equally, no sensory deficits or paresthesia)
      - No midline spinal tenderness (palpate cervical spine under collar)
      - No altered mentation (GCS=15)
  - No intoxication
      - No distracting injury (at discretion of doctor, but typically a limb amputation would be an example of a distracting injury)
    - If patient does NOT meet above criteria, keep c-collar in place and consider cervical spine imaging (X ray or CT scan)
  - Using log roll technique, roll the patient to check his back for injuries and palpate the spine for pain or deformities
  - Take the patient's history

    A: Allergies

    M: Medications

    P: Past Medical History

    L: Last meal

    E: Event
- Repeat the primary survey if the patient's condition worsens
- Repeat vital signs frequently preferably continuous monitoring

Recommendations

- Treat every major trauma patient with the same steps: begin assessment with ABCDE and resuscitation
  - o During each step of the ABCDEs, perform the intervention that is indicated before continuing
- Indications for referral include: positive FAST, hemodynamically unstable (tachycardia or hypotensive despite fluid bolus), penetrating trauma, open fracture, GCS<13 and need for CT scan, obvious polytrauma or at the discretion of the practitioner.

2.b Head Trauma

Definition: Head injury is defined as physical trauma to the head. It can be classified into two categories: open and closed head injury. Open head trauma includes scalp laceration with an underlying skull fracture. Closed head trauma is defined as head injury with no communication with the outside environment.

Causes

- Road traffic accidents
- Assault
- Fall from heights
- Sports injuries
- Child Abuse

Signs and symptoms

- History: Ask patient or family members about loss of consciousness, vomiting, recent alcohol use, any seizure activity, and severity of any headache or neck pain.
- Exam: Patients need a full neurological exam including GCS, sensation and movement in all limbs, test gait (be sure the patient is able to walk normally on his own).
  - o Cushing's Triad (sign of increased intracranial pressure) includes hypertension, bradycardia, irregular breathing o Signs of herniation: Unequal sizes or sluggish reactivity of pupils or fixed dilated pupils o Signs of basilar skull fracture: bruising around the eyes or behind the ears, bleeding behind the tympanic membrane, clear fluid draining from the nose or ears

Differential diagnosis

- Skull fracture
- Diffuse Axonal Injury

- Intracerebral hemorrhage/contusion
- Traumatic subarachnoid hemorrhage (SAH)
- Subdural hematoma (tear of bridging veins)
- Epidural hematoma (tear of meningeal artery)
- Scalp laceration

Investigations

Labs

- Glycemia, FBC type and cross for blood

Imaging

Indications for CT scan without contrast:

- o If GCS 14-15 (mild head injury): patient needs brain CT *only* if
  - ■ GCS remains < 15 for more than 2hr after injury
  - ■ GCS is falling since injury
  - ■ Patient has focal neurological deficit
  - ■ Patient has seizure
  - ■ Patient has vomited more than 1 time since injury
  - ■ Signs of depressed or basilar skull fracture (blood from the ear, bruising around both eyes)
  - ■ Patient is intoxicated and not able to give reliable exam
- o GCS 3-13 (moderate to severe head injury): Transfer patient for immediate brain CT after stabilizing other injuries. Place c-collar.
- o Skull XRs are not useful in head injury patients.

Management: General goal for head injured patients is to stabilize and do full trauma evaluation before deciding if patient needs to be transferred to referral hospital for brain CT.

- Place TWO large IVs, supplemental oxygen supply, full vital signs
- ABCDE (see General Approach to Trauma)
- Avoid secondary injury to brain by preventing hypotension (SBP <90 mmHg), hypoxia (spO2<92%), and by preventing elevation of intracranial pressure (ICP)
  - o Elevate head of the bed to 30 degrees
  - o Sedation and analgesia can reduce ICP (but avoid hypotension)
    - ■ Paracetamol as needed for mild pain
    - ■ IV analgesics are options but do not administer in patients with hypotension
  - o Avoid hypo/hyperglycaemia
  - o Do **not** give steroids

        - Mannitol may offer temporary reduction in ICP; give only if neurosurgery is pending and the patient is not hypotensive
            - Mannitol 0.5 -Img/kg IV
- Skull Fracture
    - Non-depressed, linear fracture with scalp intact does **not** need treatment
    - Depressed skull fractures should be transferred for neurosurgery consultation
- Intracranial Hemorrhage/Contusions
    - Consult neurosurgery
    - Most patients are non-surgical and are observed
- Scalp Laceration
    - Can bleed excessively
    - Irrigate with at least 1L NS or sterile water, debride any contamination or foreign bodies and suture. Apply compression dressing to reduce bleeding

Recommendations

- Patients with GCS of 14-15 after head trauma without any other injuries can be observed for 12-24hr for any decrease in GCS. If they have normal mentation they can be discharged home *without* a head CT.
- Definitive indications for brain CT include GCS 3-13

2.c Chest Trauma

Definition: Any blunt trauma to the chest (See Penetrating Trauma Chapter for details on penetrating chest trauma).

Causes

- Acceleration-deceleration injuries
- Fall from height
- Road traffic accident
- Seatbelt injury
- Assault to chest

Signs and symptoms

- History
    - Difficulty breathing
    - Chest pain
- Exam
    - Assymetric or unsynchronized chest rise
    - Hypoxia
    - Tachypnea or respiratory distress

  - Breath sounds: unilateral decreased breath sounds may indicate pneumo-thorax or hemothorax
  - Subcutaneous emphysema may indicate pneumothorax
  - Tracheal deviation may indicate tension pneumothorax
  - Cardiac exam: distant or muffled heart sounds, jugular venous distention or Hypotension may indicate cardiac injury or tension pneumothorax o Localized chest wall tenderness may indicate rib fracture
- Bedside ultrasound
  - eFAST can diagnose
    - Pneumothorax/hemothorax
    - Pericardial effusion
    - Major intra-abdominal injury

Differential diagnosis

- Rib fractures
- Flail chest
- Pneumothorax/hemothorax
- Lung contusion
- Blunt cardiac injury
- Diaphragmatic rupture
- Intra-abdominal injury (splenic injury, hepatic injury)

Investigations

- Labs: FBC, type and cross for blood if hypotensive or significant tachycardia
- Imaging
  - Chest X-ray- upright

Management: General goal is to treat all trauma patients with a thorough primary and second survey, and stabilize with TWO large IVs, supplemental oxygen as needed, fluids, and frequent reassessment of vital signs while waiting for diagnostic imaging.

- Rib fractures
  - Oxygen if hypoxic
  - Analgesia
  - Admit for observation
  - Repeat CXR after 24h
  - Rule out associated pneumothorax, hemothorax or lung contusion
    - Pulmonary physiotherapy to prevent pneumonia: give patient a latex glove to blow up several times a day
  - Isolated rib fractures in patients with normal saturation are not life threatening.

        - Ibuprofen 800mg PO every 8hr as needed for pain (sometimes require stronger medication like Tramadol for pain control)
        - Discharge home. Patient should expect pain to resolve in about 4-6 weeks
- Flail chest
    - Fractures of >2 adjacent ribs
        - Paradoxical movement seen on exam
    - Admit for observation, supplemental oxygen
    - Transfer if patient has hypoxemia despite supplemental oxygen or if respiratory rate remains above 25 despite oxygen and opiate pain control
        - Intubation and mechanical ventilation may be indicated in severe cases
- Pneumothorax (see Pneumothorax Chapter for details)
- Hemothorax,
    - Upright CXR
    - Treat with tube thoracostomy (drain). See Pneumothorax Chapter for instructions on chest tube placement. o Massive hemothorax defined as drainage of more than 1.5 L of blood initially, or 200 mL/hr for 2 hours
        - Consider transfusion of blood (and platelets and FFP where available)
        - Transfer to referral center immediately
- Lung contusion
    - Observe for hypoxia, dyspnea
    - May have delayed presentation, initial x-ray may be normal
    - Treat with bronchodilator, chest physiotherapy
    - Transfer if patient has worsening hypoxemia despite supplemental oxygen, respiratory rate above 25 despite oxygen, or hypotension
        - Intubation and mechanical ventilation in severe cases
- Blunt cardiac injury
    - Stunned myocardium with transient hypokinesis
    - Contusion with infarction
    - Cardiac valve rupture, papillary muscle or chordae rupture, septal rupture
    - Cardiac wall rupture o Pericardial effusion o Treatment in emergency department is supportive with aggressive resuscitation; invasive management should be pursued only in operating theater
- Diaphragmatic rupture
    - May present similar to pneumothorax
    - Left sided diaphragm rupture is more common than right sided
    - Bowel may herniate through defect in diaphragm

- o Rare to diagnose with chest XR; often diagnosed on CT scan only. Often missed injury.
- o Requires operative management

Recommendations

- Bedside eFAST ultrasound is a helpful diagnostic tool during trauma assessment.
- Transfer to referral center
  - o All polytrauma patients with hypotension or severe tachycardia despite IV fluids
  - o Any polytrauma patient requiring blood transfusion o Blunt chest trauma patients with hypoxemia despite supplemental oxygen and treatment (chest tube, etc) o Blunt chest trauma patients with respiratory rate >25 despite supplemental oxygen and treatment o Place chest tube for hemothorax, pneumothorax prior to transfer if facilities allow (Tintinalli et al, 2012 ; Wallis et al , 2013).

3. Respiratory

3.a General Approach to the Dyspneic Patient

Definition**:** Shortness of breath or difficulty in breathing is a very common reason people go to the hospital, and it has a very large differential diagnosis. Respiratory failure (patient is not able to maintain adequate oxygenation or ventilation) is also a very common cause of death in Rwanda. It is a physician's job to first stabilize the patient in respiratory distress (the work of breathing is increased) and then to find the cause so that appropriate treatment can be started.

Causes

- Inability to oxygenate (cannot get oxygen into lungs)
- Inability to ventilate (no CO2 exchange; cannot push air out of lungs)
- Decreased mentation (inability to keep airway open to exchange air)

Signs and symptoms

- The first five minutes that a patient presents in respiratory distress is the most important. Always start with ABCS:
  - o A: can the patient speak? If yes, the airway is good. Is there significant oral airway edema or trauma? Has the patient recently vomited? If yes, there is an increased aspiration risk
    - ■ If airway is NOT intact, STOP. Position patient with the jaw thrust and chin lift maneuvers. Look for foreign body. Suction if needed. Start

oxygen with non-rebreather mask (bag reservoir) and consider intubation if possible.

  - B: Check saturation- Is there hypoxemia? Are breath sounds equal bilaterally? Is the patient posturing (sitting upright, uncomfortable, with increased work of breathing)? Is the trachea midline? A shifted trachea is a sign of tension pneumothorax.
    - If breathing is NOT intact, STOP. Position patient with the jaw thrust and chin lift maneuvers., start oxygen with nonrebreather mask (bag reservoir). Do needle decompression if possible pneumothorax or tension pneumothorax. Place oral airway *only* if patient is in coma. Start Salbutamol if wheezing.
  - C: Is the patient in shock? If extremities are cold, then yes. Check BP for hypotension; Are pulses weak and rapid? Are they tachycardic? Pale?
    - If circulation is NOT good, STOP. Get two large IVs and start 2L bolus NS or LR before continuing.
  - D: Do GCS score.
    - If patient has low GCS, check glycemia immediately. Give dextrose if low.
- Do not continue with history and exam until ABCs are stabilized.
- A focused respiratory exam includes looking at saturation on room air, checking for distended neck veins, listening to breath sounds and also heart sounds (cardiac issues can cause respiratory distress). Look for edema and note if it is unilateral (sign of DVT). Ask about recent trauma.
- A focused bedside ultrasound exam should be a part of your initial triage, if machine is available.
  - Look at lung sliding to exclude pneumothorax
    - Linear probe, mid-clavicular line, 2nd rib space
  - Look for pleural effusion or hemothorax o Look for pericardial effusion o Look for B-lines (sign of pulmonary edema)
  - Do a full FAST exam to look for free fluid in abdomen (ascites if liver or kidney failure; blood in recent trauma)

<u>Differential diagnosis</u>

- Pulmonary edema
  - Congestive heart failure chapter o End stage renal disease (see renal failure chapter)
  - End stage liver disease (see liver disorders chapter) o ARDS (non-cardiogenic shock - usually from sepsis)
- Wheezing
  - Asthma (see asthma/COPD chapter)

- COPD (see asthma/COPD chapter
  - Allergic reaction
- Hemoptysis
  - TB
  - Bronchitis
  - Pneumonia (see pneumonia chapter)
  - Pulmonary embolism (see pulmonary embolus chapter)
  - Malignancy
- Rapid breathing with a *normal* pulmonary exam
  - Pulmonary embolism
  - High amount of acid in body (sepsis, diabetic ketoacidosis (DKA), aspirin toxicity)
  - Anxiety
- Fever
  - Pneumonia
  - Bronchitis
  - Epiglottitis
  - TB
  - Malignancy
  - HIV
- Chest pain with shortness of breath
  - Pulmonary embolism
  - Pleural effusion (see pleural effusion chapter) or hemothorax
  - Myocardial infarction (see acute coronary syndrome chapter)
  - Spontaneous pneumothorax
  - Aortic dissection
- Recent vomiting
  - Aspiration
  - Esophageal rupture
- Stridor (inspiratory noise with breathing that you hear from the neck areado not need a stethoscope to hear it)
  - Epiglottitis
  - Upper airway obstruction (cancer, foreign body, mass)
  - Retropharyngeal abscess (see pharyngitis and complications chapter)
- Associated rash, itching, tongue swelling, fainting
  - Angioedema o Anaphylaxis

Investigations

- Labs: FBC, electrolytes, renal panel, liver tests, HIV, malaria, urine pregnancy
- Other tests that are important for diagnosis but limited availability
  - D-dimer (in case of possible PE)
  - ABG (to differentiate an oxygenation or a ventilation problem)
  - EKG (to look for ischemia)
  - Troponins (in case of possible myocardial infarction)
- Imaging: All patients with shortness of breath should have at least a chest XR, even if the suspicion is high for emotional upset or anxiety
  - Bedside ultrasound should be performed on all patients with dyspnea if machine is available

Recommendations

- Stabilization of ABCs is absolutely critical to preventing death in your patient. Consider early intubation if the equipment is available in your hospital and the physician is trained on the procedure. More importantly however, is stabilizing the patient until they reach a referral center.

3.b Pneumonia

Definition: Infection in the lung space that can be caused by a virus, bacteria, and less often a fungus. Pneumonia and other lung infections remain a leading cause of death in Rwanda. It is important to diagnose early, start the appropriate treatment early, and initiate NIPPV (non-invasive positive pressure ventilation) where available if there is respiratory distress or failure.

Causes

- Simple community-acquired pneumonia
  - S. pneumoniae, Mycoplasma, viruses
- Community-acquired pneumonia in patients with co-morbidities (diabetes, old age, renal disease, alcohol, malignancy)
  - Also consider Haemophilus influenza, gram-negative bacteria, S. aureus (in addition to above common pathogens)
- Aspiration pneumonia
  - Klebsiella, anaerobes
- HIV patients
  - PCP, pulmonary Kaposi's sarcoma, TB, in addition to above pathogens
- Tuberculosis

Signs and symptoms

- Start with ABCs- signs of severe respiratory distress include increased work of breathing, hypoxemia, accessory muscle use, cyanosis. Immediately start oxygen mask, place two large IVs, and isolate any patient at high risk for TB

- Ask about new cough, possible hemoptysis, fever or chills, sweats, or myalgias. Consider length of time cough is present and any weight loss or night sweats (concern for TB, cancer, or HIV)
- Consider co-morbidities like asthma, tobacco use, daily alcohol use (possible aspiration), previous TB
- While dullness to percussion and crackles may be present in pneumonia, sometimes the lung exam can be normal.

Differential diagnosis

- Asthma, COPD
- Congestive heart failure
- Pulmonary edema
- Pneumothorax
- Pulmonary embolism
- Influenza
- Malignancy
- Myocardial infarction
- Severe anemia
- Transfusion related acute lung injury (TRALI)

Investigations

- Labs: FBC, HIV test if unknown
  - o If patient in respiratory distress or shock, also order electrolytes, renal function, blood cultures
  - o If TB risk, order sputum
- Imaging: Chest XR, PA and lateral

Management: The goal is to recognize early any respiratory distress and treat aggressively with oxygen, early antibiotics and IV fluid support for dehydration or shock. Consider a Foley catheter in any patient who is ill appearing and be sure urine output is at least O.5-lcc/kg/hr. If respiratory status does not get better with oxygen, initiate (or if not available transfer early) for NIPPV (non-invasive positive pressure ventilation) or intubation.

3.c. Pneumothorax

Definition: A collection of air between the two layers of pleura.

Causes and types

- Spontaneous**:** in individuals with no clear precipitating event.
  - o Primary spontaneous: without known lung disease; smoking is a risk factor
  - o Secondary spontaneous: with underlying lung disease (TB, asthma)

- Posttraumatic: after blunt or penetrating chest trauma
- Iatrogenic**:** as a result of medical procedure (e.g. pleural tap/thoracocentesis or central line placement)
- Tension pneumothorax: air enters the pleural cavity during inspiration and does not escape during expiration, resulting in progressive hyperinflation of the affected lung. Results in mediastinal displacement and kinking of the great vessels, which compromises preload and cardiac output and can cause cardiac collapse/death
- Open pneumothorax (sucking chest wound): due to a direct communication between the pleural space and surrounding atmospheric pressure

<u>Signs and symptoms</u>

- Clinical status and stability of patient is related to size of pneumothorax.
- Patients often note sudden onset chest pain on the side of the pneumothorax. They can have shortness of breath, but low saturation is not always present.
- Exam findings include absent/reduced breath sounds on affected side, asymmetrical hyper-resonance on percussion, subcutaneous emphysema (not always present)
- Look for associated hypotension, signs of poor perfusion (cold extremities), tachycardia, dilated neck veins (concerning for tension pneumothorax)
    - Criteria for stable patient with pneumothorax:
        - RR< 24 breaths/min
        - No dyspnea at rest, speaks in full sentences
        - HR> 60 and < 120/min
        - Normal blood pressure for patient
        - 02 saturation >90% on room air
        - Absence of hemothorax
        - Bedside Tests:
    - Lung US: absent lung sliding, no visible comet tails. In M mode, presence of a bar code sign. May also see associated hemothorax. US shown to be more sensitive than supine CXR for detection of pneumothorax after trauma.

<u>Differential diagnosis</u>

- Hemothorax
- Pulmonary embolism
- Pneumonia
- Musculoskeletal chest pain
- Pericardial or pleural effusion
- Heart failure
- Acute coronary syndrome

Investigations

- Imaging
  - o Chest XR: MUST BE UPRIGHT IF POSSIBLE! More sensitive than supine since air rises. Air between the visceral pleural line and chest wall seen as area of black without vascular or lung markings. Visceral pleural line seen as convex line under radiolucent area. Air fluid level sometimes seen and indicates hydropneumothorax.
    - ■ Supine chest X-Ray: Not very sensitive (28-75%). May see "deep sulcus sign" (deep lateral costophrenic angle)
  - o Chest CT without contrast: Not usually necessary. In COPD, can differentiate bullae from PTX

Management: The patient's clinical status, rather than the pneumothorax size, determines treatment options.

- Stable pneumothorax
  - o Give supplemental oxygen- even if saturation is normal, oxygen will help pneumothorax to resorb, healing faster o If pneumothorax is small (pleural line < 2 cm from chest wall), observe for 6 hours on oxygen and repeat imaging. If patient's condition does not worsen and the pneumothorax is not larger, patient can be discharged o If the pneumothorax is large and simple, can attempt needle aspiration
    - ■ Place the patient in semi upright position
    - ■ Sterile prep and drape. Wear sterile gloves.
    - ■ Use ultrasound to identify area of pneumothorax and depth of pleura from the chest wall.
    - ■ Anesthetize the area above the rib with 2mL Lidocaine
    - ■ Attach a 16 or 18 gauge IV needle to a 5ml or lOmL syringe with 2mL of NS inside.
    - ■ Insert the needle into the area of pneumothorax, entering the skin perpendicular to the body. If you do not have US, place in the 2nd intercostal space in the midclavicular line. Aspirate as you advance slowly until you get bubbles in your NS, indicating you have entered the pleural space.
    - ■ Remove the needle as the patient coughs to avoid air from entering into the needle
    - ■ Attach a 3 way stopcock to prevent air from entering the pleural space when you remove the syringe

        - Attach a 20-50 mL syringe to aspirate. Aspirate until can no longer pull back air. If more than 2.5L are aspirated, stop the procedure and place a thoracostomy tube, as there is probably an air leak
        - Get a post procedure chest x-ray
        - Observe for 6 hours
        - If worsening clinically or there is failure to aspirate adequately, place a thoracostomy tube
    - If the pneumothorax is large and NOT simple (i.e. traumatic or in the setting of underlying lung disease), place a thoracostomy tube. If the patient will be intubated and/ or given positive pressure ventilation, a chest tube should be placed as a small pneumothorax may be made larger
- If patient does not meet the criteria for stability:
    - Give supplemental oxygen
    - Perform immediate need decompression:
        - Insert 14 -18 gauge needle into the 2nd or 3rd intercostal space, just above the inferior rib, at the mid clavicular line
    - Place a chest tube as above
- If open pneumothorax:
    - As a temporary measure, the skin wound should be occluded on three sides with a dressing of gauze or plastic sheet:
        - Leave one side of the dressing open to act as a flutter valve (i.e. allow air to exit but not to enter).
        - If the dressing is completely occlusive or if you suture the wound an open PTX may be converted to a tension PTX.
        - Open will require a chest tube (see above). Do NOT place the chest tube through the existing skin wound, which should be presumed to be dirty

Recommendations:

- All patients should receive oxygen, regardless of level of hypoxia. Oxygen will actually help the pneumothorax resolve more quickly
- If clinical signs and symptoms of a tension pneumothorax, don't hesitate to perform needle decompression followed by tube thoracostomy
- Most patients with pneumothorax can be managed at district hospital, provided there are materials and knowledge needed to place and manage the tube. Any patient who will be transferred for management of pneumothorax should be evaluated for stability; if there is any question of a tension pneumothorax, needle decompression should be performed BEFORE transfer and the catheter left in until a chest tube can be placed.

3.d Asthma/COPD

Definition: Asthma is a disease characterized by bronchoconstriction, bronchial wall edema and thick secretions. Chronic obstructive pulmonary disease (COPD) is an inflammatory response in the small airways and lung parenchyma that causes airflow obstruction and inflammation. While the two are different and often unrelated processes, their clinical symptoms and treatments are similar.

Causes

- Asthma
  - Allergic/extrinsic
    - Family history or related to seasons, animals, dust
  - Nonallergic/intrinsic
    - More common; inciting allergen can't be identified
- COPD
  - Non-tobacco related
    - Probably most important in Rwanda
    - Cooking smoke (from indoor cooking), environmental pollution, passive smoke inhalation, occupational exposure, genetic
  - Tobacco

Signs and symptoms

- Always start with ABCs- Get a full set of vitals, including saturation. Put patient on a small amount of oxygen, if needed, and start IV line.
- Ask about recent steroid use, prior hospital visits, recent illness
- COPD patients will have chronic shortness of breath, and often hyperventilate to compensate for lung's inability to oxygenate the blood. Breath sounds are diminished and there is prolonged expiratory phase. They will note chest tightness, dyspnea, and possibly change in sputum.
- COPD patients will often have chronic hypoxia as a result of alveolar destruction and saturations between 85 and 89% may be baseline for them
- Asthma patients typically have cough, dyspnea, wheezing with prolonged expiratory phase. Can present anxious (because of inability to breathe), tachypneic, tachycardic, and with wheezing.
- Severe asthmatic attacks may have a "silent chest"- there is no wheezing because there is no airflow. This is a severe form of asthma attack.
- Patients with asthma attacks typically have normal oxygen saturation levels. A low saturation level is a very serious sign of impending respiratory failure.
  - Other signs of respiratory failure include confusion, cyanosis, inability to speak

Differential diagnosis

- Pneumonia
- Pneumothorax
- Bronchitis
- Croup
- Bronchiolitis
- Congestive heart failure (CHF)
- Pulmonary embolism
- Allergic reactions
- Upper airway obstruction from foreign body or edema

Investigations

- Labs: FBC not very helpful unless pneumonia or other infection also present; electrolytes and renal function more helpful in chronic COPD patients or to rule out renal failure as etiology of shortness of breath
  - If ABG is available, COPD patients with decreased mentation (confusion) will have high pCO2 (obstructive process means they can't exhale CO2 out of lungs). However, management will be guided by clinical findings, not the ABG.
- Imaging: Chest XR to rule out opacity, pleural effusion, pneumothorax

Management

- Asthma exacerbation
  - Mild attack (normal vital signs, talks in full sentences, comfortable appearing)
    - Salbutamol MDI inhaled: 2 puffs every 2-6hr as needed
    - If patient is better with MDI alone, and doesn't require nebulization, steroids likely not needed.
  - Moderate attack (normal vital signs, talks in short sentences, comfortable appearing, but requires nebulization)
    - Salbutamol nebulization: 2.5mg every 2-4hr as needed
    - Prednisolone 60mg PO lx/day for five days (no taper needed) - PO steroids as effective as IV steroids!
    - Consider admission if patient is not better with three nebulizations and four hours of observation
  - Severe attack (abnormal vital signs, patient not talking well, ill appearing, "silent chest")
    - Salbutamol nebulization 2.5mg every 15 minutes or a continuous nebulization with 10 - 15mg/ hour
      - If nebulization solution is not available, use MDI 2 puffs at least every 15 minutes (10 puffs replaces one nebulization)

- Use IV steroids if patient is unable to swallow by mouth
  - Hydrocortisone lOOmg IV once
- Ipratropium 500mcg nebulized or MDI every 15min for 3 doses, then every 6hr
- Magnesium Sulphate 2gm IV over 20 minutes (rapid infusion will cause hypotension)
- For worsening respiratory failure consider
  - Adrenaline 0.3mg IM of 1:1000 ratio
  - Adrenaline 5mg nebulized (mix with NS)
  - If available, use non-invasive ventilation with ambu-bag and PEEP valve
  - Intubation ONLY in extreme circumstances and ONLY by experienced provider with access to an intensive care unit.
    - Use Ketamine for induction agent
    - Keep patient on low tidal volume on vent, with respiratory rate at least

- COPD exacerbation
  - Use oxygen to maintain saturation at goal of 90-92% in all patients (COPD patients generally have a low saturation at baseline; it is not necessary to get them to 100% saturation and could be dangerous)
  - Studies show that antibiotics are useful in COPD exacerbations, even if mild
    - Doxycycline lOOmg PO BID x 7 days
  - Mild attack (normal vital signs, talks in full sentences, comfortable appearing)
    - Salbutamol MDI inhaled: 2 puffs every 2-6hr as needed
  - Moderate attack (normal vital signs, talks in short sentences, comfortable appearing, but requires nebulization)
    - Salbutamol nebulization: 2.5mg every 2-4hr as needed
    - Prednisolone 40-60mg PO lx/day with 7-10 day taper- PO steroids as effective as IV steroids!
    - Consider admission if patient is not better with three nebulizations and four hours of observation
  - Severe attack (abnormal vital signs, patient not talking well, confusion)
    - Salbutamol nebulization 2.5mg every 15 minutes or a continuous nebulization with 10-15 mg/ hour
      - If nebulization solution is not available, use MDI 2 puffs at least every 15 minutes (10 puffs replaces one nebulization)
    - Use IV steroids if patient is unable to swallow by mouth
      - Hydrocortisone lOOmg IV once

- Ipratropium 500mcg nebulized or MDI every 15min for 3 doses, then every 6hr
- Less evidence for Magnesium Sulphate in COPD patients, but okay to try in severe cases if renal function is normal
  - 2gm IV over 20 minutes (rapid infusion will cause hypotension)
- Non-invasive positive pressure ventilation is most helpful to prevent respiratory or ventilatory failure in these patients. If NIPPV is not available at your hospital, transfer early if patient appears ill or is not getting better with nebulization alone.

Recommendations

- Hypoxemia is a late, serious sign in an asthmatic.
- Be prepared to intubate for respiratory failure or transfer early.
- Goal saturation in a COPD patient is 90-92%. Main concern in these patients tends to be build-up of CO2 in body and academia due to obstructive airflow. NIPPV most helpful, when available. (Bukhman, et al, 2011; Steg, G. et al. 2012; Ntsekhe, M and Damasceno, A. 2013; DeBacker D, Biston P, Devriendt J, et al. 2010; Gheorghiade, M. et al. 2013; Pasquier. M et al. 2013).

3.e Hemoptysis

Definition: Blood within the respiratory tract. Can range from small volume and insignificant to life threatening. *Massive hemoptysis* is rare but frequently fatal; definitions vary from 100-600 ml of blood over 24 hours.

Causes

- Infection (TB, bronchitis, pneumonia, lung abscess)
- Malignancy
- Cardiovascular (mitral stenosis, CHF, pulmonary embolism)
- Trauma
- Other: Autoimmune diseases, AV malformation, chemical pneumonitis, coagulopathy
- *Massive hemoptysis* most commonly caused by malignancy, tuberculosis, and vascular malformations
- In 30% of cases no cause is found

Signs and symptoms

- History
  - Important to have patient differentiate between coughing up blood (hemoptysis) and vomiting blood (hematemesis)
    - Hemoptysis usually bright, frothy
  - Try to determine amount the patient coughed up

        - Blood stained sputum vs. frank blood or clots?
        - Estimation of amount can be difficult
    - Associated symptoms key to dx:
        - Cough? Fever? Chest pain?
        - History of cardiac disease?
- Exam
    - ABC's
        - Massive hemoptysis can cause hypoxia, hypotension
    - Careful exam to rule out other sources of bleeding (ENT, GI tract)
    - Lung exam: Signs of infiltrate? Effusion?
    - Heart exam: Murmur?
    - Pallor, signs of anemia?
    - Unilateral swelling suggestive of DVT?
- Bedside tests
    - Bedside ultrasound to look for underlying cause (mitral stenosis, PE, CHF) and to examine the lung (consolidation? Effusion?)

<u>Differential diagnosis</u>

- GI hemorrhage
- ENT hemorrhage

<u>Investigations</u>

- Labs: FBC, creatinine, sputum for tuberculosis, HIV
- Imaging:
    - CXR: Look for sign of TB, pneumonia, malignancy
    - CT is diagnosis unclear
    - Bronchoscopy: can help with diagnosis in cases of malignancy or immune mediated process. Only consider if prognosis is reasonable and referral facility will be able to obtain useful tests (i.e. cytology, etc)

<u>Management</u>

- Massive hemoptysis
    - Can rapidly cause asphyxiation
    - May need intubation to help improve oxygenation
        - Will likely need PEEP. Use ventilator or PEEP valve.
    - Place lung with hemorrhage down to improve oxygenation of good lung
    - Transfuse blood early
        - Transfuse without an Hb if patient has massive hemoptysis and hypotension
        - Transfuse if ongoing hemoptysis or melena
        - Transfuse for Hb<7 if hemoptysis has stopped

- FFP and platelets if suspect coagulopathy
- All patients must be transferred to referral center IMMEDIATELY

- Mild-moderate hemoptysis
  - Not life threatening
  - Suppress cough to avoid progression to more severe hemoptysis
  - If unclear how severe, can check two FBCs, about six hours apart, and see if Hb is dropping
    - Transfer to referral center if Hb drops more than 1 point during the 6hr or if hemoptysis resumes while patient is being observed
- Other management aimed at underlying cause (e.g. diuresis for CHF, antibiotics for pneumonia)

Recommendations

- Most hemoptysis is minor and not life threatening. If you are unsure, check two FBCs six hours apart and look for dropping Hb
- Massive hemoptysis can be rapidly fatal even with excellent management
- Hemoptysis can be difficult for patients to distinguish from other sources of bleeding (GI or ENT). Take the time to tease this out in the history and physical exam.

3.f Pleural Effusion

Definition: Fluid in the pleural space. Normally, there is < 20 *cc* between the parietal and visceral pleura. Effusions can be either transudative (caused by changes in the hydrostatic and or osmotic gradient) or exudative (caused by pleural inflammation and increased permeability). An empyema is an abscess surrounding a pneumonia.

Causes

- Overall, CHF, TB, pneumonia and malignancy most common causes
- Transudative
  - Fluid overloaded states and/ or hypoalbumen states
    - CHF, cirrhosis, nephrotic syndrome, hypothyroidism, constrictive pericarditis, pulmonary embolism
    - Often bilateral
- Exudative
  - Infection
    - Tuberculosis, pneumonia (parapneumonic effusion or empyema), intra-abdominal abscess, hepatitis
  - Inflammation

        - Pancreatitis, viral or uremic pleuritis, pulmonary embolism with infarction, ARDS, autoimmune disorders (lupus, rheumatoid arthritis)
    - Malignancy
        - Leukemia, lymphoma, lung cancers

Signs and symptoms

- History
    - May be asymptomatic if small
    - Often will have pleuritic chest pain and dyspnea
    - History key to determining underlying cause
        - Fever, cough -> infection
        - Chronic cough, weight loss -> suggests TB or malignancy
        - Risk factors for TB (HIV? Exposures?)
        - Risk factors for malignancy? (Smoking? indoor smoke exposure?)
- Exam
    - If large, can result in hypoxia and increased respiratory rate
    - On lung exam, will have decreased breath sounds and dullness to percussion
- Bedside tests
    - Bedside ultrasound essential in accurately diagnosing. Will see black fluid surrounding lung above diaphragm. May see septations suggesting loculations. Always look to rule out associated pneumothorax. Also look for other abnormal fluid collections (pericardial or ascites).

Differential diagnosis

- Pulmonary embolism, pneumonia, and pneumothorax can all cause dyspnea, and hypoxia
- Trauma causing pneumothorax and/ or hemothorax can have similar Presentation

Investigations

- Labs
    - Creatinine, FBC, HIV, serum protein, serum LDH (if available)
    - Most effusions will require aspiration for diagnosis, unless they are bilateral in a patient with known CHF.
        - Send fluid for: cell count (RBC, neutrophils, lymphocytes), microcopy, tuberculosis, protein and LDH.
        - Grossly bloody fluid: TB or malignancy until proven otherwise
        - If have concern for malignancy, send fluid to referral center for cytology (to look for malignant cells)
        - If not clear if is a transudate or exudate, send protein and LDH, It is likely to be exudate if Light's Criteria is met:

- Pleural/ serum protein ratio > 0.5
- Pleural/ serum LDH ratio > 0.6
- Pleural LDH >2/3 upper limit of normal for serum
- Imaging

o CXR: Will show blunting of the costophrenic angles. May also show associated pneumonia or lesions suggestive of TB

o Ultrasound as above to look for other fluid collections (common in TB)

o CT scan can help to diagnose cause if malignancy is in question

Management

- Any effusion *other than that in a patient with CHF and bilateral effusions* should be aspirated for diagnostic purposes
- Any effusion that is compromising oxygenation should be drained for therapeutic purposes
  - o Thoracentesis
    - ■ Procedure is the same whether diagnostic or therapeutic; only the volume of fluid removed will differ
    - ■ Contraindications: platelets < 20,000, mechanical ventilation, overlying cellulitis, uncontrolled cough or hiccups
    - ■ Place patient in sitting position with arms and head resting on a bedside table. If unable to sit, lie patient on affected side with ipsilateral arm above head
    - ■ Use ultrasound to find the largest pocket of fluid and measure distance from skin to fluid. Take note of the depth of the pocket determined on ultrasound to help guide you.
    - ■ If US not available, mark site 1-2 intercostal spaces below where dullness ends in the hemithorax midline (approximately 5-10 cm lateral to the spine). To avoid intra-abominal injury, do not go below the 9th rib space. Mark site with permanent marker.
    - ■ Sterilely prep and drape skin
    - ■ Anesthetize skin with Lidocaine, and then anesthetize tissues along expected tract, going over the rib. Aspirate as you go avoiding injecting into a vessel. Stop once fluid is aspirated and inject some Lidocaine to anesthetize the parietal pleura.
    - ■ Advance an 18-20-gauge angiocatheter attached to a syringe over the rib through the anesthetized area while aspirating. Stop once fluid is aspirated.
    - ■ Remove the needle, leaving the plastic catheter in place.

        - Attach a 3-way stopcock and tubing to the catheter and aspirate the desired amount. Make sure to turn the stopcock to the off position when removing the syringe to prevent air from entering the pleural space.
            - Remove 100 *cc* for diagnostic purposes
            - Remove 500cc-l L for therapeutic purposes
                - Avoid removing >1.5 L at one time as increasing risk of pulmonary edema
        - When finished draining fluid, have patient take a deep breath and hum to increase intrathoracic pressure and decrease the risk of a pneumothorax while you remove the catheter.
        - Cover site with a sterile occlusive dressing
    - If effusion is very large and expected to accumulate, might consider placement of chest tube to drain. Be careful of draining > 1.5 L at a time.
- Other management will be aimed at treating the underlying cause
- Patients who are stable may be discharged to have their workup completed as an outpatient.

<u>Recommendations</u>

- A pleural effusion is not a diagnosis, but rather a finding suggestive of a disease process
- Patients should be referred if initial drainage at district hospital has not been successful, if they need CT scan for malignancy investigation AND have a good prognosis, or if there is another reason for referral for diagnosis or management of the underlying disease state (e.g. surgical evaluation for valvular heart disease) (Jusabani, A et al. 2011; Kehinde, K and Vento, S. 2011; Middleton, St et al. 2011).

3.g Pulmonary Embolism (PE)

<u>Definition:</u> Obstruction of a pulmonary artery by a blood clot. Can range from occult and insignificant to massive, causing obstructive shock and death.

<u>Causes/ risk factors</u>

- Bed rest >48-72h
- Age > 50 years old
- Immobilization of the hip and knee
- Surgery in the previous 4 wks
- Malignancy (diagnosed or suspected)
- Pregnancy (highest risk after C section delivery)
- Oral contraceptives
- Nephrotic syndrome
- Congestive heart failure
- HIV may also be an important risk factor

Signs and symptoms

- History
  - o Ask all patients with unexplained shortness of breath about risk factors as above o Usually acute onset shortness of breath with or without pleuritic chest pain
    - ■ Consider PE in a patient who complains of shortness of breath, but has a normal lung exam and a normal chest XR
  - o Hemoptysis
  - o Syncope
  - o Most patients with PE and baseline cardiopulmonary disease describe dyspnea with PE as "worse than usual"
- Exam
  - o Often non-specific, leading to frequent misdiagnosis
    - ■ One half of previously healthy patients with first time PE have normal vital signs at presentation
  - o Hypoxemia, tachycardia, tachypnea
  - o Usually CLEAR lungs at auscultation
  - o May see unilateral leg swelling (DVT)

Differential diagnosis: Other causes of acute dyspnea

- Acute pulmonary edema
- Pneumothorax
- Pneumonia

Investigations

- Labs: FBC to check for associated anemia, low platelets, renal function, liver function (AST, ALT) and coagulation factors if possible (aPTT, PT, INR)
  - o ECG: non specific and insensitive. May see sinus tachycardia, signs of right heart strain (T wave inversion in V1-V4, S1Q3T3 pattern, right bundle branch block)
- Imaging:
  - o Ultrasound: of the lower limb veins (to document a possible thrombus in a vein) and of the heart (large PE can cause signs of right heart strain: increased in size of the right ventricle compared with the left and shift of the intraventricular septum)
  - o CXR to rule out alternate diagnosis (chest XR for patients with PE is typically normal)
  - o CT thorax with contrast
    - ■ Gold standard test

Management: Patients with PE can present within a range of illness, from having normal vital signs to severe shock. The general goal is support patient with IV fluids (patients are preload dependent) and supplemental oxygen while starting anticoagulation.

- All patient need two IVs, supplemental oxygen, and to be on a monitor (or frequent vital signs check)
- Give 2L bolus for any tachycardia or hypotension (patients are preload dependent)
- Start empiric systemic anticoagulation when you have a high clinical suspicion (risk factors present with signs of DVT or abnormal vital signs) even in the absence of confirmatory tests
  - Low molecular weight heparin (LMWH)
    - Does not require lab monitoring or a pump
    - Enoxaparin (Lovenox): lmg/kg subcutaneous every 12 hours or 1.5 mg/kg subcutaneous every day
  - Warfarin
    - Potential to cause iatrogenic bleeding if not managed closely
    - Requires frequent blood level checks (INR)
    - Start at 5mg PO every night and adjust according to INR levels (goal INR 2-3)
  - Unfractionated Heparin: 80ui/kg bolus then 18ui/kg/h infusion
    - Typically started during hospitalization and requires pump and ability to check aPTT frequently
- Patients will usually have to continue at least 3 months of anticoagulation as an outpatient with either Warfarin (if INR testing and appropriate anticoagulation monitoring is available) or with LMWH
- In patients with massive PE causing shock, fibrinolysis with streptokinase may be a consideration.

Recommendations

- Consider pulmonary embolism in patients with shortness of breath with no alternative diagnosis, clear lungs, or normal chest XR.
- Transfer to referral hospital for CT and further management after discussion with the receiving team.
  - For CT scan
    - If diagnosis is in question AND anticoagulation is likely to improve overall patient outcome
- Avoid referring patients with underlying comorbidities and poor prognosis (e.g. malignancy, stroke, chronic CHF). Instead, consider empiric treatment at DH. (Tintinalli et al .2012; Wallis et al .2013; Wilson et al 2012).

4. Cardiology

4.a Heart Failure

Definition: Heart failure is a condition in which the heart is unable to meet the body's demands. In its extreme, it results in cardiogenic shock. According to data from three district hospital outpatient clinics with access to echocardiography, the leading causes are cardiomyopathy (41%), rheumatic heart disease (33%), hypertensive heart disease (8%), and congenital heart disease (2%). Ischemic heart disease as a cause of heart failure is thought to remain relatively uncommon in Rwanda, particularly in more rural settings.

Causes

- Heart failure secondary to high afterload (e.g. flash pulmonary edema)
  - Very hypertensive
- Heart failure secondary to poor forward flow from low contractility (Cardiomyopathy)
  - Often hypotensive or normal blood pressure o Can be caused by many things:
    - Viral myocarditis
    - Alcohol
    - Peripartum cardiomyopathy
    - Long-standing aortic or mitral regurgitation
    - Advanced HIV
    - Sepsis
    - Severe anemia
- Heart failure secondary to poor forward flow from valvular disease
  - Acute mitral or aortic regurgitation
  - Will usually have very loud murmurs, pulmonary edema and seemingly normal ejection fraction
  - Can be caused by:
    - Acute rheumatic fever
    - Decompensated rheumatic valvular disease
    - Endocarditis
- Heart failure secondary to poor left ventricular heart filling
  - Mitral stenosis
  - Pericardial disease/ tamponade

Signs and symptoms

- History

- Patient may carry diagnosis of "cardiopathy" but given lack of cardiologist access in country, unreliable history o Ask about dizziness, weakness, dyspnea, orthopnea, edema
    - Palpitations and chest pain not very sensitive or specific
- Exam
    - Possible confusion from shock and/or hypoxia
    - Lungs: Crackles and hypoxia, if left sided failure
    - Heart: Tachycardia, murmurs and irregular heart sounds often found.
    - Abd: May have distension from ascites in right sided failure.
    - Extremities: May be cold, edematous
- Bedside tests
    - US
        - IVC: plump or collapsing?
        - EF: low or high?
        - Mitral valve: Opening well or not?
        - Pericardial effusion present?

Differential diagnosis

- Pneumonia
- Tuberculosis
- Asthma/ COPD
- Anemia
- Pulmonary embolism
- Renal failure
- Liver failure
- Malnutrition

Investigations

- Labs: Creatinine most important. If creatinine high or diuresing, electrolytes (K and Na) helpful.
- LFTS may be elevated
- Imaging
    - Chest x-ray to look for other causes of dyspnea
    - Bedside ultrasound as above. If anything other normal or cardiomyopathy, should be referred for formal echocardiogram (possible candidates for cardiac surgery)

Management**:** Initial approaches to heart failure the same in all patients. Start with IV line, oxygen, and place patient on monitor. Keep patient in sitting position. Assess ABCs. Severe heart failure may require aggressive airway management with positive pressure ventilation or intubation. Specific therapies will be guided by:

1. Blood pressure (hypotensive, normal or hypertensive)
2. Ejection fraction
3. IVC/volume assessment
4. Presence or absence of mitral stenosis
   - Hypertensive heart failure (i.e. Heart failure secondary to high afterload)
     - o Need to rapidly decrease afterload to allow the left side of the heart to empty
       - ■ Nitroglycerin 0.3-0.5 mg SL every 3-5 minutes

       OR
       - ■ Nitroglycerin 50-300 mcg/min IV (drip/pump required)
       - ■ Captopril 25-50 mgSL or PO
       - ■ Hydralazine 20mg-40mg IV/IM; repeat as needed or 10-25mg PO every 6-8hr
   - Caution as may drop blood pressure very quickly and unpredictably
       - ■ Non-invasive ventilation with BIPAP or CPAP very useful. May need to intubate if not able to tolerate non-invasive pressure ventilation.
     - o Patient may or may not be fluid overloaded (check IVC with bedside US)
     - o Often in renal failure -> Check creatinine Heart failure secondary to low contractility (Cardiomyopathy)
     - o If in shock, will need to supplement contractility with inotropes. titrate up to MAP 65 or SBP>85 with warm extremities and good urine output
       - ■ Dobutamine 2-20mcg/kg/min IV
   - Pure inotropy but can decrease blood pressure so may need to use in conjunction with another agent
       - ■ Dopamine 2-20mcg/kg/min IV
       - ■ Adrenaline 0.05-0.1mcg/kg/min
     - o Will often be volume overloaded
       - ■ Diuresis with Furosemide once no longer in shock (when extremities are warm and blood pressure is higher)
       - ■ Decreasing preload can sometimes help contractility if very fluid overloaded.
     - o Has poor prognosis- Counsel family and patient early to decide when appropriate to switch goals of care towards palliation. Heart failure secondary to poor heart filling: Main causes in Rwanda include tamponade and mitral stenosis
     - o Tamponade
       - ■ If large effusion and in shock, perform immediate bedside pericardiocentesis (see pericardial effusion chapter for information on procedure)

o Mitral stenosis:

- Look for and treat rapid atrial fibrillation, including anticoagulation.
- Patient often fluid-depleted
  - Do NOT give diuretics unless have convincing signs of volume overload (i.e. plump IVC on bedside US)
- At very high risk for thromboembolism
  - Screen for signs of stroke even if in sinus rhythm Heart failure secondary to poor forward flow

o Often normal to hypotensive

o Blood pressure support, diuretics and afterload reduction as for patients with cardiomyopathy o Need urgent cardiologist review; with surgery many of these patients have a good prognosis.

o Consider workup and treatment for acute rheumatic fever in ages 5- 30 and give empiric IM Benazthine penicillin. o Consider endocarditis if febrile, embolic phenomenon and other signs of infection. Draw blood cultures and then start a 3rd generation cephalosporin.

Recommendations

- Heart failure is a common presentation in Rwanda, but very difficult to manage in a resource limited environment. The most useful diagnostic tool is a bedside ultrasound. If one is not immediately available, use blood pressure measurements (very high or very low will have different treatments as above), renal function (high Cr has worse prognosis), diuresis, and palpation of extremities (cold extremities=shock) to guide your management.
- If your patient is not breathing well on his/her own, or you feel his/her presentation is too complicated to manage in the district, transfer to referral hospital immediately. Aggressive management is needed early in order to ensure good outcome for patient.

4.b Bradycardia with a Pulse

Definition: Bradycardia is defined as a heart rate less than 60 bpm or less than two standard deviations from normal for children. Bradycardia may reflect a primary cardiac problem or may be a marker of disease in another system.

Causes

- Sinus bradycardia
- Sick sinus syndrome
- Heart block
- Other

  - Athletic heart: Normal resting heart rates in athletes can be as low as 30's-40's
  - Medication use or overuse: Beta-blockers and Digoxin can both cause bradycardia
  - Toxic ingestions: Cholinergic poisoning (i.e. organophosphates)
  - Hypoxia, hypothermia, hypoglycemia, hyperkalemia, hypothyroid and hypocalcemia are important causes of bradycardia.

Signs and symptoms

- History
  - Review medications (e.g. beta blockers, calcium channel blockers, Digoxin) or possible toxic exposures (e.g. organophosphates)
  - Comorbities such as renal failure (hyperkalemia? common cause of bradycardia), previous heart disease
- Exam
  - Perform a focused exam to look for signs of end organ damage, heart failure, poor perfusion as a result of bradycardia.
- Bedside tests
  - ECG
    - Better than the monitor in helping determine rhythm
    - More important for determining long-term treatment/ need for pacemaker
  - Echocardiogram
    - Not as important, but can be useful to assess left ventricular function, presence of pericardial effusion, large RV, mitral valve opening, and IVC

Investigations

- Labs: Creatinine and electrolytes (K, Ca)
- Repeat ECGs often useful

Management

- Initial management
  - IV, 02, monitor. Assess ABCDs. Remember hypoxia is an important cause of bradycardia, especially in children. o Check a blood glucose as hypoglycemia can cause bradycardia o Check a temperature as hypothermia can cause bradycardia o Look for signs of instability such as hypotension, syncope, heart failure or altered mental status.
- Asymptomatic bradycardia
  - Generally does not require any treatment. o If has rhythm that has risk of asystole (2nd degree Mobitz II or complete heart block) consider referral for pacemaker.

- Symptomatic bradycardia
  - o Atropine 0.5 mg IV x 3 doses
  - o If any concern for renal failure, give calcium gluconate 2 grams IV to treat possible hyperkalemia o If no response, start transcutaneous pacing or pressors
    - ■ Dopamine (2-10mcg/kg/min) OR Adrenaline (2-10mcg/min IV)
    - ■ Transcutaneous pacing
      - Ensure IV, 02, monitor
      - Contraindications: Hypothermia, broken skin where pacing pads would go, prosthetic tricuspid valve
      - Sedate patient with Ketamine (lmg/kg) or diazepam
      - Attach patient to pacing pads one on anterior chest and one to posterior chest
      - Attach patient to ECG leads
      - Choose demand pacing mode
      - Set rate to > 30 bpm above patient's intrinsic rhythm
      - Set current to 100 mA and begin pacing. Increase energy until you have both electrical capture (broad QRS after pacer spike) AND mechanical capture (can feel a femoral pulse with each paced QRS).
      - If not getting capture at a current of 120-130 mA, reposition electrodes and try again.
      - Once have capture, set current 10% above mechanical capture threshold.
  - o If suspect beta blocker overdose, can consider glucagon and calcium. If calcium channel blocker overdose, can consider calcium, high dose insulin and glucose
  - o Refer for transvenous pacer

Recommendations

- Don't treat asymptomatic bradycardia
- Look for common causes of bradycardia: hypoxia, hyperkalemia

All cases of symptomatic bradycardia without identified reversible cause need to be referred for transvenous pacer and eventually permanent pacemaker implantation.

4.c Tachycardia with a Pulse

Definition: Tachycardia is defined as a heart rate greater than 100 bpm or greater than two standard deviations from normal for children. Tachycardia may reflect a primary cardiac problem or may be a marker of disease in another system.

Causes

- Sinus tachycardia: The rhythm is a marker of a disease and not a disease itself.
- Ventricular tachycardia
  - o Monomorphic VT
  - o Polymorphic VT - Often torsades
  - o Hyperkalemia and TCA overdose can cause wide complex tachycardias
- Atrial fibrillation with rapid ventricular response
  - o Can often be precipitated by sepsis or hypovolemia o Often have underlying structural heart disease, especially mitral stenosis
- Supraventricular tachycardia (SVT)
  - o Many types, often re-entrant at the level of the AV node

Signs and symptoms

- History
  - o Usually tachycardia is not patient's presenting complaint. Important to elicit symptoms that may give clue to underlying cause, e.g. sepsis, pulmonary embolism, heart failure, medication/ drug use, pain, anxiety
- Exam
  - o Physical exam should be guided by history and seek to establish the cause of hemodynamic instability, and rule out common drivers of tachycardia such as infection, hypovolemia, heart failure, pulmonary embolism
- Bedside tests
  - o ECG
    - ■ Better than the monitor in helping determine rhythm
    - ■ Follow algorithm as below
  - o Echocardiogram
    - ■ Assess left ventricular function, presence of pericardial effusion, large RV, mitral valve opening, and IVC

Differential diagnosis

- If sinus tachycardia, look for underlying abnormality driving tachycardia (e.g. fever, sepsis, hypovolemia, pain, thyroid storm)

Investigations

- Labs
  - o FBC, creatinine, electrolytes helpful in most cases
- Cardiac ultrasound for anyone with non-sinus tachycardia other than simple SVTs
- Repeat ECGs often useful

Management

Initial management

- IV, 02, monitor. Assess ABCDs.
- On monitor, try to determine if there is a p wave before every QRS complex.

If there is, treat as sinus tachycardia. If not, assess whether wide or narrow QRS complex. Follow algorithm below:

- o Seek and treat underlying cause, Do NOT treat tachycardia itself
- o Consider giving fluids, treating pain and/or fever.
- o Cardioversion will not help. Beta blockers almost NEVER indicated.
  Unstable non-sinus tachycardia (hypotension, confusion)
- o Prepare for immediate synchronized cardioversion
  - ■ Ensure IV, 02, monitor
  - ■ Sedate patient with Ketamine (lmg/kg) or diazepam 10 mg IV
  - ■ Attach patient to defibrillator pads or place paddles on patient's chest, one in the left mid axillary line and the other at the right, mid-clavicular line, just below the clavicle.
  - ■ Choose synch mode
  - ■ Choose energy
  - ■ Charge
  - ■ Make sure no one is touching patient and deliver shock
- o If patient's arrhythmia not terminated, may try escalating shock doses
- o Consider antiarrhythmic according to underlying rhythm

4.c.1 Ventricular Tachycardia

- o If any signs of instability OR no antiarrhythmic available, immediate cardio-version is appropriate (see above)
- o If irregular and polymorphic, give magnesium 2-4 grams o Consider possibility of hyperkalemia (give calcium) or tricyclic antidepressant overdose (give sodium bicarbonate)
- o If stable, can give trial of antiarrhythmics.
  - ■ Amiodarone 150 mg IV over 10 minutes followed by lmg/min on pump/drip for 6hrs (360mg)
  - ■ DO NOT give any AV nodal blocking agents (beta blockers, Digoxin, calcium channel blockers) Atrial Fibrillation with Rapid Ventricular Response
- o If unstable, perform synchronized cardioversion as described above
- o Rate control: Consider fluids (if hypovolemic), beta blocker if BP is normal (IV best), Amiodarone or Digoxin

- Atenolol 50-100mg PO lx/day OR
- Amiodarone IV dosing as above OR
- Digoxin 8-12 mcg/kg IV (0.008-0.012 mg/kg) total loading dose: administer 50% initially, then cautiously and slowly give 25% or *V** the loading dose every 6-8hr two times OR Digoxin 10-15 mcg/kg PO total loading dose: administer 50% initially, then cautiously and slowly give 25% or % the loading dose every 6-8hr two times OR
- Diltiazem 15-30 mg IV

o Anticoagulation with heparin or LMWH unless contraindication
- Patients at very high risk of embolic stroke from clot in left atrium, especially if have mitral stenosis
- Will need to be discharged on anticoagulation (low molecular weight heparin or Coumadin)

o Suspect and rule out structural heart disease, especially mitral stenosis

4.c.2 Supraventricular Tachycardia

o Often re-entrant rhythms within AV node and can be terminated by vagal maneuvers (valsalva, ice water on face or carotid massage and elevation of the legs) or adenosine,

o If responds, reassess patient.

If asymptomatic and ECG now normal, may be discharged without further workup o If fails to terminate with above, can try beta-blockers or calcium channel blockers

- Atenolol 50-100mg PO lx/day

o Rarely unstable but if becomes unstable, perform immediate synchronized cardioversion

4.d Pericardial Effusion and Tamponade

Definition: Pericardial effusion is a fluid collection within the pericardial sack. When this fluid collection impairs cardiac filling, it is considered pericardial tamponade.

Causes

- Trauma with a hemopericardium
- Infection (Tuberculosis most common; viruses also can cause)
- Cancer (often metastatic and often bloody)
- Renal failure

Signs and symptoms

- Pericardial effusion can mimic symptoms of pericarditis including chest pain (often pleuritic and positional), palpitations, malaise, weakness and shortness of breath.

- On cardiac monitor, may see low voltage QRS complexes and/ or QRS complexes of changing axis (= Electrical alternans, represents swinging of heart in pericardial fluid)
- Enlarged heart (displaced PMI), muffled heart sounds (fluid collection makes more difficult to hear)
- Tamponade
  - May present in shock: cold, reduced cap refill, hypotension
  - May or may not have signs of pulmonary edema
  - Beck's Triad: Distended neck veins, hypotension, muffled heart sounds. Classic three symptoms, but rarely complete.
  - Tachycardia
  - Pulsus paradoxus: Decrease in pulse pressure greater than 10 mmHg with inspiration
- Bedside tests
  - Ultrasound
    - Look for black stripe (fluid) around the heart. Circumferential effusions causing right atrium and/ or right ventricular collapse during diastole.
    - IVC will be large and non-collapsing

<u>Differential diagnosis</u>

- Other causes of obstructive shock
  - Pulmonary embolism, tension pneumothorax
- Other causes of shock
  - Cardiomyopathy, valvular disease, sepsis, hypovolemia.
    - Should be able to differentiate based on physical exam and ultrasound.

<u>Investigations</u>

- Labs: FBC, creatinine. If non-traumatic pleural effusion, send TB tests.
- If pericardiocentesis is performed, send fluid for cell count, protein, acid fast bacilli smear and culture. TB effusions will usually have high protein and leukocyte count with monocyte predominance.
- Bedside ultrasound as above. If have time and concerns about your diagnosis, consider formal echocardiogram.
- CXR: Will show enlarged heart silhouette, usually clear lungs.
- ECG: Tachycardia, electrical alternans (not always present), low voltage or findings consistent with pericarditis (diffuse ST elevations without reciprocal changes, downsloping TP segment, PR segment depression)

Management

- Tamponade
  - o Heart cannot fill because of compression by pericardial effusion (preload problem). Must urgently reduce pericardial effusion to allow heart to fill by performing a pericardiocentesis.
- Pericardial effusion without tamponade
  - o Management depends on presumed etiology. I.e. if concern for tuberculosis, consider starting empiric TB therapy; if concern for uremic pericardial effusion, consider dialysis, etc.
  - o Pericardial effusions with tuberculosis may be helped by steroid therapy, although no good data
  - o If effusion large enough to obtain fluid, consider diagnostic pericardio-centesis.
  - o If fluid is from malignancy, generally indicator of very poor prognosis.

Recommendations

- Tuberculosis most important and reversible cause of pericardial effusion in our setting.
- Refer any patients in whom causes of pericardial effusion is unclear, patient with acute renal failure and uremic effusion who are candidates for hemodialysis, or who need a formal echocardiogram.

4.e Hypertensive Emergency

Definition

- *Hypertension: A* chronic, usually asymptomatic disease defined as persistently elevated blood pressure > 140/90 in adults.
- *Hypertensive urgency:* An acutely elevated blood pressure *without* evidence of acute end organ damage
- *Hypertensive emergency:* An acutely elevated blood pressure (almost always > 180/120mmHg) with evidence of acute end organ damage:
  - o Cardiac: ischemia, aortic dissection, pulmonary edema
  - o Renal: acute renal insufficiency
  - o CNS: hemorrhagic stroke, encephalopathy

Causes of hypertension

- Cardiovascular
  - o Essential hypertension (most adults)
  - o Coarctation of the aorta (children)
- Renal
  - o Renal failure

- o Renal artery stenosis
  - o Glomerulonephritis
- Metabolic
  - o Cushings
  - o Pheochromocytoma
  - o Thyrotoxicosis
- Other
  - o Pain, anxiety
  - o Alcohol withdrawal
  - o Pre-eclampsia/eclampsia,
  - o Increased intracranial pressure (hemorrhage or stroke)
  - o Drugs/ medications (steroids, cocaine)
  - o Rebound hypertension (Clonidine, B blockers)

Signs and symptoms

- History
  - o Hypertension is usually asymptomatic
  - o Patients with acute, severe elevations of blood pressure causing end organ damage may complain of dyspnea, chest pain, blurred vision, nausea/ vomiting, severe headache, confusion o Headache by itself is *not* a marker of end organ damage. See Chapter on Non-traumatic Headache for guidance on whether a headache needs further investigation
- Exam: Look for signs and symptoms of end organ damage
  - o Neurologic: Altered mental status, focal neurologic deficits, papilledema, reduced visual acuity
  - o Cardiac: Acute pulmonary edema, ischemia
  - o Be sure that you are measuring blood pressure with an appropriately sized cuff. A cuff that is too small will result in over-reading blood pressure. A cuff that is too large will result in under-reading blood pressure.
- Bedside tests
  - o Cardiac US: Look for LV function (high or low) and IVC (collapsing in dehydration or full in normal fluid status or volume overload).
  - o Thoracic US: Look for B lines (suggests pulmonary edema)
  - o Fingerstick glycemia if altered mental status or focal neurologic Deficits

Investigations

- Labs: Renal function (Cr), urine dipstick (protein in suspected nephrotic syndrome)
- Thyroid function tests (TSH, T3, T4)
- ECG if concerned for ischemia, but not otherwise helpful

- Imaging: Bedside cardiac/ thoracic ultrasound as above. Consider formal echo and renal ultrasound if working up secondary causes of hypertension. Head CT without contrast if concern for intracranial hemorrhage or hypertensive encephalopathy (if any neurological defects on exam, confusion).
- Fundoscopy (for retinopathy)

<u>Management</u>

- Hypertensive Emergency (evidence of end organ damage like stroke, pulmonary edema, renal failure)
  - Aim to decrease blood pressure (MAP) by 20% within 2 hours (IV Labetalol, Captopril, Nifedipine, IV Hydralazine). Furosemide is not a good agent unless the patient is fluid overloaded. Be careful of rapid drops in blood pressure with Nifedipine and Hydralazine, as this can cause end organ damage.
    - Labetalol 20mg IV over 2 minutes initially, then 40-80mg IV every 10 min; total dose not to exceed 300mg (first choice)
    - Hydralazine 20-40mg IV/IM; repeat as needed (second choice)
    - Captopril 12.5-25mg PO; repeat as needed (not to exceed 450mg/day) (third choice)
    - Nifedipine lOmg PO every 8hr (fourth choice)
  - HTN Emergency with pulmonary edema: Use IV or sublingual nitroglycerin and Captopril (check creatinine before giving more than one dose). Positive pressure ventilation can also help treat pulmonary edema. May use Furosemide if patient appears fluid overloaded
  - HTN Emergency with acute ischemic stroke: Avoid treating hypertension during acute ischemic stroke unless patient has other indication (CHF, aortic dissection, active ischemia).
  - HTN Emergency with acute hemorrhagic stroke: Consult neurosurgery when available. Target blood pressure is 160/90. Nicardipine is first line agent, but not available in Rwanda. May also use beta-blocker (2nd choice) or Hydralazine (3rd choice)
    - Labetalol 20mg IV over 2 minutes initially, then 40-80mg IV every lOmin; total dose not to exceed 300mg
    - Hydralazine 20-40mg IV/IM; repeat as needed
- Chronic, asymptomatic hypertension
  - There is no evidence that acute management in the ED is beneficial; there is some evidence that it could be harmful. o If patient has stopped their medications, restart them. o If patient is not on any anti-hypertensive medication, you can consider starting them on a first line agent (e.g. hydrochlorothiazide 25 mg daily, Amlodipine 5 -10 mg daily)

- o Recommend close follow up in OPD for medication titration and any further work up (e.g. creatinine)
- Hypertension caused by anxiety and/ or pain
  - o **VERY common in the emergency department**
  - o If patient has a painful condition, treat pain before treating hypertension

<u>Recommendations</u>

- Elevated blood pressure regardless of severity, if chronic, does ***not*** represent an emergency and does ***not*** need to be treated in the emergency department.
- Always consider pain and anxiety as causes of elevated blood pressure
- Refer cases of hypertensive emergency where you suspect intracerebral hemorrhage, acute ischemia or if the patient requires mechanical ventilation to treat pulmonary edema or if patient is deteriorating with available district level treatments.

4.f Infective Endocarditis

<u>Definition:</u> Infection of the endocardium (valves and/ or mural endocardium). Usually caused by bacteria. Risk increased greatly with rheumatic or prosthetic heart valves or with history of congenital heart disease. Other causes of bacteremia (e.g. septic abortion) can seed valve.

<u>Causes</u>

- Rheumatic heart disease is the most important risk factor in sub Saharan Africa
  - o Others include hemodialysis, injection drug use, HIV infection.
- Can be caused by bacteremia from any source (e.g. septic abortion, septic joint)
- Viruses, mycobacteria, and fungus can also less commonly cause infective endocarditis
- Non-infective inflammatory endocarditis is a rare complication of some rheumatic diseases and malignancies

<u>Signs and symptoms</u>

- Symptoms can vary greatly from vague constitutional symptoms (persistent fever, malaise, weight loss) to florid sepsis and heart failure. Fever is present in almost all cases.
- Should be considered in anyone with a fever and a murmur or findings suggestive of septic emboli (e.g. brain abscess). More subtle findings include vascular phenomenon (Janeway lesions, splinter hemorrhages, other systemic emboli) and immune phenomenon (splenomegaly, nephritis, Osier nodes, Roth spots)

- Bedside ultrasound should be used to look for clear evidence of vegetation. However, formal echocardiography will be necessary to definitively diagnose.

Differential diagnosis

- Acute rheumatic fever
- Tuberculosis
- Other causes of sepsis

Complications

- Congestive heart failure (most common)
- Embolization (CVA, limb or mesenteric ischemia) (second most common)
- Conduction system involvement: arrhythmias
- CNS abscess
- Mycotic aneurysm
- Glomerulonephritis

Investigations

- Labs: 3 sets of blood cultures from 3 separate sites should ideally be drawn before giving antibiotics. FBC, creatinine, electrolytes.
- Imaging: Formal echocardiogram should be performed to look for vegetations. CT scan of brain if concern for embolic stroke/ brain abscess.
- Diagnostic criteria includes: 1. Two positive blood cultures from 2 separate sites AND 2. Echo showing evidence of vegetation, abscess, etc.

Management

- It is impossible to treat endocarditis unless you consider it in your differential diagnosis! Consider in any patient with a fever and either new murmur or signs of thrombotic emboli (gangrene limb, stroke). Stabilize patient using ABCs, start two IV lines, and start antibiotics.
- Empiric antibiotics should be started immediately and ideally will cover both streptococcus (most common) and staph. Options include:
  - o Ceftriaxone 2g IV 2x/day AND
  - o Gentamycin 1-2.5mg/kg/dose IV 2x/day
  - o Add Cloxacillin 500mg PO 4x/day if concern for staphylococcal infection o Add Vancomycin 1g IV 2x/day if concerned for MRSA (i.e. prosthetic valve, prolonged hospitalization)
- A proportion of patients will present in acute heart failure. Treat according the heart failure algorithms (see heart failure chapter)
- Many patients will require surgical intervention and should be transferred immediately to referral center with cardiology available. Start antibiotics before transfer.

Recommendations

- All patients with suspected endocarditis should be referred to center capable of performing echocardiography and cardiology review.
- Blood cultures are very important for guiding therapy. But if the patient is very sick, do not delay antimicrobial therapy

4.g Syncope

Definition: Syncope is a transient loss of consciousness followed by complete recovery of neurologic function without resuscitative efforts. It is caused by either lack of blood flow to both cerebral hemispheres or to the reticular activating systems. Pre-syncope is transient near loss of consciousness and is treated the same as syncope.

Causes

- Neurally-mediated (reflex)
  - o 25-65% of syncope, excellent prognosis; most common cause
  - o Self-limited bradycardia and/or vasodilation leads to transient hypotension, causing syncope o Usually preceded by sensation of warmth, nausea, tunnel vision, diaphoresis
  - o Associated with situations that activate vagal nerve: emotional distress, painful stimulus, prolonged standing, heat, micturition, defecation, cough/ sneeze, carotid sinus stimulation (in cases of carotid sinus hypersensitivity)
- Neurovascular
  - o Very rare: Requires insufficient blood flow to posterior cerebral circulation or bilateral hemispheres o Vertebrobasilar TIA/ insufficiency, subclavian steal (use of arm causes retrograde flow from posterior circulation), subarachnoid hemorrhage, complex migraine o Most cases would have residual neurologic deficits, and thus not fit definition of true syncope
- Cardiogenic
  - o Caused by insufficient cardiac output, often from arrhythmia. Other causes include obstructive lesions (hypertrophic cardiomyopathy, pericardial tamponade, stenotic valve lesions), very large pulmonary embolism. Rarely caused by ischemia.
  - o Suggested by a history of exertional syncope, syncope while sitting or lying down, palpitations or chest pain or lack of a prodrome
  - o Risk increases with age
- Hypovolemic/ Orthostatic
  - o Acute severe hemorrhage (trauma, GI bleed, ruptured ectopic, ruptured AAA)

- Vasodilated states: pregnancy, medications, older patients, alcohol
  - Suggested by moving from sitting to standing position
- Other
  - Large pulmonary embolism rare but well documented cause of syncope o Metabolic: hypoglycemia

Signs and symptoms

- History
  - Ask about situation surrounding syncope- was there valsalva, standing from sitting, PO intake, exertional
  - Preceding symptoms: Tunnel vision, nausea, lightheadedness, chest pain, palpitations, shortness of breath, severe headache, no prodrome
  - Event: Witnessed seizure activity, tongue bite, urinary or bowel incontinence, vomiting, head trauma, duration
  - Post-event: Confusion, headache
  - History of similar events in self or family, family history of sudden, unexplained death at young age, cardiac history, substance use, last menstrual period, medications or traditional remedies
- Exam
  - Vital signs should include bilateral upper extremity blood pressures (aortic dissection, subclavian steal will have very different blood pressures in each arm)
  - Orthostatic vital signs neither sensitive nor specific for identifying cause of syncope
  - Cardiac: Murmurs, irregular rate o Neurologic: Full neurological exam looking for new deficits, focus particularly on cerebellar exam (ataxia, gait), post-ictal state
  - Associated injuries from fall
- Bedside tests
  - ECG to look for arrhythmia, ischemia (very rare cause), delta wave (WPW), large voltage and deep q waves (hypertrophic cardiomyopathy), Brugada pattern, long QT, sinus tachycardia (hypovolemia)
  - Pregnancy test on ANY woman of childbearing age, regardless of reported last menstrual period
  - Bedside US: Cardiac function, pericardial effusion, sign of right heart strain or DVT (PE), IVC (hypovolemia)
  - Bedside glucoseâ

Differential diagnosis

- Seizures (caused by abnormal electrical activity in brain; note, syncope often also associated with jerking motions that can be confused with a seizure. Patients with seizures often have a prolonged post-ictal state that is not seen in syncope)
- Intoxication (do not often return to normal neurologic function after regaining consciousness)
- Hemorrhage

Investigations

- Despite exhaustive testing, many patients will lack clear diagnosis
- Everyone should have an ECG performed to look for signs of dangerous arrhythmia
    - o Many young, otherwise healthy patients who are well appearing with normal vital signs and normal ECG can be discharged without further testing.
- Labs: pregnancy, glucose; hematocrit if concerns for blood loss
- Imaging:. Head CT not often useful, unless suspecting subarachnoid hemorrhage as cause or if there is significant head trauma associated with the event.
- Obtain formal echo if ECG abnormalities or murmur on exam.
- CT ONLY indicated if patient does not result to baseline neurological status

Management: General goal is to address ABCs, check glucose, and perform ECG. Treat any identified precipitants (e.g. IV fluids for hypovolemia, PO challenge and/or glucose for hypoglycemia)

- Reflex-mediated
    - o Most likely diagnosis in young person without comorbidities.
    - o If well appearing, normal exam, not exertional in nature, normal ECG, history consistent with reflex mediated syncope, can discharge without further work up
- Cardiogenic
    - o Rare cause, but potentially deadly.
    - o Obtain formal echo to rule out structural heart problems
    - o If ECG or monitor identifies arrhythmia, treat according to arrhythmia protocols
    - o Resources to address arrhythmias limited. Consider referral to cardiologist to discuss options.
- Neurogenic

- MRI can evaluate posterior cerebral circulation problem. However, given lack of resources to address an identified problem, should not be routinely recommended.
- If concern for TIA, look for embolic source.

Recommendations

- Most syncope in young people is from a benign etiology.
- Head CT is rarely useful in work up of true syncope.
- Consider referral to OPD Internal Medicine/Cardiology for further work up for patients with
  - abnormal ECG
  - history of cardiac disease
  - SBP <90mmHg
  - associated dyspnea
  - old age/comorbidities
  - family history of sudden, unexplained death
  - exertional syncope

    (Ntsekhe et al .2013 ; O'Donnell, M. et al. 2010 ; Purrucker, J. etal. 2014)

5. Renal and Genitourinary

5.a Acute Scrotal Pain

Definition: Common reasons for testicular pain include torsion, epididymitis, hydrocele, or varicocele. Testicular torsion is an emergency- surgery can correct the problem and save the testis if done within six hours.

Signs and symptom

- Timing of onset of pain- if less than six hours, transfer immediately without work up
  - Torsion: sudden onset scrotal, inguinal, or abdominal pain. The pain might be intermittent it is *not* positional in nature (testicular torsion is primarily an ischemic event)
    - Exam: Involved testis is firm, tender with a unilateral absence of the cremasteric reflex
  - Torsion of the appendage of testis: sudden or gradual onset of pain; more common in age 3-12yr; more commonly see localized tenderness in the head of a testis without mass or erythema
- Ask about trauma, sexual activity, penile discharge, dysuria, hematuria
- Ask about vaccination status (mumps can present with orchitis)

    - In orchitis, testicular pain is more gradual and global; epididymitis is normal and spermatic cord is tender but not thickened
- Epididymitis can be sudden or gradual onset pain; can occur any age but more common in post-puberty boys and adults; usually history of painful voiding, discharge, or recent UTI; recent heavy lifting or straining can cause epididymitis
    - Exam: Relief of pain with elevation of the affected testicle (positive Prehn sign)

<u>Differential diagnosis</u>

- All painful scrotums should be presumed testicular torsion until proven

Otherwise

- Torsion of appendage
- Epididymitis (inflammation of the epididymitis on the back side of the testicle)
- Orchitis (inflammation of the testes from mumps, STI, or other infection)
- Hydrocele (fluid collection in the scrotal area)
- Varicocele (dilation of pampiniform venous plexus and the internal spermatic vein)
- Incarcerated hernia
- Carcinoma (gradual onset symptoms, usually not painful)

<u>Investigations</u>

- Physical exam findings
    - Torsion: painful or non-palpable testis that has elevated; typically see swelling of testicle and secondary swelling of scrotum; affected testis usually lies horizontal instead of vertical
    - Torsion of appendage: "blue dot sign" is a small, tender, pea-like structure seen through the scrotal skin
- Labs: Urinalysis, urine cultures, urethral swab if suspecting STI
- Imaging: Immediate Doppler ultrasound looking for blood flow to the testis, if available. If clinical diagnosis is suspicious for torsion and less than 6hr since onset of symptoms, refer immediately for ultrasound and surgical evaluation without delay.

<u>Management:</u> The general goal is to decide whether there is a high likelihood of testicular torsion based on exam and history.

- Testicular torsion
    - Manual detorsion is successful in 30-70% of patients and **should be attempted before transfer**
    - Patients still require transfer for urological review, even if detorsion was successful.

- Hydrocele or Varicocele
  - Refer to OPD urology for further management; non-emergent
- Torsion of testicular appendage
  - Self-limiting
    - Reduce activities, NSAIDs like Brufen 800mg PO every 8hr
- Epididymitis
  - In younger adults, treat for gonorrhea and chlamydia
    - Ceftriaxone 250mg IM once AND
    - Doxycycline lOOmg PO 2x/day for 10 days
  - In older men less likely to have an STI, treat for common UTI pathogens
    - Nitrofurantoin lOOmg PO 2x/day for 10 days OR
    - Ciprofloxacin 500mg PO 2x/day for 10 days OR
    - Amoxicillin 500mg PO 2x/day for 10 days

Recommendations

- Testicular torsion is an emergency that requires immediate referral if onset of pain is less than 6hr. If immediate transfer not possible or if arrival to urology will be more than 6hr after onset of pain, attempt manual detorsion.
- Consider testicular torsion in the differential diagnosis of any male presenting with abdominal pain. All males with abdominal pain should have a brief GU exam or at least ask patient about testicular swelling during history.

5.b. Hematuria

Definition: Abnormally high number of blood cells in the urine- can be microscopic (urine is still yellow, but RBCs present in urinalysis) or gross (urine is red with blood). The color of urine does NOT correlate with amount of blood lost.

Causes

- Most common causes in adults are : UTI, bladder cancer, calculi and BPH in men >60
- Pseudohematuria: eating beets, porphyria, hemoglobin (hemolytic anemia), myoglobin (rhabdomyolysis), vaginal bleeding, drugs (phenazopyridine, Rifampin)
- Systemic disease: sickle cell, autoimmune (lupus), coagulopathy (hemophilia, other bleeding disorders)
- Renal/Glomerular: post-streptococcal, lupus, hemolytic uremia syndrome (HUS)
- Renal/Non-glomerular: pyelonephritis, infarction, trauma, interstitial nephritis, malignancy

- Post-renal: infection (cystitis, prostatitis, urethritis, calculi, trauma (blunt, catheter placement), malignancy

Signs and symptoms

- Most cases of hematuria are clinically stable. If excessive blood, check vitals for hypotension, tachycardia. Look for fever. Ask about anticoagulants like Warfarin.
- History
  - o Ask about amount, duration, whether this has occurred before. Ask about flank pain (calculi), trauma, fever, back pain or hesitancy (UTI), vomiting (pyelonephritis)
  - o Recent skin or other infections (post-infectious glomerulonephritis)
  - o Transient hematuria can be from sexual activity or menstruation
  - o Vigorous exercise may produce transient hematuria or myoglobinuria
  - o Exposure to schistosomiasis, malaria, TB o Risk factors for urothelial cancer in patients with microscopic hematuria
    - ■ Smoking, age >40, gross hematuria, history of irritative voiding symptoms, occupational exposure to chemicals or dyes (benzenes or amides)
- Exam
  - o Focus on presence of rash (especially in children), fever, flank tenderness, hypertension, edema, palpable abdominal masses. Do rectal exam in older males to evaluate prostate
  - o Glomerular cases are usually painless o Extraglomerular cases usually present as clots in the urine

Differential diagnosis

- See causes above

Investigations

- Labs: FBC to check Hb, electrolytes, renal function, urinalysis (protein, RBC)
- Imaging: If clinically stable, refer for ultrasound of kidneys (renal size, masses, and to rule out obstruction), urine culture (UTI, schistosomiasis, TB), urethral culture (if suspect STI), possible referral for outpatient CT abdomen without contrast (larges stones, renal mass)

Management: General goal is to rule out life threatening bleeding, identify source of blood, treat infections, and refer for proper follow up

- UTI, pyelonephritis, or infected stone: antibiotics
  - o Uncomplicated UTI
    - ■ Nitrofurantoin lOOmg PO, two tablets 2x/day for 10 days OR
    - ■ Cefuroxime 500mg PO 2x/day for 5 days
    - ■ Encourage high fluid intake
  - o Pyelonephritis (UTI with flank pain, fever, vomiting)

        - Admit for IV antibiotics, IV fluids, monitoring
        - Ceftriaxone lg IV 2x/day until tolerating PO and fever resolved THEN CHANGE TO PO medications above for seven more days
    - If not getting better, consider unusual UTI
        - TB (sterile pyuria), candiduria, schistosomiasis, gonorrhea, chlamydia
- Urethral catheter for obstruction and to remove clots
    - Irrigate with NS until clots clear
- Refer to OPD Internal Medicine for nephrologist consult if
    - Acute kidney injury
    - Decreased urinary output (oliguria or anuria)
    - Indication for renal biopsy (persistent hematuria, 2+ protein)
    - Underlying cause unclear
- Refer to urology if
    - Gross hematuria
    - Abnormal cytology
    - High risk factors for cancer
    - Cystoscopy needed
    - Imaging showing urological disease

Recommendations

- Determine whether hematuria is microscopic or gross
- Assure patient is hemodynamically stable before sending home
- Check renal function (urea, creatinine) before sending home

5.c. Urinary Retention

Definition: Inability to pass urine voluntarily when the bladder is full. It can be painful when acute or painless if chronic.

Causes

- Obstructive
    - BPH (benign prostatic hyperplasia), bladder calculi, bladder neck stenosis, blood clot, cancer, cystocele, iatrogenic (previous catheters), phimosis/ paraphimosis, pregnant uterus, prolapsed uterus, rectocele, trauma, uretheral obstruction (tumor, inflammation, calculi), urethra stricture (mostly men), cystitis, herpes, prostatitis, STI, TB
- Neuropathic
    - Trauma, mass lesions, infection in the spine
    - Encephalitis, meningitis, stroke, diabetes, multiple sclerosis
- Medications
    - Antidepressants, antipsychotics,

Signs and symptoms

- Dysuria, painful urge to pass urine without output, uncontrolled dribbling of urine through the urethra
- Patients often have significant lower abdominal pain, fullness
- Do full GU exam to look for penile problems like phimosis/ paraphimosis

Investigations

- Labs: urinalysis with urine culture, renal function
- Imaging: If bedside ultrasound available, can help verify full bladder; referral for formal ultrasound once retention is relieved

Management: General goal is to catheterize the bladder, preferably by Foley catheter. Suprapubic catheter can be placed if Foley does not pass.

Recommendations

- Suprapubic catheter placement has many potential serious complications such as bowel perforation and bladder rupture. Use an ultrasound, when available, to verify a full bladder and ensure no bowel is present.
- Bleeding after catheter insertion is typically transient, and can be flushed with NS or sterile water.
- Patients with long-standing obstruction are at risk for post-obstructive dieresis as well as post-obstructive renal failure
    - o Check renal function in these patients
    - o If more than 1L of urine passes after catheterization, monitor patient for signs of hypotension and check renal function. Instruct patients to return if they develop fever, abdominal pain, catheter blockage or penile pain

Refer to urology OPD for further management once retention has resolved.

Patients with clot retention, significant hematuria, sepsis or possible neurologic cause of urinary retention should be transferred on an emergent or urgent basis, depending on vital signs

5.d. Renal Failure - Acute and Chronic

Definition: Decrease of kidney function that can be acute (decline in kidney function over hours to days) or chronic (decline in kidney function over months to years).

Typically, patients with acute renal failure have clinical symptoms that require prompt attention while chronic renal failure patients have subacute or chronic symptoms.

Causes

- Acute renal failure
    - o Pre-renal (most common cause)

        - Hypovolemia, vomiting/diarrhea, heat loss, burns, decreased cardiac output, sepsis, cirrhosis,
    - Intrinsic renal
        - Acute tubular necrosis, drugs, infections, acute glomerulonephritis, malignant hypertension
    - Post-renal
        - Urethral obstruction, cervical cancer, intra-abdominal tumor, neurogenic bladder
- Chronic renal failure
    - Obstructive
        - Nephrolithiasis, prostatic, congenital
    - Tubulointerstitial
        - Sickle cell, TB
    - Glomerular
        - Diabetic nephropathy, post infectious
    - Hereditary
        - Polycystic kidney disease
    - Vascular
        - Renal arterial disease, hypertensive nephrosclerosis

<u>Signs and symptoms</u>

- Assess ABCs. Start two IV lines in ill-appearing patients and assess oxygen saturation. Consider early Foley catheter placement to monitor urine output.
- For acute renal failure, there are no specific symptoms or signs to diagnose. It is often found on routine labs or during acute illness.
- Renal failure patients may present with uremia- pericardial effusion, coma, seizures, nausea/vomiting, platelet dysfunction. Uremic symptoms more common in chronic renal failure.
- Look for signs of volume overload (acute pulmonary edema is a common presentation of patients with acute renal failure)- hypertension, rales, peripheral edema, JVD
- Ask about urine output and place foley catheter to assess actual output over a 24hr period. Good urine output is at least 0.5cc/kg/hr.

<u>Investigations</u>

- Labs: FBC, electrolytes, calcium, renal function.
    - Potassium is the single more important electrolyte to obtain as hyperkalemia is a life-threatening emergency.

- o Chronic renal failure patients typically have chronic anemia, hypocalcemia. o Urea:Cr ratio in pre-renal >20; intrinsic renal 10-15 ratio; post-renal obstructive normal ratio
- Imaging: Ultrasound of kidneys- chronic renal failure typically shows bilateral small kidneys with increased parenchymal echogenicity

Management: Volume overload and hyperkalemia are the most common causes of death in acute renal failure. The goal is to start treatment on each of these conditions while awaiting transfer to referral hospital for dialysis consideration. At the time of publication, Rwanda's health insurance scheme will at times cover six sessions of dialysis if renal failure is deemed to be acute in nature. Typically, insurance will **not** cover chronic dialysis treatments, but patients can pay out of pocket for treatment.

- Volume overload associated with renal failure
  - o Check IVC (inferior vena cava) by ultrasound (if available) to see if patient is dehydrated. o A significant number of patients will have a pre-renal cause of acute renal failure (vomiting, burns, diarrhea, sepsis).
    - Place TWO IV lines and give 1L fluid bolus, while watching for clinical signs of worsening overload (increased respiratory rate, decreased saturation, development of rales on lung exam)
  - o Do NOT give iv fluid if the clinical picture is highly suggestive of pulmonary edema; if this is the case consider the following:
    - Give oxygen as needed to keep saturation above 95%.
    - Morphine l-2mg IV may help air hunger, but use is controversial
    - Furosemide 40-80mg IV 2-3x/day depending on Cr (the higher Cr, the more Furosemide that is needed)
  - o Positive pressure ventilation (at referral hospital only)
  - o Consider transfusion of blood in patients with Hb<7
- Hypertension associated with renal failure
  - o Nitroglycerin SL or IV is best to control blood pressure. Give 0.4mg SL every 5min on arrival for maximum three doses.
  - o Labetalol 20mg IV over 2 minutes initially, then 40-80mg IV every 10 min with total dose not exceeding 300mg- can be used in case of extremely high blood pressure and obvious volume overload on exam
  - o Captopril 25mg-50mg PO every 8-12 hour
- Hyperkalemia associated with renal failure
  - o Calcium gluconate IV
  - o Insulin IV/glucose IV
  - o Salbutamol nebulized

- o Sodium bicarbonate IV
- o Furosemide IV
- o Kayexalate PO

- Indications for acute dialysis
    - o Severe acidosis (pH less than 7)
    - o Electrolyte abnormalities (hyperkalemia and hyponatremia)
    - o Toxic Ingestions (ethylene glycol, methanol, salicylate/aspirin,
    - o Volume overload (acute pulmonary edema)
    - o Uremia

Recommendations

- Sometimes it will be quite difficult to determine if a patient's renal failure is acute or chronic, unless there is a documented history of renal problems in the past.
- Life-threatening complications of renal failure include hyperkalemia and volume overload. These must be recognized quickly and treatment started.
- Transfer any patient that has significant volume overload with or without uncontrolled blood pressure. It is also reasonable to transfer any patient anuria, not responding to fluid bolus. Do not delay treatment of above complications for transfer. Start treatment in the district.

5.e Urolithiasis

Definition: Stones that are found in the kidneys or the ureters. 75% of stones are either calcium oxalate or calcium phosphate.

Causes

- Calcium oxalate (majority)
- Infection stones
- Uric acid

Signs and symptoms

- History
    - o Patients often have rapid onset, excruciating pain (severe pain), typically from the back/flank radiating to the groin/front area. Pain can come and go.
    - o Blood tinged urine. Ask about fever, vomiting
- Exam
    - o Costovertebral tenderness (typically one side only)
    - o Normal pelvic exam in women (must rule out pelvic infections)
    - o Normal testicular/scrotal exam in men (must rule out torsion)

Differential diagnosis: Any patient over the age of 60 who presents with first-time renal colic, consider other diagnoses BEFORE urolithiasis (very uncommon to have first stone later in life)

- Pyelonephritis
- Appendicitis
- Abdominal or GYN tumors
- Abdominal aortic aneurysm
- Muscle strain or low back injury
- Gallstones
- Testicular or ovarian torsion

Investigations

- Labs
  - o Urinalysis is most important test
    - ■ Hematuria in 85%of patients, but it should not be used alone to exclude or confirm the diagnosis of ureterolithiasis o Consider FBC for WBC, renal function to ensure no renal failure o Test all females of childbearing age for pregnancy when considering renal colic
- Imaging: Abdominal XR will show up to 85% of renal stones; US is good to rule out hydronephrosis, but only shows stone 60% of the time; CT without contrast is 99% sensitive, if available.
- If patient has previous CT that confirms stone, no need to repeat

Management

- Urolithiasis
  - o Main goal is good hydration, pain control, rule out hydronephrosis and renal failure and rule out infection
    - ■ IV NS2L bolus
    - ■ Consider Tramadol for moderate pain
- Tramadol 50-100mg IV
    - ■ Consider opiate medication if severe pain
- Morphine O.lmg/kg IV
  - o If urinalysis confirms leukocytes/nitrites/bacteria, treat with IV antibiotics o Try abdominal XR, but a negative XR does NOT rule out stone (15-40% may not be visible on XR)
  - o If available, perform ultrasound to rule out hydronephrosis
  - o Most patients can be referred for outpatient evaluation with urology.
  - o If needed, a CT without contrast is the definitive imaging study to determine stone size and location

        - Stones larger than 5mm typically will NOT pass without urological intervention
        - Discharge with Brufen TID as long as renal function is normal(best pain medication) and ask patient to drink extra water to flush kidneys at home
    - Admit to district hospital
        - Signs of infection, fever
        - Uncontrolled vomiting
        - Need for repeat IV pain medications (uncontrolled pain)
        - History of diabetes (more prone to renal damage or failure)
    - Transfer to referral hospital
        - Unstable vital signs despite 2L of fluids IV
        - Confirmed hydronephrosis
- If unrelieved, irreversible renal damage occurs within 3 weeks with complete obstruction
        - Renal failure (new increase in Cr or anuria)
        - Calculus> 5 mm

<u>Recommendations</u>

- Any older patient presenting with first time flank pain, consider more serious diagnoses other than kidney stone (aneurysm) and refer for definitive imaging
- Patients with stones typically require opiate medication for pain control
- Stones larger than 5mm will not typically pass on their own and will require urgent urology referral

<u>5.f Urinary Tract Infection (UTI) and Pyelonephritis</u>

<u>Definition:</u> Diagnosis requires significant bacteriuria plus clinical signs and symptoms of infection. UTI is very common in women due to the short urethra. Men rarely develop UTIs before the age of 50. UTI is rarely life threatening in its uncomplicated form, however complicated UTIs such as pyelonephritis can cause **sepsis.**

<u>Types</u>

- Acute cystitis
    - Infection/ inflammation of the bladder and urethra (lower urinary tract)
    - Not systemically ill
- Acute pyelonephritis
    - Infection of the upper urinary tract (ureters, kidneys)
    - Usually have systemic symptoms
- Uncomplicated

- o UTI in an otherwise healthy non-pregnant woman with no urologic abnormalities
- o Causal bacteria:
  - ■ Will depend on location; no great data for Rwanda
  - ■ Escherichia coli: 80 to 90%
  - ■ Klebsiella, Proteus, Enterobacter, Pseudomonas: 5-20%
  - ■ Staph saprophyticus: up to 15% UTIs in young, sexually active women, rarely causes upper tract infections

- Complicated
  - o UTI in any other group other than healthy, non-pregnant women
  - o Associated with higher morbidity and/ or presence of anatomical abnormalities o Bacteria may be different
  - ■ More often pseudomonas or enterococcus

Signs and symptoms

- History
  - o Lower Tract Infection
    - ■ Dysuria
    - ■ Increased urinary frequency
- In young, healthy women, dysuria + frequency -> > 90% chance of UTI
    - ■ Hematuria
    - ■ Urgency
    - ■ Hesitancy
    - ■ Suprapubic discomfort
    - ■ Vaginal discharge makes diagnosis less likely
  - o Upper Tract Infection
    - ■ Lower tract symptoms PLUS:
- Back pain
- Nausea and vomiting
- Fever
- Exam
  - o Lower tract infections
    - ■ Rarely show abnormal vital signs or signs of systemic toxicity
    - ■ May have suprapubic tenderness
    - ■ Perform pelvic exam on any woman with lower abdominal pain or who has urinary symptoms without a positive urinalysis
    - ■ Perform testicular, prostate and penile exam on any man < 50 with UTI symptoms

    - Upper tract infections
        - Fever, tachycardia common
        - Uncommonly progresses to septic shock with low blood pressure
        - Often have unilateral costovertebral angle (CVA) tenderness
- Bedside tests
    - Urine dipstick to look for leukesterase (suggests presence of white blood cells) and nitrites (suggests presence of bacteria)
    - Urine pregnancy test for ALL women of childbearing age

<u>Differential diagnosis</u>

- Women
    - Sexually transmitted infection (HSV, cervicitis, pelvic inflammatory disease)
        - Especially if recurrent or fails to resolve with UTI treatment
    - Vaginitis (yeast or gardinella)
    - Local irritation (soaps, douching, trauma)
- Men
    - Young men *more likely* to have one of the following diagnoses than to have a UTI
        - Urethrithritis
        - Prostatitis
        - Epididymitis
- Nephrolithiasis
- Perinephric abscess
- Schistosomiasis
    - Especially if hematuria and from endemic area
- Urinary TB

<u>Investigations</u>

- Labs
    - Urine dipstick or urinalysis for all symptomatic patients
        - Can consider treating young women with dysuria and urgency without dipstick IF they can reliably return if symptoms to do resolve
    - Pregnancy test for ALL women of childbearing age
        - Will change treatment
    - Other labs not need routinely unless signs of upper tract infection/ toxicity
    - If signs of upper infection
        - FBC, creatinine useful
- Imaging
    - None for lower tract infections in adults

- In suspected upper tract infections, consider renal ultrasound to look for evidence of hydronephrosis (might indicate infected nephrolithiasis) or perinephric abscess

<u>Management</u>

- Best antibiotics will vary depending on local resistance patterns. Small surveys in Rwanda suggest very high resistance rates for most commonly available antibiotics. Therefore, if a patient is not improving, consider sending a urine culture with sensitivities and/ or changing antibiotics
- Uncomplicated UTI
    - Lower tract
        - Goal is to prevent progression to upper tract infection
            - Ciprofloxacin 500 mg BID x 3 days
            - Co-trimoxazole 160/800 BID x 3 days
            - Amoxicillin/ clavulanic acid 875 mg PO x 5 days
            - Nitrofurantoin 100 mg TID x 7 days
    - Upper tract
        - Outpatient treatment appropriate if patient is tolerating PO and well appearing
            - Pain control
            - Give above treatments (other than nitrofurantoin) for 14 days
        - Inpatient treatment if signs of severe infection (fever, hypotension, uncontrolled pain) or not tolerating PO
            - IVF for dehydration or sepsis
            - Pain and nausea control
            - Antibiotics
        - Ceftriaxone 1 gram IV BID OR
        - Cefotaxime 1 gram IV TID

          PLUS
        - Gentamycin 7 mg/kg IV Qday OR
        - Ampicillin 2 grams IV Q6H + Gentamycin 7mg/kg IV Qday
        - Be careful of using Gentamycin in patients in whom creatinine is not known
- Complicated UTI
    - Same as pyelonephritis regimens, treat 10-14 days o Consider urology referral if concern for concomitant nephrolithiasis, perinephric abscess, or structural urinary tract abnormality
- Pregnancy

- Asymptomatic bacteriuria increases risk of miscarriage; treat all women who are pregnant with a positive urinalysis regardless of symptoms
  - Nitrofurantoin x 7 days
  - Amoxicillin/ clavulanic acid 875 mg PO x 5 days

Recommendations

- UTI is an unlikely diagnosis in men < 50
- Consider STI as a common mimic
- Refer patients who may require urologic evaluation or instrumentation. Outpatient referral reasonable for stable patients.

6. Eye, Ear, Nose, & Throat

6.a Pharyngitis and Related Complications

Definition: Inflammation of the mucous membrane lining in the pharynx. Acute pharyngitis may lead to immediate complications including abscess, cellulitis, epiglottitis. Untreated pharyngitis may lead to a later complication of rheumatic fever, which is a leading cause of structural heart disease later in life.

Causes

- Group A beta-hemolytic Streptococcus (GABHS) is most common cause of pharyngitis
- Rhinovirus
- Epstein-Barr virus (EBV)
- HIV
- Mycoplasma pneumonia

Signs and symptoms

- ABCs- assess airway for adequate breathing, talking. Treat tachycardia or hypovolemia with pain control, fever control, and IV fluids
- History
  - Sore throat, fever, headache, swollen nodes at neck, dysphagia
  - Ask about trauma or possible swallowed foreign body
- Exam
  - Patients with deep space neck infections and epiglottitis may be very sick and appear toxic, dehydrated, and have fever. Examine patient for trismus (inability to open mouth), drooling, meningismus, stridor or other signs of severe disease or airway compromise. Severe disease may also present with inability to swallow or lie supine, muffled voice or respiratory distress (use of accessory muscles)

- Patients with retropharyngeal abscess may hold the head stiff and complain of neck pain. In adults, often extends into mediastinum
- Patients with peritonsillar abscess may lean to one side
- Patients with simple pharyngitis will be well appearing, have a clear voice, no difficulty with respirations.

Differential diagnosis

- Acute pharyngitis
- Retropharyngeal abscess
- Peritonsillar cellulitis
- Peritonsillar abscess
- Epiglottitis
- Ludwig's angina
- Foreign body
- Malignancy

Investigations

- Labs: Throat swab. FBC, renal function if toxic appearing and needs admission or transfer
- Imaging: None for simple pharyngitis. Imaging may be needed to diagnose complications of pharyngitis, but do not delay transfer of a sick patient to obtain imaging
  - If toxic appearing or needs ENT referral, the referral hospital may consider *CT with contrast* of neck. Abscess will only appear on CT if IV contrast is given. CT is the image study of choice for diagnosis of peritonsillar, retropharyngeal, and parapharyngeal abscess.
  - Lateral soft tissue airway X-ray: May see enlargement of epiglottis (thumb sign) or ballooning of the hypopharynx (in supraglottitis). May also see absence of a deep, well-defined vallecular air space running parallel to the pharyngotracheal air column that approaches the level of the hypoid bone (vallecula sign) in epiglottitis.

Management:

- The goal of management is to recognize simple throat infections and treat with appropriate antibiotics.
- Antibiotics start to work within 48hrs. Therefore, patients should be told that if they continue to have severe pain or fever after two days, they should return for further examination. These patients should be referred to ENT for further evaluation
- Any ill-appearing patients with fever and throat pain, who continue to have abnormal vital signs (tachycardia, hypotension) after pain control, fever control,

and IV fluids after 48hrs of treatment need immediate transfer to referral center.

- Acute pharyngitis- leading cause of rheumatic fever in children in the developing world, which can lead to mitral stenosis and severe cardiomyopathy.
  - If patient has normal vital signs (other than fever), is non-toxic in appearance, and can swallow tablets, can treat with PO antibiotics.
    - Amoxicillin 1000mg PO 3x/day for 7 days OR Penicillin VK 500mg PO 3x/day for 5 days

    AND
    - Ibuprofen 400mg PO 3x/day for 3-5 days
  - A single dose of PO or IM Dexamethasone in immunocompetent, pediatric and adult patients with moderate to severe pharyngitis has been shown to achieve an earlier onset of pain relief and a shorter duration of pain (Wing, etal).
  - Patient should have resolution of fever within 48hr of starting antibiotics. Their pain should be resolved within a few days. If pain worsening or fever continues, consider alternative diagnosis. Peritonsillar abscess (PTA)
  - Needle aspiration is the treatment of choice, in addition to either PO or IV antibiotics (antibiotics *without* needle aspiration or I&D typically does not treat PTA). Well-appearing patients can go home with drainage, antibiotics, and pain killer. Drainage of a PTA is a highly specialized procedure and should only be done by trained providers. Complications include puncture of the carotid artery, which could lead to massive hemorrhage. If it cannot be performed locally, transfer to ENT for drainage.
    - Drainage Procedure: With patient sitting upright or slightly hunched forward, insert an 18 gauge needle to the depth of 1cm, aspirating during insertion. Insertion of the needle more than 1cm runs the risk of puncturing the internal carotid artery. Internal carotid artery runs laterally and posterior to the posterior edge of the tonsil.
    - PO antibiotic choice: Amoxicillin/Clavulanic acid 875mg PO BID x 10 days OR Penicillin VK 500mg PO 4x/day for 10 days

    AND
    - Metronidazole 500mg PO 3x/day for 10 days OR Clindamycin 150mg PO 4x/day for 10 days (in Penicillin allergic patients)
    - A single dose of IV Dexamethasone steroids reduces pain
    - IV antibiotic choice: same as retropharyngeal abscess

  Retropharyngeal abscess

- More common in children under 3 years old. These patients are ill-appearing, and should prompt immediate transfer to referral center after stabilization with IV fluids, first dose of antibiotics, and supplemental oxygen as needed.
- Usually diagnosed by CT with IV contrast, but if suspected, start antibiotics, IV hydration, and transfer immediately for ENT referral
  - Clindamycin 600-900mg IV (first choice) OR
  - Cefoxatime 2g 3x/day IV OR
  - Ceftriaxone 2g 2x/day IV
- Usually requires surgical drainage by ENT
- Epiglottitis
- Patients are very ill-appearing. Often present in a "tri-pod" position-sitting up and forward with obvious difficulty breathing or stridor. They can have a hoarse voice, drooling and sit with a hyper extended neck. Do not ask them to lie down.
- Keep patient sitting upright in a position of comfort. Immediate transfer to referral center with notification of ENT or A&E doctor prior to arrival. Tell team at referral hospital to be prepared for surgical airway. Treatment begins with supplemental *humidified* oxygen, IV hydration, and IV antibiotics. Start antibiotics before transferring:
  - Adults:
- Ceftriaxone 2g IV 2x/day OR
- Ampicillin lg IV every 4 hours AND
- Gentamycin 3mg/kg/day IV divided in doses every 8hr IV
  - Pediatrics:
- Ampicillin IV 50-100mg/kg 4x/day for 10 days AND
- Gentamycin IV 3-5mg/kg 2x/day for 5 days

6.b Epistaxis

Definition: Bleeding from the nose. About 90% of bleeds come from a blood vessel in the anterior part of the nose and can be visualized. Posterior bleeding is less common. Posterior hemorrhage cannot be visualized, tends to be more severe, and these patients need to be seen by ENT immediately. Except in trauma, bleeding is localized to one point on one side of the nose.

Causes

- Most cases are spontaneous and without good cause
- Facial trauma
- Nose picking
- Foreign body, tumors
- Bleeding disorder

- High blood pressure

Signs and symptoms

- Check ABCs
- History: Trauma? History of similar? Bleeding from other body sites (gum bleeding, easy bruising, etc.)?
- Exam
    - o Blood typically comes from one side of the nose. Ask patient to blow nose and clear clots in order to visualize bleeding vessel better. Use the brightest light possible

Investigations

- Labs: FBC if bleeding is extensive or patient has other signs of abnormal bleeding
- Nasal endoscopy if available

Management

- Epistaxis with massive hemorrhage
    - Check and stabilize ABCs. Prepare for immediate transfer if airway is at risk. Provide supplemental oxygen if saturation is low, and start IV lines with NS fluids. Transfer immediately to A&E or ENT
    - Consider early transfusion if hypotensive and not responsive to fluids
    - Attempt packing of affected naris before transfer.
- Epistaxis without massive hemorrhage
    - Clean blood clots from the nose
    - Direct pressure applied by pinching the soft fleshy part of the nose for at least 10-20 minutes continuously o Have patient bend forward at the waist to prevent blood from entering airway o If direct pressure doesn't work, use a light and attempt to locate bleeding vessel (anterior chamber only). Attempt anterior nasal packing:

        Apply tetracycline ointment to tip of gauze before packing.

        Keep packing in place for two days before removal. If bleeding continues beyond two days with packing, refer to ENT immediately.

        If a patient goes home with nasal packing, they need prophylaxis antibiotics to prevent sinus infection: amoxicillin PO for seven days.

Recommendations

- Most cases of epistaxis are benign and resolve with good pressure to the nasal bridge.
- Take a good history to rule out a bleeding disorder as the cause of epistaxis and send an FBC as a screening test.
- Continued or recurrent bleeding must be transferred for ENT consultation

6.c Ear, Nose Throat Foreign Body

Definition: It is a foreign object inserted into the nose, ear, or throat.

Causes

- Typically, self-inflicted by children putting foreign body into their nose or ear or swallowing foreign body. Adults with mental disorders also at risk. Insectsmay also crawl into the ears during sleep.

Signs and symptoms

- Always start with ABCs, particularly looking for respiratory complaints if swallowed foreign body
  - Listen for stridor (noise coming from the throat), change in voice, new wheezing
- History
  - Adults will say, "there is something in my ear" or have hearing deficit. Children will sometimes just tug at the ear, have bleeding, or hearing deficit. Infants may also present with unexplained crying or fussiness.
- Exam
  - Foreign bodies in nose and ear are clinical diagnosis, but require a good light to examine
  - Foreign body in throat may cause odynophagia, dysphagia o
  - Foreign body in the airway may cause stridor
- Bedside tests
  - For foreign body in the throat not visualized, can do chest XR for radio-opaque objects

Differential diagnosis

- Nose
  - Insect/parasite in chronically ill adults
  - Sinusitis, gripe
  - In children you can see food, beads, toys, disk batteries
  - Septal hematoma, polyp, tumor
- Ear
  - Otitis media, otitis externa
  - Wax impaction
  - Tympanic membrane perforation
  - Cholesteatoma
  - Insect in ear
- Throat/Airway
  - Pharyngeal FB
  - Laryngeal FB
  - Esophageal FB

- Croup
- Epiglottitis
- Residual orophaiyngeal trauma after spontaneously resolved obstruction

Investigations

- Labs: none- diagnose by clinical history and physical exam
- Imaging: consider XR if swallowed foreign body

Management: General goal depends on equipment available at local hospital. If a good light, otoscope/microscope, and tools like alligator forceps are available, it may be possible to try to remove a foreign body from the nose or the ear. If you don't have proper equipment don't try the extraction as there is a risk of pushing object further in and there is a risk of causing worsening damage. If good equipment is NOT available, transfer to ENT for extraction.

- Insect in ear
  - Kill insect with mineral oil or other viscous material, irrigate with water at body temperature. Attempt to suction smooth objects like a bean or bead, but insects require alligator forceps under direct visualization
- Foreign body in nose
  - If object can be visualized with light, can attempt the "Kissing Technique."
    - Blow forcefully into mouth with unaffected nostril occluded. Object will come out of naris/nostril.
    - Attempt only once. If it doesn't work, transfer to ENT for extraction.
  - If object is smooth like bead or bean, can attempt gentle suction if available
- Esophageal foreign body
  - Diagnosed by history alone (witness watched child swallow object) or by XR
  - Immediate transfer to ENT for extraction
- Foreign body in throat/Airway
  - If patient has shortness of breath or stridor (noise from the throat with regular breathing), needs *immediate* airway maneuvers such as Heimlich maneuver. Prepare for immediately transfer to ENT/A&E for airway protection. Give supplemental oxygen en route.
    - Heimlich maneuver, stomach thrusts, back blows depending on age of patient o If patient has pain after swallowing meat or fish bone, but can drink water or eat food, no need for emergent referral. OPD/ENT follow up is needed.. If unable to swallow water or can't swallow own saliva, needs immediate referral to ENT/A&E.

7. Neurology

7.a Altered Mental Status (AMS) and General Approach to Coma

Definition: Change in neurologic awareness from baseline mental status. It can be acute (occurring within the past few hours or days) or gradual (occurring within the past weeks or months). *Drowsiness or lethargy* is a minor change with slightly decreased wakefulness, but patient is aroused with verbal stimuli or light. *Coma* is a state by which patient cannot be wakened by any stimuli.

Initial approach to assessment and management

- Initial interventions: ABCs, vital signs, IV, immediate bedside glycemia, oxygen saturation
  - Is patient protecting airway (secretions, emesis)? o Signs of shock (hypotension, cold extremities, weak pulses, delayed capillary refill,)?
    - Start IV fluid 1L bolus if signs of shock present.
  - All patients with altered mental status need rapid glycemia at triage; give dextrose IV if glycemia is unavailable
- History
  - Ask about recent trauma
  - Onset, evolution, duration?
  - Associated fever, headache, N/V/D, shortness of breath, polyuria?
  - Recent illness, new medications?
  - Exposure to tick/snake/spider?
  - Possible ingestion, intoxication or withdrawal?
- Exam
  - Focused neurological exam
    - Mental status (GCS or AVPU)
    - Eyes: Deviation, nystagmus, pupillary reactivity, cranial nerves, motor (tone, symmetry)
    - Focused exam for etiology: hematoma, laceration, signs of head trauma? Fever, hypotension, rash (septic shock)? Respiratory difficulty (hypoxemia)? Abdomen (pregnant with HELLP or eclampsia)? Skin infections (bedsores, rashes)? Smell of ketosis (fruity breathe) or rapid shallow breathing (DKA)?
    - Unilateral weakness (sign of CVA)?

Differential diagnosis: Several mnemonics can help to remember extensive differential diagnosis list. AEIOU-TIPS is just one of them.

- A: alcohol (ethanol, methanol, thiamine deficiency/Wernicke's encephalopathy)

- E: epilepsy and endocrine (continuous seizure, post-ictal state, hyponatremia, hypernatremia, hypercalcemia, hypoglycemia, DKA, hypothyroidism, thyrotoxicosis, hepatic encephalopathy)
- I: insulin (hyperglycemia or hypoglycemia)
- 0: overdose and oxygen (organophosphate poisoning, opiate over-dose, hypoxemia)
- U: uremia (renal failure)
- T: trauma and toxins (subarachnoid hemorrhage, subdural, epidural, cerebral contusion, diffuse cerebral edema, carbon monoxide)
- I: infection (meningitis, intracranial abscess, sepsis, cerebral malaria, encephalitis)
- P: psychiatric (should be a diagnosis of exclusion)
- S: stroke, shock, space occupying lesion (hypertensive bleeds, ischemic stroke, sepsis, tumors)

Investigations

- Labs
    - FBC, electrolytes, renal function, HIV status, glucose, malaria, liver and thyroid function tests, in some cases. o Cerebral spine fluid analysis if concern for infection.
- Imaging
    - Brain CT (the majority of brain CTs for altered mental status and trauma presenting to the ER or hospital should be WITHOUT IV contrast; IV contrast is reserved for patients with known HIV positive serology or known space occupying lesion).

Management: The management varies depending on etiology of altered mental state. Patients presenting to district hospitals with altered mental status and STABLE vital signs should have a minimum work up to determine the cause (electrolytes, FBC, malaria test, HIV test). If patient has UNSTABLE vital signs, district hospitals should give oxygen, start IV fluids, give dextrose if needed, place foley catheter, start antibiotics if concern for sepsis, and consider transfer to referral hospital within 24hrs if no improvement for further work up and management

7.b Non-traumatic Headache

Definition: Pain in the head that can be classified as acute and singular (first headache), acute recurrent, or chronic in nature. The main goal is to appropriately select patients for emergency investigation (with brain CT) and to offer pain relief to those with a benign, reversible cause of headache with a good follow up plan.

Causes

- Primary headache
  - Migraine
  - Tension headache
- Secondary headache
  - Vascular
    - Subarachnoid hemorrhage
    - Epidural hematoma
    - Subdural hematoma
    - Stroke
    - Intraparenchymal hemorrhage
    - Venous sinus thrombosis
    - Temporal arteritis
  - CNS Infection
    - Meningitis
    - Encephalitis
    - Cerebral abscess
  - Tumor
  - Toxicity
    - Carbon Monoxide (CO) poisoning
  - Preeclampsia
  - Hypertensive Emergency

Signs and symptoms

- History
  - General history includes onset, headache location (unilateral is typically migraine, occipitonuchal leads to higher suspicion for intracranial pathology), associated symptoms (syncope, confusion, neck pain, visual disturbance, fever), remote or recent trauma history, toxic exposures (indoor cooking-carbon monoxide), possible HIV or malignancy, history of hypertension
  - History should include any "red flags" (warning signs that there is a serious etiology behind the headache)
    - Sudden onset (time from onset to maximal pain is seconds), especially if it begins during exertion (coughing, defecation, etc.), worst headache of life -> SAH
    - Positional in nature (worse with laying down or bending forward) -> space occupying lesion
    - First headache in life and age over 50 -> consider space occupying lesion, bleeding

- Fever, neck stiffness, change in neurological status -> meningitis or abscess
- History of malignancy, weight loss, possible TB, HIV -> space occupying lesion or infection
- Post partum or currently pregnant -> Preeclampsia

- Exam
  - All patients needs full set of vital signs looking for high blood pressure, low saturation o

    Complete full neurological exam
    - Strength in all four extremities
    - Vision and visual field examination
    - Sensation in all four extremities
    - Coordination (finger to nose, gait, Rhomberg test)
    - Cranial nerves

<u>Investigations</u>

- Labs
  - FBC to rule out anemia, thrombocytopenia (patients with platelets less than 10,000 are at high risk of intracranial bleeding); malaria smear, urine pregnancy test
- Imaging
  - CT without contrast is typically adequate to exclude a critical space occupying lesion and is the best test to diagnose subarachnoid hemorrhage
  - CT with contrast is typically indicated in patients with known history of HIV, high suspicion of space occupying lesion (first time *focal* seizure, history suggestive of increased intracranial pressure)
    - Performing CT with contrast on every patient with headache increases time, expense and risk of adverse effects
- Lumbar puncture (LP) if recent fever, HIV (suspected meningitis) or high suspicion of subarachnoid hemorrhage (SAH) when CT scan findings are normal
  - CT scan should be done before lumbar puncture if there is suspected increased intracranial pressure.
    - There is currently no consensus as to when a CT is absolutely indicated before LP. Some would argue that patients with a normal consciousness (GCS=15) and normal neurological exam do NOT need a CT before an LP, even if there is a history of HIV.

    ■ If there is altered mental status (GCS<14) or a focal neurological finding on exam (unilateral weakness, gaze paralysis, facial droop, etc.), then do a CT before LP.

<u>Management:</u> The general goal is to determine who needs a CT scan and on what time basis (immediate, OPD, or no indication) and to offer pain control for primary causes of headache.

- Who to CT?
  - Patients with any of the "red flag" symptoms/signs, as described above, should be transferred or admitted for immediate CT brain.
  - Patients with recurrent headaches or headache for many weeks/months *without* any of the "red flag" symptoms can be referred for an outpatient CT and then given follow up with OPD for review.
  - Patients with suspicion of primary headache (tension, migraine), with a normal neurological exam and no history of immunocompromise or cancer do not need a CT. They can be treated and discharged home with OPD follow up. If symptoms change or worsen, tell the patient to return to the hospital for evaluation.
- Tension headache: typically bilateral, non-pulsating, not worsened by exertion, not associated with nausea and vomiting
  - Typically better with Paracetamol or NSAIDs. Encourage patient to drink plenty of water, as dehydration can play a role. Talk about stressors at home, alcohol use.
  - Refer to OPD for follow up after prescribing pain control to ensure headache is better
- Migraine headache: typically slow in onset (gradually worsens over hours to days), lasts from 4-72 hours, unilateral, pulsating, worsened by physical activity; may see nausea/vomiting and photophobia; may also note visual auras (dark spots, flashing lights)
  - No clear consensus on the best therapy for migraine. o Within Rwanda, two possibilities from randomized controlled ED-based trials exist:
    - ■ 1L NS (IV fluids) AND
    - ■ Metoclopramide 10mg IV once AND
    - ■ Tramadol 50-100mg IV once

    OR
    - ■ 1L NS (IV fluids) AND
    - ■ Dexamethasone 20mg IV once AND
    - ■ Tramadol 50-100mg IV once

    - Refer to OPD for follow up after prescribing pain control to ensure headache is better
- Non traumatic bleeds or intracranial processes: subarachnoid hemorrhage, subdural hematoma, space occupying lesion, epidural hematoma
    - Consider the patient's age and prognosis as you consult neurosurgery. If patient is older than 50, has metastatic disease, multiple comorbidities, or has a very low GCS, consider palliative care in the district hospital
    - If patient is young, otherwise healthy and tumor is only medical condition, consider immediate transfer for further evaluation and treatment
- Carbon monoxide poisoning
    - Supplemental 02 by NRB

Recommendations

- The key to deciding whether a patient with nontraumatic headache needs emergent brain CT is in a good history and complete physical exam (including detailed neurological exam).
- Refer patients for immediate brain CT when they have one of the "red flags" in their history or an abnormal neurological exam. Other patients can be referred for an outpatient brain CT and OPD follow up. Suspected primary headaches and be treated and discharged without consideration for brain CT.

7.c Seizure

Definition: Uncontrolled shaking in the body from excessive and disorderly neuronal discharge in the cerebral cortex. *Epilepsy* is a condition of unprovoked seizures. Some seizures are partial or focal, while others are generalized or "whole body." *Post-ictal state* refers to the time after the seizure finishes, when a patient can be comatose or confused. *Status epilepticus* is defined as a seizure that lasts 5-10 minutes or two seizures without full recovery between them. If a seizure lasts more than 30 minutes, the body can no longer regulate homeostasis-blood pressure drops and acidosis builds, sometimes resulting in neuronal damage.

Initial approach to assessment and management

- Initial interventions include assessing ABCs, vital signs, IV access, and rapid glycemia check
    - Airway: risk of emesis, aspiration
    - Breathing: aspiration or hypoxemia
    - Circulation: signs of shock?
- History:
    - Onset, progression, duration

  - Responsive during event (during partial seizures, patient may be responsive; during tonic clonic or generalized seizures, patient is not responsive)?
  - Ask family to describe movements- are they bilateral or focal (happening in only one part of the body)?
  - History of previous seizure?
  - Drug use? INH use? Possible ingestion?
  - Immunosuppression? Recent fever or illness? Recent trauma?
- Exam:
  - General exam, including full neurological exam
    - Evidence of ingestion? Suspicious odors?
    - Evidence of trauma?
    - Focal deficit during seizure (gaze preference, unilateral shaking)?
    - Fever or signs of shock (cold extremities, weak pulses)?

Differential diagnosis

- Fever or immunosuppression: meningitis or other CNS infection, cerebral malaria, toxoplasmosis, neurocysticercosis
- Ingestion or toxicity: Tricyclic antidepressant overdose, INH overdose, Theophylline overdose, organophosphate overdose, Phenytoin overdose alcohol withdrawal (usually 24-72 hours after last drink)
- Trauma: head injury
- History of epilepsy: factors lowering seizure threshold (infection, insomnia, puberty), missed dose of seizure medication, progressive disease (need for new medication), undiagnosed space-occupying lesion (no previous brain imaging), undiagnosed metabolic or thyroid disease
- Refractory seizures: electrolyte disturbance (hyponatremia), toxin exposure (especially INH), venous sinus thrombosis
- Behavior change or focal neurological signs: encephalitis (HSV), space occupying lesion, HIV/AIDS with toxoplasmosis, vasculitis (SLE)
- Vomiting and/or diarrhea with seizures: hypoglycemia, electrolyte imbalance, GI infection with associated Shigella toxin, DKA, organophosphate poisoning
- Other seizure-mimicking etiologies: syncope (patient will NOT be confused after a syncopal event, there is no tongue biting or urinary incontinence in a syncopal event), migraine with an aura, hypoglycemia (all seizure patients need immediate glycemia), tetanus, psychogenic event (this is a diagnosis of exclusion and should NOT be assumed until a full work up, including head CT and possibly lumbar puncture has been completed)

Investigations

- Labs
  - FBC, electrolytes, renal function, malaria, HIV, urinalysis, lumbar puncture (possibly after brain CT)
- Imaging
  - Chest XR if concern for infection
  - Brain CT without contrast if concern for trauma, space occupying lesion, or cause of seizure is unknown. o If patient has known HIV, order CT brain with contrast for better evaluation of infection or possible abscess.
  - Patients with first time seizure disorder should have a brain CT as a part of their work up, but this can be done as outpatient or OPD clinic if patient is stable and has returned to normal baseline mentation.

Management: General goal is to stop the seizures as soon as possible to prevent permanent brain damage and aspiration. Once seizures are under control, patient should return to normal mental baseline between 1-8 hours. If a patient does not return to baseline mental status, he needs further evaluation for underlying causes, including CT.

General management of seizing patient

- Place patient in lateral position. Do NOT put anything in patient's mouth to stop tongue biting
- Place patient on oxygen mask
- Do immediate bedside glycemia. Give IV Dextrose if glycemia measurement is not available.
- Start treatment of seizure immediately without waiting for results of special investigations
- Pharmacologic treatment (first line)
  - If IV line:
    - Diazepam, 10-20mg IV, not faster than 2mg/minute OR
    - Clonazepam lmg IV every 5min until seizure stops (max dose 4mg)

    THEN
    - Phenytoin 20mg/kg IV diluted in NS administered not faster than 50mg/minute preferably with cardiac monitoring (NOTE: IV Phenytoin can cause cardiac abnormality. If arrhythmias occur, stop infusion and start again more slowly)- loading dose
  - If no IV line:
    - Diazepam 10-20mg IM (takes longer to work and less reliable)

    THEN
    - Phenytoin 20mg/kg PO OR Phenobarbitol 20mg/kg PO loading doses

- If seizures continue despite above measures, use
    - Phenobarbital loading dose 20mg/kg IV at rate of 50-75 mg/min. If no response, repeat at 5-10mg/kg IV. Maintenance dose l-5mg/kg/day orally. Can cause respiratory depression so be prepared to intubate.
- If seizure continues after 30 minutes despite above measures, then
- Intubate and ventilate patient
    - Start thiopental sodium 2-4mg/kg IV, followed by 50mg boluses every 2-3 minutes to control seizures. Maintenance dose l-5mg/kg/hour.
      Watch for hypotension. Once seizures are controlled for 24hr, wean off thiopental by decreasing the dose by lmg/kg every 12hr.
- Maintenance therapy once seizures are controlled
    - Phenytoin lOOmg IV every 8hr OR 300mg PO every night

Recommendations

- Every patient actively seizing needs immediately bedside glycemia on arrival. Give IV Dextrose if no glycemia measurement available.
- Actively seizing patient should be turned on their size to prevent aspiration, and give IV or IM medications as soon as possible to stop the seizures.
- Any patient that doesn't return to normal mental status after their seizures (within 12 hours) should be transferred to a referral center for further evaluation.

7.d Subarachnoid Hemorrhage (SAH)

Definition**:** Bleeding into the subarachnoid space.

Causes

- Traumatic
- Spontaneous
    o Rupture of aneurysm, usually congenital

Signs and symptoms

- Initial interventions: Check ABCs, start IV line, place on cardiac monitor if available, check glycemia if altered, oxygen saturation
- History:
    - Spontaneous SAH typically presents with **sudden severe headache** often described as worst headache of life. Reaches maximal intensity within minutes (rather than a gradual onset).
    - Often presents with nausea, vomiting, syncope, confusion, and diplopia.
    - Risk factors include age greater than 30 years old (rare before 30yo), HTN, smoking history, family history, alcohol or stimulant abuse, female gender, and connective tissue disorder (Marfan's)

- Exam:
  - Full neurological exam looking for focal findings

Differential diagnosis

- CNS infection (meningitis, abscess)
- Severe primary headache (migraine, tension)
- Space occupying lesion
- Stroke
- Hypertensive encephalopathy

Investigations

- Labs: Regular labs will NOT diagnose SAH. If admitting for altered mental status/coma, can order FBC, electrolytes, renal function, malaria, HIV.
- Imaging: CT brain to diagnose SAH is not a good study if the bleeding is very small, but is useful if bleeding is large. CT brain is better the earlier it is done (more useful in first several hours of headache and less useful if many days have gone by). While CT brain with IV contrast is a superior study at detecting a bleeding vessel, most patients with an undifferentiated headache should receive CT without contrast as first study.
- Lumbar puncture is better at detecting SAH compared to CT. Send two tubes of CSF fluid. Evaluate for increase in the number of RBCs in the second tube compared to the first tube. Can also see xanthochromia (yellowing of CSF after fluid is spun).

Management

- Subarachnoid hemorrhage
  - Keep head of bed elevated to 30 degrees
  - Blood pressure control to keep systolic BP <160mmHg or diastolic BP <100mmHg or MAP<110mmHg
    - First line medication: labetalol 20mg IV over 2 minutes initially, then 40-80mg IV every 10 min until blood pressure is lowered by 25% or at a goal of 160mmHg; total dose NOT to exceed 300mg
    - Second line medication: Hydralazine 20-40mg IV/IM; repeat every 30 min as needed until target BP reached
    - Nicardipine 5mg/hr IV by slow infusion (50mL/hr) initially; may be increased by 2.5mg/hr every 15minutes; not to exceed 15mg/hr
    - Nitroprusside 0.25-0.3mcg/kg/min IV infusion; may increase by 0.5mcg/kg/min every few minutes to target BP
  - Prevent cerebral vasospasm with calcium channel blockers
    - Nimodipine 60mg PO every 4hr for 21 days; begin therapy within 96 hours of SAH

OR

- ■ Nicardipine IV (see above for dose)

- o Seizure control with benzodiazepine
  - ■ Diazepam 10-20mg IV as needed for seizure control
- o Transfer to referral hospital for neurosurgical review. Patients may present with GCS<8, which is normally an indication for intubation. However, if CT brain result is available, discuss intubation with neurosurgery consultant and consider ICU bed availability. Most cases of severe SAH with low GCS are conservative management only in a district hospital; therefore intubation may not be the best course for the patient. (Roth well, P et al. 2011; Runchey, S and McGee, S. 2010; Walker, R. et al. 2011; Stevens D, Bisno A, et al. 2014; Yealy, et al. 2014).

8. Anemia

Definition: A decrease in the number of circulating red blood cells (RBCs) in the body as well as a decrease in the capacity of the blood to carry oxygen to the body's tissues. Anemia is not a disease within itself. It is necessary to search for the underlying cause of anemia.

- Normal values: >13g/dl men, >12g/dl women, >llg/dl pregnant women, >llg/dl children, >9.5g/dl age 2-6 months, >13.5g/dl neonates

Causes and differential diagnosis

- Increased red blood cell destruction
  - o Infections (malaria, syphilis, parasites)
  - o Thyroid disease
  - o Cancer (leukemia, lymphoma)
  - o Hypersplenism
  - o Thalassemia
  - o Medications (anti-retroviral agents)
- Decreased red blood cell production
  - o Iron deficiency
  - o Chronic conditions (diabetes, liver failure, renal failure)
  - o Lead poisoning
  - o Folic acid or Vitamin B12 deficiency
  - o Viral infections (HIV)
- Blood loss
  - o Trauma (chest .abdomen ,femur .environment .pelvis)
  - o Hemoptysis

- GI tract (upper and lower GI bleeding)
- Obs and Gynecologic (vaginal bleeding, placenta previa, abruption)

Signs and symptoms

- History
  - Ask about any blood loss (menstrual, GI tract) o Ask about symptoms of anemia including chest pain, dizziness, shortness of breath
- Exam
  - Acute blood loss will cause hypovolemia, tachycardia, and hypotension
    - Consider menstrual or GI tract blood loss
  - Anemia secondary to chronic blood loss will cause progressive fatigue, malaise, weakness.
    - Vital signs may be normal
  - Pale conjunctiva, palms, and soles (signs of low Hb) o Hypoxia, crackles on lung auscultation, tachycardia, tachypnea, edema of hands or feet (signs of heart failure)
  - Jaundice (hemolysis), splenomegaly (thalassemia), petechiae, purpura (bleeding disorder)

Investigations

- Labs: FBC, peripheral smear, coagulation factors, reticulocyte count
  - If avaiable, send peripheral blood smear BEFORE transfusion in order for hematologist to accurately investigate cause of anemia

Management

- Blood transfusion (1 unit of blood will raise hemoglobin by approximately lg/dl)
  - Transfuse packed RBC for
    - Acute, severe anemia with low blood pressure or severe tachycardia (trauma, massive bleeding during surgery)
    - Hemoglobin<5g/dl in patients with chronic anemia but feeling well (consider chronic anemia in patients with normal vital signs)
    - Hemoglobin<6g/dl in patients with heart failure, severe chronic anemia with fatigue or intolerance, or anemia in late pregnancy who is not responsive to folic acid and iron
    - Hemoglobin <7g/dl in acute anemia (acute GI or GU blood loss) with ongoing bleeding
    - Pale conjunctiva alone is NEVER a reason to do transfusion
- Treatment of iron deficiency
  - Ferrous sulphate 200mg PO TID with meals for six months

  OR

- Ferrous fumarate 200mg PO TID with meals for six months

Recommendations

- Try to differentiate acute versus chronic anemia by a good history and looking at vital signs. Chronic anemia rarely needs transfusion unless hemoglobin<5g/dl.
- Immediate transfer to referral center for patients with ongoing, active blood loss or abnormal vital signs
  - Patients with active upper GI bleeding should be referred early as they can decompensate and die quickly if the bleeding is not controlled
- Referral to OPD appropriate for patients with chronic anemia with normal vital signs

8.a Transfusion Reactions and Complications

Definition: A transfusion reaction is any complication that can arise during or after receiving a blood transfusion. The most common reaction, simple febrile reaction, is not life-threatening, but needs to be recognized early. Other reactions are more rare, but have a very high mortality rate (acute hemolysis and transfusion-related acute lung injury), and must be recognized and treated immediately.

Causes:

- Simple febrile reaction
  - Caused by antibodies that accumulate in the stored blood
  - Most common, but not dangerous if noted and treated early
- Acute hemolysis
  - Most often clerical error (wrong blood type given to patient)
  - High mortality rate and most common cause of transfusion-related death
- Transfusion-related acute lung injury (TRALI)
  - A non-cardiogenic pulmonary edema (equivalent to an adult respiratory distress syndrome) caused by antibodies in donor reacting with patient's WBCs
  - High mortality rate and second most common cause of transfusion-related death
- Anaphylaxis
  - Patient is allergic to IgA, which is present in transfused blood (unable to predict which patients are allergic)
- Sepsis

    - Occurs when a contaminated blood product is given to a patient (more common in platelet transfusion because they are stored at room temperature)
- Delayed hemolysis
    - Caused by reactivation of antibodies to minor RBC antigen systems

<u>Signs and Symptoms</u>

- Simple febrile reaction
    - Isolated fever during transfusion **without** more serious signs of vomiting, back pain, hypotension, or evidence of hemolysis
- Acute hemolysis
    - Acute renal failure, DIC, mucocutaneous bleeding cardiovascular collapse
    - Patients experience sudden onset fever, chills, low back pain, vomiting, tachycardia, hypotension, itching, shortness of breath
    - Symptoms typically begin within one hour of starting transfusion, but may occur later
- Transfusion-related acute lung injury (TRALI)
    - Acute, progressive dyspnea and rales that develop after a period **no longer** than 6 hours following a blood transfusion
    - Must differentiate TRALI from congestive heart failure by patient history and chest XR (TRALI chest XR will show diffuse interstitial edema WITHOUT cardiomegaly) Flat neck veins is a good sign that helps differential of these two conditions
- Acute congestive heart failure (CHF)
    - Acute, progressive dyspnea and rales that develop over minutes or hours, during or soon after a blood transfusion. Distended neck veins are present.
    - Must differentiate congestive heart failure from TRALI by patient history and chest XR (CHF chest XR will show diffuse interstitial edema WITH cardiomegaly)
- Anaphylaxis
    - Sudden flushing, pruritus, laryngospasm, bronchospasm, hypotension
- Sepsis
    - Fever, chills, hypotension
- Delayed hemolysis
    - Presents less severe and less dramatic than acute hemolytic reaction days or weeks after a transfusion
    - Low-grade hemolysis and progressively worsening anemia
    - Progression to renal failure a possibility, but rare. Typically self-limiting

Differential diagnosis:

- Acute, severe reactions
  - Acute hemolysis
  - Anaphylaxis
  - Septic
  - Transfusion-related acute lung injury
  - Congestive heart failure
- Acute, minor reactions
  - Simple fever
  - Allergic
- Delayed reactions
  - Delayed hemolysis
  - Graft-versus-host disease
  - Infections: Hepatitis, HIV, Cytomegalovirus, Epstein-Barr virus, syphilis, malaria, toxoplasmosis, Trypanosomiasis, Cytomegalo-virus)

Investigations

- Labs: blood and urine cultures if signs of sepsis
- Imaging: CXR for rales, wheezing, dyspnea

Management

- Simple febrile reaction
  - Paracetamol 500mg PO every 4hr as needed for fever
  - Consider resuming transfusion if no vomiting, back pain, hypotension
- Acute hemolysis
  - IV fluid bolus
  - Vasopressors to support blood pressure
    - Dopamine 10-20ug/kg/min to keep SBP>120 or MAP>65
  - Consider Furosemide 40-60mg IV x 1 dose
- TRALI or CHF
  - Obtain chest XR to differentiate the two processes
  - Nitroglycerin 0.4mg sub lingual (if available]
  - Furosemide 40-80mg IV once to start diuresis
- Anaphylaxis
  - Adrenaline O.lmg IV every 20min for upper airway edema, active wheezing, hypotension (put 1 ampule of 1 mg/ml adrenaline into a lOcc syringe with 9 ml NS to make O.lmg per lml]
  - Dexamethasone lmg/kg IV once OR Methylprednisolone 125mg IV once
  - Diphenhydramine 50mg IV once
  - Salbutamol 5mg nebulized (if wheezing]

   - IV fluid bolus Adrenaline, ethylprednisolone IV, diphenhydramine IV, Ibutamol (ifwhec IV fluid bolus
- Minor allergic reaction
   - Diphenhydramine 50mg PO/IV/IM every 6hr to prevent itching
   - Consider resuming transfusion if no vomiting, back pain, hypotension

Recommendations

- There are risks involved in everything we do, including a "simple" blood transfusion. Ensure the patient really needs the transfusion and that the benefits outweigh the risks.
- Explain to the patient the basic risks of a blood transfusion and obtain consent before giving blood.
- Two health providers need to agree that the correct blood is being given to the correct patient.
- There is no supported recommendation as to how fast to run blood in, but it should be **no longer than four hours.** Generally speaking, you can transfuse a unit of blood over 2hr (faster if it is a trauma patient or someone who is severely ill).
- Monitor a patient regularly during blood transfusion for signs and symptoms of a reaction and treat accordingly.

9. Infectious Disease

9.a Sepsis and Septic Shock

Definitions

- *SIRS (systemic inflammatory response syndrome):* the presence of two or more of the following clinical indicators:
   1. a temperature over 38C (100.4F) or below 36C (96.8F),
   2. a heart rate over 90 beats per minute,
   3. a respiratory rate over 20 breaths per minute (or a paCO2 < 32mmHg),
   4. a white blood cell count over 12,000/uL or less than 4,000/uL
- Typically caused by infection, though other causes (such as thyroid storm, trauma, blood product reactions) can also explain these vital sign changes.
- ***Sepsis:*** SIRS + documented or suspected source of infection
- ***Severe Sepsis:*** Sepsis + evidence of inadequate perfusion such as decreased urine output or altered mental status
- ***Septic Shock:*** Sepsis + refractory hypotension (in spite of adequate fluid resuscitation)

- ***Bacteremia:*** The presence of bacteria in the blood, which may lead to a clinical presentation of SIRS, sepsis, or septic shock

<u>Causes</u>

SIRS presentations can have non-infectious causes. However, by definition, all sepsis presentations are related to infection. Likely organisms include:

- E. coli
- Pneumococcus
- S. aureus
- Meningococcus
- Group A beta-hemolytic streptococcus

<u>Signs and symptoms</u>

- History
  - Use pre hospital personnel, patient, family, and friends to get best possible history about when symptoms started. Ask about any antibiotic use or traditional medicine use prior to arrival. If there is a transfer sheet from another facility, find out what antibiotic was given and how many doses
- Exam
  - Obtain full set of vital signs, including saturation and temperature. Cold extremities are important clinical sign of shock (lack of perfusion to extremities)
  - Early symptoms of sepsis/shock include
    - Hyperthermia (Fever, chills, rigors) or hypothermia
    - Tachycardia
    - Wide pulse pressure
    - Tachypnea
    - Mental status change
  - Organs that are typically damaged from shock
    - Pulmonary function
- Acute respiratory distress syndrome (ARDS)
    - Renal insufficiency
- Oliguria, urinary sediment
    - Hepatic dysfunction
- Jaundice
    - Coagulation abnormalities (DIC)
    - Increased bleeding
- Bedside test: Immediate glycemia check

<u>Differential diagnosis</u>

- Hypovolemic shock (GI bleed, major trauma)
- Cardiogenic shock (massive myocardial infarction)

- Anaphylactic shock (allergic reaction to foods, insect bites, drug reactions)

Investigations

- Labs: FBC (look for neutropenia), electrolyte, liver function tests, renal function, urinalysis, blood cultures if febrile, malaria test, HIV test. If available, coagulation factors (low in DIC) and lactic acid (value>4 predicts bad mortality) are invaluable to monitor septic patients
- Imaging: Chest XR
- Consider bedside ultrasound for IVC measurement for fluid status
  - Collapsing IVC indicates patient is dehydrated and would benefit from more fluids

Management: Early antibiotics and adequate resuscitation are the essential aspects of care.

- As always, start with ABCs. Reposition and open airway, if needed. Give supplemental oxygen. Patients with SIRS criteria at triage need TWO large IVs and a 2L bolus within one hour of arrival to health facility. Do bedside glycemia check. Consider early foley catheter placement to monitor urine output. If patient with fever on arrival and signs of sepsis, start antibiotics immediately.
- Fluid resuscitation
  - Place TWO large IVs (18g or larger)
  - Start NS or LR (LR is better for large volume resuscitation)
  - Start with 2L bolus run as quickly as possible (may have to squeeze bottle)
    - Continue fluids as long as the patient shows improvement in their hemodynamics.
    - Best methods to monitor fluid status are foley catheter with urine output at least 0.5cc/kg/hr OR bedside ultrasound for IVC collapse
  - If blood pressure stays low or extremities stay cold after 4L of fluid, consider vasopressors to maintain blood pressure. All vasopressors are titrated to maintain a goal Mean Arterial Pressure (MAP) of 65 or a systolic blood pressure (SBP)>100. They require pumps for regular infusion and constant blood pressure monitoring (every five minutes). Ideally they are run through a large central line (available only in limited ICU settings). Vasopressors must run through at least an 18g IV in the brachial vein (nothing smaller)
    - First line vasopressors for septic shock include norepinephrine, which is not currently available in Rwanda
- Norepinephrine 0.05-1mcg/kg/min IV
    - Second line includes adrenaline or dopamine
- Adrenaline 0.05-1mcg/kg/min

- Dopamine 5-20mcg/kg/min
  - Note that as you increase dopamine above 20mcg/kg/min, tachyarrhythmias increase
- Antibiotics: Initial broad coverage, but try to tailor antibiotic to cover source of infection as labs/imaging results return. Blood and urine cultures should ideally be drawn *before* starting antibiotics. Research shows that antibiotics started within ONE HOUR of arrival significantly increases patient chance of survival (Yealy, etal).
- Transfer septic/shock patients within 24hrs . Treat aggressively with fluids and antibiotics, but if vital signs not improving or mentation stays low, call for transfer and further evaluation. Record on the transfer sheet
  - Amount of fluid given over what time period
  - Types of antibiotics and for how many days
  - Lab and imaging results obtained

Recommendations
- Key points include recognition of SIRS/sepsis and shock and aggressive treatment with TWO IV lines, adequate fluid resuscitation and early administration of antibiotics.
- Transfer patients with septic shock (evidence of end organ damage) EARLY for further evaluation and treatment.

10. Endocrine/Metabolic

10.a Hyperglycemia Disorders (DKA, HHS)

Definitions
- Hyperglycemia: A fasting glucose greater than 111 mg/dl (6.16 mmol/L) or random glucose greater than 200 mg/dl (11.11 mmol/L).
- Diabetic Ketoacidosis (DKA): Hyperglycemic state (glycemia >250 mg/dL) associated with anion gap acidosis (pH <7.25 and HCO3- <18 mEq/L) with ketosis (ketones in urine or blood)
- Hyperosmolar hyperglycemic Syndrome (HHS): Hyperglycemia (glycemia > 600 mg/dL or 33.33 mmol/L) associated with hyperosmolarity (> 320 mOsm/kg) and altered mental status. These patients do **not** have significant ketoacidosis.

Causes
- Newly diagnosed or poorly controlled diabetes mellitus
- Acute disease: CVA, infection, seizure
- Medications

Signs and symptoms

- History
  - Ask about diabetes history, whether on oral pills or insulin, and whether patient has been taking medication appropriately (or ran out of drugs or missed doses), dietary compliance, and any recent changes to medication regimen. This will help determine if medication change or
  - noncompliance is the cause of hyperglycemic state
  - DKA patients can have altered mental status, confusion, polyuria, polydipsia, vomiting
  - HHS patients are typically ill-appearing with confusion
- Exam
  - Patients with simple hyperglycemia are usually well-appearing with normal vital signs. They have no vomiting, no fast breathing, and no abdominal pain
  - Patients with DKA can either be ill-appearing or relatively well-appearing. They will often have vomiting, fast breathing, fruity breath, confusion, and vomiting. Vital signs often include tachycardia, tachypnea, and possible hypotension
  - Patients with HHS are always ill-appearing and usually quite confused, in a coma state. They are always very dehydrated with dry mucous membranes.

Investigations

- Labs
  - Bedside glycemia upon arrival in any patient with confusion, coma, or history of diabetes with polyuria, polydipsia, or abnormal vital signs
  - Any patient with glycemia>250 needs ketones checked to ensure no DKA (urine ketones or blood ketones).
  - FBC, renal function, electrolytes (potassium is single more important electrolyte to obtain)
  - Malaria test, HIV, urinalysis to look for source of infection in DKA and HHS patients
  - If available, venous blood gas (VBG) or arterial blood gas (ABG) and bicarbonate level will be helpful in diagnosis and treatment goals for DKA patients o If available, serum osmolarity >320mOsm/kg seen in HHS patients
- Imaging
  - Chest XR in any patient with DKA or HHS to look for cause of infection

Management: General goal is to quickly determine if patients with hyperglycemia have DKA or HHS as treatment and prognosis varies greatly.

- Hyperglycemia without complications (glycemia high, but negative ketones, no vomiting, normal vital signs)

- Determine the cause first as that will guide treatment
  - Medication non-compliance, normal vital signs
- Restart oral medications or insulin, give guidance on diet, follow up in clinic in one week to recheck glycemia
- Can give IV fluids at facility, but will only reduce glycemia for the next 1-2 hours. Medication is the key to treatment
  - Taking mediation as prescribed but glycemia still high
- If on oral medications, start on insulin. These patients typically should be admitted overnight for glycemia monitoring to ensure correct insulin dose is started. Patient must be taught how to give self injections. Offer nutrition counseling. Follow up in one week to check glycemia
- If on insulin and taking appropriately, increase dose as needed. Typically no need to admit. Can follow up in clinic in one week for glycemia check
  - Taking medication, but has new symptoms of infection, fever, cough, etc.
- Continue medication, look for source of infection with labs and imaging. Likely admit if patient is wellappearing.
- Diabetic Ketoacidosis (high glycemia, positive ketones, low bicarbonate, low pH)
  - These patients are quite sick and have high mortality if not treated aggressively and appropriately. Start TWO large IV lines, give supplemental oxygen as needed, start with 2L fluid bolus (NS or LR immediately, place Foley catheter for close urine output monitoring,
  - keep on monitor to watch vital signs or check vital signs ever 30 minutes
  - Correct fluid losses first: Average fluid deficit is 4L on DKA patient, but can be as high as 6L. Must check renal function (Cr) and/or make sure patient is making urine (reason for Foley catheter) before giving entire fluid bolus. Give at least 2L fluid within one hour of arrival *before* starting insulin therapy
    - After fluid bolus of 2-4L (run in as fast as possible), continue NS at 125cc/hr while starting insulin infusion
  - Correct hyperglycemia next: Best therapy is insulin infusion
    - Regular insulin on infusion pump at O.lu/kg/hr (first choice)
    - Fast acting insulin O.lu/kg every 2hr subcutaneous (second choice)
- Patient remains on insulin infusion until anion gap closes or ketones disappear from urine/blood. Sometimes the infusion therapy does NOT stop when the glycemia drops below 250. You must check for continued ketones regularly before stopping insulin therapy.
- If glycemia <250, but ketones remain, start D5NS fluids along with insulin infusion
  - Correct electrolyte problems: Monitor potassium, magnesium, sodium

- ■ Potassium: Patients with DKA typically have LOW potassium (total body potassium low although lab value may be normal or high). When you give insulin, the potassium will drop even lower. Therefore, must check potassium and supplement during insulin infusion

- If K > 6 mEq/L, do not give potassium
- If 4.5 <K <6 mEq/L, give lOmEq/hour potassium mixed with patient's fluids
- If K <3.5, stop insulin therapy, replace potassium until it is 4.5; then restart insulin therapy
    - ■ Magnesium: If available, check magnesium and replace to goal of 2
    - ■ Sodium: Patients with hyperglycemia have *falsely elevated* sodium levels.
- True sodium level = lab measured Na + (0.016)x(serum glycemia-100). If true sodium level is elevated (>145), change fluids from NS to 1/2NS
    - o Reason for DKA: Infection is a common cause of DKA (along with medication non-compliance). Look for source of infection, start antibiotics early.
    - o Patients with DKA have a very high mortality and require a level of care comparable to an intensive care unit. Transfer any patient with DKA whose vital signs are not improving within 24hr.
- **Hyperosmolar Hyperglycemic Syndrome:** (very high glycemia, negative ketones, high serum osmolarity)
- Correct fluid deficit: HHS patients have typical fluid deficit of 6-10L (much more compared to DKA). Start with 2L bolus, but make sure patient urinating and check renal function before proceeding with remainder of fluid bolus. Continue to run at least 4L as fast as possible.
  Then run remainder in about 500cc/hr.
    - o Correct glycemia: HHS patients sometimes respond to IV fluids alone, but insulin infusion should be started at same dose with same guidelines as patients with DKA. See above
    - o Correct electrolytes: HHS patients have similar electrolyte disturbances as DKA patients. See management above
    - o It is difficult to differentiate DKA from HHS, especially if serum osmolarity, bicarbonate, and ketone testing is not available. Give plenty of fluids in each case, monitor urine output, electrolytes, and do glycemia checks every 2hr while on insulin therapy. Transfer patients with suspected HHS if vital signs are not improving within 24hr.

<u>Recommendations</u>

- It is crucial to differentiate simple hyperglycemia (minimal treatment needed) from DKA and HHS (both life threatening processes with high mortality). Check ketones when possible in any patient with high glycemia. If no ketones available, but patient has tachycardia, tachypnea, vomiting, or hypotension, presume DKA and treat aggressively as described above.

- Remember to monitor electrolytes in all patients in insulin infusion as described above. Even when lab potassium is near normal, patients are actually hypokalemic and need repletion.
- Most DKA or HHS patients require ICU level care. Transfer early- typically any patient who continues to have tachycardia, hypotension, tachypnea, or confusion after 24hr of aggressive treatment.
- All DKA and HHS patients need TWO large IVs, Foley catheter placement, and frequent vital sign checks.

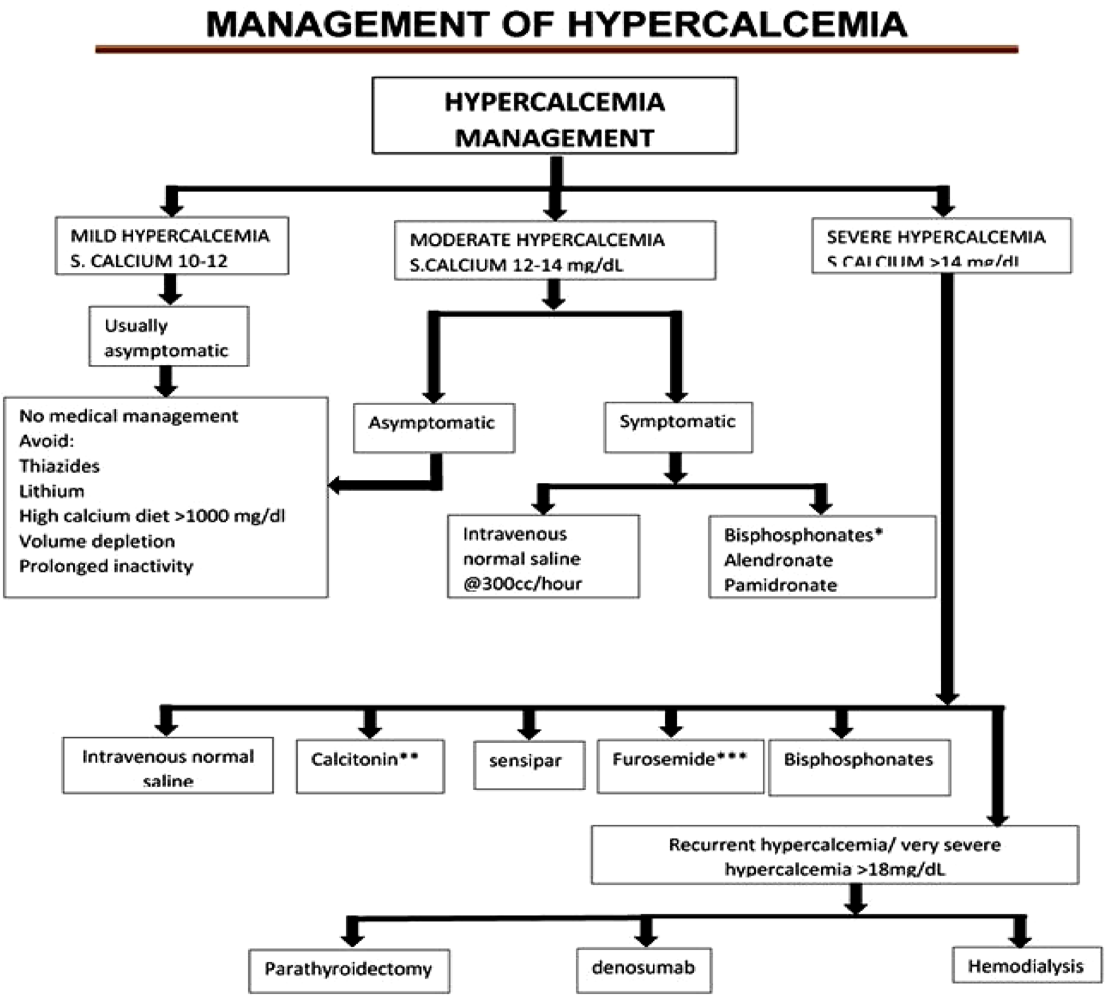


Fig. 17 Management of hypercalcemia

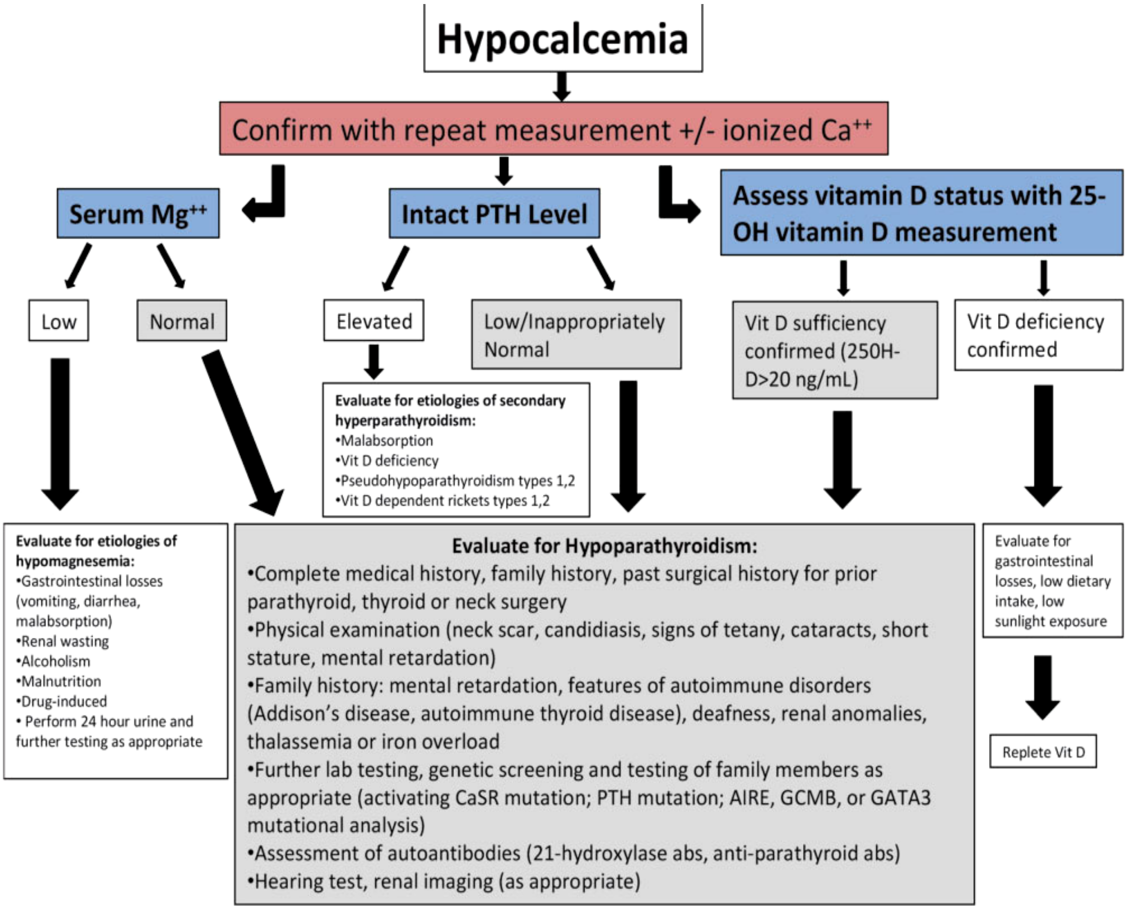


Fig. 18 Hypocalcemia

10.b Hypokalemia

Definition: Hypokalemia is when the serum potassium is < 3.5 mEq/L. Moderate hypokalemia is below 3.0 mEq/L, and severe hypokalemia is below <2.5 mEq/L

Causes

- Nutritional deficiencies
- Renal losses
- Diuretic use (Furosemide/Lasix)
- Vomiting/diarrhea
- Chronic alcohol use
- Theophylline use

Signs and symptoms

- History
  - Most patients with mild hypokalemia are asymptomatic o

- Moderate hypokalemic patients may have muscle cramping, generalized weakness, paresthesia
- Exam
  - Most patients have a normal physical exam

Investigation

- Labs
  - Check magnesium, if available, and other electrolytes along with potassium; check renal function
- Imaging
  - None

Management

- Replacement of potassium can be done orally or through an IV
  - Expect an increase of about 0.1 mEq/L for every 10 mEq of PO or IV potassium chloride given
- Patient with mild hypokalemia or asymptomatic moderate hypokalemia who can tolerate orals can be treated with foods rich in potassium (banana) or PO potassium chloride (40 mEq) if available
- Patients who are symptomatic or who have severe hypokalemia should be treated with IV potassium chloride (10 mEq/hr IV)
  - Do not run potassium in any faster than lOmEq/hr IV! Going more quickly can burn the vein or cause arrhythmias of the heart. Put patient on monitor, if possible, when giving IV potassium
- Patients who have low magnesium need to have magnesium replaced prior to potassium repletion.
  - Magnesium sulfate 2 gm IV over 30 min
- Once patients are stable, identify and treat the underlying cause

Recommendations

- Mild to moderate uncomplicated hypokalemia can be discharged home with IM OPD follow up in 2 weeks.
- Symptomatic patients and patients with K+ <2.5 should be admitted to the hospital, with cardiac monitoring where possible.

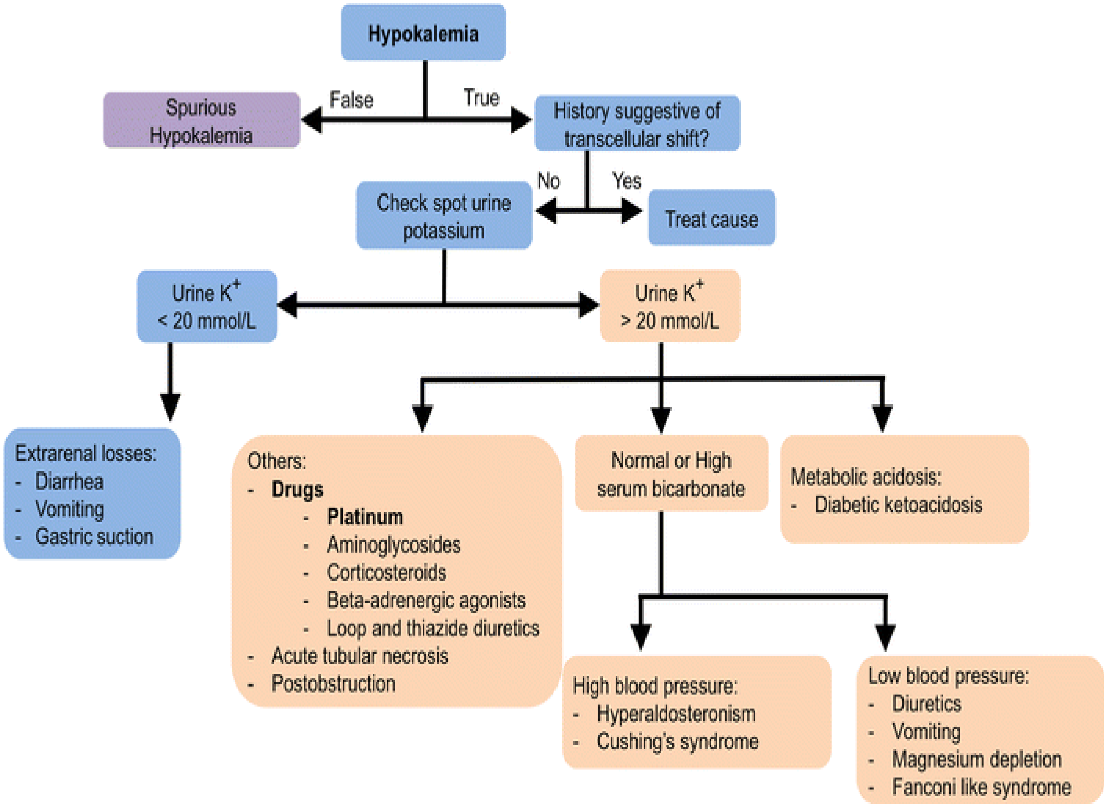


Fig. 19 Hypokalemia

10.c Hyperkalemia

Definition: Serum potassium >5.0 mEq/L.

Causes

- Renal failure (chronic or acute)- most common cause
- Rhabdomyolysis
- Potassium-sparing diuretics (Spironolactone)
- Digitalis toxicity
- Tissue necrosis (ischemic bowel, tumor lysis syndrome)
- Lab error (common to see falsely elevated potassium if blood sits in tube for a long time before going on to machine)

Signs and symptoms

- History
  - Most patients are asymptomatic, but can have weakness, paresthesia, nausea, vomiting, diarrhea
- Exam
  - Typically a normal exam

Investigation

- Lab
  - In addition to seeing high potassium, check renal function for high BUN/Cr, and FBC (anemia common in chronic kidney disease, but not always)
- Other tests
  - EKG is important in patients with K>5.5. It varies, but certain EKG changes are expected at various levels of hyperkalemia.
    - K+ 6.5 -7.5 mEq/L: Prolonged PR interval, short QT interval, and peaked T waves
    - K+ 7.5- 8.0 mEq/L: Flattening of P wave, QRS widening
    - K+ 10.0 mEq/L and above: QRS complex degradation into a sinusoidal pattern and PEA arrest (death)

Management: The definitive treatment for hyperkalemia is to treat the underlying cause. There are three goals of treatment with different types of medications working for varying reasons.

The goals of treatment are to 1) stabilize cardiac membrane, 2) cause an intercellular shift of K+, and 3) remove K+ from the body. Put patient on cardiac monitor, if available.

- Interventions working in seconds (stabilize cardiac membrane): Only needed in patients with ECG changes (as above) or K>6.6
  - Calcium Gluconate: Give 2 ampules IV. Works within 1-3 min by stabilizing membranes. Lasts 30-50 min.
- Interventions working in minutes (shift K into cells): Give to any patient with K>5.5
  - Salbutamol: Give as nebulized treatment—30 mg with 5 ml of saline nebulized over 15 min. Works within 15-30 min by shifting K+ into cells. Lasts 2-4 hours.
  - Insulin with Glucose: Give dextrose 50% 1 ampule or 5% 500cc bolus with insulin. If the patient has glc <200 mg/dl, give 2 ampules of dextrose. Check finger stick 20-30 min later. Works within 30 min by shifting K+ into cells. Lasts 4-6 hours.
  - Furosemide: Give 40-80mg IV. Has variable onset of action and duration. Reduces total body K+.
- Interventions working in hours (the only interventions to actually remove K from the body)

- o Kayexalate: Give 30-60g PO. Works within 1-2 hours by increasing GI excretion of K+. o Hemodialysis: Works within minutes of initiation by direct removal of K+ from the extracellular space.
- Dialysis should be considered in patients with hyperkalemia and renal failure. This is the ONLY long-term cure. Transfer to referral center for dialysis consideration any patient with hyperkalemia and renal failure.

<u>Recommendations</u>

- Asymptomatic patients with K+ < 6.0, without EKG changes, and with normal renal function can be discharged home with IM OPD follow up in 2 weeks
- Patients with K>5.5 should have EKG when available
- Patients with K>6 with EKG changes or patients with K>7 regardless of EKG, need calcium gluconate treatment, along with the other listed treatments, and immediately referral for dialysis.

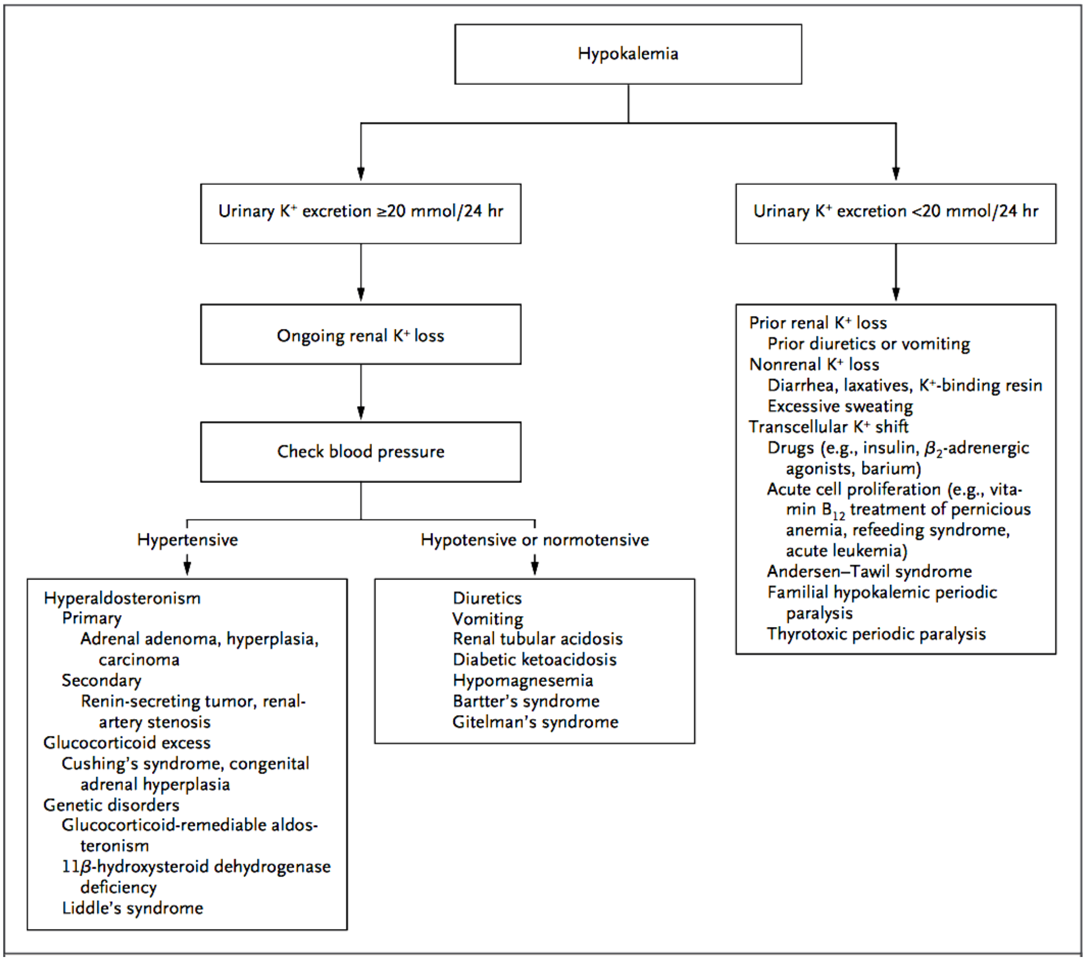


Fig. 20 Algorithm for the Differential Diagnosis of Hypokalemia

10.d Hypernatremia

Definition: Hypernatremia: serum sodium concentration above 145 mEq/L; all hypernatremic patients have deficit of free water relative to sodium Severe hypernatremia: serum sodium greater than 158 mEq/L

Causes

- Decrease in total body water
  - Inability to obtain or swallow water (old person not drinking)
- Excessive sodium
  - GI
    - Vomiting, diarrhea, intestinal fistula
  - Renal loss
    - Central diabetes insipidus
    - Hypercalcemia
  - Sickle cell disease
    - Multiple myeloma
    - Sarcoidosis
  - Drugs/Medications
    - Alcohol, Lithium, Phenytoin
  - Skin loss
    - Burns, sweating

Signs and symptoms

- Symptoms progress depending on severity of disease
  - Restless, agitated-> tremulous, ataxic->hyper-reflexic, twitching->seizures, death
- Patient most commonly presents as coma or confusion
  - Patients will often be old, bed-bound, and not taking oral food or water at home

Investigations

- Labs: Immediate bedside glycemia in any patient with confusion or coma. Check serum electrolytes, renal function, FBC. If available, urine studies for urine osmolality and urine sodium may be useful

Management

- The main treatment is volume repletion, first with NS or lactated Ringer's solution (LR).
- **Correcting the sodium too quickly can lead to cerebral edema.**
  - Sodium correction should not exceed 10-15mEq/L per day!
  - Check serum sodium TWICE after fluids are started (at six hours, then twelve hours) to ensure sodium is not falling too quickly.

Recommendations

- All patients with acute hypernatremia should be admitted to the hospital.
  - o Patients with chronic hypernatremia who are symptomatic (agitated, confused, tremors) should be admitted to the hospital.

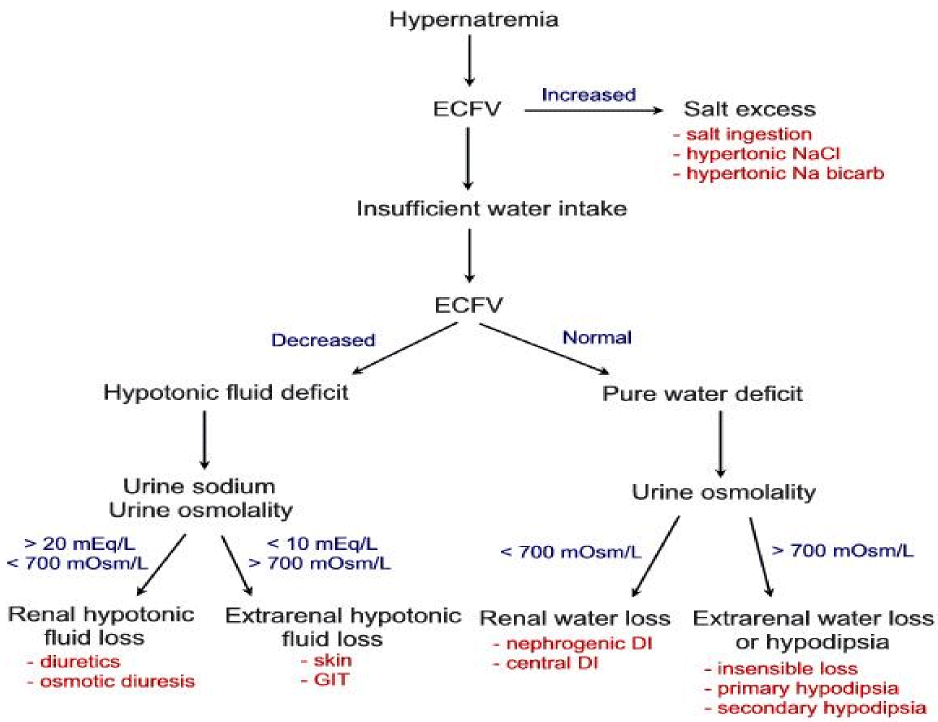


Fig. 21 Algorithm for Hypernatremia

10.f Hyponatremia

Definition

- Hyponatremia: serum sodium less than 135 mEq/L
- Severe hyponatremia: serum sodium less than 125 mEq/L

Causes

- Hyperglycemia (most common)
- Renal failure
- Alcoholism
- Obstructive jaundice
- Multiple myeloma
- Diuretic use
- Diarrhea/vomiting
- Burns
- Excessive sweating
- Malnutrition

- CHF
- Cirrhosis
- Pregnancy

Signs and symptoms

- History
  - o Most patients are asymptomatic, particularly if they have a serum sodium over 130 mEq/L.
  - o When patients are symptomatic, the severity of symptoms typically depends on the severity of hyponatremia and the time frame in which the hyponatremia develops (the faster onset, the more symptomatic)
  - o Symptoms of hyponatremia include headache, muscle cramping, nausea/ vomiting, confusion
  - o Severely hyponatremic patients can present with seizures

Investigations

- Labs
  - o Bedside glycemia should be done on all patients presenting with coma, confusion, seizure
  - o Renal function, liver function tests, other electrolytes in addition to sodium o Serum osmolality, if available, will help guide reason for hyponatremia
  - o Urine studies like osmolality, creatinine, and urine sodium are helpful, if available

Management: True management of hyponatremia begins with calculating volume status of patient (hypovolemic, hypervolemic, or euvolemic), measured osmolalities and plasma osmolalities. Those equations are beyond the scope of these introductory guidelines and osmolalities are not often available. The following management guidelines are based on clinical symptoms. Recognize that correcting the sodium too fast will lead to severe brain damage and irreversible neurological deficits. Therefore, it is crucial that you correct sodium slowly and that you check blood samples for sodium levels at least every 2hr while treating with NS.

- Severe Hyponatremia (presents with seizure and serum Na<115mEq/L)
  - o Treat with 3% NS (where available) at 25-100mL/hr until seizures stop
  - o Recheck Na immediately after giving 3% NS
  - o Maximum sodium increase is l-2mEq/L per hour
- Moderate hyponatremia (presents with signs of cerebral edema like lethargy, confusion, delirium and serum Na<120mEq/L)

- Treat with a NS bolus at a rate of about 1-2 ml/kg/hr for 1-2 hours or until symptoms have improved. o Re-check sodium level after 2 hrs of NS infusion
  - Maximum sodium increase should be 0.5-1mEq/L per hour
- Mild hyponatremia (presents with mild symptoms, no confusion, and Na>120mEq/L). Treatment depends on estimated body fluid status.
  - Euvolemic patients: use free water restriction
  - Hypovolemic patients (recent GI losses, hyperglycemia, etc.): use normal saline
  - Hypervolemic patients (CHF, etc.): restrict water and salt to correct their hyponatremia; diuretics can also be used.

Recommendations

- Patients with asymptomatic hyponatremia with a sodium >120 mEq/L can be treated with free water restriction for 24hr and then gentle NS infusion, only if needed.
- Only patients presenting with seizures need to be treated with rapid boluses of 3% NS or regular NS.
- In general, do not correct sodium too quickly, as it will lead to permanent brain damage.
- Transfer any patient who has severe symptoms like coma or seizure and is not improving with sodium correction as described above.

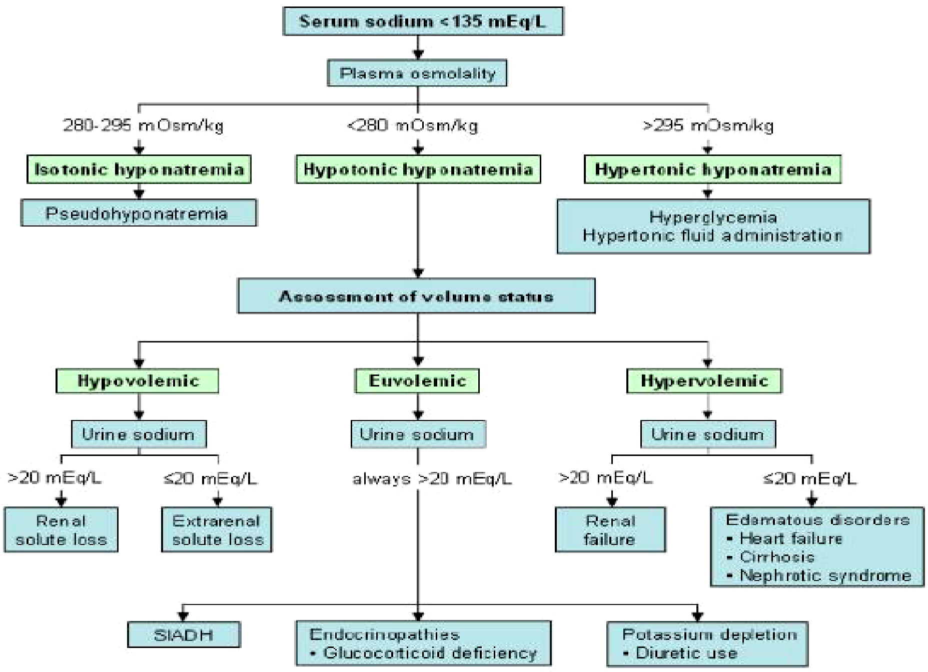


Fig. 21 Algorithm for patients with severe symptoms

Assadi F. 2012; King JD. 2010; Overgaard-Steensen C. 2011; Pfennig CL, Slovis CM. 2012; Pfennig, C. L. and C. M. Slovis .2012; Sood L, Sterns RH, Hix JK, Silver SM, (Chen L. 2013; Sterns RH, HixJK, Silver S. (2010) Sterns, R. H. (2015).Tintinalli, J et all .2011; Tzamaloukas AH, Malhotra D, Rosen BH, Raj DS, Murata GH, Shapiro JI. 2013; Vaidya C, Ho W, Freda BJ. 2010).

Fluid Management

- Parkland formula: 4mL x (Patient's weight in kg) x (%BSA)
  Example: 75 kg patient with 20% partial thickness burn: 4mLx 75x20 = 6000 ml
  - Half of this should be administered in the first 8 hours from the time of burn; the second half should be administered in the following 16 hours
  - There is little/no research on how to manage fluids in patients who present more than 24hr after burn. Therefore, use clinical judgment.
  - If patient has tachycardia, delayed cap refill, or hypotension, start with IV fluid bolus at 2L for adults or 20ml/kg in children and reassess
  - Place foley catheter to monitor urine output
  - Target urine output lml/kg/hr
  - Children with >10% BSA burn have high fluid requirements
  - Estimate with Parkland formula for fluid resuscitation AND, for children, add maintenance fluids (D5) using the 4:2:1 formula.
- Maintenance Fluids in Pediatric Patients:_"4,2,l **Rule"**
  - Give 4mls/kg/hr for first 10kg of body weight, 2mls/kg/hr for next 10 kg of body weight and lml/kg/hr for any additional kgs
  - Example: Fluids for a 40kg child would be
    - 4mLs x 10kg + 2mL x 10kg + lmL x 20kg = 40+20+20 = 80mLs/hr

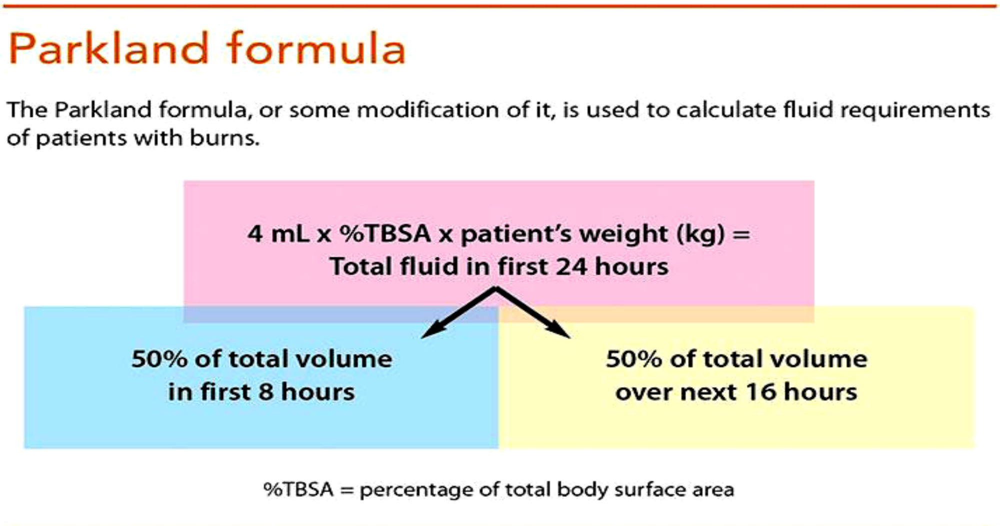


Fig. 22 Parkaland Formula

Table 8:
Resuscitation Calculations

RESUSCITATION CALCULATIONS

I. RESUSCITATION

A. Calculated resuscitation and basal requirement (less than 2 yrs. — 2000 mL/m^2)

1. (4 mL × ____________ kg × ____________ % burn) + (1500 mL × ____________ m^2) = mL/24 hours
(____________________) + (____________________) = ____________________ mL/24 hours

B. Resuscitation fluid per 8 hours

1. 1st 8 hours ______________________________ mL, ______________________________ mL/hr.
2. 2nd 8 hours ______________________________ mL, ______________________________ mL/hr.
3. 3rd 8 hours ______________________________ mL, ______________________________ mL/hr.

II. MAINTENANCE FLUIDS

A. Basal fluid requirement — 1500 mL/m^2 (less than 2 yrs. — 2000 mL/m^2)

1. Total body surface area ______________________________ m^2
2. 24 hours ______________________________ mL
3. Hourly ______________________________ mL/hr.

B. Evaporative water loss

1. Adults — (25 + % burn) m^2 = mL/hr.
Children — (35 + % burn) m^2 = mL/hr.
2. Calculated evaporative water loss
a. (________ + ________ % burn) ________ m^2 = ____________ mL/hr; ____________ mL/24 hours

C. Total maintenance fluids — Basal requirement and evaporative water loss

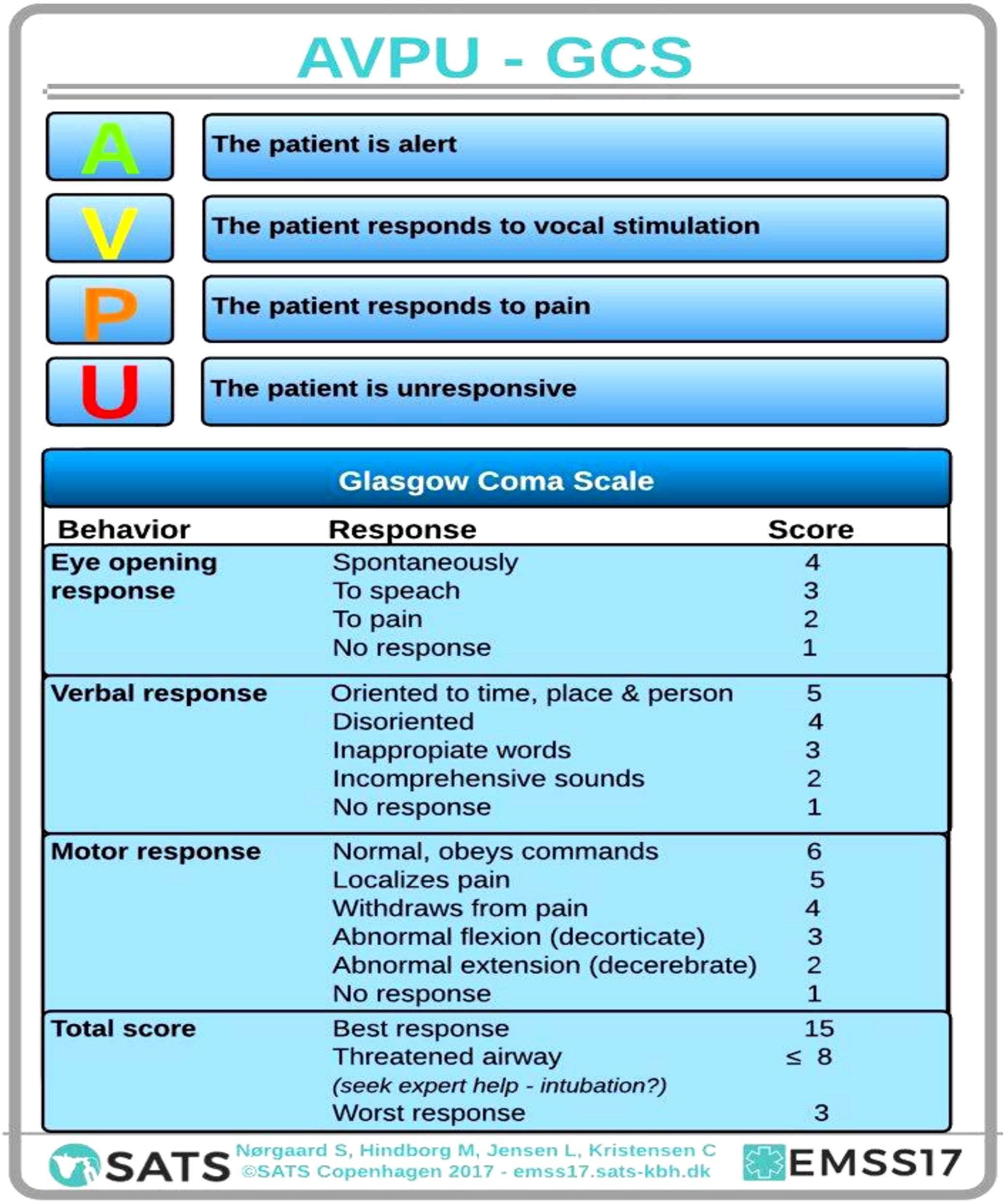
1. 24 hours ________________________ mL
2. Hourly ________________________ mL

Assessment of Mental Status

Coma Score (GCS): Best score is 15; worst score is 3

- Eyes
  - Open spontaneously: 4
  - Open only to verbal command: 3
  - Open to pain: 2
  - No eye opening: 1
- Motor
  - Obeys commands: 6
  - Localizes pain: 5
  - Withdrawal from pain: 4
  - Flexion to pain: 3
  - Extension to pain: 2
  - No motor response at all: 1
- Verbal
  - Oriented, speaks well: 5

- Confused, but talking: 4
- Talks some, but inappropriate words: 3
- Incomprehensible sounds/mumbling: 2
- No verbal response: 1
- Intubated: 1


AVPU - GCS

A The patient is alert

V The patient responds to vocal stimulation

P The patient responds to pain

U The patient is unresponsive

Glasgow Coma Scale

Behavior	Response	Score
Eye opening response	Spontaneously	4
	To speach	3
	To pain	2
	No response	1
Verbal response	Oriented to time, place & person	5
	Disoriented	4
	Inappropiate words	3
	Incomprehensive sounds	2
	No response	1
Motor response	Normal, obeys commands	6
	Localizes pain	5
	Withdraws from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score	Best response	15
	Threatened airway *(seek expert help - intubation?)*	≤ 8
	Worst response	3

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Fig. 23 AVPU Scale

Favored in pediatric patients- has four possible outcomes. Best is A; worst is U.

Logroll Technique

In-line immobilization to be used in trauma patients that are at risk for spinal injuries. Requires at least 4 providers: 3 for movement of the patient and one for examination of the patient's back. Maintain logroll precautions until spine injuries have been ruled-out.

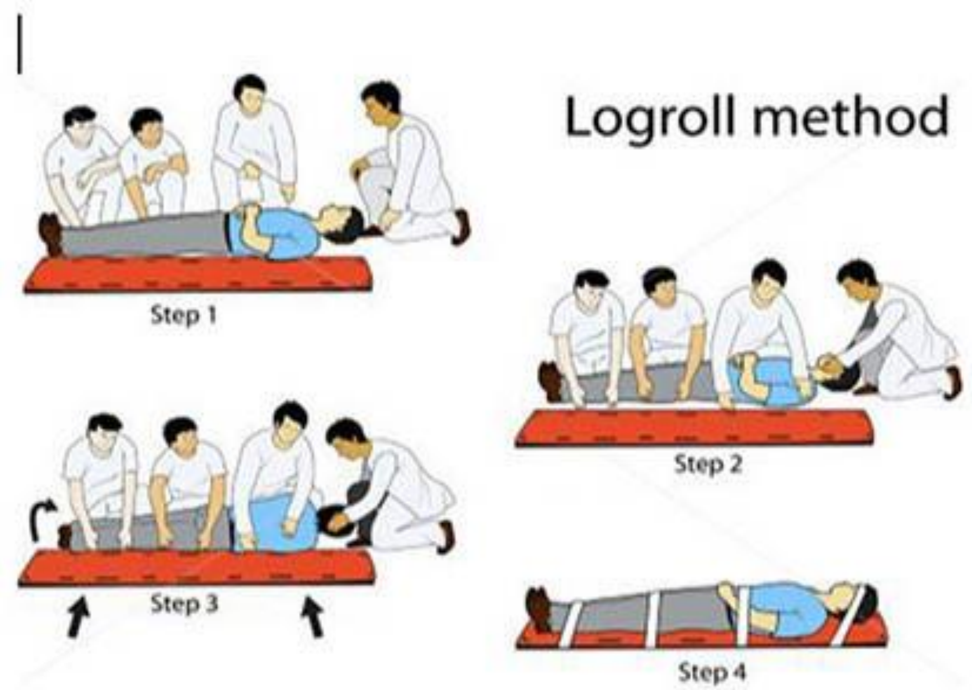

Fig. 24 Logroll method

Procedures

Retrograde Urethrogram

Indications: the presence of blood at the urethral meatus after blunt or penetrating trauma in the setting of trauma to rule out urethral injury.

Contraindication: patient allergic to radiopaque contrast.

Procedure:

- Place just the tip of a Foley catheter into the penis (do not advance completely to the bladder as this could worsen uretheral injury)
- Gently inject 20-30mL of contrast into the urethra
- Obtain a pelvic XR
- Normal urethrograms show contrast following the urethra into a normal appearing bladder
- Extravasation of contrast confirms a urethral disruption

Tube Thoracostomy (Chest Tube)

Indications: pneumothorax, hemothorax, pleural effusion

Contraindication: skin infection over the insertion site, coagulopathy

Procedure:

- Consider procedural sedation with Ketamine if deemed safe and appropriate as this is a painful procedure
- Place patient supine with arm abducted above head
- Chest tube insertion site is 4th or 5th intercostal space, along anterior axillary line
- Sterilize and drape area. Wear sterile gloves.
- Using a syringe and needle with local anesthetic such as Lidocaine, anesthetize subcutaneously **over** (just above) the chosen rib, then anesthetize deeper towards the rib; guide the needle above the rib while aspirating until air bubbles are withdrawn into syringe; anesthetize in and around the pleura. Use approximately 7mL of Lidocaine.
- Make a 2-3 cm incision with a sterile scalpel/blade parallel to the chosen rib
- Bluntly dissect through the intercostal muscles with a curved clamp towards the rib, then **above** the rib, until the pleura has been pierced
- Spread the clamp, then replace it with a finger; sweep in a complete circle with your finger inside the inner chest wall to clear out any adhesions
- Load the chest tube (24-36 Fr) onto a curved clamp, and use the clamp to guide it into the intrathoracic space along your finger that is in the puncture site. ***Note:*** *it is very important that you do not remove your finger before the tube goes in. If you remove your finger, you will lose the "track" and risk placing tube into a space other than the lung!*
- Guide the chest tube in an apical and posterior direction until all drainage holes are in the intrathoracic space
- Secure the chest tube with a horizontal mattress suture to pull the sides of the incision tight around the chest tube, and tie the loose ends around the chest tube to keep it from sliding.
- Apply an occlusive dressing over the chest tube site
- Ideally, connect the chest tube to suction with a water seal, such as a pleural-evac system (available at pharmacies in Kigali, but expensive). If this is not available, connect chest tube to Heimlich valve and/or create a water seal using a sterile saline bottle.
- Confirm placement with a chest X-ray

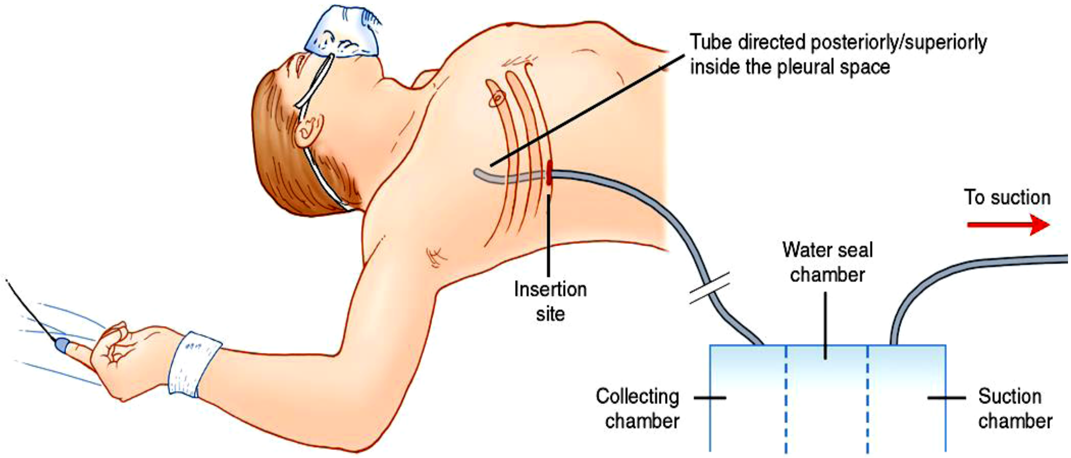

Fig. 25. Chest Tube technique

Pericardiocentesis

Indications: the presence of life-threatening hemodynamic changes in a patient with suspected cardiac tamponade

Contraindication: in the hemodynamically unstable patient, no absolute contraindications exist to performing pericardiocentesis.

Procedure:

- Consider giving 1L NS bolus to increase right-sided filling pressure, while preparing for pericardiocentesis
- Consider sedation with Ketamine or diazepam
- Prep and drape subxiphoid/ parasternal area in sterile fashion
- Prepare equipment. You may use a spinal needle or, if available, a central line kit, which will allow for the placement of a catheter over a wire and continued drainage of the effusion (leaving a draining catheter in place, is preferable).
- Infiltrate local anesthesia
- Position patient in semi-recumbent position at 45°
- If ultrasound-guided (preferred):
  - ■ Find the largest pocket of fluid (in subxiphoid, parasternal or apical probe position) and use this to guide needle.
  - ■ Try to enter your needle in plane with the ultrasound probe so that you can visualize the needle tip at all times. Aspirate as you advance. Never advance the needle without having a view of the needle tip.
  - ■ If placing a catheter over a wire, inject agitated saline to first confirm needle position.
- If no ultrasound available (blind):

- Insert the needle to the immediate left of the xiphoid
- Advance the needle towards the left shoulder at 15-30° angle aspirating as you go. May feel a "pop" when you enter the pericardium.
- Aspirate fluid. Small amount should improve vital signs.
- Remove needle and dress puncture wound

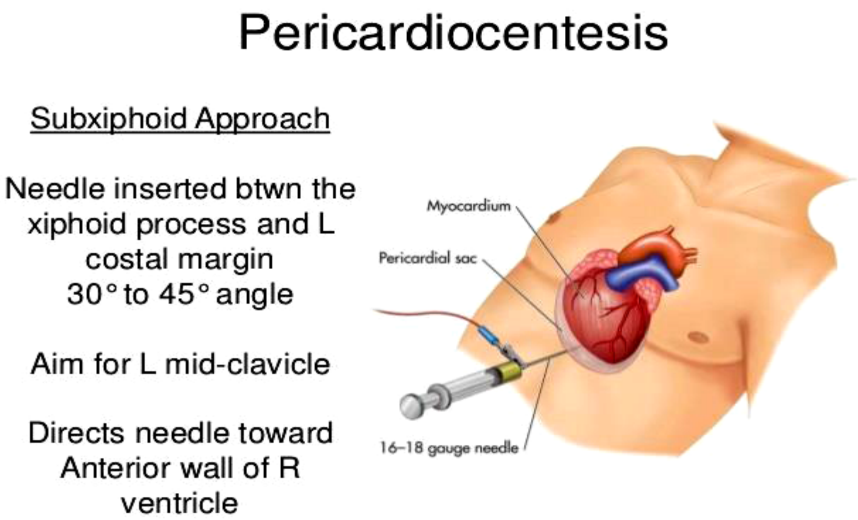

Fig. 26. Pericardiocentesis

Manual Detorsion of the Testes

Indications: strong suspicion of testicular torsion

Contraindication: suspicion for other causes of testicular pain or if the duration of torsion is more than 6 hours

Procedure:

- Patient supine with physician at patient's right side
- Patient is in "frog leg" lithotomy position for best access to GU area
- Inform patient that this is a painful maneuver. Consider light sedation with Diazepam IOmg IV once
- Manual detorsion is a twisting of the testis in a medial to lateral direction (like you are opening a book). The patient's right testis is detorsed in a counterclockwise direction while the left is detorsed in a clockwise direction.
- Rotate affect testis 180 degrees and kept in that position.
- If initial rotation increases the pain, try to rotate in an opposite direction. One to three turns is appropriate.
- Stop detorsion when anatomy appears normal again or pain is relieved.

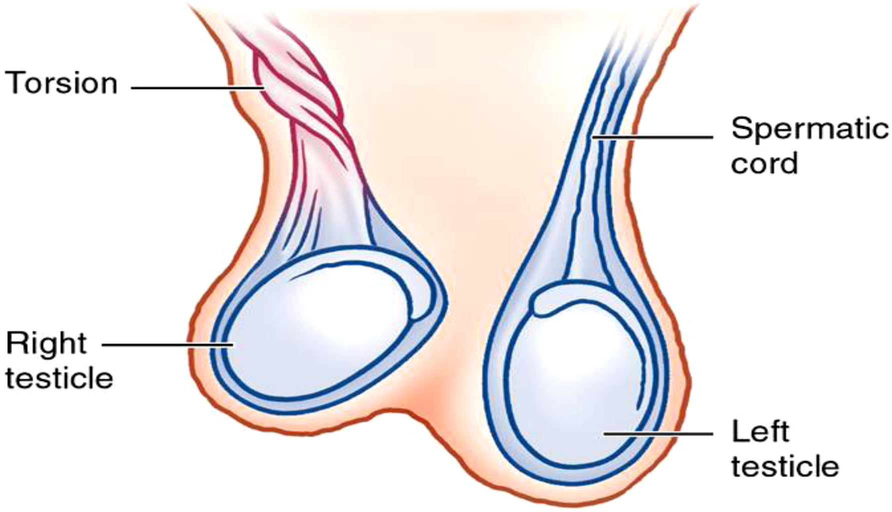

Fig. 27 Manual Detorsion of the Testes

Foley Catheter Placement

Indications: urinary retention, monitoring of urine output, among many others

Contraindication: suspicion of urethral injury or obstruction

Procedure:

- Preliminary washing of hands; wearing mask recommended
- Place patient supine with legs slightly apart (male) or apart with knees flexed (female)
- Clean genital area with antiseptic solution
- Put on sterile gloves and drape sterile cover over area, keeping genitals exposed
- Check foley catheter balloon by introducing 5mL water into balloon then deflating
- Lubricate sterile catheter with water-soluble lubricant

Women:

- Separate the labia with the thumb and index finger of your non-dominant hand and identify the urethral meatus
- Gently advance lubricated catheter through the meatus until urine appears in the tube (remember the female urethra is short, about 4cm)
- Inflate balloon with 5-10mL saline and pull catheter back gently until you meet resistance
- Connect catheter to collecting bag. Use tape to secure tubing to patient's inner thigh.

Men:

- Hold penis with your non-dominant hand upright, away from scrotum

- Hold catheter firmly with your dominant hand and gently pass well lubricated catheter through external urethral meatus. Advance catheter until urine comes through the tube.
- Inflate balloon with 5-10mL saline and pull catheter back gently until you meet resistance
- Connect catheter to collecting bag. Use tape to secure tubing to patient's inner thigh.
- If catheterization produces gross blood, deflate de balloon, remove the catheter and do not attempt reinsertion because a false passage (through the penile soft tissue instead of the urethra) may have been produced
- Urgent urology consultation

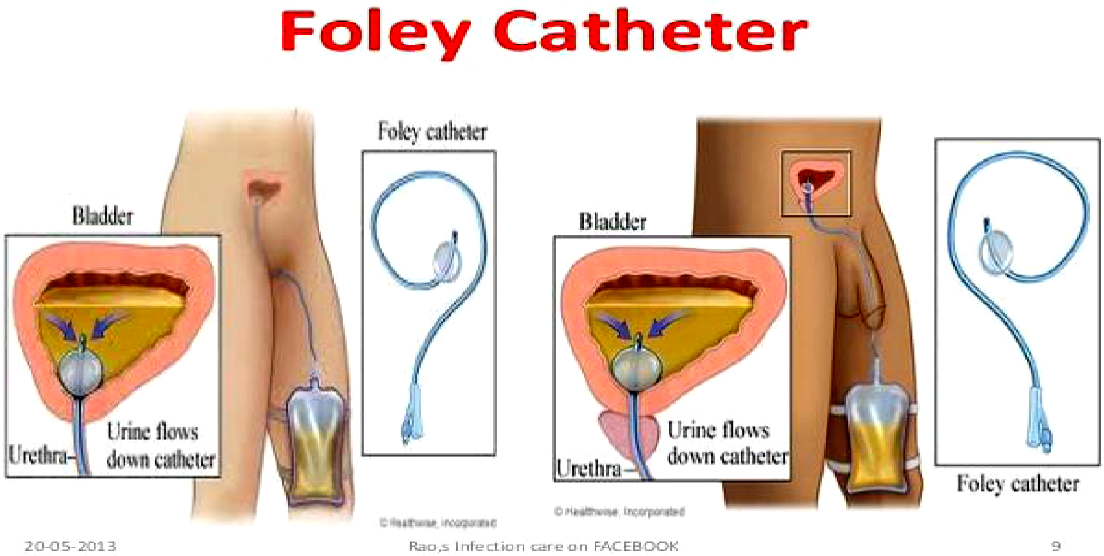

Fig. 28 Foley Catheter

Suprapubic Catheter Placement

Indications: inability to pass foley catheter, suspicion of urethral injury

Contraindication: coagulopathy, prior lower abdominal or pelvic surgery

Procedure:

Equipment

- Sterile gloves, drapes, gauze
- Antiseptic solution
- Local anesthetic
- lOmL syringe
- 18g and 25g spinal needle
- scalpel

- percutaneous suprapubic catheter set or trochanter set
- sterile urine collection bag
- skin tape
- bedside ultrasound, when available, to ensure passage into bladder

Procedure:

- Palpate distended bladder and mark insertion site at the midline, two fingers (4-5cm) above pubic symphysis. If available, use the US to verify bladder location and ensure no loops of bowel are between abdominal wall and bladder
- Apply antiseptic solution and use sterile drapes over area, keeping open insertion site
- Inject local anesthetic (lidocaine) with smallest gauge needle available. After injecting a small wheel of anesthesia to the skin, gently advance the needle, aspirating along the way until urine comes into the syringe. This will ensure the bladder is full with urine and also help you to determine the depth at which you must insert the trochanter.
- Using the scalpel, make a 4mm stab incision at the insertion site. Stab only the skin. Do NOT cut through to the rectus sheath
- Insert percutaneous instrument that is available (most likely trochanter set), using your non-dominant hand on the lower abdomen to stabilize the unit. Insert very slowly and stop as soon as urine flows.
- Pass catheter through hole of trochanter until urine flows through tubing.

Withdraw trochanter needle

- Connect to collection bag.
- Undrape patient and apply dressing around the insertion site.

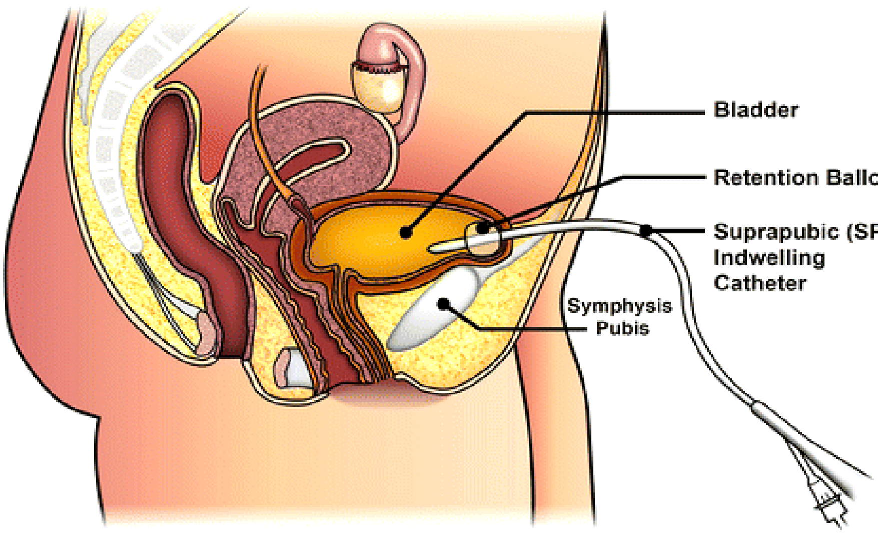

Fig. 29 Suprapubic Catheter Placement

SUMMARY AND RECOMMENDATIONS

The young Israeli doctor, nurse and paramedic are required to exhibit knowledge and skill in life support activities and initial treatment of injured people. We examined to what extent med schools in Israel contribute to the preparation of their graduates for emergency medicine. The subject was examined by us for the first time in 2003 among fifty doctors before the end of their internship.

The survey examined three aspects of the emergency medicine: evaluation of the level of training, utilization of knowledge for the solution of urgent problems, and practical experience in performing 20 basic activities which are required for life support and initial treatment of injured people.

About 80% of the doctors said they had not been trained at all or that their training had been insufficient in subjects of providing emergency treatment to injured people, priorities of treating the severely injured and urgent activities. 73% of the doctors in the survey mentioned they were incapable of confidently handling problems of respiratory distress of an injured person, the order to actions in life support and sever shock.

It was found that about one quarter of med graduates completed the med school without ever performing endotracheal intubation and without performing a closed cardiac massage. Only 21% of the doctors have ever inserted intercostal trochar and most of the doctors have not even observed such action. 26% of the respondents have never installed a central vein infusion and 82% have never fixed a femur break, 84% of the doctors have never carried out actions such as the insertion of a probe to the stomach, insertion of catheter to the urethra and insertion of peripheral infusion – compared to the nurses and paramedics who performed 94% of the vital life support activities.

95% of the med graduates in Israel are placed as military doctors at the end of their internship year. The ability of such a doctor to treat injured people in the field is taken for granted, and he is expected to find solutions when treating severe and urgent injuries and performing life support operations. He must work alone being cut off from the hospital's "nursery". Therefore, most of the knowledge and experience he should have acquired at the med school and the internship period.

We wanted to examine the contribution of the med schools and the schools for health sciences, for nurses and paramedics in Israel in teaching emergency medicine and producing a graduate who has control over the emergency medicine basics. The med schools curriculums have concentrated on the preclinical years and they include lectures and seminars on subjects of injuries and emergency medicine. In several universities 3-day courses were planned for learning emergency medicine subjects including arrhythmia and internal emergency medicine in the form of workshops. Nevertheless, no courses or workshops regarding emergency medicine have been included in the curriculum. The clinical wards did not receive instructions to teach emergency medicine or teach actions required for life support in particular.

Most med schools throughout the world have abandoned the teaching of emergency medicine and of initial treatment of injured people. Curriculum designers assumed that the required knowledge and skill would be obtained during the training period or in the framework of the internship. Surveys conducted in the US found severe defects in this area. In the last year emergency medicine training gained momentum and received much attention concurrently with the development in emergency medicine specialization. The teaching of emergency medicine was integrated in the curriculums of med schools in the US and many auxiliaries were developed. It would be expected that in Israel, which is a country experienced in wars and terrorist attacks, where most doctors have served as military doctors, the teaching of emergency medicine will be specifically emphasized.

The results of the research presented above clearly indicate that the curriculums in Israeli med schools do not teach doctors the basics of emergency medicine. The graduates are not trained enough during their studies towards their function as military doctors and as emergency doctors.

The lack of experience and skill in basic practical actions in emergency medicine are particularly noticeable. The fact that 43% of the graduates finish med school and the training year without even once performing endotracheal intubation, closed cardiac massage and other life support activities, speaks for itself. It is a fact that a student who spends about two years and a half at various clinical wards including some two months in surgery and later undergoes a year of internship, graduates without occasionally performing (or sometimes even once) a simple action like inserting a probe to the stomach or catheterizing the urinary bladder.

The experience in life support actions is mostly acquired through the initiative of the student or intern himself and depends on the willingness of the department doctors to train him in performing the actions. Anyway, experience is not gained by orderly and institutional teaching.

The present research examined and compared the practical performance and the processes of making decisions of doctors, nurses and paramedics while being required to handle a well-defined emergency situation. In order to check the decision making processes it is essential to document all the student's actions whether relevant or not, and analyze them according to chronological order. We have found that the method of knowledge test, examination of autonomous signs and observation are effective tools for the purposes of the present research. Tools such as multiple-choice (American) questions or open-end questions, which serve as tools for the evaluation of the students' knowledge or cognitive abilities in the theoretical med studies, do not examine the students' performances in real situations. In a structured clinical examination as well, the sequence of events and unnecessary action carried out by the students are usually not included in the check list, and therefore this method is disqualified for the purpose of the present research.

Doctors who just completed the sixth and last year of the med school were considered in this research as having declarative knowledge, compared to paramedics and nurses who just completed the fourth and last year and were considered as having practical knowledge.

The method of solving emergency situation problems in the curriculum of paramedics and nurses is based on an **Algorithm**. This is a method of thinking according to which the person tries all the existing possibilities in order to solve a certain problem. This type of thinking ensures the finding of a quick and correct solution. On the other hand, doctors make use of a **Heuristic** plan to solve emergency situation problems. According to this method one is assisted by previous experience and rules known in advance. The skill of wide thinking among paramedics and nurses such as when exercising life support, knowing what to do, when to do, how to do, which tools to use, what the consequences will be, which factors to take into consideration – is much more than knowing the rules of reason and refraining from making logical mistakes which will eventually cause the patient's death. The thinking skill of doctors is largely engaged in concepts and directing attention. It relates here to the matter of investigating the accumulated experience and utilizing the knowledge: knowing how to handle situations, with your own ideas and the thoughts of others. Anamnesis should be drawn. This subject involves planning, making decisions, looking for evidence, guessing, being creative, and many other very different aspects of thinking. Regarding the group of paramedics and nurses in this research, the thinking lessons acquired in their curriculum might have a way to some skill in expanding the concept. The intention is to encourage the students to look at life support situations from a wider perspective instead of thinking about them in selfish of immediate terms only. These situations assist the students to think in a wider manner. While med students who are not trained in thinking make initial judgment and thereafter look for points to support their judgment, med students who are trained in thinking are capable of finding points that contradict their opinion as well as those supporting it. The objective is to create thinking which is "detached" from the ego so that the thinker will be able to utilize it in the most effective way. A thinker should be able to say: "My thinking in this field is not particularly good", or: "My thinking performances in this field are poor", without his ego being threatened. This feeling must be shared by all doctors, nurses and paramedics in order to benefit from their work in saving the patient's life.

Our analysis discovered a difference between the three groups of students. All the paramedics and nurses applied most of the necessary procedures, compared to only 43% of the doctors. For example, all the paramedics and nurses gave oxygen as required, compared to sixteen of the doctors who did not. The doctors probably did not notice the fact that according to the medical findings presented the patient was hypoxemic, and/or they did not internalize the critical function of oxygen in that situation. The doctors learnt about the function of oxygen in such situations and definitely knew it on the theoretical level. But they did not implement their knowledge to the specific situation they were facing. In other words, the doctors did not transfer the theoretical knowledge to action regarding the emergency situation they were supposed to handle. "Transfer" is defined as implementing previously learnt knowledge on dealing with a new situation. Our findings support the conclusion presented in the following quote: "Nobody expects a wide transfer any more, but research over the last 2-3 decades shows that transfer to parallel problems is narrower even than the forecasts of the greatest pessimist". But the question still remains: Why does a medical person who knows so much and has all the required knowledge and theoretical background finds it hard to implement the knowledge efficiently while handling an emergency situation? Another explanation for this finding could be what is called "the hidden specificity phenomenon" according to which the more there is resemblance between a situation where something is learnt and a situation where the learnt is implemented, the more it is likely that a transfer of the learnt will take place. Both the doctors and the paramedics and nurses had contact with real patients. Doctors had more contact with real patients, but we claim that the difference resulted from the different approaches between the three curriculums and the way in which the three groups received their training as to how to handle medical situations. The curriculum emphasizing declarative knowledge the emphasis is on theory and facts regarding diseases. The curriculum emphasizing practical knowledge studied by paramedics and nurses is based on learning procedures and acquiring skills that are required to perform them. This way the paramedics were more trained to deal with an emergency situation which requires implementation of procedures, compared to the implementation of factual knowledge. We understand from this that a curriculum with practical emphasis is more suitable for preparing the learners to deal with emergency situations. An additional complementary explanation is that in the course of their studies paramedics and doctors develop different strategies for solving problems. Doctors develop problem-solving strategies that are more suitable for handling most of the medical situations. They learn that drawing anamnesis is the first step of intervention and therefore they first ask diagnostic questions – usually one after the other – and then carry out the clinical examination. But this method "doesn't hold" in emergency situations. For example, although it is important to ask diagnostic questions, in emergency situations the severity of the problem should be identified in the quickest possible manner and intervention should be made before it is too late. We believe that the way the students learns in class how to handle non-urgent problems has a tremendous implication. The student who is "bound" by this method does not manage to "break himself free" of the "questioning first" method and move to a state of "acting first", and this fact postpones and interferes with the intervention required for saving life in emergency situations. Nurses and paramedics, on the other hand, learn to "act first" and implement the required intervention at the right time instead of "asking first". We conclude thereof that doctors are not trained enough to handle emergency situations, and therefore have not developed independently the suitable thinking patterns for handling emergency situations such as the one tested. This fact shows that the curriculum at the med school does not provide students with the knowledge and skills required in order to handle emergency situations.

We believe that the future curriculum at med school will change the emphasis from declarative knowledge to practical knowledge, especially regarding those parts of the curriculum that deal with emergency situations. This can be done by: (a) inviting the students to join experienced paramedics on ambulances. Doctors should also join nurses working at the general and the children intensive care; (b) patient simulations. Recently these simulators have become sophisticated human dolls with mechanical lungs, air changing mechanism, physiology and breathing sounds which can be listened to, palpable pulses, measurable blood pressure and heart sounds, as well as limb movements, voice transmitter and responding eyes. Students can intubate them and give medication and other treatment. These actions produce real time reactions and changes in the vital signs which can be seen, heard, felt and experienced by the students. According to Gardner (1991) the use of such simulator enables to learn in a supportive environment. Students can make mistakes and "practice without risking" prior to treating real people. We believe that working with such dolls can assist students to develop themselves the correct procedures and the right thinking patterns in order to function efficiently in emergency situations.

The second objective was to examine the decision-making processes among medical persons in well-defined emergency situations. We reviewed the problem space theory, which was used as a theoretical framework according to which we interpreted and analyzed the data by means of the problem space theory concepts. Doctors are expected to immediately identify the medical problem in emergency situations, locate the target and take the required actions which will quickly lead to the desirable solution. In other words, the expectation is that a doctor will show in an emergency situation that he knows the shortest way, within the problem space, and make use of it to save life.

Our main findings were:

a) Students failed to take the necessary actions. Only half of them properly implemented the most important intervention – giving oxygen. This shows that the problem space of many students in emergency situations did not include the proper knowledge and the actions required for dealing with such situations.
b) Students failed to choose the correct way towards finding a solution in the problem space. The students were engaged in obtaining thorough anamnesis instead of immediately providing oxygen and thus failed in identifying the critical importance of the time factor in the given situation.
c) The actions of the students in general were implemented in clusters.

In order to explain the findings we used the deductive-hypothetical model (Elstein et al, 1978; Feltovich et al, 1984) and the identification of a decision-making pattern (Groen & Patel, 1985). According to the deductive-hypothetical model, information received from the patient raises initial hypotheses which are tested by other diagnostic questions or medical treatment. This process creates a delay in drawing conclusions where the hypotheses invoke the interpretation of information against hypotheses stemming from the new information (Patel & Groen, 1986; Patel & Groen, 1991). A delay in drawing conclusions, solving problems and making decisions (backward reasoning) takes place mainly when doctors are lacking the knowledge required to reach the solution while relying only on the identification of a pattern according to the present information. Backward reasoning is slow, cognitively demanding and better characterizes beginner students (Larkin et al, 1980; Arocha et al, 1993). Those med students who did not identify immediately the boy's severe condition and demonstrated lack of knowledge as to the actions to be taken, were busy looking for the problem the boy was suffering from in his medical history by extracting more anamnesis from the patient.

But in emergency situations the appropriate method of thinking should be according to the identification of a pattern based on thought (Groen & Patel, 1985), because the knowledge embedded in clinical deduction is stored in the memory in the shape of "if… then…" laws. When the problem is known, a line of rules can be approached which will quickly lead to a solution. The method of identifying the pattern requires addition deduction which is quick, effective and dependent on a good knowledge one has in the specific medical occupation area (Greeno & Simon, 1986).

Regrettably, the students in our research who did not have a well-organized knowledge-base regarding the emergency situations they were dealing with, could not present the use of pattern identification process.

Whether the examination of hypotheses or the identification of a pattern have been used, this partly depends on the level of practical experience, the knowledge and study methods, as well as the type of clinical task throughout the years of medical studies. Students learn to first ask diagnostic questions (usually one after the other) (Arocha et al, 1993; Patel et al, 1991), to make possible assumptions and then test their initial assumptions by asking additional diagnostic questions, or performing a physical examination, and only then decide about the proper treatment. These problem-solving methods can be identified through the behavior of a student characterized by a cluster of questions and actions. In other words, as a result of study methods the students develop backward reasoning in drawing conclusions and thinking patterns. In addition it seems that one question raises another without making the connection whether it is required or not in the present situation and questions are asked, which are irrelevant to the situation itself.

But these methods have failed in emergency situations where the time factor is vital and immediate actions must be taken. In such cases quick judgment is required. It is possible that the way in which the students learn to handle non urgent situations affects their behavior in emergency situations and even interferes with it. Students who are "trapped" in this concept are incapable of shifting from the method of "asking first" to the method of "acting first".

This research is primary in kind and has several limitations. **First**, it is "focused" around a human doll which is usually used for life support. This could create the wrong impression that the purpose of the OSCE station is to carry out life support, and that explains why at least 45% of the students were "quick" to intubate although there was no indication for that action in the given situation.

Several students, especially those who have found it difficult to playact, are capable of exhibiting better functioning in real situations.

Second, this research has been carried with a relatively small cross-section of students from one med school. Additional research which will include med students from other schools is required to verify the results.

Third, only five emergency situations have been presented to the students and it is unclear whether these results can be generalized to other types of emergency situations. Despite the need for additional research in this field, the present findings show that teachers should provide med students more opportunities to develop thinking patterns and strategies for solving problems related to emergency situations. By training the students to shift from "asking first" to "acting first", the teachers will succeed in obtaining the flexibility and creativity required from their students to handle medical emergency situations, where quick thinking and action make the difference between life and death. The results of the present research show that teachers should dedicate more attention to emergency situations and implant in the students thinking pattern related to the strategies which are suitable for solving problems that are required for handling emergency situations.

The research results have significant implications on the study of clinical medicine. It is obvious that both med students and nurses & paramedics obtained considerable information from visual signs, although the nurses and paramedics extracted more from the visual information than the med students. Surprisingly, med students as well found it hard to identify common clinical signs from pictures, as became evident from the rise in accuracy at the rate of 20% when identification of the clinical signs was provided. It is important to emphasize that those interpretation errors were not the result of signs which could have been mixed or vague; the signs were chosen from study books and their authors classified them as classical examples of the signs. That fact was verified by analysis of the identified signs carried out by nurses and paramedics before and after giving the diagnosis, which showed improvement in the identification capability after the diagnosis was given. The signs were available and identifiable but became clearer when the diagnosis was available.

The research has limitations and it is based on relatively small samples, but the differences discovered had great meaning. One can criticize the use of students at the pre-clinical stage, but that was an intentional strategy – to choose that cohort which would exhibit the deepest gaps between participants regarding medical knowledge and medical experience. In this sense, med students have less clinical exposure than nurses and paramedics, but in general the differences between the students are based on knowledge, data collection, problem solving and decision making. Med students excelled in receiving anamnesis and presenting the medical problem, but nurses and paramedics had more experience and clinical knowledge and found it easier to solve the problem and make decisions.

Whereas it is likely that teachers could consider a sign as a clear one, it would be reasonable to say that we underestimate the value of contextual information connected to identifying the sign. In the absence of a suspicion for the Cushing Syndrome (or knowledge about the disease) it is likely that a "moon face" child would seem as a slightly chubby child. There is clear evidence from radiology that even among med students, the interpretation of the presence or non presence of signs is subject to recurrent interpretation in view of additional information. The clinical training is not specifically directed to this subject. We provide the students with an opportunity to exercise clinical skills as to finding signs by touching, listening, x-rays, etc. and we waste expensive resources for testing such skills. On the other hand, students learn by heart the signs and symptoms of diseases ranging from common to rare, but there are clearly difficulties in interpreting information in the critical transition between observation and identification of a specific sign. Teaching approaches should reexamine the importance of this element regarding clinical skills, thinking processes, decision making and problem solving.

Quick action should be taken to rectify the situation. Every medical graduate should be capable of functioning independently in emergency situations at the hospital and outside of it and to carry out the basic life support actions skillfully. There is no doubt that this problem should be solved already at the med school. The authors of this work think that the most suitable time for teaching the theoretical and scientific basis for emergency medicine is during the clinic studies and not beforehand. During the pre-clinic studies the student does not have the tools and knowledge to benefit from life support courses. He is still detached from contact with patients and clinical work and the subject of life support still seems distant and does not integrate with the other study subjects.

During the clinical study period, on the other hand, the student is exposed to cases of severe diseases and injuries. He can both observe and take part in various activities that involve life support and emergency medicine. In our opinion the teaching of emergency medicine should not be isolated in a separate and concentrated course. Such course will require the shortening of the duration of teaching of other subjects thus leading to teaching in larger groups. In the regular clinical track, on the other hand, the students are divided into small groups of five to eight, and it is possible to hold practical, almost personal, training and enable the performance of random activities. A concentrated course is meant at refreshing the subject for interns and doctors who have already been taught the basics of emergency medicine in a detailed and orderly manner.

Authors believe that the simplest and most efficient way to teach emergency medicine is to integrate it with the existing curriculum of clinical studies. Each of the teaching clinical departments should be obligated to relate to the emergency medicine at its area. Similarly to the way teaching is carried out at the internal departments regarding the immediate treatment of pulmonary edema and the quick balancing of diabetic acidosis, so should the treatment of injured and life support be taught. The surgical departments, the intensive care and anaesthetization departments must teach the initial treatment of injured and the basic analytical actions related to life support.

In each of the taught subjects the following should be specifically emphasized: quick evaluation of the injured person, the initial treatment, the use of simple means to support life, to stabilize the injured and prepare him for transportation. Special emphasis should be put on teaching actions and providing basic life support skills, this way the teaching of skills can be controlled by a list of mandatory skills to be obtained. Every student and intern will receive an "activities card" in which every action he has performed and in which he has accumulated experienced will be mentioned and approved by the trainer's signature. This procedure is required to be determined as condition for receiving the degree of graduate in medicine.

One of the difficulties in teaching emergency medicine and immediate actions is that actual cases of injury are required to illustrate the problems. Cases of injury are not common and the arriving of an injured person to the hospital is not coincidental with the regular study hours. Therefore, the use of teaching, illustration and exercise aids is extremely important. Training aids such as video films, exercise dolls, specialized library and self-teaching pamphlets should be concentrated by the teaching departments. Computers have also been introduced lately for the purpose of illustration and self-teaching. From our experience we have found that exercising at the hospital's animal lab is extremely valuable for the training of activities such as venisection, hemostasis, intercostals drainage and tracheostomy. Training on anaesthetized dogs and on live bleeding tissues provides a sense of reality and adds to the experience and self confidence of the student and intern.

The research indicates a continuous deficiency in teaching emergency medicine and the teaching of basic life support skills in Israeli med schools. We call for an urgent action to rectify this deficiency.

The education for thinking stems from different fields of knowledge. In different timeframes it is dominated by different fields of knowledge. Education – and certainly the education for thinking – is governed today by cognitive psychology ("the new science"), which is also your field of occupation.

Two contributing areas can be mentioned here that seem particularly important in this research. The first is the developmental perspective. As a result of general development researches and development researches in the various disciplines we are able to see more clearly the obstacles standing on the way of children, adults and graduates of health and medicine sciences faculties to better thinking and learning. The second area is that of building constructivist learning models. Different researches indicate the power of active learning where the learner "builds" his understanding without having clinical experience – and this is what characterizes med students. Generally, this direction is known to us at least since Plato, but the researches of recent decades have deepened our knowledge. They have taught us which types of constructivist learning assist in handling different kinds of challenges in the course of life support and emergency situations.

Authors of this work do not put the development of thinking at the head of the line – they put it on the first row. They do not put it before reading, writing and arithmetic – which are also on the first row. This is not a question of either/or. The following wise basic statement for those going to school should be borne in mind: "Learning is the outcome of thinking". Good learning involves a lot of thinking, in addition to meta-cognitive attention to the processes of learning and thinking connected to it. When it is carried out this way, it produces better learning of contents and thinking skills plus learning of how to think and learn during emergency situations, e.g. stress management during life support. As to ethics, it is important to maintain it not only at the medical and health sciences school but also at home. This "thread" should be "woven" in many subjects. It is also positioned in the first row. There is good synergy between thinking and moral development. Moral development involves better thinking about moral issues. Moreover, thinking itself has a moral dimension – proper attention to evidence, different perspectives, judgment based on arguments, etc. But this, of course, does not mean that skilled thinking automatically leads to moral behavior. No way! Satan, it is claimed, is a perfectly skilled thinker. Hence, in everything connected to moral development one should do more than develop thinking about moral aspects or develop thinking for its own sake.

It seems that all things – all teaching goals – have "taken a place" on the first row at med schools, and the last row in the clinical field. But this is not so.

Quite a few things taught at school should be "sitting in the back". Anyway, education and good thinking have a place on the first row.

We can see significant progress in theory – better learning models, more complex concepts of intelligence, more efficient approaches to the fostering of thinking, in addition to several convincing examples that it is possible. Regarding schools, we see an improvement in various "niches". Many schools have successfully experienced valuable innovations. The fundamental problem is of the scope of change: significant successes have remained isolated. The reason for this phenomenon – the difficulty to create a wide-scale change – does not relate only to the agenda of education for thinking. In fact, all wide-scale reforms, with their different agendas, have encountered difficulties in this field. Many factors have contributed to this: the political significance of educational initiatives, economic aspects, the isolation of schools of health and medical sciences as institutions from their communities and the research communities, the many tasks these schools are required to undertake, and more. Nevertheless, we hope that the means of teleprocessing and especially the World Wide Web will help neutralizing at least some of these factors and make a wider-scale change possible.

You expect the medicine and health school to teach thinking and you have even developed "theories for practice" – which will teach how to make the distinction between "theories for practice" and "theories for understanding" to assist in carrying them out – but you also wish to preserve its traditional structure, which is built entirely for authoritative teaching of basic knowledge and skills, i.e. the "learning of poor thinking".

Structural change is a welcome thing, but based on what I have seen during the last two decades, we don't think such a change is about to take place, anyway not in a wide scale. I have great interest in a wide-scale change and that is why we are trying to develop work frames and methodologies which will be able to penetrate the med school structure as it is, more or less, and assist the teachers in teaching students how to learn better even in traditional frameworks – to teach and learn the conventional study subjects, to examine and be examined, etc. and all this in crowded classrooms.

Authors of the present work have indeed learnt about important intercultural differences, but they have also learnt that the similarities are greater than the differences. What makes it difficult to learn reading or arithmetic or to learn thinking is similar in all cultures. Naturally, the level of development depends on the local education system and the possibilities at the disposal of learners, but the types of obstacles and misunderstandings are similar everywhere – not only from the aspect of learning but also from other aspects which relate to the education system, i.e.: problems connected to the professional development of teachers, the balance between decentralization and centralization in the educational policy, exams and their status, and more. Still, there is, for instance, "another education" in Israel, and in Venezuela and South Africa and the US, and other places. There are always local initiatives and medium-scale programs that offer stimulating and beneficial innovations, but they are exceptions to the rule, i.e. "raisins" in quite a uniform "cake". Good people throughout the world make an effort to change the situation and to create a wide-scale change. I am also trying to make a contribution to this effort.

"Good thinking" is exactly what you think it is, namely, the common sense serves us well in this matter. For example, good problem solving is the solution of problems which produces wise and practical solutions for those concerned. Good decision making is the making of decisions which explores possibilities flexibly and examines outcomes in order to properly choose and serve those concerned. There isn't much mystery as to the nature of "real" good thinking – it is exactly what you think it is.

And an even more basic question: According to the research – what is "thinking"? What distinguishes it from other mental activities at a time of stress?

We can summarize it with an example: What is a chair? Apparently it is not easy to answer this question categorically. Chairs come in different styles. Some chairs are "borderline cases", such as a stool with back support. It is hard to define a "chair" in terms of essential and sufficient conditions, but we all know how to identify it. Thinking is not different in that sense. It is a natural term of the language which is defined by a lingual form. It is best to refer to "thinking" as a prototypical term, the way we refer to "chair" or other natural terms of the language. As there are chairs which are absolutely prototypical and others which are borderline cases, the same applies to thinking. It is hard in emergency situations – with the help of essential and sufficient conditions – to clearly distinguish thinking from other types of mental activities. Some mental activities are prototypes of thinking while others are not – they are thinking in a "borderline case" sense. For example, a systematic and improved decision-making in an emergency situation is prototypical thinking; but what about a quick and intuitive decision? It could be thinking only in the borderline-case sense. And what about daydreaming? It could be non thinking at all; and what about an idle reflection about something? This is probably another borderline case of thinking.

The history of the attempt to nurture thinking is indeed ancient and its roots go back at least as early as Plato. What is new in this field is that today we have more complex knowledge about the challenge of the development of thinking

– its nature and the ways of handling it. For example, philosophers and psychologists have located and classified typical thinking failures; researchers of sciences and mathematics-teaching have identified typical misconceptions in the teaching of these fields of knowledge which partly reflect general thinking problems; theoreticians who deal with the "tendency" aspect of thinking have shown how good thinking depends not only on skills but also on being sensitive to opportunities and the drive to make an effort – elements which have been abandoned by various theories wishing to understand and improve thinking. These are only quick glances of quite a rich "landscape". Today we know much more than in the past.

In addition to knowledge about thinking and its teaching, we also know more about ways to change the school in order to adjust it to the teaching of thinking – how to increase the involvement of doctors, how to make an organizational change, how to handle problems relating to the extent of change. Indeed, the knowledge we have is still not wide enough to enable the making of change easily and painlessly, but we know more than we knew three decades ago and to an extent that enables us to create significant changes.

To sum up it will fair to say that the process of learning and what is learnt tend to be tightly anchored in certain connotations and activities, with these connotations and activities being very artificial, detached from actual implementation, with non-sufficient clinical experience.

Nevertheless, it is also true to say that general knowledge which is not connotation-anchored usually interests people and provides them with power in certain situations; it is also true to say that sometimes people produce from certain situations knowledge of a very general nature to which they find good uses in other places. We can summarize these ideas in three principles having a dialectical relation between them:

- **Positional learning:** meaningful and effective knowledge tends to be extremely suitable for its special acquiring and application connotations. Therefore, effective learning should take place in social environments and activity environments having a certain measure of authenticity as learning environments, which offer the possibility of application later on (e.g., the connection between data collection and the performance of problem solving and decision making).
- **General learning:** through processes of diversified exercising or active simplification it is possible to extract beneficial general knowledge from specific connotations; through extraction of well practiced processes by identification patterns and by materialization of principles, it is possible to beneficially implement general knowledge to special connotations (performance of skills).

- **Self-learning guidance:** knowledge, beliefs and opinions about learning itself are likely to assist the learners and organize their learning in a more efficient manner (internalizing the knowledge through skill implementation, decision making and problem solving, active involvement connected to knowledge building in order to handle emergency situations).

The principles phrased above are neither supposed to form a learning bible nor do they make the most of all the important things. E.g. they do not specifically handle the importance of feedback in effective learning – a considerable behaviorist principle whose importance is not less in contemporary theories. They do not emphasize the importance of motivation in learning, although the turning of learning into connotation-dependent, social, aimed at understanding and at being independent, will surely enhance motivation as it enhances the relevance, internal motivation and other similar elements. Nevertheless, the above eight principles embody several current ideas about learning and thinking in the process of decision making and problem solving.

Which experiences in learning and thinking during an emergency situation comply with these principles? An ideal learning experience according to these principles will excel in characteristics such as the following:

- Active involvement of med students, nurses and paramedics that ensures construction of the knowledge how to cope with an emergency situation.
- Activities that require clinical thinking in proper ways for med students, nurses and paramedics such as linking, collection and choosing of information, raising assumptions and their evaluation, drawing conclusions – all this in order to construct understanding, treatment and the reaching of a solution to the problem, as well as making decisions in the quickest manner.
- An opportunity for med students to examine several meaning relations which include the required knowledge in order to build a rich network of connections while treating emergency situations.
- Patterns of social interactions in the framework of thinking and mutual learning teams in order to support the above elements (such as medical staff, nursing staff, paramedics).
- Responsibility for different aspects of the required knowledge which is somewhat distributed among different learners and supported by different products (such as learning the theoretical material and implementing it practically).
- The required knowledge, which is interwoven in social environment and activity environment, is abundant with manners that nurture the development of a certain adapted knowledge, and full of future potential applications; some call it an “authentic environment”.

- Med students who implement their general knowledge to social environment and activity environment and extract from it a more abstract knowledge, namely – learning the theoretical knowledge and implementing it in the field.
- Encouragement of opinions, skills, behavior in the course of performance, beliefs and actions that lead to independent learning and guided thinking, in order to reach the solution of problems and the process of making decisions.

Strategies for improving emergency care for children: Perceptions and practicalities

What do parents want when they take their child to an emergency department? A short waiting time, staff who care, a thorough examination, an accurate diagnosis and explanation about what it means and the treatment required. Meeting these expectations may result in better compliance with discharge instructions, decreased use of medical services, more compliments, more satisfied staff and a lower risk of complaints and law suits. Tertiary paediatric EDs are perceived to have greater expertise and facilities for children and attract patients from a large catchment area despite appropriate services being available locally. The article by Oakley *et al.* in this issue of *Emergency Medicine* partially succeeded in their aim to improve emergency care for children in a mixed ED through a partnership with a tertiary paediatric hospital.

How can we improve the care for children and adalut in emergency? There is no substitute for experienced staff. Improvements in staffing lead to improvements in direct patient care, supervision, teaching, quality improvement activities and research. However, there is limited literature on the subject. In an American ED senior medical review of trainees' assessments led to frequent important changes to patient care, including averting potentially life-threatening problems. Another American urban paediatric ED reported that an increase from part- to full-time attending physician coverage decreased malpractice claims and payments by over 40%.

As senior staffing in EDs increases and joint training in paediatric emergency medicine is coming closer to being realized, there will be greater numbers of physicians with high levels of expertise in paediatric emergency care. Many Australian and New Zealand hospitals have secondment arrangements for junior medical staff in emergency medicine and paediatrics, which provide different experiences of casemix, clinical care, formal teaching and opportunities for greater clinical responsibility and support. There is potential for similar networking within senior medical and nursing staff. As staffing levels in the major centres approach the Medical Workforce Advisory Committee (AMWAC) recommendations, there will be greater opportunities for shared or regional appointments.

In addition to adequate staffing levels, care can be improved through education, clinical guidelines and quality improvement projects. Short courses in acute paediatric care such as Advanced Paediatric Life Support (APLS) and Emergency Nursing Paediatric Course (ENPC) aim to teach a minimum level of knowledge and skills. They also provide opportunities for informal networking between specialties, hospitals and professions.

Clinical guidelines can also be an effective means of improving the process of health care and improving outcomes. The extent to which the potential health gain is realized depends on how effectively the guideline is implemented. Key factors in implementation include clinical leaders who use the guidelines, involvement of staff in the change process and readily accessible guidelines in an appropriate style and format. Support for the implementation is critical, involving all staff who contribute to patient care in the ED and in the wards.

Attempted to achieve an appropriate environment for children, similar to the ACEM policy: 'The physical environment should provide for the various and special needs of children and adolescents and in particular the special emotional needs of children must be recognized. A well defined area should be provided so that the paediatric patients can be shielded as much as possible from adult patients. 'Children must be protected from the sights and sounds that may be stressful to them.' The problems of access block and high demand for emergency services affecting the quality of care for adults similarly impact on the care for children. noted the dedicated paediatric area was increasingly occupied by adult patients, with a corresponding drop in staff perception that the ED was suitable for children. Unfortunately the views of parents were not surveyed at this time.

Sharing the brand name of a tertiary paediatric hospital with the paediatric unit in a metropolitan hospital is currently being considered in several Australasian cities as a marketing strategy to improve the appeal of local services. Sharing the brand name of a respected institution will be ineffective if it is not supported by the quality of service for which the brand is respected. Failing to provide the quality of service for which the tertiary paediatric brand is recognized risks damage to both institutions. Consumers consider information provided by family and friends to be the most credible source of information about the quality of medical care.

'Badging' the paediatric section of the Emergency Department in the study by Oakley *et al.* was supported by the improvements in staffing, education and clinical care. As a result there were improvements in staff confidence, parent satisfaction and paediatric attendances. It will be interesting to see if the trends can have been sustained. The partnership model described in the study has the potential to be successful in other hospitals, but only if backed by the staffing, education, quality improvement activities and engagement of the clinicians and support staff who provide the essentials of care.

Anyway, it is useful to distinguish between the methods dimension and the contents dimension of the progressive/conservative tension although in real life the two dimensions certainly co-operate. Some contents could be more or less progressive and some methods could be more or less progressive. Regarding the methods dimension – if we imagine a "scale of methods" which begins with extreme conservatism and ends with extreme progressiveness – we are probably found at the area of 7/10 from the beginning of the scale.

This is what the authors of this book dislike about any type of extremity: it tends to be ideological. In education, of course, there is an inevitable element of ideology. But education is also a design science. As a design science the major question it asks is: "How can one carry out this work?" According to every point of view, the basic object of education includes thinking, remembering knowledge, understanding it and undergoing active clinical experience of it.

Does the educational pendulum have to move forever only because education is ideological by nature (as known, ideologies cannot be refuted)? Or is it possible that the pendulum will stop one day because education has a meditational and scientific dimension as well and some findings might support one aspect (e.g. constructivist findings about learning which support the progressive aspect)?

We believe that the dimension of the progressive/conservative **content** is a matter of eternal tension – it reflects what people value, and people in different cultures and times will continue being different from the point of view of what they value. On the other hand, the disputes around the dimension of the progressive/conservative **method** will gradually diminish as they relate to the question of the effectiveness of means. We gradually accumulate decisive knowledge as to what works the best way regarding different goals in emergency situations (life support) and at the same time also acknowledge that more than one method is likely to serve a certain purpose in a certain situation, and that additional renovations are always possible. Teaching how to read is a good example for this matter: the ideological dispute between the phonetic method followers and the holistic method followers is gradually dissolved into arguments about subtleties regarding the way in which children learn to read and different ways of teaching how to read.

The main problem connected with the study of thinking processes is simple but also very hard to solve: thinking is an internal action which cannot be directly observed. There is no reliable way to follow the thinking processes with our senses and therefore there is also no way to register them, record or film them. Still there are ways, although not perfect, to penetrate the 'black box'. The simplest way is to ask the respondent – the problem solver – to describe the continuity of his thoughts, from the moment of getting the problem up to providing the answer. This is a possible solution and many researchers have indeed used this method called 'thinking aloud' to study thinking. But this method is not without difficulties. First of all, no one knows if the description given by the respondent is indeed a true description of the thoughts going through his mind at the time of their occurrence. Even if the respondent tries his best to carry out the task sincerely and accurately (many researchers have used themselves as respondents), can he utter all the thoughts coming up to his head? Can he at the same time concentrate on solving the problem and describe his thoughts while making the attempt? Moreover, is the person generally aware of his own thinking processes? It could be that important stages in the process of solving the problem take place outside the awareness, outside that range of thoughts that the respondent is aware of and capable of reporting. All these are real difficulties.

Hospital Development Strategy for Emergency Medicine

- Provision of high-quality integrated and efficient emergency care services
- Establishment of working practice with sharing of emergency physician roles between the Emergency Department, the Department of Medicine and Department for Care of the Elderly
- Co-location of a combined Medical & Surgical Admissions Unit with the Emergency Department with increased capacity, focusing on rapid assessment and decision making, facilitated by dedicated access to diagnostics and multidisciplinary clinical input
- Establishment of a streamed service for resuscitation, assessment and minor injuries
- West PCT Provision of a base for GP out-of – hours services in association with Suffolk

Thinking is an action that takes place almost all the time. We think when we try to solve a problem bothering us, when we wish to choose one of several modes of action facing us, when we weigh disadvantages against advantages. Our thinking is not always aimed at a clear and defined goal. Often our thoughts shift automatically from one thing to another and sometimes we even find it hard to answer the question what we are thinking about at a certain moment. Sometimes we daydream or indulge in fantasies and even when we dream at night it is actually thinking. It is hard for us to consciously tell ourselves when to think and when not to think, and sometimes we find it difficult to choose what to think and what not to think about, and this state is very typical to medical and nursing staffs in emergency situations.

The products of thinking are the positions, feelings, opinions and beliefs we reach through thinking. There is almost no area of psychology which does not deal with these or other products of thinking. This way, for example, social psychology examines our positions in various social-cultural issues; personality psychology deals with positions about the "self"; the field of motivation deals with the power of wills and aspirations to create behavior; the research of emotions finds that emotions such as joy, anger or fear are also, to a great extent, products of thinking activity. Medical psychology is engaged in stress situations, handling emergency situations, questions of life and death, problem-solving processes, problems of pressure, crisis, etc.

Well, we learn in this research that the activity of thinking deals with information – both the information absorbed from the outside through the senses and the information extracted from within, from the memory reservoirs. We also learn that thinking reorganizes this information and that with the help of different activities it creates new information. We further learn that thinking is carried out with the help of "symbols", "ideas" and "representations".

In the research of thinking there is a tendency to make a distinction among the general activities defined as thinking between target-aimed thinking and thinking which is not target-aimed. When speaking about target-aimed thinking it means solving problems, making decisions and drawing conclusions. The thinker is faced with a target (e.g. to solve a certain problem) and the thinking processes are as aimed as possible towards its achievement. On the other hand, there are many thinking processes which are not aimed at a clear and defined target, such as asking multiple questions, obtaining anamnesis, medical treatment not according to priorities, impaired treatment, which are types of "wandering thought" processes. It should not be inferred from this term that the latter processes are considered as "idle thought". Many relevant important and innovative ideas for solving problems suddenly come up exactly during such a "wandering thought" process.

Contrary to the multiple concepts of preclinical teaching, the clinical teaching in all med schools in the west is taught uniformly in the framework of rotations at hospital wards. The students stay at these wards for 1-2 week periods (at the "small professions" – skin, eyes) up to 8-12 weeks (the "large professions" – internal, pediatrics, psychiatry). Teaching in general is carried out with groups of 8-12 students. They acquire clinical experience by watching what is done with patients, taking anamnesis, performing physical examinations and initial examinations. In several med schools the students are given defined duties which enhance their awareness to responsibility.

The advantages of clinical teaching are expressed both in logic and convenience of performance. Med students are exposed to the different medical fields under the supervision of expert doctors, who have teaching experience, found at the tertiary medical centers which are branched to universities. Nevertheless, the clinical teaching in all med schools including modern ones such as McMaster has several disadvantages: the main one is the selective exposure to hospitalized patients only who do not form representative sampling of the diseases in the general public. Thus the students are prevented from getting to know patients of many diseases such as the flue, tonsillitis, inflammatory intestine diseases or hyperactivity of the thyroid gland, the diagnosis and treatment of which is carried out at outpatient clinics. The population of ambulant patients is different from that of hospitalized patients and there is a fundamental difference between these two populations in the rational approach. As the clinical skill is specific, the selective exposure of the med students to hospital patients does not qualify them to work in the community and at clinics; and this supports the authors' opinion that learning the theoretical knowledge without its implementation at the hospital or in the framework of a treatment unit, will continue to be irrational and ineffective for emergency or life support situations, and will continue to be a thinking process which is lacking as far as application and treating patients are concerned.

The second disadvantage of clinical teaching at the hospital is that it is carried out in an authoritative hierarchical environment under high pressures. Much has been written about the hospital atmosphere and the culture developing as a result thereof. In many departments students are required to participate in a planned activity of visitations, seminars, patient absorbance, and other joint activities with the department staff, which stretches over 10-11 hours a day. This activity is physically and emotionally exhausting and does not leave time for individual learning and thinking. The stressed atmosphere, the work load and the hierarchical structure encourage conformism and imitation of the senior doctor's model along with his desirable and undesirable qualities.

Another disadvantage is that emphasis is put on knowledge rather than thinking and skills. Teaching knowledge can be carried out by lectures to groups of students. Teaching skills requires personal training which is not achievable in the current clinical teaching organization. The large majority of med school graduates complete their studies without even once obtaining anamnesis under the direct supervisions of a teacher. The training for other skills starts only during internship teaching.

The fourth disadvantage is that the clinical curriculum is not constructed only to meet the students' needs but the teachers' needs as well. Teaching bestows status and prestige. Sometimes the curriculum succumbs to pressures of strong departments. This is the only way to explain differences in the composition of clinical teachings among western med schools. And lastly, most clinical subjects are taught without a defined syllabus and without mentioning the educational goals. The clinical curriculum is determined by clinical experts who often find it difficult to define the difference in expectations between med students, doctors and interns. This leaves the students in ambiguity regarding what to learn and what to leave aside. With a lack of clear definition of goals, the students determine their study priority according to the composition of tests from previous years and according to those subjects emphasized by their clinical trainers. The ambiguity regarding what is more important and what less, the ambiguity regarding "Do I know enough?" – enhance the level of anxiety during studies and the dependency on the clinical trainers. This affects the student's ability for self teaching.

In view of the above, a teaching program has been presented which can be materialized in the framework of the existing resources at general hospitals. In view of the positive reactions of students, we recommend to expand the program according to the following outlines:

- To organize clinical experiences for doctors in the framework of the emergency department, the intensive care unit and the operation rooms for adults and children.
- To obligate all the staffs (doctors, nurses and paramedics) to take PALS, ATLS and ACLS courses.
- To use exercise dolls and animals in performing intensive actions such as intubation, intra-osseous infusion, peripheral massage, ambo ventilation…, etc.
- To train doctors, through thinking processes, to imagine objects and events which are not physically present when we teach life support and emergency situations. Thinking without images is not possible, and this supports our claim that during life support performed on dolls and patients, a lot of imagination should be operated in order to reach the solution of the problem.
- To train doctors to be able to function in a physical and stressful environment in order to handle life support and emergency situations.
- To combine the teaching of emergency medicine in the framework of the clinical chapters not only regarding internal medicine (two weeks in year 4 and eight weeks in year 6) but also pediatrics (two weeks in year 4), women and parturient (about 7 weeks in year 5/6). In the course of med students' stay at the

eyes, ear nose and throat, psychiatry and urology departments they should be presented with aspects of the emergency medicine in these areas in the framework of the clinical material addressing the emergency room. Integration of fourth-year students with nurses of pediatrics and general intensive care, or their integration with intensive care doctors for three months.

- To integrate sixth-year students with intensive care ambulance teams for two months.
- To determine explicit educational goals in the different medical fields that are included in the framework of emergency medicine and their inclusion in the preclinical and clinical curriculum while paying attention to subjects which are usually not included in the material taught at the hospitalization departments: intoxication, injury by animals, drowning, life support, states of unconsciousness.
- To obligate students and interns to fill in an urgent-medicine "training card" to be signed on the basis of experiencing and observing a list of emergency situations, and rotations of emergency medicine. Signing will be approved only by a senior intensive care doctor.
- To include questions about medical emergency situations in the final exams for clinical subjects and hold a practical exam in providing first aid and performing life support activities.
- To consider the introduction of changes in the organization and operation of emergency rooms with a view to operate them on the basis of defined areas regarding departmental rotations under the control and supervision of senior doctors. In our opinion, students should be obligated to stay at the emergency room for a defined period of time as part of the internship track, similar to the mandatory month at the emergency room during the training period.
- To integrate senior doctors from different departments in teaching and supervising at the emergency rooms or to allocate academic standardization to the emergency rooms according to the extent of teaching in them which will be used as a means of attracting clinical experts to the emergency rooms. Hopefully this will produce the creation of emergency medicine training, encourage research and improve the level of medical service at the emergency room.

It is assumed that the preclinical teaching program will merge the two models in such a way that in the course of the coming years the following changes in the traditional curriculums will gradually take place while adopting some of McMaster's open curriculum characteristics:

1. The preclinical teaching will continue to be based on disciplines. Nevertheless, a reduction will take place in the level of teaching in general and the number of lectures in particular of physics, biology, chemistry, biochemistry and physiology

while letting students have greater freedom in focusing on contents that interest them such as: life support, emergency situations, skills required at the time of life support or emergency situation, intensive care units of adults, children, premature babies, neurosurgery, etc.

2. The aim of teaching will be to teach thinking processes, understanding and analysis ability rather than memorizing information items. More emphasis will be put on skills, values, positions and the ability to use the library and the computer in order to draw the required information. During exams the examinees will be allowed to use books and every other source of information.
3. The students will be encouraged to study and experience in groups by imposing group tasks.
4. Greater emphasis will be put on behavior sciences and the research methods practiced in them.
5. Statistics will not be taught to students as "just another discipline" to be learnt and forgotten but rather as a way of action and scientific methodology.
6. Anatomy, pathology, pharmacology and microbiology will be taught as means of solving a clinical problem. E.g. the target of teaching anatomy will not be to learn the structure of the human body as a goal in itself but as a means of thinking and understanding the ways the organs operate in the clinical making. Concurrently with learning the anatomy of a given organ, the student will see how that organ "looks" through a physical examination, an x-ray, nuclear scanning, angiography or endoscopy. Similarly, the teaching of pathology will focus on common diseases whose diagnosis is determined by pathological examination; the teaching of microbiology will focus on nosological units rather than families of microorganisms. The teaching of clinical pathology, pharmacology, microbiology and biochemistry will have a clinical orientation while emphasizing the applicable aspects of these disciplines when diagnosing and treating patients, and with a quantitative evaluation of the uncertainty of clinical solutions they offer to the clinician.

As a result of the increasing awareness to the shortcomings of traditional clinical teaching it seems to me that in the future the curriculum will be gradually altered in the following directions:

1. Large sections of the clinical teaching will be shifted from the hospitalization wards. The teaching at med schools will be changed from two-stage (preclinical and clinical teaching) to three-stage teaching (preclinical, hospital teaching and teaching at clinics). The third stage will be given at the primary outpatient clinics, the consultation clinics, emergency rooms, adult and pediatric intensive care departments, rehabilitation departments and retirement homes.

2. The load of patients and tasks imposed on the student will be reduced in order to enable him/her to become acquainted with alternative approaches to a clinical problem while critically analyzing the data in the literature and operating thinking processes.
3. Emphasis will be put on diseases, road accidents, domestic accidents which are common in the geographic area where the school is located. The student will be guided throughout the studies by a list of knowledge and skill goals which will form a minimum requirement for graduation.
4. The clinical consideration and medical decisions will not be based on "intuition" but rather on arguments which have explicit logical explanation. For that purpose, the students will receive structured training in analyzing clinical decisions. Such analysis will be based on the results of observations on similar patients in the past, on cost effective constraints and ethical considerations.
5. The students will be required to get to know in detail the health services system in the geographical area where the school is located. Emphasis will be put on the continuous commitment to individuals and the community in terms of treatment, prevention of diseases and advancement of health.
6. Supervision on med students during clinical rotations will be extended and deepened, by personal training and by additional investment in thinking process and problem solving.

In view of the results discovered in the research we have chosen to build a model, according to clinical judgment, of thinking processes and problem-solving during emergency situations of urgent medicine.

This model is to be the work basis for every sixth-year med student, third-year paramedic and fourth-year nurse:

Approach the standardized patient

↓

Read the instructions to the examinee

↓

Focus on the patient's problem

↓

↑

← **Mentally develop the checklist** →

↓

This method describes an objective clinical test system which uses a "make believe" patient and enables a simultaneous testing of a group of examinees by rotational visits to a number of "test stations" at measured periods of time. In every station the examinee is required to demonstrate a defined skill at a unified timeframe, usually 4-7 minutes. All examinees are required to visit all the stations. The stations are diversified and can include collection of medical anamnesis, physical examination, advising the patient, giving treatment, life support, ventilation, administering fluids and solving diagnostic and nursing problems, making diagnostic decisions, etc.

In every station there is a "strict" examiner who evaluates the task performance according to points prepared in advance. The patient, the subject-matter of the test, is sometimes a "make believe" patient whose medical condition has been prepared in advance and sometimes a real patient who tells the story of his disease.

Hence, of the three variables of the test – the examinee, the examiner and the patient – two are predetermined, so the test results actually reflect the student's knowledge and skills. The test simulates a clinical situation, it examines the teaching goals.

From our experience in the research we have learned that such test can be implemented in small groups of 5-8 people, and it is effective for the evaluation of study groups in the department.

The specific objectives of the different test "stations" are as follows:

1. Examining the skill of collecting intended medical anamnesis.
2. Examining the skill of carrying out an intended medical examination.
3. Solving diagnostic and/or nursing problems regarding the specific problem while using support means such as chest x-ray, ECG, lab tests, etc.

In view of the research results the researcher has constructed a checklist of common cases in urgent medicine, which could help the med student in the process of thinking, problem solving and diagnosis as well as making nursing decisions at the quickest and most efficient possible way.

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APPENDIXES

APPENDIX I

Knowledge Test Before Solving Critical Thinking Case Studies by Osce and Cort

Test I

1. **The The right order of actions taken by a single caregiver in the course of life support of a child who does not breathe is:**
   a. Check consciousness, put in the right position, open airway, check breathing, give two ventilations, check pulse, perform cardiac massage, call an ambulance
   b. Call for help, check breathing, give two ventilations, check pulse, start ventilations and external cardiac massage, call an ambulance
   c. Check breathing, call for help, give two ventilations, check pulse, start ventilations and external cardiac massage, call an ambulance
   d. Check breathing, feel the pulse, start cardiac massage, call an ambulance

2. **Which of the following signs assist in the assessment of a shock condition in a child?**
   a. Pulse
   b. Intensity of pulse
   c. Skin color and temperature
   d. Capillary filling time
   e. All the above

3. **A 7-month old baby was referred due to diarrhea. On examination he looks pale and has: pulse 188 per minute, respiratory rate 46 per minute, blood pressure 96/58 and capillary filling time 5 seconds. The immediate treatment includes:**
   a. Close monitoring and administering fluids through the mouth
   b. Giving infusion and crystalloid fluid exchange at a rate of 10 to 20 ml/kg
   c. Blood gas, electrolytes and administering bicarbonate
   d. Administering glucose 5% at the rate of 20 ml/kg

4. **A 9-month old baby is referred with 10% to 15% (clinical) dehydration. Respiratory rate 48 per minute, pulse 187, blood pressure 98/65, fever 38 and capillary filling time 4 seconds. No peripheral vein infusion can be implemented. The treatment preferences include:**
   a. Cut down in cephalic vein, cannulation of femoral vein by venipuncture, intra-osseous infusion
   b. Intra-osseous infusion
   c. Administering fluids through the mouth, cut down in peripheral vein and cut down in central vein
   d. Central infusion
5. **If a child with fibrillation does not respond to the first defibrillation attempt, your next step will be to:**
   a. Give intracardiac adrenaline
   b. Repeat the defibrillation but with double voltage
   c. Repeat the defibrillation with the same voltage
   d. Punch the chest
   e. Give intravenous adrenaline

6. **A 4-month old baby is brought to the emergency room due to lack of appetite and fast respiration. Pulse 263 per minute, skin color gray, low perfusion, ECG suitable for supraventricular tachycardia (SVT). This baby should be treated with:**
   a. Electroversion
   b. PO digitalization
   c. Intravenous verapamil
   d. Quick intravenous digitalization
   e. Vegal stimulation, cold water on the face, insertion of finger into the mouth

7. **Adrenaline is the most useful medication for child life-support for the following reasons, except for:**
   a. Adrenaline raises the automaticity which is vital in cardiac standstill
   b. Adrenaline reduces the oxygen consumption of the cardiac muscle
   c. Adrenaline improves the defibrillation success rates
   d. Adrenaline raises the diastolic blood pressure
   e. Adrenaline increases the heart's contractility

8. **Which of the following sayings regarding the airway in children is incorrect?**
   a. The narrowest part of the airway in children is under the glottis opening at the oricoid cartilage level
   b. In order to observe the glottis one should bend the head backwards and bend the neck (flexion) in order to open an airway
   c. The tongue is large and forms the main cause for blocking the airway
   d. The glottis opening in children is found at a higher position than in adults

9. **The treatment of supraventricular tachycardia with hemodynamic instability is:**
   a. Vegal stimulation such as with a bag of ice on the face
   b. PO digoxin for the symptomatic baby
   c. Giving verapamil in case the propranlol has been ineffective
   d. Giving morphine to reduce the sympathetic tonus
   e. None of the above

10. **Which of the following patients requires immediate pharmacological treatment with adrenaline after securing airway and oxidization?**
   a. 5-month old baby, pulse 58, blood pressure 90, alert, drinking from a bottle. Was given 6 digoxin tablets of 0.25mg two hours before arriving
   b. 4-month old baby, pulse 120, crying and messing around
   c. 2-month old baby, pulse 50, blue, non-responsive
   d. 6-month old baby, pulse 70, blood pressure 90, sitting and smiling

11. **The first defibrillation dose for babies and children with ventricular and supraventricular arrhythmia is:**
   a. 0.5 joule/kg for supraventricular arrhythmia, 2 joule/kg for ventricular arrhythmia
   b. 2 joule/kg for supraventricular arrhythmia, 1 joule/kg for ventricular arrhythmia
   c. 5 joule/kg for supraventricular arrhythmia, 2 joule/kg for ventricular arrhythmia
   d. 10 joule/kg for supraventricular arrhythmia, 2 joule/kg for ventricular arrhythmia
   e. 20 joule/kg for supraventricular arrhythmia, 10 joule/kg for ventricular arrhythmia

12. **The most common cause of cardiac standstill in children is:**
    a. Respiratory disorder or cardiac standstill
    b. Pulmonary embolism
    c. Electrocution
    d. Chest injury
    e. Myocardial infarction

13. **The first steps in infant life support are:**
    a. Touch stimulation, position, ventilation
    b. Position, ventilation, suction, touch stimulation
    c. Position, suction, ventilation, touch stimulation
    d. Position, suction, touch stimulation, ventilation

14. **Which of the following can be useful in <u>endotracheal</u> administration for the life support of a 6kg baby?**
    a. 0.6cc adrenaline at 1:1000 dilution
    b. 6 (meq) bicarbonate
    c. 120mg calcium chloride (100 mg/cc)
    d. 0.6cc adrenaline at 1:10,000 dilution
    e. 12 (meq) bicarbonate

15. **The treatment of an airway obstruction in a baby includes:**
    a. Back stroking and abdomen pressing
    b. Abdomen and chest pressing
    c. Back stroking and chest pressing
    d. Blind mouth-survey, back stroking and abdomen pressing

16. **Life support medications in cardiac standstill can be given through:**
    a. Femoral vein
    b. Intra-osseous infusion
    c. Brachial vein
    d. Tracheal tube
    e. All the above

17. **The initial fluids volume suitable for treating a hyperbulimic child is:**
    a. 10 cc/kg of normal saline solution 0.2 D5
    b. 10 cc/kg of fresh frozen plasma
    c. 10 cc/gk albumin 5%
    d. 20 cc/kg of normal saline solution

18. **The best indication for the efficiency of life support efforts in an infant is:**
    a. Muscle tonus
    b. Pulse
    c. Color
    d. Respiratory rate

19. **An 8-month old baby was referred because of diarrhea. On examination he looks pale and agitated. Respiratory rate 45 per minute, pulse 180 per minute, weak peripheral pulses, capillary filling time 5 seconds and blood pressure 85/58. What should you do first?**
    a. Put infusion and give fluids at maintenance dosage
    b. Give 100% oxygen, monitor while administering fluids PO
    c. Give 100% oxygen, put infusion and administer 20 ml/kg crystalloid
    d. Give 100% oxygen, check arterial gases and electrolytes

20. **Which statement correctly describes the chain of events leading to the development of a cardiopulmonary arrest in children?**
    a. Cardiopulmonary arrest usually testifies a cardiovascular problem
    b. Cardiac standstill is usually the result of neurological functioning disorder and hyperventilation
    c. Cardiac standstill is usually caused as a result of ventricular arrhythmia
    d. Cardiac standstill is usually the final outcome of deterioration in pulmonary functioning and shock

21. **A 3-year old child is brought to the emergency room by his mother who says: "I think he swallowed a button". The child is blue, cannot cough and gasps for air. The immediate treatment includes:**
    a. Abdomen pressing
    b. Giving 100% oxygen and close monitoring
    c. Blind mouth-survey with the finger
    d. 5 back strokes followed by 5 chest presses

22. **What is correct regarding intubation of a baby and child with pulmonary failure?**
    a. The location of the tracheal tube should be assessed by listening to the trachea
    b. One should always use a tracheal tube with balloon

c. One should stop the attempts and perform ambo ventilation with 100% oxygen – if the heart rate drops or there is clinical deterioration
d. One should keep trying to perform intubation uninterruptedly until successful

23. **Immediately after labor the baby is blue but moving, what should e done first?**
a. Putting infusion
b. Drying, warming, laying, suction and stimulation
c. Ventilation with 100% oxygen
d. Immediate intubation

24. **What is correct about using epinephrine in life support?**
a. Epinephrine reduces the cardiac oxygen consumption
b. Epinephrine is ineffective in fibrillation
c. Epinephrine is likely to restore electric activity in a cardiac standstill state
d. Epinephrine reduces the peripheral arterial resistance

25. **A baby is brought to the emergency room because of vomiting and diarrhea. During examination he hardly responds, cold periphery with capillary filling time of more than 5 seconds and weak pulses. After infusion, the correct initial treatment is:**
a. 20 ml/kg of 0.9 saline solution
b. 10 ml/kg of whole blood within 30 minutes
c. 20 mk/kg of Hartman Solution within 40 minutes
d. 20 ml/kg of 0.45 saline solution within 5 minutes

26. **A 6-year old girl was admitted to emergency, artificially ventilated, suddenly she turns blue and bradycardiac. Upon manual ventilation the breathing sounds are normal, equal on both sides and the chest rises symmetrically. The most reasonable cause for the duskiness and bradycardia in this case is:**
a. Development of septic shock
b. Failure of the respirator
c. Pressurized pneumothorax
d. Tracheal tube blocking or drawing

27. **After assessment and treatment of the airway and breathing and after stopping an external hemorrhaging, the administration of fluids suitable for a child, after injury, with low blood pressure and suspicion of internal bleeding is:**
   a. Giving 5% albumin solution and reassessment
   b. Giving 20 ml/kg DSW solution, giving blood is considered
   c. Giving inotropic medicines, giving blood is considered
   d. Giving 0.9% saline, giving blood is considered

28. **A 5-month old baby is found with apnea, and cardiac monitor shows pulse of 45 per minute. Femoral pulses are felt. The initial treatment to be given is:**
   a. Intubation and ventilation
   b. Opening the airways, ventilation at positive pressure with 100% oxygen and reassessment
   c. Intubation and giving 0.1 mg/kg epinephrine through the tracheal tube
   d. Cardiac massage

29. **A 10-month old baby with respiratory rate of 45 per minute, heart rate 280 per minute with narrow complexes in ECG and systolic felt pressure 50. He reacts only to pain. A lot of vomiting or diarrhea. The correct initial treatment is:**
   a. Verapamil
   b. Putting infusion and giving 0.1 mg/kg adenosine
   c. 20 ml/kg saline
   d. Synchronized cardioversion

30. **Oxygen can be given in a number of ways. The most effective way of giving high-concentration oxygen (90%) to a patient who breathes spontaneously is:**
   a. Via nasal prones
   b. Non-rebreathing oxygen mask with reservoir
   c. Simple oxygen mask
   d. Oxygen tent

31. **Which of the following are <u>advanced signs</u> of compensated shock?**
   a. Urination of 2 ml/kg per hour, low blood pressure
   b. Agitation or drowsiness, marble skin, peripheral vasoconstriction, tachycardia
   c. Urination stoppage, grimace in response to pain, duskiness
   d. Absence of central pulses, peripheral vasoconstriction

32. **Regarding a child who does not respond and does not breathe, the first thing to do is:**
   a. Call for help, open an airway while preserving cervical spine, perform 2 ventilations
   b. Perform 2 ventilations and then call an ambulance
   c. Call an ambulance and resume treatment
   d. Check pulse

33. **A 17-month old child has been suffering from cough and runny nose for a week. On examination reacts only to pain, dusky, breathing 64 per minute with severe intercostals retractions, heart rate <u>139</u> per minute and capillary filling of less than 4 seconds. The immediate initial treatment is:**
   a. 100% oxygen, blood gas and putting infusion
   b. 100% oxygen and immediate chest x-ray
   c. Opening an airway and ambo ventilation under positive pressure with 100% oxygen
   d. 100% oxygen, putting infusion and administering fluids

34. **A 2-year old boy is brought to hospital suffering from diarrhea. The child is apathetic and pale. Breathing 47 per minute, heart rate 163 per minute, capillary filling time 5 seconds and thready peripheral pulses. The most reasonable diagnosis is:**
   a. Mild dehydration
   b. Hypovolemic shock
   c. Cardiologic shock
   d. Pulmonary insufficiency

35. **A 6-month old baby is brought to the emergency by a MD"A team. They ventilate him and carry out cardiac massage. The baby does not have a pulse, an intraosseous infusion has been installed and intubation has been performed. In the ambulance he received 0.01 mg/kg epinephrine through the intraosseous infusion 5 minutes earlier. In addition to giving oxygen, the first medication you should give is:**
   a. Atropine through the intraosseous infusion
   b. 50% Dextran through the intraosseous infusion
   c. Epinephrine through the intraosseous infusion
   d. Epinephrine

36. **Which of the following testifies a successful insertion of a needle into the bone marrow?**
   a. After the insertion the needle moves freely inside the bone
   b. Resistance to the needle insertion suddenly increases when the tip of the needle moves from the osseous cortex into the bone marrow
   c. Fluids and medications can be administered easily, without causing the swelling of many tissues
   d. Only if it is possible to draw blood or bone marrow

37. **A 1.5-year old child is brought to the emergency room due to diarrhea. He is pale and apathetic. Breathing 45 per minute with no distress signs. Pulse 150 per minute, capillary filling time 5 seconds, thready peripheral pulses. He receives 100% oxygen and an infusion is being installed. The immediate treatment is:**
   a. Giving fluids for drinking
   b. Giving intravenous or intraosseous bolus
   c. Giving intravenous fluids at maintenance dosage
   d. Chest x-ray

38. **A 6-year old child who weighs 20kg, had a birth defect in the past which was corrected by surgery, was found with no pulse, and does not breathe. The monitor shows ventrilation. The first treatment is:**
   a. Intubation, ventilation and administering epinephrine
   b. Defibrillation while using the small paddle
   c. Defibrillation while using the large paddle
   d. Cardioversion to synchronization

39. **What is the correct method of transport of an 18-month old baby after near drowning following successful life support? The child is stable now, ventilated and receives dopamine for maintaining the blood pressure:**
   a. A local ambulance team with a nurse qualified to treat children, to be transferred to the tertiary center
   b. A team qualified to treat children from the tertiary hospital which will receive the boy, located 50 minutes away
   c. A local ambulance team with a paramedic
   d. A helicopter carrying a team with some qualification to treat children, located 30 minutes away

40. **A 4-year old child remains unconscious after having convulsion at his hospital bed. The correct method of an initial opening of his airway is:**
   a. Laying him on a pillow at a neutral position; clearing the airways from secretion, phlegm or blood; performing intubation
   b. Laying him on a pillow at a neutral position and opening the airway by putting 2 or 3 fingers under the lower jaw angle and lifting the jaw upwards and inwards
   c. Laying in a neutral position while refraining from flexion or excess pressure of the neck extension. Performing intubation
   d. Laying in a neutral position with mild extension of the neck, clearing the airways from secretion, phlegm or blood

41. **You arrive at a road-accident site. A 6-year old child, conscious, breathing 12 per minute with stridor and loud respiration. The preferable method of opening the airway in this child will be:**
   a. Lifting the lower jaw while maintaining a cervical spine
   b. Lifting the jaw and tongue while maintaining a cervical spine
   c. Lifting the lower jaw
   d. Deflecting the head and lifting the chin while maintaining a cervical spine

42. **A 4-year old child after near drowning is brought to the emergency room while performing life support. The child has not pulse, he is ventilated but without infusion. The first medication you should give is:**
   a. Atropine through the tracheal tube
   b. Lidocaine through the tracheal tube
   c. Epinephrine through intra osseous infusion quickly installed
   d. Epinephrine through the tracheal tube

43. **You are examining an 11-month old baby with fever. He is alert but agitated, has marble skin, cold limbs and acidosis. Heart rate 160 per minute, respiratory rate 45 per minute, blood pressure 88/56, pH 7.25 in arterial blood. Your assessment is that the baby is suffering from:**
   a. Compensated shock, as there is evidence of disorder in blood supply to the tissues with no significant decrease in blood pressure
   b. Compensated shock, and therefore there is no need of intervention except for giving fluids to drink
   c. Decompensated shock, as there is evidence of disorder in blood supply to the tissues with significantly low blood pressure
   d. Decompensated shock, as there is acidosis and evidence of disorder in blood supply to the tissues

44. **You ventilate manually with ambo a child who weighs 10kg. In the initial life support the volume and pressure, to be given in every ventilation, are:**
   a. The volume and pressure as calculated prior to starting the ventilation
   b. The volume and pressure which result in good rising of the chest
   c. As given to every kid weighing 10kg.
   d. Half the ventilation given to an adult.

45. **A 21-year old man was burnt by boiling water when a pot fell on him while cooking. Examination shows first and second degree burns in the lower abdomen, upper limbs, chest. The percent of burning is 30%. What is the immediate treatment he should be given if we assume that he weighs 56kg? What is the correct order of treatment?**
   a. Ventilation, inserting two peripheral infusions. Giving fluids according to the following formula: burning percent x weight x 4
   b. A,B,C
   c. Maintaining an airway, inserting two large peripheral infusions and administering fluids according to the formula: burning percent x weight x 4

46. **A 32-year old man was admitted to the emergency after a road accident, with head, chest and abdomen injuries. Vital signs on admission: pulse 98, stortion 94, blood pressure 109/59. While performing CT head and chest, the following occurred: pulmonary deterioration, stortion reduced to 84, blood pressure 84/39, pulse 116. The patient was ventilated during the CT. Blood pressure 75/38, pulse 50. On listening to the lungs no air is inspired into the left lung. What are the diagnosis and the treatment?**
   a. Pneumothorax – insert a trochar into the fifth intercostals gap from the armpit center front
   b. Right lung lysis – take out the ventilation tube
   c. Cerebral hemorrhage – surgery
   d. Tension pneumothorax – insert a needle into the second intercostals gap on top of the third rib at the cervical midline. After the patient is stabilized, insert a trochar into the fifth intercostals gap from the armpit center front

47. **A 21-old man drowned after jumping into the water. Two friends rescued him. He was found in the field unconscious, ventilated by the lifeguard, arrived at the hospital ventilated with a collar. Vital signs on admission: pulse 51, blood pressure 80/40, bardixal breathing, fever 34.8, stortion throughout the transfer to hospital of 85-92. What is the guy suffering from?**
   a. Hypovolemic shock
   b. Cardiologic shock
   c. Spinal shock
   d. Hemorrhagic shock

48. **A 24-year old swimmer was found on the beach with pulse 46, breathing 9, pale, cold, capillary filling of more than 5 seconds. What is the correct order of treatment?**
   a. Ambo ventilation followed by intubation in the field
   b. Taking off wet clothes, monitoring body heat and heart rate
   c. Taking off wet clothes, protection against loss of heat and against wind, maintaining horizontal position, A,B,C
   d. A,B,C, taking off wet clothes, protection against loss of heat and against wind, maintaining horizontal position

49. **Which medications can be given through the tracheal tube during life support assurance actions?**
   a. Adrenaline
   b. Bicarbonate
   c. Lidocain
   d. Atropine
   e. Isopral
   f. All the above

50. **You faced the following situation:**
   A 22-year old woman with asthmatic background was admitted to emergency with respiratory distress. On admission, she lies high in bed, receives oxygen via nasal prones, 5 liter per minute; she feels drowsy, her breathing is evidently accompanied by auxiliary muscles, she has a barrel chest and there is almost no expansion movements while breathing.
   On listening: distant breathing sounds with no addition sounds.
   Number of breaths 34, pulse 125.
   The received blood gas is:
   pH – 7.34
   PaCo2 – 48
   PaO2 – 61
   HCO3 – 17
   Stortion – 91%

APPENDIX 2

Test 2

Answer all the following 1-6 questions:

1. **The most important data in the gas picture which testifies a deterioration in the patient's condition is:**
   a. Bicarbonate level
   b. Stortion level
   c. Partial oxygen pressure level
   d. CO2 level

2. **Giving inhalation of bronchodilators will generally not assist the patient at this stage due to:**
   a. The airway being blocked by thick sputum
   b. Over-distended chest (barrel chest)
   c. Hyperventilation
   d. Hyperreactivity of the airways

3. **Treating the patient will include, inter alia:**
   a. Infusion of fluids, steroids, valium, aminophylline
   b. Infusion of fluids, β blockers, steroids, aminophylline
   c. Valium in inhalation and infusion of fluids, steroids
   d. Infusion of fluids, steroids, androgens, aminophylline

4. **When trying to receive information from the patient, at this stage you wish to find out:**
   a. If the patient is treated with aminophylline
   b. When did she last inhale ventolin
   c. When did she last had an asthmatic attack
   d. Is she sensitive to steroids

5. **The patient started being ventilated by an assist/CMV method. The nurse notices that the patient does not operate the respirator (there is no trigger). The cause for such situation is probably that:**
   a. The patient is incapable of creating sufficient negative pressure
   b. The patient is resting from the previous breathing effort
   c. It is not expected from the patient to operate the respirator
   d. The high ventilation pressure prevents the patient from creating negative pressure

6. **After several hours of ventilation the peak inspiratory pressure dropped from 55cm to 45cm water. This data is important because:**
   a. There is aggravation of breathing resistance
   b. It is required to perform secretion suction
   c. There is decrease in the airways resistance
   d. It is possible that air is escaping the tubes

51. **You are faced with the situation:** Y. is a 63-year old man who was admitted for hospitalization after prognosis of hyperglycemia due to diabetes. On admission the rate of his breathing is fast, he is disoriented and shows signs of dehydration.

Answer all the following 1-4 questions:

1. **The signs and symptoms which Y. is expected to show are all the following, except:**
   a. Warm and dry skin
   b. Reduced skin turgor
   c. Oligoria
   d. Low blood pressure

2. **The gas findings in Y.'s blood are: pH – 7.27, HCO3 – 20mEq/liter, PaO2 – 80mmHg, PaCO2 – 35mmHg. These values testify a state of:**
   a. Metabolic acidosis
   b. Metabolic alkalosis
   c. Pulmonary acidosis
   d. Pulmonary alkalosis

3. **As far as cell-level compensation is concerned, it is expected that the electrolytic disorder to appear is:**
   a. Hyporeclamation
   b. Hypernatremia
   c. Hypercalcemia
   d. Hypokalemia

4. **The treatment Y. is expected to receive is:**
   a. Giving potassium chloride (KCL)
   b. Giving sodium bicarbonate (NaHCO3)
   c. None of the above.

Duration of the test: 1.5 hours (90 minutes)

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The thinking, behavior, and clinical perception in emergency medicine