

**Arabian Gulf University
College of Medicine &
Medical Sciences**



**Health Professions
Education Program**

Professional Skills Programme at Arabian Gulf University
Students' perception and predictive validity of examination scores

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE MASTER'S DEGREE IN HEALTH PROFESSIONS EDUCATION

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Dedication

With all my love to ...

*The memory of my father (may Allah have mercy upon him)
& my loving mother
Who by their example raised me to spirit
and live my life with honesty
& ambition.*

*My dedicated husband
Who has been a great source of motivation & inspiration*

My happy shining children

&

All those who believe in the richness of learning

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Abstract

The acquisition of appropriate clinical skills is a key element of health care education. Therefore, assessment of students' performance on the acquired skills using valid outcome measures is an important component of clinical skills training programme.

This study attempted to investigate students' opinion about pre-clerkship clinical skills training programme at Arabian Gulf University in preparing them for the clerkship phase and determine the predictive validity of the assessment method used in this programme on future performance.

The perception of 110 clerkship students (75 female and 35 male) was obtained and scores of 135 students were analyzed. Results showed that students are generally positive about their training, and the results of the assessment could predict students' performance at the clerkship phase, however, the written examination component is a better predictor than skills examination of history taking or physical examination ($r = 0.945, 0.546, \text{ and } 0.645$ respectively).

Recommendation were made in regard to future research about this programme by taking opinion of the teachers and studying the validity and reliability of the assessment method that is currently in use.

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• Abbreviations

CLS	(Clinical Skills Lab)
PSP	(Professional Skills Programme)
OSCE	(Objective Structural Clinical Examination)
AGU	(Arabian Gulf University)
ATLS	(Advance Trauma Life Support)
SPs	(Standardized Patients)
CPS	(Cardiac Patient Simulator)
NBME	(National Board of Medical Examination)
CCS	(Computer-based Case Simulation)
GMC	(General Medical Council)
MCQ	(Multiple Choice Questions)
SD	(Standard Deviation)
CST	(Communication Skills Training)

Chapter One————1

Introduction

● Background

The acquisition of appropriate clinical skills is a key element of health care education. Nonetheless, it is common knowledge that students may complete their educational programmes armed with theoretical knowledge but lacking essential skills of communication and physical examination, and the ability to undertake simple practical procedures. Recognition of inadequate or incomplete competence in clinical skills amongst medical graduates has led to a radical review of the approach to clinical teaching (Bligh, 1995). Emphases have been given to early introduction of clinical training in the undergraduate curriculum and the use of skills lab in training.

The developed Clinical Skills Lab (CSL) do not replace clinical experience but they allow the early practice of not only routine skills but also difficult, painful or embarrassing procedures in a safe, supervised and ethical environment (Ledingham & Harden, 1998). They provide an opportunity for students to learn and practice skills in controlled environment on models and mannequins, before they have to perform them on patients (Boulay & Medway, 1999).

However, facilities alone are not enough. Instructors who have appropriate training in the teaching methods skills and an understanding of learning objectives are required to guide students through their learning of clinical skills. Assessment of students' performance using valid outcome measures is an important component of clinical skills training (Issenberg & McGaphie, 2002). The establishment of the Objective Structural Clinical Examination (OSCE) has removed some of the ambiguity of clinical assessment and a clinical skills center can provide ideal resources for running both formative and summative assessment (Harden & Gleeson, 1979).

In a recent study, students' perceive that the innovative approach of early clinical skills training using skills lab had prepared them well for clerkship and enhanced the learning process during clerkships (Mandira et al, 1998). The extent to which individual institutions offer these learning opportunities in a clinical skills center depends on the available physical facilities and human resources and indeed on the commitment to this particular component of the overall teaching programme.

Unlike traditional system, the curriculum at Arabian Gulf University (AGU) introduces Clinical Skills Training as early as the second year of the study. Professional Skills Programme (PSP) spread over three years gives the students ample time to practice, revisit and master skills required for practice at the clerkship period. The use of simulated patients as an alternative to real patients in clinical skills training can offer advantages such as availability, and controllability. However it is difficult to ensure that each student experiences an adequate breadth and depth of clinical skills expected of every graduate (Remmen, 1999).

The aim of this programme is to assist students in developing competence in a spectrum of skills related to future medical practice. However, the proposed outcomes were not measured since its implementation.

● **Significance of the study and research problem**

Conclusive evidence of the effectiveness of the innovative skills training programmes with respect to the desired results, however, are still lacking.

“The quality of outcomes of an educational programme is a reflection of the characteristics of the input and process used in the programme. Assessment of educational programme quality will necessitate evaluating all the elements of quality, i.e. fitness for purpose as viewed by different stakeholders involved and affected by the programme, “input”, “process”, and “outcome” (Hamdy, 2002).

Evaluation of the programme curriculum by students is an important aspect of educational quality assurance. The students’ satisfaction approach to evaluation is a quality enhancement tool designed to improve the quality of the students’ learning experience (Harney & Grenn, 1993).

This study will also examine if students assessment results on the PSP can predict their performance during the clerkship phase.

● Aim of the study

The aim of the study was to evaluate the PSP at AGU and to obtain pertinent information of the educational process and outcome using quantitative measures. The assessment of the programme would help its developer for further improvement and to value its outcome in predicting future performance.

● Research questions

This study attempted to answer the following questions:

1. What is the students' perception of the Professional Skills Programme in preparing them for the clerkship phase?
2. Can students' assessment scores at the end of the Professional Skills Programme predict their performance in clerkship phase?
3. What is the relation between students knowledge base as determined by the written exam scores on the B.Sc. examination "end of phase II" and scores on the PSP to predict the performance on the clerkship phase.

● Definition of terms

<u>Quality:</u>	Fitness for purpose as viewed by different stakeholders involved and affected by the programme (Ball, 1985)
<u>Skill Lab:</u>	A facility in which students and qualified staff learn three types of skills including: clinical, communication and information technology skills and apply theses skills to reach specified level of competence prior to or coordinated with direct patient contact (Rees & Jolly, 1998).
<u>Simulated Patients:</u>	A well person trained to simulate a patient's illness in a standardized way (Barrows, 1993)

<u>Professional Competence:</u>	Is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the benefit of the individual and community being served (Epstein & Hundert, 2002).
<u>Outcome:</u>	Something that follows as a result or consequence of a programme (Hamdy, 2002).
<u>Predictive Validity:</u>	Association with some relevant outcome measure obtained some time in the future (Neufeld & Norman, 1985).
<u>Reliability:</u>	Is a measure of the reproducibility or consistency of a test, and is affected by many factors such as examiner judgments, cases used, candidate nervousness and test conditions (Wass et al, 2001)
<u>Validity:</u>	Is the adequacy and appropriateness of the interpretations made from assessments, with regard to a particular use (Linn & Gronlund, 1995).
<u>Input:</u>	Characteristics of students, teachers, educational context and educational programmes (Hamdy, 2002).
<u>Process:</u>	A continued set of actions performed intentionally in order to reach some result. Learning, teaching and student assessment, educational philosophy, strategic and activities (Hamdy, 2002).
<u>Output:</u>	What a programme can produce quantitatively. Commonly described as pass/fail rates, dropouts, enrolment in postgraduate studies (Hamdy, 2002).
<u>Assessment:</u>	A term used instead of measurement when a number of value is not involved, e.g. checklists of behaviors Quinn, 2000).
<u>Evaluation:</u>	Is the process of judging the value or worth of an individual's characteristics obtained by measurement or assessment (Quinn, 2000).
<u>Test:</u>	An instrument or tool for obtaining measurements or assessments e.g. an essay (Quinn, 2000).
<u>Examination:</u>	A formal situation in which students undertake one or more test under a specific rules (Quinn, 2000).

Chapter Two—————2

Review of Literature

● Introduction

Many medical schools are introducing students to clinical activity early in their careers. The use of clinical skills laboratories or units is an approach that has proved popular in new medical schools.

To understand the basic cognitive concepts behind this establishment, this chapter firstly illustrates the historical background of clinical skills, theories of skills acquisition and the characteristics of such units. Moreover, the various teaching strategies of clinical skills will be discussed.

Secondly, there is an attempt to explore the world of simulation; a technology which is now widespread in professional education and evaluation. In addition, an attempt is made to shed light on the various methods of clinical skills assessment.

Lastly, a trial is made to explore the most challenging issue that is the aspect of prediction. Its relationship to quality and measurements of outcomes will be addressed in the light of understanding the process of programme evaluation.

Chapter Two—————2.1

Clinical Skills Programme

• Introduction

Recognition of inadequate or incomplete competence in clinical skills amongst medical graduate has led to a radical review of the approach to the clinical teaching (Bligh, 1995).

Boulay & Medway (1999) stated that “Traditionally, clinical teaching has been largely apprenticeship based, with students able to learn their clinical skills in clinical environments. With increasing pressures and workload, health care staff find it difficult to give clinical teaching a high priority, and so students’ experience varies in amount and quality. In addition, as education in health-care becomes increasingly technical and more subject to scrutiny in the context of clinical governance frameworks, there is now greater need for both students and staff to acquire and maintain vocational skills for the provision of quality service. The development of skills centers is perceived as being one way to address these needs” (p. 185-186).

It has been shown that improved acquisition of knowledge accompanies the development of clinical skills competency so that clinical skills centers are now seen to be complementary to real patients’ encounters in conventional clinical setting (Ledingham & Harden, 1998).

In this review attention will be given to the theories of skills acquisition after historical review of clinical skills. We shall elaborate on clinical skills programme, and what good skills training should be like. In addition, we shall introduce the concept of retention of skills.

● Historical review of clinical skills in medical education

What a patient experiences, the symptoms, he/she takes them to the physician. The first role of that physician is to diagnose what is wrong before considering the prognosis and providing treatment.

Accurate diagnosis is most dependent on the history obtained. But at the same time the physician uses the senses, sight, touch, hearing, smell and in the past even taste to identify abnormalities in the patient.

Peary (www.ea.pvt.k12.pa.us) described the history of clinical skills as follows:

Hippocrate (400BC) (www.umanitoba.ca) had developed observation of the patient and the progress of their disease as the science of medicine.

Hippocrate described the appearance of the patient, felt their temperature, and smelled their vomit. To examine the inside of the body, Hippocrate shook the patient with pleurisy to detect a splash whether was fluid in the pleural space, the Hippocratec succession splash”.

Alexandria Herophilus 300 BC would feel the pulse and count it using a water clock. Galen 129 AD relied heavily on touch, “palpation for diagnosis” and essential skill for assessing wounds and injuries. Galen had practiced sports medicine with the gladiators. He would describe the general appearance of the patient but also tasted sweat for jaundice and listened to the rumbling abdomen. Galen learnt much from feeling the pulse, which he did in both wrists using three fingers for it, was thought to reveal disorders of the organs of the body much more than we can.

In 1583 a medical student was bored by a sermon and observed that the swinging of the altar lamp was unvarying and that this could be used to measure time. The student was Galileo (1564-1642) who as we know gave up medicine for astronomy fame and ill fortune at the hands of the Catholic Church. Sanctorius 1620 AD, measured the pulse with what he called the pulsilogium adapted Galileo’s pendulum clock.

In 1761 Auenbrugger (1722-1809) who had observed his father, an innkeeper, assess how much wine was left in barrels by knocking on them introduced percussion of the chest to identify if it contained excess fluid- "a pleural effusion". Corvisart, physician to Napoleon, (1755-1821) applied Auenbrugger's work. He used percussion to diagnose heart disease. This encouraged Parisian to use the other senses and in particular they began to palpate the body and listen to the sounds of the heart by applying their ear directly to the chest.

1819 was a seminal date in medicine with the publication by the Parisian Laennec of "L'auscultation mediate". He described his discovery thus; "In 1816, I was consulted by a young woman laboring under general symptoms of diseased heart, and in whose case percussion and the application of the hand were of little avail on account of a great degree of fatness. The other method being rendered inadmissible by the age and sex of the patient, I happened to recollect a well-known fact in acoustics, and fancied, at the same time, that it might be turned to some use on the present occasion. I rolled a quire of paper into a sort of cylinder and applied one end to my ear and other over the heart" Thus was borne the instrument that Laennec named the stethoscope.

In 1844 Hutchinson published his studies of the size of a maximum breath in over 1200 men using the spirometer; a measurement he called the "Vital Capacity". He showed that reduction in vital capacity would detect tuberculosis before signs of it revealed with the stethoscope.

In 1896 Riva Rocci introduced the modern sphygmomanometer – a cuff of a pneumatic band attached to a mercury manometer. In 1906 Korotkoff identified the value of listening to the arterial sounds as the cuff was inflated and deflated. At the end of the 19th century came the greatest advance in the physician's ability to see inside the body with the discovery of x-rays by Roentgen.

In 1901 Einthoven recorded the electrical function of the heart and the electrocardiogram was born.

It seemed that the science of physical examination, which as a skill is viewed as the art of medicine, has been mainly replaced by the technology of imaging and measurements. However both science and measurement enhances the certainty and reproducibility of the observation and improves the accuracy of diagnosis.

Advances in technology have strong impact on the world of medical education and replacing the traditional methods of learning by the use of medical technology simulation.

● An overview of components of Clinical Skills Programme in medical schools

Patrick (1992) stated a definition of skill from Glossary of Training Terms as follows: “An organized and co-ordinated pattern of mental and /or physical activity in relation to an object or other display of information, usually involving both receptor and effector processes. It is build up gradually in the course of repeated training or other experience. It is serial; each part from second to second is dependent on the last and influences the next. Skills may be described as perceptual, motor, manual , intellectual, social etc according to the context of the most important aspect of the skill pattern” (p. 20).

The acquisition of appropriate clinical skills is a key element of health care education.

Ledingham and Harden (1998) suggested some clinical skills competencies that should be part of a core curriculum which includes:

- ❑ Communication and history-taking skills;
- ❑ Professional attitudes and awareness of the ethical basis of healthcare;
- ❑ Physical examination, procedural and clinical laboratory skills;
- ❑ Diagnostic and therapeutic skills;
- ❑ Resuscitation skills;
- ❑ Critical thinking, reasoning and problem-solving skills;

- ❑ Team-working, organization and management skills;
- ❑ Information technology skills.

A clinical skills center could provide opportunities for students to learn and practice these skills in a controlled environment on models and mannequins, before they have to perform them on patients.

Ledingham and Harden (1998) also mentioned that The World Federation for Medical Education (1994) identified many principles that must be followed to assure success of skills training programme:

1. Skills do not stand-alone. Their proper use depends on both knowledge and attitude;
2. Selecting students with aptitude and motivation is the first step;
3. Both curriculum and student assessment must be guided by educational objectives and involve the practice of skills, feedback on performance and assessment by direct observation;
4. Teachers and assessors must be trained;
5. Skills must be reinforced in postgraduate education.

One may assume that good skills training programme must have the following qualities: well selected students, trained teachers, valid and reliable assessment methods in the form of formative and summative assessment, a clear teaching goals and the learned skills should be revisited during the years of training.

Ledingham and Harden (1998) suggested some tips to ensure success of skills training programme:

1. Attention should be paid to the outcome of healthcare programme. The experience in a clinical skills center should be able to contribute to some of these outcomes. Like the development of communication skills and physical examination skills, basic procedures, problem solving and clinical reasoning. Other educational outcomes as ethical issues and skill of self-study and self-assessment could be introduced.

2. Administrative team should be developed; the team is responsible for the general day to day running of the clinical skills center. Other responsibilities include timetabling, coordinating and overseeing of academic sessions, setting up teaching areas, arranging rooms and equipment, arranging and supervising assessment programmes and examinations, and developing and maintaining simulated and real patient banks.
3. The teaching staff may be appointed specifically to work in the clinical skills facility. This helps to ensure that teaching sessions are sacrosanct and teachers are available who can give adequate time and attention to the work of the center. They suggested that the staff involved should be from different healthcare backgrounds to be able to contribute positively to the overall educational goals of the center.
4. The clinical skills center/setting should be accessible to major users, attractive to students and provided with appropriate telecommunication links and audio-visual and computer facilities.
5. An adequate range of equipment is required for teaching practical procedures. An extensive array of models and simulators is now available to help students acquire the necessary clinical competencies in areas such as vaginal, rectal and breast examination. Models play a key role in training for cardio-pulmonary resuscitation and other acute care diagnostic and therapeutic activities.
6. An extensive simulated patient training programme is necessary. A staff member should be responsible for recruiting, coordinating the training and maintaining the commitment of the simulated patients.
7. Continuous evaluation of the clinical skills learning programme is an important quality assurance issue and should be an integral part of the overall educational strategy.
8. Finally, Ledingham and Harden (1998) highlighted that the clinical skills facility should be seen as an integral part of an institution's overall educational structure and process. Ownership of the facility by a wide range of teachers, instructors and facilitators must be encouraged.

a wide range of teachers, instructors and facilitators must be encouraged.

The design of training could follow an analysis of the task to be trained. It translates the content of training, which has been derived by some form of analysis, into an effective training programme. It should cover all of the activities associated with translating training content into a training programme (Patrick, 1992).

Patrick (1992) described the following figure which represents the main components to a fully designed training programme (p. 272)

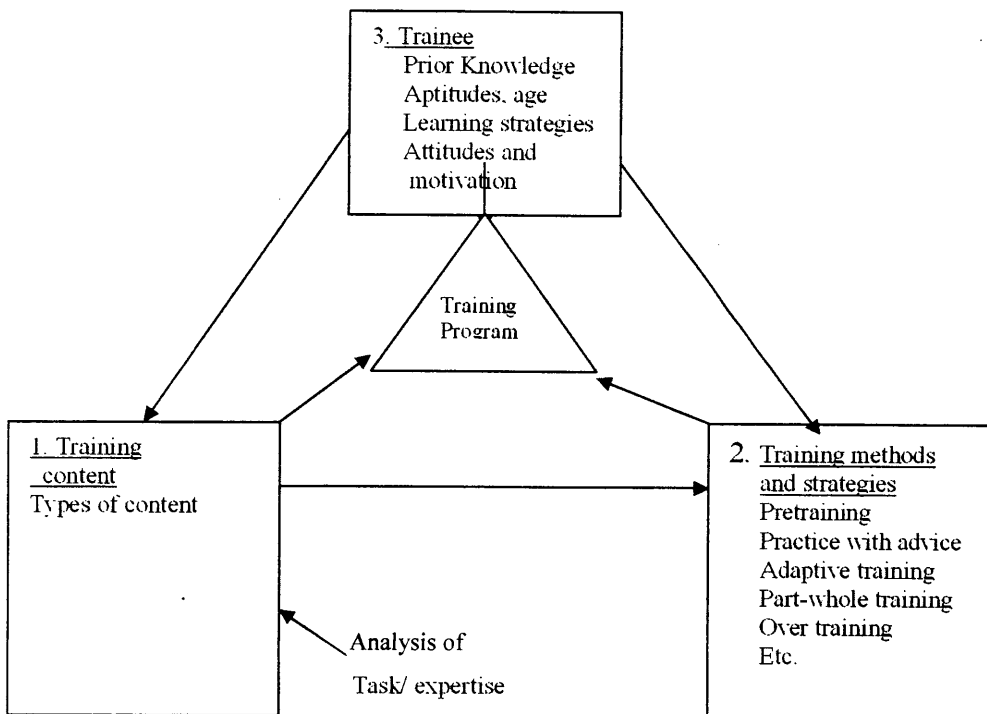


Figure (1): Components in the design of training

The first component of the above framework is training content which forms the basis of the training programme that has to be mastered by the trainee. The training content can be broken according to various design methods and strategies.

Patrick (1992) also describes different approaches to the analysis of the tasks concerning training contents these approaches can be divided into two main categories:

1. Task oriented approach
2. Person- oriented approach

Patrick (1992) defined the difference as follows:

“Task-oriented descriptions concern the goal of performance, the equipment or conditions in the work situation or the observable activities associated with a task. Person-oriented descriptors relate to the cognitive capacities used or required by the person performing the job. For example, the description of a task associated with the job of a production technician in industry as “establish the machine conditions for operating” would be task-oriented. On the other hand a description of the same situation in terms of the abilities, skills, aptitudes or capacities required by the technician for efficient performance would be person-oriented” (p. 142).

The second component of training design is the training method (Harden et al 1984) suggested six curricular issues that teachers or medical school should consider in planning learning strategy that afford an excellent method for learning clinical skills. Each issue is presented as a spectrum between two extremes. On one end are more innovative approaches and on the other end are ones that are more traditional.

These strategies were described as follows (SPICES):

Student-centered- The students have to take more responsibility for their own learning.

Problem-based- The clinical skills instruction may be part of an overall PBL strategy or may introduce this approach to learning integration.

Integration- It may be described as horizontal integration or as vertical integration. The horizontal integration is integration between parallel disciplines that is traditionally taught on the same phase of the curricula. While vertical integration is integration between disciplines taught in different phases of the curricula. Clinical Skills Learning affords an excellent opportunity to unite the different subjects and disciplines, and promote the concept of the scientific basis of clinical practice.

At early stage of the curricula more emphasis may be placed on the medical sciences and the clinical sciences and the practice of medicine in the later years. It is illustrated in the figure below:

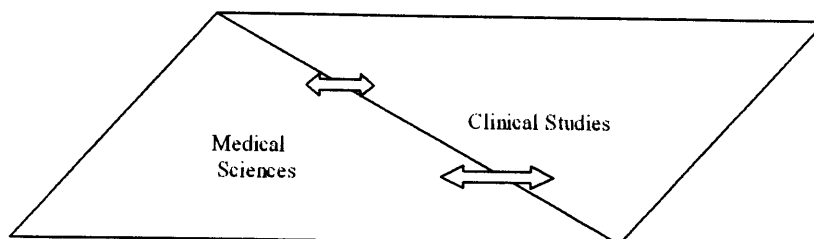


Figure (2): Vertical integration of Medical Science and Clinical Studies

Elective- Competency- The clinical skills is a core curricular requirement. Yet students may choose to study the subject in depth in an elective programme.

System-based- Unlike apprenticeship programme the systematic approach is designed for all the students so that the experiences necessary for their training are covered.

For clinical skills, the essential components of the course should be spelled out clearly to the students or may be given a list of skills, which they have to master.

Remmen, (1999) suggested some principles that a good skills training programme should acquire as follow:

1. "Skills training should start early and fit in with the education programme as much as possible.
2. Teaching goals must be clearly defined.
3. Skills should be offered on a regular basis.
4. Demonstrations, feedback, and considerable practice are important to be followed during the training process.

5. Students should master certain skills at a certain level. Formative assessment and summative assessment are both important parts of the learning process.
6. Skills training should also come up to students' individual expectations.
7. Students should use the basic skills in the clinical context" (p. 11-12).

• Design of Clinical Skills Unit in different medical schools

Clinical Skills Units are dedicated areas where students can learn about clinical examination skills with models or simulated patients (Bligh, 1995). These areas may be purpose-built or rooms converted for the purpose of clinical skills unit.

The common physical design of a skill lab as described in the literature consists of equipped seminar rooms, bedded ward area, special rooms for interview/consultation, procedure skills training, video cameras and microphones. A common arrangement allows students to rotate through a series of stations as they work in a session (Bligh, 1995). A wide variety of realistic simulation models are now available, especially useful for procedures which may be painful, embarrassing or difficult, as well as for therapeutic skills such as injections and suturing. The clinical center should be closely linked with IT and other information technology (Boulay & Medway, 1999).

The clinical skills unit serves two main educational functions. Firstly, the unit provides a 'safe' environment where students learn and practice clinical skills without being concerned about the effect on real patients. Secondly, the clinical skills unit is a place where theoretical teaching can come alive.

Organizing teaching sessions to match the concurrent teaching programme encourages integration of basic science ideas with clinical examples. In problem based or problem solving curricula the clinical skills unit stations offer many opportunities that encourage students to use their basic science knowledge when analyzing and finding solutions to clinical problems (Bligh, 1995).

Bligh (1995) stressed important points in the atmosphere of a clinical skills unit.

White coats should be wearing. Walls and surfaces may display medical posters (e.g., first aid instructions and action plans). Essential facilities include X-R viewing boxes and clinical examination equipment (e.g., ophthalmoscopes, otoscopes, tendon hammers, pins, etc.).

Boulay and Medway (1999) stressed on the need for significant planning, organization and resources to make a successful skills center.

The organization of clinical skills centers should reflect the totality of health care. The University of Southampton compared six models for resource provision and suggested that the 'hub' and 'satellite' model would be the most appropriate delivery of information services. This allows the hub of the main resources to be placed on one site. The skills center could be linked to peripheral facilities and teaching stations in the community, primary care, health centers or Lecture Theater through IT networks. This could facilitate multi-professional community and practice based learning. The same university suggested a variety of sources for funding, including charitable donations, NHS Trust and Postgraduate Deaneries. In addition, a good management and quality control are essential for the effective running of a skills center (Boulay and Medway 1999).

Diane & Penny, (1997) suggested the use of Stufflebeam's model for evaluating the medical skills center that would help to improve the formulation of future goals.

● Learning and Acquisition of Clinical Skills

Learning skills involves the same principles as many other forms of learning, namely, an atmosphere conducive to learning that is free from threat, or stress. There must be opportunities for feedback and analysis of the performance, and teachers must appreciate that learning skill requires time and that individual students will differ in the amount of time they require. It would be useful to review the theories of skills acquisition in order to understand the principles of strategies in learning skills.

- *Theories of skill acquisition*

Theories of skills acquisition focus on the process of learning that involves qualitative changes with practice. The practice consists of repetition of skill under specific conditions. These conditions are that the students must intend to learn the skill and they must obtain feedback about their performance (Quinn, 2000).

Fitts and Posner (1967) point out that the development of skill progressed through three phases:

1. Cognitive phase, which is really concerned with the understanding of motor skill, and the more complex the skill, the longer this period will take. Individuals who are provided with a clear description and a demonstration of the task are more likely to master a new skill than those who are not.
2. The associative phase, in which the part-skills are taking on the characteristics of skilled performance and interfering responses are eliminated.
3. The autonomous phase, during which the skill becomes automatic and can occur without the student thinking about it.

Table 1: Stages in the acquisition of motor skills according to Posner

Phase	Psychomotor element	Focus of instruction
I	Cognition	Perceptual awareness
II	Integration	Comprehension of mechanical principles
III	Automation	Speed, efficiency and precision

Simpson (1972) provided guidance for the teacher in teaching psychomotor skills as follows:

- "Perception- concerned with perception of sensory cues;
- set- concerned with readiness to act;
- guided response- skills performed under guidance of instructor;
- mechanism- performance becomes habitual;

- complex overt response- typical skilled performance;
- adaptation- skills can be adapted to suit circumstances;
- Origination- creation of original movement patterns” (p. 438).

(Schmidt, 1975) suggested a schema theory of motor learning. The schema is of focus aspect, initial conditions, response specifications, sensory consequences, and response outcome. The strength of the relationship between these dimensions increases with successive repetition of the same movement type.

Gagne (1985) classifies psychomotor skills as intellectual skills or roles to determine the sequence of actions and thus students need to learn the rules as well as the motor skill aspect. When planning to teach psychomotor skills, the teacher will have to consider the level at which the student must learn the skill.

In view of the cognitive perspective in learning (Ausbel et al, 1978) we would assume that skills training should start early and start with simple command increasing gradually into the complexity. Moreover, it should be acquired together with learning knowledge to meet the criteria for meaningfulness.

The objective of the core curriculum is to produce well-qualified and problem solver doctors. They should have adequate knowledge, attitudes and skills to go into further training (GMC, 1993).

Boushnizen & Schmidt (1995) stated three components could be distinguished in the learning and development process: *conceptual, perceptual, and procedural learning*. Conceptual learning consists of acquiring concepts and theories. Perceptual learning consists of learning how to recognize observational data relating to healthy and ill people. (This is what a clinical skill is all about). Finally procedural learning is about the use of therapeutic skills or more advanced diagnostic skills. The skill of inquiry is very essential for this purpose.

During medical training networks of coherent knowledge and skills grow stronger and become richer on the basis of new concepts and the students’ own experience

(Regehr & Norman, 1996). Through a lot of practice and on the basis of recognition of certain patterns, the networks of necessary knowledge and skills are made accessible (Schmidt et al, 1990).

In this approach, basic clinical skills, such as history taking and physical-diagnostic skills are part of the networks students have to build up. Preferably to be taught when the network is developing, this is early in the curriculum (Remmen, 1999).

- Educational strategies for learning skills

Norman & Sammatti (1986) suggested a series of common stages in order to conceptualize a task which can be used to map out where errors are occurring.

1. Establishing the goal: The teaching goal must be clearly defined.
2. Forming the intention: It must be clear to state which skills have to be mastered and how it is integrated with other knowledge.
3. Specifying the action: In other words, how actions must be performed.
4. Sequence: The stage of each action must be defined.
5. Executing the action: The skills should be demonstrated and practiced regularly.
6. Interpreting the state: The students should learn how to use them in order to solve a problem.
7. Evaluating the system state with respect to goals and intentions. In addition to student formative and summative assessment.

Harden et al (1984) raised the concern that concepts such as student-centered learning or problem-based learning when applied they frequently represent only a thin gold veneer to a curriculum package. This may arise from the fact that teachers have an inadequate understanding of the concepts. A further problem relates to situations where no clear distinction is made between the educational aims of a medical school and the strategies adopted to achieve these aims. Careful consideration must be given as to how best to address the specific objectives of the clinical teaching session for which they are responsible (Issenberg & McGaghie, 2002).

Kneebone (1999) suggested some tips on teaching basic surgical skills that could be applied to any skills training programme. These tips include the following:

- The availability of simulation, teaching can be planned around the individual needs of learners.
- The earlier the skills training start the better.
- To learn new motor skill the learner should see it demonstrated, then practice it repeatedly and receive feedback about the performance.
- To teach new skills, the instructor must avoid any assumption of previous knowledge.
- Treat the learner with respect.
- Learning skills require regular reinforcement.
- The instructor should ensure his/ her familiarity with the skills to be taught.

Bligh (1995) described a typical clinical skills unit session as follow:

“The clinical skills session lasts for 90-minutes, in which the clinical skills are learned in conjunction with theoretical learning. In a number of stations the students’ answers a number of questions e.g. students may see a film of the function of the alimentary system and then review the anatomy and physiology. Later he passes naso-gastric tube and can see an X-R of the same system. The students are free to attend these sessions at any time”. (p. 731)

Peyton (1992) had outlined the application of basic educational theory to the teaching of any manual skills.

Phase	Task	Action
I	Demonstration	Instructor demonstrates the skill at normal speed
II	Deconstruction	Instructor demonstrates the skill by breaking it down into simple steps
III	Formulation	Instructor demonstrates the skill while being talked through the steps by the student
IV	Performance	Student performs the skill and describes the steps

While (Kneebone, 1999) described a learner center training method that could be followed in a procedural skills learning sessions. These steps are as follows:

1. Watching an animated graphic of the procedure
2. Watching a clinical video of the procedure
3. Watching the procedure demonstrated on a model
4. Doing the procedure on a model
5. Doing the procedure on a patient, under-supervision

Kneebone (1999) argued by saying “the combination of multimedia and simulated tissue models in a simple educational framework could lead to widespread improvements in basic procedural skills across the profession, helping to fill an important need”. (p. 573)

Boulay & Medway (1999) emphasized that “expert supervision for both scheduled teaching sessions and self study access is essential” (p. 186). They have noticed some difficulties in obtaining the co-operation of existing clinical staff in running the center. They had recommended that raising awareness about the skills lab is essential.

● **Retention of skills learned in the initial year of a curriculum**

Covell et al (1985) stated that “Academicians have little experience and no guidelines for expectations for prolong retention. Yet, the problems posed will be even more vexing as advances in medical knowledge demand more from the already heavily taxed memories of students”. (p. 596)

Mckenna & Glendon (1985) investigated the retention of the first-aid skill of cardiopulmonary resuscitation after a period of up to three years. In their study three components of the skill were examined separately, namely: the technique for inflating the lungs and pressing the chest; the performance and timing of the heart compression; and the diagnosis of the patient’s consciousness, breathing and pulse rate. An expert in terms of whether the patient would have been expected to live made an overall rating of performance as seen in Figure (3).

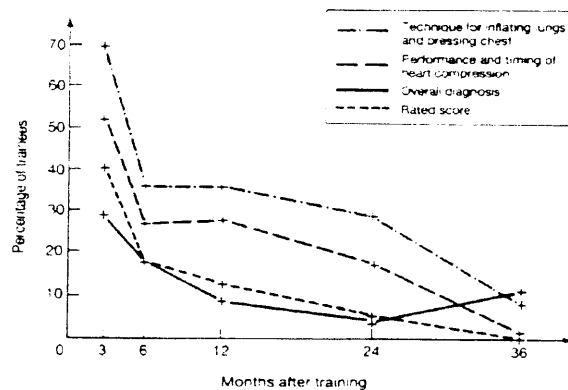


Figure (3): The effect of duration of the retention period on the skills and sub-skills of resuscitation

The results in Figure (3) indicate the extent to which different components of these skills were forgotten. By the time three years had elapsed all of these components had decayed to such an extent that few, if any patients, who encountered the first aid personnel used in this study, would have been expected to survive a heart attack.

Kraan et al (1990) studied students across a 6-year undergraduate curriculum, which included interview training in each of the first four years. They found that while skills in history taking and presenting solution increased; skills in exploring reasons for the encounter and basic interviewing skills such as asking open-ended questions decrease. They concluded that as students gain knowledge and become preoccupied with medical problem solving they are less likely to ask for and use the patient's frame of reference.

Criag (1992) studied retention of interviewing skills learned by first year medical students. 15 subjects were assigned for the experimental group offered an elective interviewing course during first year of their medical studies. The interviewing skills were assessed together with 11 subjects in the control group. The experimental group exhibited a significant increase in interviewing skills, while their rating in the following three years declined. The only significant difference between the groups in fourth year was on the degree of confidence.

• Factors affecting retention of skill learned

Retention of information is difficult to assess, and the educational system usually assumes that recall in the future, with or without review, will be proportional to what can now be remembered (Sisson et al, 1992).

Patrick (1992) had explained three factors affecting retention of skills.

1. *Level of retention is positively related to the level of learning at the end of training.*

“The type of training which produces the highest level of performance will also produce the best initial retention test performance.” (p. 102)

Patrick also mentioned “The more the training which is given before a period of “lay-off”, the higher performance will be after this period”. The evidence showed “over training will also help retention” (p. 102). He defined over training by the training that continues even after a trainee has reached an adequate level of performance. Figure (4)

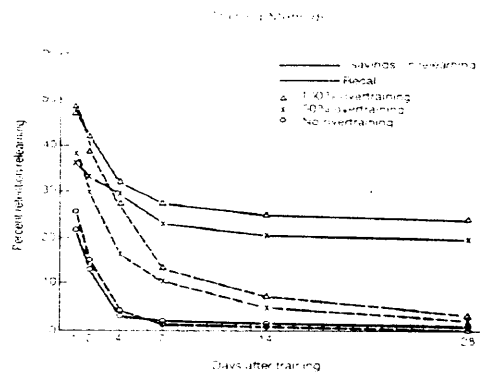


Figure (4): Different amounts of overtraining on retention of nouns

2. *Retention gets worse, the longer the retention interval.*

It is very well documented that people forget more as the period of lay-off gets longer and some sort of skills are apparently forgotten more quietly than others.

3. *Rehearsal of a skill mitigates against skill loss during a lay-off.*

Annett (1977); Gardin & Sitterley (1972) mentioned that if a trainee is provided with an opportunity to practice or rehearse a skill, this will reduce the amount of skill loss which would otherwise occur.

In addition, Patrick mentioned, “It is to be expected that the less the rehearsal tasks resemble the actual tasks the less benefit will be derived from such rehearsal. This doesn’t mean that rehearsal has to take place with the same task, rather that the trainee has to practice using a task that makes identical psychological requirements” (p. 97). He conclude by saying “Provision of some sort of refresher training during periods of no practice is important in high cost performance situations” (p. 104).

Chapter Two -----2.2

Simulation in Medical Education

● Introduction

The field of medical simulation is growing rapidly. Early simulators focused on patients and allowed the physician to practice on this patient. Other types of educational simulators have focused on diseases, and the response to clinical intervention. As computer technology becomes more powerful, simulators will be developed which present complex, interactive, and lifelike experiences that assist the process of medical education and the training of students.

The discussion will elaborate on history of simulation, types of simulation, and the use of simulation on assessment.

Simulation is not new: it has constituted a fundamental educational tool for both teaching and testing at least since the days when the human race developed the capacity for play.

● History of simulation as applied in medical education

The earliest documented use of simulation by man for training of any type is from the Roman Empire for military training. This began by the soldiers utilizing a trunk of a tree upon which to practice sword strokes on foot. This progress to practice in a boat and from horseback along with developing a 6-foot wooden figure of an enemy soldier armed with a shield and sword. Simulation for military training has continued through the ages and is still utilize today (McGuire, 1999).

McGuire (1999) also wrote that Keys and Wolf (1990) sketch a short history of the use of simulation for professional education and evaluation.

“The first use of games for education and development were the war game simulations of Wei-Hai, which originated in China about 3,000 B.C. and the Hindu game of Chaturanga. These games bore a vague similarity of the early 17th century warfare game, chess. Soon these parlor exercises became ‘serious’ games as observed in the development of the King’s Game Weilkhmann at Ulm in 1664, War Chess by Helweig in 1780 at the Court of Brunswick in Germany and the most elaborate came, the ‘New Kriegspiel’ created by George Venturini at Schleswig in 1798. War games

have also been used extensively in this century to test plans for military operations” (p. 11).

The first medical simulators were simple models of human patients. From antiquity, these representations in clay and stone were used to demonstrate clinical features of disease states and their effects on humans. Models have been found from many cultures and continents. These models have been used in some cultures as a “diagnostic” instrument, allowing women to consult male physicians while maintaining social laws of modesty. Models are used today to help students learn the anatomy of the musculoskeletal system and organ systems (McGuire, 1999).

Simulation in the 21st century has come to be known as a technique of imitating the situation or behavior of some situation of a process by means of a suitable analogues or apparatus. Modern simulators have been developed to acquire the skills necessary to control movement such as aircraft, automobiles, and ships. Additionally modern simulators have been developed to acquire the skills necessary to control processes such as air traffic control, atomic power and anesthesia.

The first anesthesia simulator was developed at the University of Southern California in the late 1960s. It featured spontaneously ventilation, a heart beat, blood pressure and cough. Upon being introduced to the anesthesia community in 1969, the first anesthesia simulator was rejected as having no place in anesthesia training.

In late 1980s, Dr. Gravenstein at the University of Florida in concert with a team of computer scientist and engineers, Human Patient Simulator was created and introduced (www.cscce.edu).

Active models, which attempt to produce living anatomy or physiology, are recent developments. The famous “Harvey” manikin was developed at the University of Miami and is able to recreate many of the findings of the cardiology examination, including palpation, auscultation, and electrocardiography. More recently, interactive models have been developed which respond to actions taken by a student or physician. Until recently, these simulations were two dimensional computer programs, which acted more like a textbook than a patient. Computer simulations have the advantage of allowing a student to make judgments, and also to make errors. The process of interactive learning through assessment, evaluation, decision making,

and error correction creates a much stronger learning environment than passive instruction (McGuire, 1999).

The “classroom of the future” will probably contain several kinds of simulators, in addition to textual and visual learning tools. This educational environment will allow students to enter the clinical years better prepared, and with a higher skill level.

● Terminology in simulation

Simulation is an old word, which in recent years has developed a rather different meaning than it formerly had.

It meant “mis-representation” or “deception” but now as defined by (Patrick, 1992) “a procedure in which an analogue or a model of a real situation is created for the purpose of teaching, evaluation, or to carry out research. It could be a person, device or set of conditions, which attempts to present evaluation problems authentically” (p. 487).

It is important to distinguish between different terminologies to avoid confusion. Role-playing for example, some one is given a role to enact, such as that of a patient or a physician, and plays it on an “ad-lib” basis. *Pseudo-patients* are people who have been instructed to give a complaint that would allow them to achieve access to a health care setting or to receive care. Once they have been encountered they then behave as themselves.

Simulated patients are members of the lay public that are trained to act as patient and reproduce a clinical history in a consistent manner.

While simulated patient instructors are simulated patients who play the role of genuine patients who are basically healthy. They give the medical students detailed feedback and evaluate student performance (Barrows, 1993).

Educational simulations are analogues to the play of the young of any species. Both share three essential attributes: (a) they imitate; (b) they offer limitless opportunity to “go wrong”; (c) they provide corrective feedback (McGuire, 1999).

The value of simulation is its ability to reproduce real situations in a non-real, non-dangerous context. Simulation allows us to create the climate within which the professional is expected to perform, with all of its inherent stresses, perceived dangers, obstacles, and frustration, yet free of actual danger.

Simulation can be viewed as an attempt to represent some characteristics or features of the real task and to incorporate them into an effective training environment away from the job.

Norman replaced the term simulated patient by the term standardized patient. While Barrows used the term simulated patient for a normal person who has been carefully coached to portray a specific examination. He reserved the term standardized patient for both simulated patients and actual patients who have been coached to present their own illnesses in a standardized way (Barrows, 1993).

In educational practice simulation has four main characteristics: (Patrick, 1992) *First*, it presents the learner with an analogous situation. *Second*, it allows the learner to provide low risk input. *Third*, it analyzes the input in terms of the overall simulation presented by the programme and then feeds back the consequences symbolically. *Finally*, simulation is replicable, so that it is possible to compare responses of different groups to each other.

Simulation can be viewed as an attempt to represent some characteristics or features of the real task and to incorporate them into an effective training environment away from the job.

Gangne (1962) emphasized that a simulator should have three important features:

1. A simulator attempts to represent a real situation in which operations are carried out.
2. A simulator provides its users with certain controls over that situation.
3. A simulator is deliberately designed to omit certain parts of the real operational situation.

● Educational principles of simulation

Using education simulations weaves substance-specific information into real-life problems in meaningful ways that students can understand.

During a simulation students typically acquire broad discipline-specific knowledge that they are able to later transfer into a professional setting.

Simulations could bring together substantive knowledge with specific practice skills. These multifaceted features make simulations powerful pedagogical tools for education.

● Motivation

Greenblat (1975) identifies four key elements involved in getting students motivated to learn from simulations:

1. We need to find modes of creating motivation prior to transmitting information;
2. The learner must be an active participant in the learning process, rather than a passive recipient of information;
3. Instruction must be individualized such that learning is at the appropriate pace for each learner;
4. There must be prompt feedback on success and error.

We all agree that motivation cannot be “imposed” on students. They have to somehow get “fired up”.

Active learning can play a key role in motivating students. McGuire (1998) concluded “During a simulation participants unconsciously process all types of information: facts, emotion, strategies, outcomes, feelings, and more----. Learning happens because the students are active and not passive in the process” (p.609).

Another factor in simulation, which fosters motivation, is that learning becomes more relevant to real world.

- **Deep Learning**

Taraporewalla (www.health.gld.gov) suggests that an education simulation has four key components that enhance a deep rather than a surface, approach to learning:

1. **Motivational context:** we learn best when we feel a need to know.
2. **Learner activity:** deep learning and “Doing” travel together.
3. **Interaction with others:** peers working as groups enjoin dimensions of learning.
4. **A well-structured knowledge base:** the more fully new concepts can be connected with students’ prior experience and existing knowledge, the more likely it is they will be synthesize.

Other learning theories support the use of simulations. For example, Gentry et al (1998) wrote about theory for experiential learning. This theory “holds that the learner passes through the following phases: (a) current state, (b) motivation, (c) experience, (d) legitimization, and (e) new state. In fact simulation instruction usually follows these phases of learning.

- **Adult learning**

Educational theories on adult learning support the use of simulations. “Behaviorism relates to the acquisition of specific manipulative abilities, which, once mastered, become part of the trainee unconscious repertoire of skills. The cognitive approach addresses how a learner processes information, using it to create useful knowledge in a particular domain. The humanist and constructivist approaches may be helpful in understanding the development of clinical judgment and professionalism, where each learner must assemble a variety of learning experiences and forge them into a meaningful whole” (Kneebone, 2003).

- **Student – centered learning**

Simulations, which leave information gathering, the key decisions and the conclusions in the hands of the students, can result in significant learning.

Simulations are adept at helping students acquire usable knowledge, that is, knowledge that can transfer and be applied to other situations

- **Integration**

Education simulations can help bridge the gaps between disciplines. It provides unique structures for integrating principles and skills.

Simulations are ideal for connecting factual knowledge, principles and skills to their application within a profession (Kneebone, 2003).

In general; simulation teachers become guides in a journey of learning. They facilitate changes in behavior, and thereby the learning, of their students.

- **Why to use simulation?**

Simulation can offer various advantages such as providing extra instructional features, improving safety and reducing costs. These and other reasons for the use of simulation in training are discussed below.

1. **Inaccessibility of tasks in the operation situation**

Patrick (1992) attributed the inaccessibility of tasks for two reasons. First, the task may not exist. Second, the operational situation may preclude opportunities for training.

2. **Costs and consequences of error**

Patrick (1992) stated that “Error occurs during training, particularly in its early stages. These errors may be either too costly or too dangerous for training to take place in the operational situation” (p. 491).

While (Barrow's, 1993) stressed that with the use of standardized patient "you have no concern about the student's making inappropriate remarks in the teaching situation or using poor examination techniques" (p.444).

In addition, he mentioned that the standardized patient allows the student to practice with simulated emergency situations and difficult and sensitive medical condition that you would not have allowed the student to work with in real patient setting.

3. Provision of advice

A simulation can be designed so that the trainee is provided with advice concerning the correctness of his or her actions. This advice, either knowledge of results or guidance may be impossible to provide on the job in a satisfactory manner.

Barrow's (1993) elaborated by saying "Medical students can work with standardized patients without embarrassment about their novice status as they are learning to take histories and do physical examinations. Working with the standardized patient they can perfect their history and physical examination techniques until they become confident. In that moment patients feel as though they are receiving a professional service from the students and not experimented upon by neophyte physicians" (p. 446).

4. Manipulation of the dimensions of a task

It is frequently desirable to manipulate the complexity and temporal dimensions of tasks during training in order to facilitate the acquisition of skill.

5. McGaphie (1999) added another important aspect to the importance of standardized patient that is *case specificity*.

He wrote "clinical performance is case-specific; there is a need to increase the number of cases and balance cases in order to make a general estimate about clinical competence." "Use of standardized patient simulations allows students to have a longitudinal experience with patients and to follow a case in a compressed time frame" (p. 15).

6. McGaphie (1999) also mentioned that the use of standardized patients allow efficient use of *physician faculty time*. A physician can train a number of standardized patients who can then teach/evaluate students.

Barrow's (1993) highlighted some points of consensus on the value of standardized patients as follows:

- Unlike real patients, the standardized patient can be available at any time and available in any setting.
- Unlike a real patient, the standardized patient presents the same problem for all students.
- The use of standardized patients avoids mistreatment of real patients when they are used for educational purposes.
- On using simulated patient, you have no concern about the student's making inappropriate remarks in the teaching situation or using poor examination techniques.
- Medical student's can work with simulated patients without embarrassment about their novice status as they are learning to take histories and do physical examinations.

Dawson & Boston (2002) mentioned further benefits of the use of simulation technology during process of training:

- a. "It allows examining boards to certify competence through a technical examination of skill rather than an oral discussion
- b. Permit prototyping new procedure in silicon giving a whole new meaning to the phrase.
- c. Allow biomedical engineers and designers to test new devices in a simulated environment.
- d. Permit patient- specific rehearsal of operations involving anomalous anatomy or other variants that would have bearing intra-operative decisions.
- e. Another important issue is that validated system of simulation based education could offer a life long log of

performance on standardized techniques, allowing measurement of skills independent of age or other arbitrary milestones” (p. 13).

● Purpose of simulation

Patrick, (1992) advocates that simulations are used for three main purposes: training, research, and assessment.

1. For training

The value of simulators to complement clinical teaching and assessment has long been recognized. Barrows (1993) himself used the standardized patients for training during clinical clerkship to provide the students with neurological problems that were important for them to encounter, yet might not occur spontaneously on the clinical service. Standardized patients can be used to provide students with an opportunity to acquire clinical and inter personal skills that may be difficult to learn in the clinical environment. Standardized patient was also incorporated into the curriculum to enhance teaching of a range of ethical issues in both the classroom and the clinical setting.

Standardized patients were used to provide students with an opportunity to acquire skills that may be difficult to learn in the clinical environment, such as learning how to give bad news to patients, ethical issues involved in the care of psychiatric patients and how to obtain a sexual history from a patient (Pololi & Potter, 1996; Sachdeva et al, 1997).

2. For research

Researchers have used standardized patients to test certain hypothesis about practice patterns, risk factors or interventions.

Sachdeva et al (1997) examined whether a single structured intervention with standardized patients as a supplement to traditional teaching during surgery clerkship would enhance the breast and abdominal examination. The intervention of the

experimental group consisted of a 70-minute teaching programme conducted by standardized patients. The experimental group attained significantly higher scores for both abdominal and breast examination. The results demonstrated that a single structured intervention using standardized patients as supplement to traditional teaching could result in a positive impact on the breast and abdominal examination skills.

Ali et al (1996) utilized OSCE methodology for a group of practicing physicians to assess the effectiveness of the ATLS course. The assessment was determined by constructing standardized trauma patient scenarios utilizing live patients model. The OSCE consisted of four 15-minutes stations, and a checklist for each standardized trauma patient was used for scoring. ATLS group had a statistically significantly higher score for each of the four stations than the non-ATLS group.

SPs provide a method to control for differences in the population of patients seen by different providers (Badger et al, 1995), and to conduct blinded evaluation in the practice setting (Carney et al, 1993).

3. Assessment of proficiency

Growth in the use of simulation has been tremendous in the area of assessment. However, it is best used to complement, not duplicate, other assessment methods. The major development in the use of standardized patients is as a tool to facilitate the comprehensive assessment of clinical competence. The value of standardized patients may exceed that of real patients, in that they can be used to assess a large number of examinees in their handling of a range of important patient challenges.

Assessment of proficiency in human interaction such as doctor-patient communication requires using standardized patients (SPs) who not only present simulated medical encounters but also record trainee responses to the simulated problems (Sawanson et al, 1995).

In addition technology simulations have been used for assessing all aspects of competency, ranging from purely intellectual skills to purely affective behavior. (Harden & Gleeson, 1979; St. Clair, 1992)

• Types of simulation in medical education

As a broad classification, simulation can be divided into two classes; class one is technology simulation class, while class two is the standardized patients.

A. Technology simulation

Miller (1997) (www.medsim.com) identifies a useful typology of classifying types of educational simulators. This typology incorporates the elements of the clinical experience, and describes how these elements interact with the user.

He used four elements, which were represented as four “Ps”. This can be represented in the following diagram:

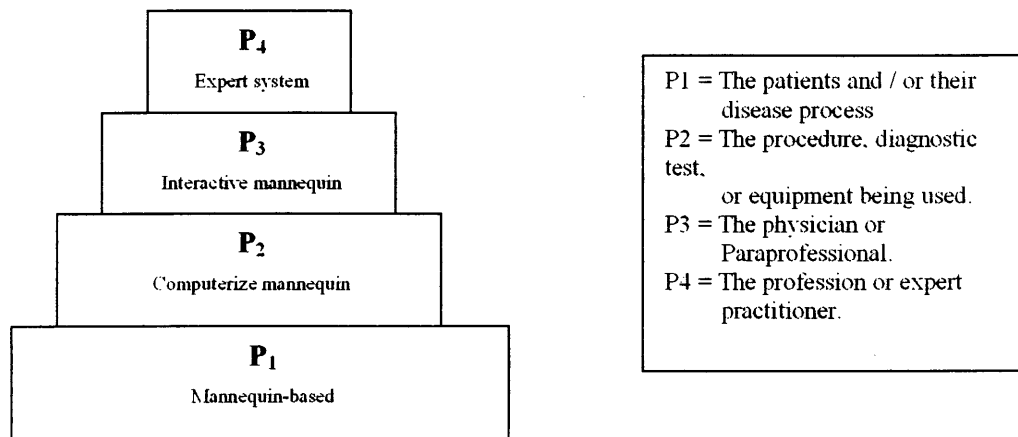


Figure (5): Taxonomy of simulation

Each element of the simulation can be passive (p), active (a), or interactive (i). A passive element is usually provided to enhance the setting or “realism” of the simulator. Active elements change during simulation in a programmed way. These elements enhance the simulation, and can provoke responses from the student. Interactive elements change in response to actions taken by the students or by any other element of the simulation.

The most common setting for clinical education occurs when a team “makes round” on patients in a clinic or hospital. This setting includes the patient, an

attending physician and one or more students. To fully simulate this interaction we would have to develop (P₁ P₂ P₃ P₄) or four “Pi” simulator.

■ P1 (one P) simulation

As defined by Miller the “One P” simulator includes anatomical models such as the dolls, which are, used for training in cardiopulmonary resuscitation.

● Mannequin-based systems

These mannequins, sometimes called realistic patient simulation, use a patient form as the trainee interface.

They can be passive, active, or interactive based on the level of training. Simple mouth-to-mouth breathing and chest compression is taught on a passive simulator (P_{1P}). More advanced models may simulate wounds, or the result of wounds such as pneumothorax. If the wound simulated bleeding, or air movement, then it would be P_{1a} simulator.

The system frequently incorporates extensive physiologic responses to drug administration, cardiac compression, intubations, or other predominantly external manipulations. They are excellent systems for team training and crisis management and have an accepted, validated role in anesthesia training. Drawbacks to the system are their limited adaptability to operative training, relatively high faculty to trainee ratios and relatively high per session training costs (Dawson and Boston, 2002).

Examples of those as mentioned by (Dawson and Boston, 2002) include:

a. Simple Body Simulators

It includes anatomical models such as the “Resuscitation” dolls, which are used for training in cardio-pulmonary resuscitation.

Examples of such systems are the MET1 patient simulation systems and the Laerdal SimMan7 ATLS system.

b. Anatomic Pathologic Simulators

It includes models for breast examination, examination of the ear and eye, the female pelvis for vaginal examination and the male pelvis for rectal examination. The advantage of such simulators is that they enable practical teaching without patient imposition, especially about sensitive maneuvers such as pelvic examination. Macintosh and Chard (1997) found that pelvic simulators were useful in demonstrating the process of pelvic and speculum examination but not suitable for training students in abnormal finding. However their use could be strengthened if we appreciate their limitation and use them in appropriate situation.

c. Procedural Skill Simulators

These simulators are used to assess procedural and practical skills. Examples of these include:

- a. Intravenous access
- b. Catheterization
- c. Airway management
- d. Soft tissue injection
- e. Ureteroscopy

d. Surgical Simulators

- ☐ Simple wound closure
- ☐ Bowel anastomosis
- ☐ laparotomy practice
- ☐ Episiotomy
- ☐ An inflamed toe
- ☐ Skin model that allow practice of cutting and suturing

■ P2 (two P) Simulators

It is a computer mannequin without onscreen display. It is of two types: (1) both patient and the diagnostic test are being simulated. E.g. advanced CPR with cardiac life support is taught on a mannequin combined with a computer programme, which

stimulates the electrocardiogram. (2) Which is interactive e.g. if the electrocardiographic portion of the simulator has been programmed to respond to the administration of medication, or electrocardioversion.

■ P3 (three P) Simulators

It includes a mannequin and software, which simulates the patient interactively. It incorporates computerized mannequins, complex graphic and sophisticated operator controls in state of the art patient simulators. Students learn from both medical concepts and manual procedures on life-size, interactive equipment that provides the benefits of anatomical correctness, unlimited repetition, scheduling convenience, and variable “health” conditions that prepare students for actual practice.

The simulator mannequin has palpable pulses, heart and lung sound, twitch response to nerve stimulation. Trainees can monitor its heart rate, cardiac rhythms, cardiac output, and blood pressure. The simulator also gives accurate patient responses to over 60 different drugs, mechanical ventilation, and other medical therapies, and allows the instructor to introduce new conditions, for example “Harvey” the Cardiology Patient Simulator (CPS). Harvey” simulates different cardiac conditions, by such it is able to integrate all the bedside findings and realistically reproduce both common and rare cardiac diseases. This system has many educational advantages. It can produce better trained physicians in less time and at less cost and it can provide an objective method for measuring the clinical competency (St. Clair et al, 1992).

Harvey has been subjected to rigorous testing to establish its educational efficiency. The most comprehensive evaluation of any simulation technology was the multi-center study of Harvey. The project involves 208 students at five medical schools. The result of this evaluation indicated that 4th year medical students who used the CPS during their cardiology elective acquired more cognitive information and were better skilled in bedside cardiac examinations than their counterparts who were trained in the traditional manner. In addition, the acquisition of knowledge was enhanced for students in the CPS trained group (Barry and William, 1999).

■ P4 (Four P) Simulator

It is a “dream machine” of an HMO administrator that would function as an expert system. It could be used to study the economic and cost-benefit aspects of health care process. It could be used to assess the functioning of other simulators or diagnostic tools. No “patients, no doctors.”

B. Standardized Patients

■ Definition

Standardized Patient (SP) is an individual who is trained to provide an accurate and reproducible presentation of a real patient’s problem. They are carefully trained to simulate the emotional, symptomatic, and physical characteristics of actual patients. SPs could be recruited from the community and trained for multiple roles according to specific scenarios developed by clinical experts (Tamblyn & Barrows, 1999).

■ Advantages

Since the SPs were first developed by Barrows in 1968, it has been used for different purposes including: teaching, evaluation and research (Barrows, 1993).

A. Teaching

For teaching SPs can be used to provide students with an opportunity to acquire skills that may be difficult to learn in the clinical environment, such as, learning how to break bad news to patients, managing the dying patient, or sexual counseling. In this context, SPs can be available to learn from in a medical education setting. They are trained to present a “real life” problem and also to provide feedback. In addition, unlike a real patient, the SP presents the same problem for all students.

Barrows (1993) also added to these advantages by saying “the standardized patients provide a transition to the real patient for medical students. Medical students can work with standardized without embarrassment about their novice status as they

are learning to take histories and do physical examinations. Working with the standardized patient, they can perfect their history and physical examination techniques until they become confident. SPs allow student to practice with simulated emergency situations and difficult and sensitive medical conditions that you would not allow the student to work with in real patient setting” (p.445).

Barrows (1993) himself used the SP for training during clerkship to provide the students with neurological problems that were important for them to encounter, yet might not occur spontaneously on the clinical service.

B. Research

SPs have been used to test certain hypothesis about practice patterns, risk factors or intervention (Ali et al, 1996).

Tamblyn et al (1997) used SPs to determine how often drug related illness was misdiagnosed and mis-managed; Ali et al (1996) used SPs to evaluate the effectiveness of an advanced trauma life support programme for physician.

C. Assessment

The major development in the use of SPs is as a tool to facilitate the comprehensive assessment of clinical competence (Barrow, 1993; Van der et al, 1990). The Objective Structured Clinical Examination (OSCE), developed by Harden and Gleeson (1979) to test technical skills (e.g., examination of the knee, interpretation of an x-ray) (Newble, 1988) was adapted to provide more comprehensive assessment of data collection, diagnostic and management abilities. Interpersonal and communication skills are usually assessed by standardized checklists that are common to all cases presented. Diagnosis and management is assessed in a follow-up “station” where students provide a written response to open-ended questions about the case. The reliability and validity of this method will be discussed further at the section of assessment of clinical skills.

● Design of simulation

There is very little literature that answers the question of how to design simulations.

Patrick (1992) suggested two solutions to answer this question including:

Solution one, A transfer of training study:

Patrick (1992) wrote that “Thorndike and Woodworth suggested that transfer depends upon the number of identical elements shared between two tasks” (p. 495). In addition, Patrick mentioned “to maximize transfer from training with the simulator, it is necessary to identify the features of types of tasks that should be represented in a simulator” (p. 495).

Solution two, On the basis of psychological principle:

The outcome of any design of simulation depends upon how well the skill involved in the real task can be pinpointed and captured in the simulated task. This depends on the appropriate use of the techniques for analyzing task/skill and the principles concerning transfer of training.

These principles are as follow:

1. Ensure that training objectives incorporate transfer requirements:

In order to develop training programmes, training objectives need to be specified. As different transfer requirements can change dramatically both the nature of skills to be trained and how training is to be designed. In addition, training has to enable a fault-finder to identify not only when an existing strategy is insufficient but also how to devise a new and more appropriate one.

2. Increase task variability in training:

The psychologists have been interested in how we are able to apply skills, often correctly, to tasks which have not been encountered previously. They believe that this is accomplished through the development of a “schema” which incorporates

significant features or dimensions of a class of tasks. This schema is gradually built up and better developed if different types of training are provided.

3. Provide a high level of training:

Another factor that has been known to affect transfer is how the task has been learned or how much training has been provided.

Another subsiding but important aim in designing a simulation is to ensure both the trainees and also the trainers accept that the simulation has sufficient face validity. And both trainees and their instructors need to have a positive attitude to the simulation and to be motivated to participate in training with it.

● **Simulation in assessment of professional competence**

The use of simulation in professional competence assessment is for no other reason than to grant assurance that the measurements taken in evaluation setting is reliable and valid.

Simulation in medical education has been used for the assessment of various components including:

i. Assessing cognitive skills

Clayman et al (1999) described a computer programme to test cognitive skills. The programme simulates a patient with an unknown problem or health care request, and allows an examinee to care for the patient. The computer records each step in the care of the patient and scores the performance.

Clyman et al (1999) outlined the following advantages for the use of computer programme:

1. The evaluation of patient care is not segregated into individual tasks. It represents the actual sequence of events in caring for real patients.
2. In real life, the differential diagnosis changes as the available clinical

information's changes. Effective monitoring of changes in the patients condition because of the disease and / or its treatment is as important as accurate diagnosis is to the outcome of the patient.

3. In comparison to SP simulator, computer programme assesses patient care over time effectively.

On the other hand SP method has the unique capacity to effectively assess history taking, physical examination and patient communication skills.

ii. Assessing communication, technical, and affective responses

Over the last decade, numerous undergraduate institutions and certifying boards in health professions have incorporated standardized patient assessment in their certifying procedures to assess interviewing and data-gathering skills, physical examination and establish an effective therapeutic relationship with the patient.

In these exercises, the candidate is required to interview Laymen trained as simulated patients who present with various health communications problems. The candidate is judged both competency to elicit relevant information and on sensitivity to patient needs and concerns. The format is usually an OSCE stations. This will be discussed in detailed in the section of the assessment of clinical skills.

The use of standardized patient in assessment is never intended to replace real patient. However, they can address the disadvantages inherent in a totally patient-dependent curriculum (Collins and Harden, 1998). These disadvantages include:

- “Unavailability of patients demonstrating known diseases at specific times in the curriculum schedule
- Embarrassment and stress to patients and beginning students
- Reluctance among patients to participate in an examination where they are exposed to large number of learners

- Unpredictable patient behavior because their physical signs of disease may change and their overall condition may deteriorate
- Skills to be learned and tested may be inappropriate or dangerous for real patients. Examples include cardiopulmonary resuscitation”

iii. Assessing integration of performance skills and knowledge

The use of simulation technology including multimedia is now widespread in medical education and medical skills assessment. The major forces driving this trend have been expanding educational needs and improving technology. These simulators ranges from basic simulators including inert anatomical models and devices used to practice surgery to sophisticated “Harvey” cardiology patient simulator and its companion computer –assisted instruction system. A simulation assessment is the response to the need for high fidelity testing. For testing in professions, this means that a practice analysis is done and tasks for the simulations are chosen from among the frequent and important activities of job incumbents. Because of the amount of testing time available, an examination is often composed of relatively few problems but each of them is treated in great depth and with great fidelity. However, the narrow sampling of tasks or problems significantly limits the degree to which scores generalize to the domain of interest. Limiting questions to a critical area could solve this problem (Issenberg & McGaghie, 1999).

A good general rule to follow in the use of simulations in training or assessment is as follows: any performance aspect requiring an immediate response in an interactive mode is best assessed by a simulation (Norcini, 1999).

Chapter Two -----2.3

Assessment of Clinical Competence

● Introduction

The assessment of clinical competence is one of the most important tasks facing the medical teacher. If the assessment methods are appropriate, or if there is an imbalance between theoretical knowledge assessment and clinical assessment, there may be unfortunate consequences on the learning under-taken by the students and for the curriculum (Newble & Jaeger 1983). In this section we shall trace the historical perspectives that have been concerned with clinical competence. In addition, we shall mention about the components of the profession competence and finally we will review the various methods of assessment used in measurement of clinical competence.

● Historical perspectives of professional competencies

Neufeld & Norman, (1985) reviewed the historical perspective of profession competencies. They mentioned “clinical competence is a battered child, because it is a relatively new area of interest with most of research having been done in the past 15-20 years. For many decades, the medical profession has struggled with the question of competence. The motivation to do so has come from a variety of sources; including (a) the influence of the profession itself, (b) the influence of society; (c) the influence of research and development” (p.3).

a. The influence of the profession

The professions have used three strategies to produce competent clinicians: the accreditation process, the licensing, certification process, and specific training programs.

b. the influence of society

Modern society exerts an influence on its professions through formal mechanism and through informal influences. The formal mechanisms include specific behavior and legal arrangements reflected in malpractice suits. The informal mechanisms are

related to the malpractice situation. Patients are more interested and knowledgeable about health and disease. They demand explanations about an illness, its prognosis, investigation and treatment.

c. the influence of research and development

The performance of clinicians is influenced by the availability of sophisticated technology. The answers to which devices should be used and in what sequence must by no means be clear to practicing physicians.

The other influence is the increased interest in research in medical education in addition to increased awareness of concepts of educational measurement such as validity, reliability, and objectivity.

● **What is professional competence?**

Senior (1976) has made a distinction between “competence” and “performance,” the former meaning what a physician is capable of doing, and the latter meaning what a physician actually does in his day-to-day practice.

The American Board of Internal Medicine (1976) outlines four dimensions that must be considered in defining competence: (1) the relevant abilities of the physician knowledge, technical skills, and interpersonal skills, (2) problem solving tasks- data gathering, diagnosis, continuing care, etc., (3) the nature of the medical illness and (4) the social and psychological aspects of the patient’s problem (Newble, 1992).

Epstein & Hndert (2002) identified a foundation at which the competence is built on. It includes basic clinical skills, scientific knowledge and moral development.

Newble (1992) represented these components in the following diagram:

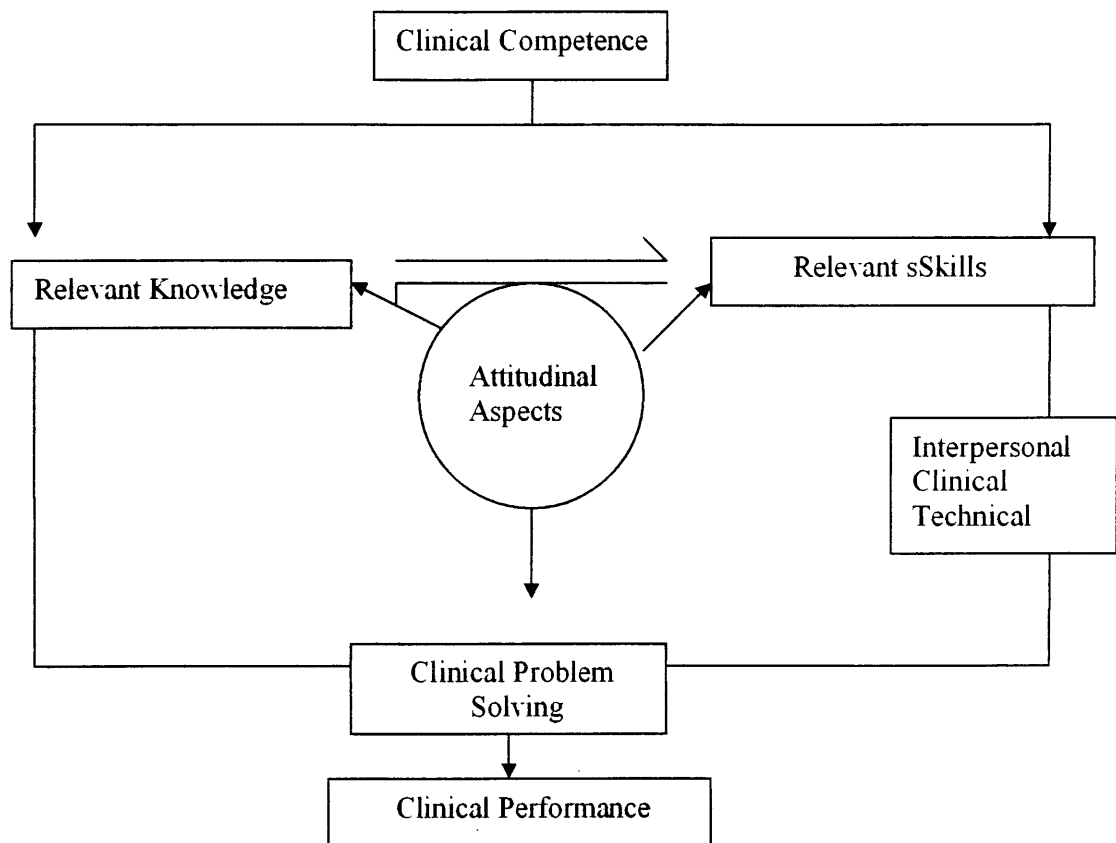


Figure (6): Components of clinical competence

• Purposes of assessment in professional competency

Williams (2000) explained a number of purposes for assessment, which considered being important including:

1. Placement

To place or classify individual pupils in relation to each other and in relation to the curriculum content where there is a strong element of continuity and where later learning seems to depend on earlier ones. It is directed for making a decision about whether students have met the requirements of a course.

The placement includes:

- Recognition of the pupil's status in a particular content sequence.
- Provision of instruction at levels suitable for different pupils.

2. Diagnosis

Assessment can provide valuable feedback to students' about their progress and gaps in their knowledge and skills. A diagnostic tests scores finishes intra-individual comparisons, as their will not be much concern with an individual's performance in relation to the performance of other individual; rather, the concern is with the individual performance on what may be regarded as one function of some skill in relation to his performance on other functions pertaining to that skill.

Diagnosis shifts the emphasis from outcomes to causes. It is to provide students with information about their performance. The author described the diagnostic test as intensive rather than extensive, focused at relatively low level.

3. Assessment of change

It is the assessment of effectiveness of teaching methods or other elements of the instructional programme. It gives the chance to compare the individual after instruction with him-self before instruction.

4. Prediction

Prediction seeks from a measure of present performance or status, a clue to future achievement.

5. Evaluation

It is concerned with the effectiveness of the institution and in that sense is a performance indicator of quality.

● Characteristics of good assessment systems

Williams (2000) also stressed that, when developing any type of assessment, a number of criteria should be taken into account including:

1. Validity

Neufeld and Norman (1985) identified and defined different types of validity including:

Face validity- A non-numerical judgment of the degree to which a test appears to measure the attribute of interest.

Content validity- The extent to which an instrument covers or samples all aspects of the attribute of interest

Concurrent validity- It is the statistical association with the ‘best’ external measure available.

Predictive validity- Association with some relevant outcome measure obtained some time in the future.

Construct validity- The demonstration of expected differences, using the test in question.

Williams (2000) has described ways to build validity into assessment system as follows:

a. Blueprinting

Assessment drives learning, students focus on learning only what is assessed. Test content should be carefully planned against learning objectives (Wass et al, 2001). Blueprinting will help you achieve broad and systematic coverage of the domain of competencies and situations that are considered important (William, 2000). Many medical curricula define objectives in terms of knowledge, skills and attitudes. These can not be properly assessed by a single test format. All tests should be checked to ensure that they are appropriate for the objectives being tested.

Grossley et al (2002) described three frameworks that have been described in the literature; these frameworks can assist in defining a clear and reproducible focus for assessment. First, Miller’s pyramid that describes behaviors of a physician as a complex set of components. It is demonstrated on a hierarchical pyramidal shape. It is composed of two types of outcome: learning outcome and practice outcomes. At the base of the pyramid is knowledge, but it is generally recognized that knowing is not enough. A Successful physician must know how to use the knowledge that is the student’s competence must be translated into appropriate performance- the ability to show “how” knowledge is used. At the peak of the pyramid is independent action, which is carried out in the absence of any observation “does”.

The pyramid was further extended by (Hamdy, 2002) by adding one more level that is the “impact” of the performance on target populations (Figure 7):

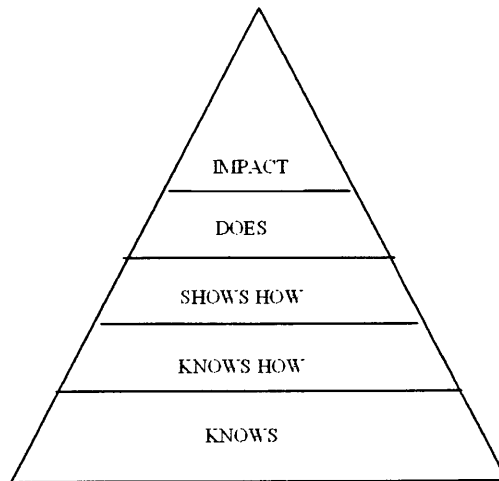


Figure (7): Level of measurements of outcome in medical education

Next framework is Bloom's taxonomy has been transmuted into the widely accepted framework "knowledge", "skills", and "attitude".

Grossley et al (2002) claimed that selecting the important elements of professional activity for a particular assessment is based on expert opinion, consensus among stakeholders, task analysis, or an analysis of critical incidents.

The other ways that (Williams, 2000) described to build validity include:

- b. Observe and judge students performance on adequate sample of clinical tasks taught.*

That is to measure student ability to perform a broad and systematic sample of the tasks that make up the domain of health professions education.

- c. Use assessment tools that are appropriate to the competencies being measured.*

The tasks of clinical competence are so diverse that it will take a multitude of observation using different assessment tools to achieve a meaningful estimate of clinical competence.

The other criteria that should be taken into account when developing any type of assessment as described by (Williams, 2000) include:

2. Reliability

Two important aspects of reliability have been researched.

a. Inter-rater reliability:

It measures the consistency of rating of performance by different examiners.

b. Inter-case reliability

It is the state where the judgment is based on observing a second sample of behavior. Doctors do not perform consistently from one task to another. Broad sampling across cases is essential to assess clinical competence reliably. This observation challenges the traditional approach to clinical competence testing, where-by the competence of the candidates was assessed on a single case (Wass, 2001).

3. Discrimination

The purpose of any test is to discriminate between those who answer correctly and those who do not.

4. practicality

It is important that a test is practical for its purpose. This implies such factors as the time taken to conduct the test, the cost of using it and the practicality for everyday use.

5. Impact

Test can have impact in two ways. First, the fact that the test used can have impact on what students' learn regardless of the scores and decisions that are based on these tests. Second, the scores can have an impact on decisions that students and faculty make.

A score that is valid, reliable and reducible still falls short if it doesn't lead to action when action is called (Wass, 2001).

● Methods of assessment of clinical competence

Assessment must encompass the qualities that define a good physician: the cognitive, technical, integrative, contextual, relational, reflective, affective and moral aspects of competence.

The pyramid of competence introduced by Miller (Figure 5 earlier) (Grossley et al, 2002) is a simple conceptual model, which outlines the issues involved when analyzing validity in clinical competence testing as was discussed earlier. Wass et al (2001) described the pyramid as follows:

“The pyramid conceptualizes the essential facets of clinical competence. The base represents the knowledge components of competence: knows (basic facts) followed by knows how (applied knowledge). These can be more easily assessed with basic written tests of clinical knowledge such as multiple-choice questions. Clearly, this test format cannot assess the more important facet of competency required by a qualifying doctor i.e. the shows how. However, the ultimate goal for a valid assessment of clinical competence is to test what the doctor actually does in the work place.

In addition, the consistency of candidate performance across the cases (increase reliability) is perhaps the most important issue in clinical competence testing. Doctors do not perform consistently from task to task. Broad sampling cross cases are essential to assess clinical competence reliably” (p. 946).

Epstein & Hundert (2002) argued that there are four levels at which a trainee might be assessed. The “knows” level refers to the recall of facts, principles and theories. The “knows how” level involves the ability to solve problems and describe procedures. The “shows how” level usually involves human (standardized patient), mechanical, or computer simulations that involve demonstration of skills in a controlled setting. The “does” level refers to observations of real practice.

Newble (1992) described two settings that are usually undertaken to assess clinical competence: a ward or practice setting or an examination setting.

Epstein and Hundert (2002) had reviewed 430 articles on the reliability or validity of measures of clinical or professional competence of physicians, medical students and residents. They found that “the three most commonly used assessment methods are subjective assessment by supervising clinicians, multiple-choice examinations to evaluate factual knowledge and abstract problem solving, and standardized patient assessments of physical examination and technical communication skills. Although curricular designs increasingly integrate core knowledge and clinical skills, most assessment methods evaluate these domains in isolation. Few assessments use

measures such as participatory decision making that predict clinical outcomes in real practice. Few reliably assess clinical reasoning, systems-based care, technology, and the patient-physician relationship” (p. 229).

Table 2 shows an overview of the different methods of assessment measures that were described in the literature. In the section below the methods are briefly outlined.

Table (2): Methods of assessment of clinical competence

Measurement attribute	Direct observation	Written examination (MCQ)	Computer simulation	OSCE
<i>Credibility</i>	Fair	Low	High	Fair
<i>Comprehensiveness</i>	Low	Fairly high	No data found	High
<i>Precision</i>	Low	High	High	High
Validity	Fair	Mixed situation, may be high on clinically relevant knowledge	High	High if the number of cases increased
<i>Feasibility</i>	Low	Fair	Fair with advancement in technology	Costly, needs time to prepare but can be used for large number of students
<i>Educational Consideration</i>	Useful for feedback, and evaluation of interpersonal skills	Useful for self assessment	Good for learning process. It helps in achieving competency in less time	Can test a wide range of skills

• Direct observation

Barro, (1973) defined the direct observation test as a technique for gathering information about physician performance by directly observing the physician during a visit or consultation with a patient.

The properties of direct observation technique include:

Credibility: direct observation has credibility as a method for obtaining information for an assessment (Kent & Foster, 1977).

Comprehensiveness: direct observation has been used to assess interviewing, history taking, physical examination, and interpersonal-relationship skills. At times it has been used to assess problem solving and management skill. Information about management plans obtained from direct observation needs supplementation by either discussion or record review. Without this additional input, direct observation does not yield accurate or reliable assessment of these dimensions of performance (Wakefield & Norman, 1977).

Precision: direct observation is limited in obtaining consistent, reliable quantitative expressions of the behaviors being measured (Kent and Foster, 1977). Hamdy (2002) reported that direct observation yields reliable scores for ranking as well as pass/fail decisions.

Validity: the results of the studies of the validity of direct observation are tentative. Some studies assessed predictive validity by whether performance in direct observation accurately predicts performance on the college certification examination. The results yield moderate correlation coefficients for similar categories from entraining assessments and poor correlation for doctor-patient relationships and interviewing skills (Wakefield and Noramn, 1977).

Test of concurrent validity comparing the performance on direct observation with the performance on PMPs indicate that more data are elicited on history, in examination, and with investigations on written PMPs than in clinical encounter with the patient (Norman & Feightner, 1981; Hamdy, 2002).

Feasibility: The issues of feasibility and cost have been a major constraint in certain settings (Harden et al, 1975; Ekwo & Loening, 1979).

Educational effect: although direct observation with feed back has been widely advocated, few studies have been done assessing its effectiveness as an educational strategy.

● **Written examination**

Barrows (1987) proposed “written examinations that include multiple choice, true-false, matching, word completion and short answer test items are heavily used for

student assessment in the clinical years of medical school and for physician assessment in licensure or specialty board examinations. Such examinations are used despite a general recognition among educators that these test formats assess only the ability to recognize or recall facts and concepts and that performance on these tests does not correlate with the clinical performance” (p.443).

Multiple Choice Questions (MCQs) are the main component in many certification procedures, its measurements properties include:

Credibility: several specific features of MCQ testing have been described in the literature that limit its credibility.

Anderson (1979) mentioned:

1. There is little resemblance between the writing of MCQ examinations and the work of a clinician.
2. Most critics would agree that its role in medical education is limited to testing factual knowledge.

Comprehensiveness: How extensive do MCQ examinations assess clinical competence? The answer depends upon the assumption behind the question. A large MCQ examination can sample a broad spectrum of knowledge, and the appropriate sampling methods can ensure that it is representative of a designated “universe “of knowledge. However, they are not usually representative of the full range of intellectual activities, which medical students and physicians should demonstrate (Neufeld and Norman 1985).

Precision: Evaluation of factual knowledge and problem-solving skills by using multiple-choice questions offers excellent reliability and assess some aspects of context and clinical reasoning (Mathieu et al, 1999).

Validity: Neufeld and Norman (1985) concluded from their review about validity of MCQ the following:

1. Considerable disagreement exists in the available literature (Rothman & Kerenyi, 1980).
2. At best, MCQ examinations test the “clinically relevant knowledge” component of clinical competence.
3. MCQ examinations are not sufficient in themselves to assess all cognitive components of clinical competence.

Van der and Swanson, (1990) proposed that a high validity could be obtained from MCQs if they are constructed appropriately.

Feasibility: in general MCQs are relatively easy to prepare, administer, and score and the cost is justified.

Educational considerations: Neufeld and Norman (1985) proposed three purposes on using MCQs:

1. Physician self assessment;
2. Having students preparing MCQ, the students gain a sound understanding of the topic;
3. It could be used to provide feedback to teachers and to assess the impact of curriculum change.

The criticism of the validity of multiple choice questions has simulated much research into alternative option, such as true or false, single best answer, extended matching, long and short menus of options and PMPs (Wass et al, 2001). Norcini et al (1985) concluded that MCQs are more efficient, valid and reliable when compared to PMPs.

Mathieu et al (1999) discussed the short answer question by saying “Guessing and cueing are less problematic with short answer questions, because no choices are offered to the examinee. Potential problem with this format are their lack of precision regarding what is expected from the students, the increase faculty time and effort for scoring, and lower test reliability due to the fewer number of test items and more subjective scoring” (p.234).

These difficulties have led to an increase in focus on testing “knows how” that is the assessment of knowledge as applied to problem solving or clinical reasoning in specific context. However, it is difficult to set questions that test application rather than straight delivery of factual knowledge (Van der, 1996).

Problem solving seems to be closely linked to knowledge and also to be content specific i.e., a candidate’s problem solving ability is inconsistent across different tasks (Wass et al, 2001).

- **Computer simulation:**

Computer simulations can replace written or verbal scenarios and could be used to raise the standard of clinical setting (Schuwirth et al, 1996). The essential feature of computer simulation is that the computer is playing the role of patient, providing information in response to the request of clinician.

Neufeld and Norman, (1985) indicated the rational behind using computer simulation as follows:

- a. To make the learner a participant in a realistic learning experience. The learner may take the role of the physician and the simulation gives him data about the patient;
- b. To provide access for certain problems not readily available to the learner;
- C. To allow reproducibility of the same problem either for the same learner until mastery, or for different students, facilitating the evaluation process;
- D. To allow compression of time;
- E. To eliminate risk to the patient;
- F. To provide feedback to the learner about his performance.

The field of computer simulation holds greater promise. No studies were found in the literature to study the validity and reliability when used in assessment.

- **Objective Structural Clinical Examination (OSCE)**

The Objective Structured Clinical Examination (OSCE) is the most common type for the assessment of show how.

Harden and his colleagues first described the OSCE in 1975 (Harden et al, 1975). It involves a range of testing methods, in which the examinees rotating around a circuit of stations at which they are required to perform a variety of clinical tasks. These tasks may include taking a brief history from a patient, performing some portion of a physical examination, undertaking a procedure, ordering or interpreting

diagnostic studies, counseling a patient, writing notes or answering questions. The time allowed for each station can vary from a few minutes to an hour, depending on the task to be performed. Examinee performance is scored on checklists and rating forms tailored to the content of each station.

In a way the OSCE is not an examination method, rather it is an examination format or framework into which a variety of methods can be embedded to obtain an assessment of clinical skills (Hart, 2001). These methods could include short cases, oral exams, interpretation of laboratory results and images, computerized problem-solving, observation of procedural skills or even traditional multiple choice questions. Most frequently however, Standardize Patients (SPs) are used to test “hand-on” clinical skills.

The significance of the standardized patient technique in assessment as reported in the literature is that it can produce valid clinical tests and can be scored in a reliable way, since each student is normally exposed to the same standardized patients and is evaluated using a standard set of criteria (Van der & Swanson, 1990).

One of the concerns that have been raised in the literature about the use of standardized patients for clinical assessment is “case specificity”. Barrows (1993) mentioned that the use of multiple standardized patients in assessments gets around the problem of case specificity.

Heard et al (1998) identified some key points for the activity of development of the OSCE: through planning, strong support of the administration, faculty participation, a diligent and interested coordinating committee and well-trained standardized patients.

Van der & Swanson (1990) had suggested some practical points for improving SP-based tests after their review of published and some unpublished studies of the psychometric characteristics of SP-based test. SP-based tests should focus on hands-on skills like history taking, physical examination and communication skills. Linking the hands-on components to written questions concerning differential diagnosis, laboratory utilization and treatment greatly reduces the reproducibility of scores. Non-physicians can be used as raters, given adequate training and there is no need to have more than one rater per station.

Barrows (1993) highlighted the following points in the value of SPs in the assessment:

- ❑ Standardized patients provide the opportunity for faculty members to observe and judge student's performances in history taking and physical examination.
- ❑ Standardized patients can give feedback to both students and faculty members.
- ❑ Using standardized patients, faculty members can assess directly how students put their knowledge and skills into use, rather than attempting to infer clinical performance from case presentations and medical records.
- ❑ Standardized patients provide a method to control the clinical problems used in performance evaluation.
- ❑ The faculty can control the criteria used to judge the adequacy of each student's performance by constructing specific clinical problems against which the performance of all students can be compared.
- ❑ Feedback from standardized patients provides a patient's perspective in the assessment of interpersonal skills.

Defining pass- fail criteria for OSCEs has been complex. There has been some debate about who should rate student performance in an OSCE. Rating by the SP are generally accurate but may be hampered by memory failure, whereas external raters, either physicians or other SPs may be less attuned to affective aspects of the interview and significantly increase the cost of the examination (Tamblyn et al, 1997).

Tamblyn et al (1991) identified three sources of unreliability in the rating of examinee behavior during SP assessment: differences in rating within the same rater, differences in rating between raters trained in the same site and differences between raters trained to rate the same test in two or more test sites. They had selected a random sample of 537 of the 2,560 examinee-patient encounters that occurred in two universities. Examination on 16 cases was videotape and rated by 44 SPs who rated the case during the examination. Overall, rater reliability of individual item was (0.37 to 0.52). Site one raters scored the same students, an average, and 6.7% lower than site two raters. Their substantive causes for differences in the quality of the instruments, the amount of rater training, and the content area rated.

Van der & Swanson (1990) analyzed published reliabilities from 13 sets of data from SP examinations. The reliabilities of the examination in relation to the length of examination ranged from 0.41 for the three-hour examination administered to 0.85 for the same period of examination. They also found that the reliability inter-rater agreement ranged from 0.42-0.93 indicating that the use of multiple raters per station has only a marginal effect on reproducibility of scores.

Stillman (1993) suggested the use of checklist that is more objective and behaviorally oriented to increase the accuracy of evaluation.

Checklist scores completed by physician-examinees in some studies improve with expertise of the examinees and with the reputation of the training program (Epstein & Hundert 2002). The authors suggested that from educational perspective, "checklists provide better definition of expectations for examinees and more specific feedback on performance. However, it is difficult to develop checklists in several areas (e.g., attitudes and aspect of communication skills) without trivializing the aspect of examinee performance to be judged, and such validity considerations are more important than interrater agreement. In such situations, use of behaviorally anchored rating scales is generally advised" (p.230).

The studies reviewed were also analyzed for reproducibility of scores as a function of testing time. It was found that a minimum of 3 to 4 hours of testing time is necessary to obtain even minimally reproducible scores.

Tamblyn et al (1991) studies the accuracy as a dimension of validity. They measured the accuracy of 88 SPs portraying 27 different patient scenarios. A total of 839 encounters were evaluated. Average accuracy appeared to be worse for physical examination findings and portrayals of patient affect. One third of the errors were systematic suggesting that these could be ameliorated with training.

The OSCE scores may not correlate with multiple-choice examinations and academic grades (Van der, 1990). The skills test is however costly and requires long tests for psychometric reasons (Mathieu et al, 1999).

● Global rating scale

Base on literature review (Neufeld and Norman, 1985) identified few points on the importance of global rating as follow:

1. It is unlikely that any examination developed in one setting will completely meet the needs of another school or department.
2. Many of the end points like “empathy” or “communication skills” are soft and do not readily lend themselves to evaluation through traditional paper and pencil tests.
3. It is considered relatively low cost as compared to other forms of evaluation.
4. Rating scales can be completed based on the preceptor’s knowledge of the student gained over time.
5. It can be used quite readily to provide feedback to the students.

● Measurement properties

Reliability: Linn et al (1975) reported that the test-retest reliabilities of vector scores over a one-week period ranged from 0.68 to 0.91. Keynan et al (1987) reported acceptable reliability as assessed by a Cronbach’s alpha.

Validity: the association between rating scale scores and medical school GPA has been uniformly low (Gardener, 1973; Linn et al, 1975). A similar picture emerges when looking at other examinations which the students take in medical school (De Nio et al, 1975). On the other hand many other studies reported low level of agreement. Erviti et al (1979) found the mean Cohen’s kappa between faculty and house staff rating the same student was 0.26.

However, (Neufeld and Norman, 1985) based on their literature review concluded that global rating scales correlate quite poorly with measures of academic performance, either before or during medical school.

The challenge lies in the assessment of a student’s actual performance. There are few validated strategies to assess actual clinical practice. Subjective evaluation is the major form of assessment during clinical clerkship and few schools use students’ portfolios rather than summative final examination, whether such methods are enough

to cover the issue of content specificity and have the necessary comprehensiveness of the assessment remains to be evaluated (Wass 2001). Barrows (1993) elaborated on the difficulties in the assessment using real patients. Real patients can change over time and between students. Also it is always difficult to find the appropriate patient problem for student assessment at any particular time. Faculty assessments of students using real patients are usually based on individual tacit criteria without any agreed-upon standards.

In general, the more closely a test simulates a real world experience, the more valid are the inferences that can be drawn from the test.

Programme Evaluation &
Educational Quality

● Introduction

Quinn (2000) states that “Quality in higher education is the extent to which the education provided by an institution consistently meets the standards defined by that institution in relation to its goals and mission” (p. 229).

The first check on the quality of curriculum occurs at the validation event for the programme, and continues in the form of programme monitoring and programme review. The term curriculum encompasses four main aspects of educational provision, as shown in Figure 8

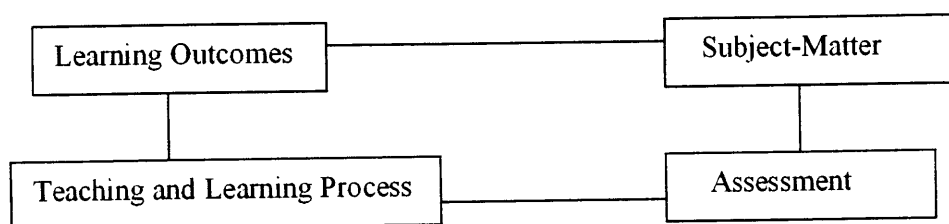


Figure (8): Components of curriculum

These four components are intimately related to each other , in that the curriculum design is seen to begin with the formulating of student learning outcomes, and then progress to decisions about what outcomes-related subject-matter should be included. Teaching and learning processes are then defined, this will help the students’ to achieve the learning outcomes, and finally, the students’ achievement of the learning outcomes is assessed using appropriate and relevant assessment methods.

The quality of outcomes of an educational programme is a reflection of the characteristics of the input and processes used in the programme (Hamdy, 2002). This is what a programme evaluation is all about.

• Evaluation of skills training programme

Programme evaluation as defined by (Coles & Grant, 1985) “is a deliberate act of enquiry which sets out with an educational event to make rigorous, informed judgment, and decisions about it, so that appropriate development may be facilitated”. It involves series of actions from planning, through data collection and analysis, to disseminating findings and decision-making, and finally implementing change and affecting educational development. This is what quality assurance is all about. Figur9

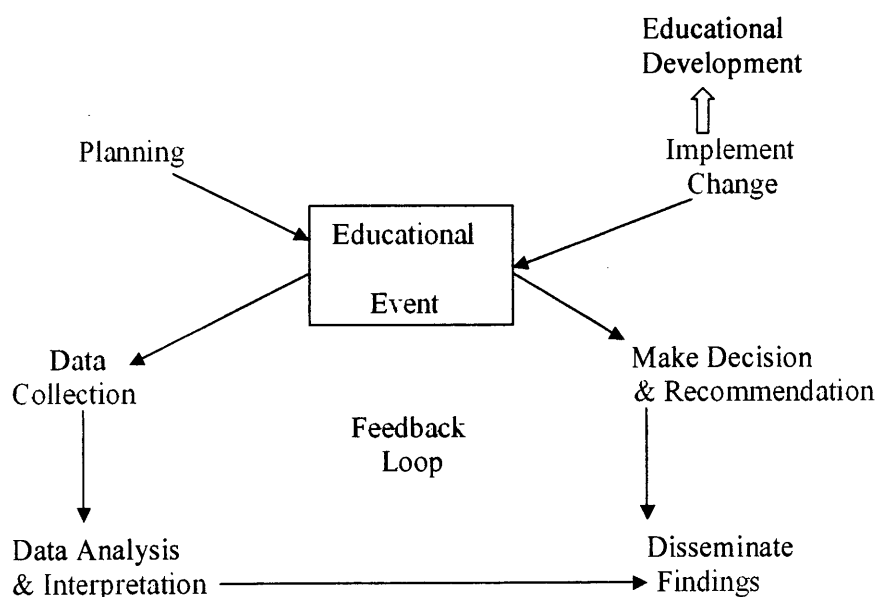


Figure (9): Curriculum evaluation model

Many models for programme evaluation have been described in the literatures. Nelson, (1992) describes three curriculum dimensions to show what is going on in the medical education programme. He has described the “intended curriculum” the curriculum as a construct of the teacher “actualized curriculum” (what the students learn and what they remember), and the “unintended curriculum” (what they learn, but which actually was not described as teaching goals). Coles & Grant (1985) connected them visually in a venn-diagram. He labeled them as the “the curriculum on paper”, “curriculum in action” and “experienced curriculum”.

Remmen (1999) proposed a third model which permits the description of the connections between the different parts of a curriculum with emphasis on the central importance of outcome evaluation, i.e. what students actually learned. Remmen model kept the description of the “intended curriculum” and the “curriculum in action”, but changed the “experienced curriculum” to the “learned curriculum”.

Hamdy (2002) proposed a fourth model which links between outcome of the educational programme “learned curriculum” and the performance in practice. He added another dimension, the “used curriculum” that is the extent to which the “learned curriculum” contributes to practice, and life beyond the undergraduate experience. This model builds the bridge between clinical competencies learned and tested in a training programme and clinical performance in practice. Fig. 10

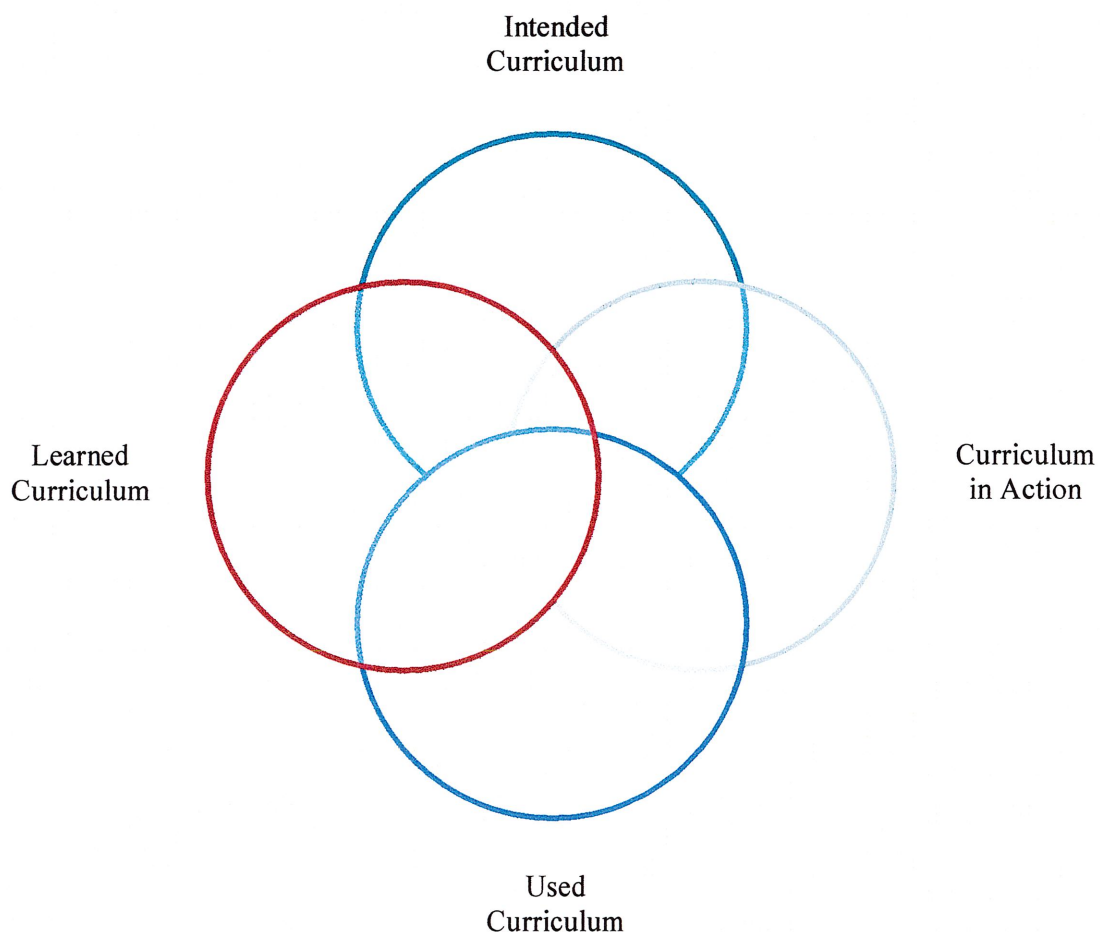


Figure (10): Conceptual model of the relations between the four curriculum’s dimensions

Remmen (1999) described the area between the rings as the part that can be experienced by the students but neither is it mentioned nor is it taught, it is referred to as the “hidden curriculum”.

The problem with this model did not include certain structural characteristics like financial means, available resources and the teacher characteristics.

Arie & Bandaranayka (1983) described a different model for comprehensive programme evaluation. It focuses at different phases of the planning and conduct of programme that is context, input, processes and outcomes.

Evaluation of input involves all the components, which together comprise the programme. The process evaluation is monitoring the adequacy of the plan action, while evaluation of the outcome is to ascertain whether the outcome matches the intended goals. A comparison between all the models is shown in table 3:

Table (3): Comparison of models in programme evaluation

<u>Donabedian</u>	<u>Nelson</u>	<u>Coles</u>	<u>Remmen</u>	<u>Hamdy</u>	<u>Arie & Raja</u>
Structure Process outcome	Intended curriculum Actual curriculum Unintended curriculum	Curriculum in paper Curriculum in action Experienced curriculum	Intended curriculum Curriculum in action Learned curriculum	Intended curriculum Curriculum in action Learned curriculum Used curriculum	Context Input Process Outcome

● **Methods of data collection for programme evaluation**

In the model of evaluation outlined before, an initial stage of the evaluation process comprises data collection.

Miller (1963) described two major approaches for programme evaluation:

1. Quantitative evaluation methods which include the following;
 - Questionnaire seeking views of teachers and learners.
 - Observational methods using some instruments like rating scales, checklists, and anecdotal records.

- Before and after studies with pre-test and post-test.

Arie & Bandaranayka (1983) had added students learning as a method to assess the outcome of training. Learning can be assessed by direct methods available like data from summative or formative assessment.

2. Qualitative methods which includes the following:

- Interviews;
- Observation;
- Document.

Whichever method of data collection is chosen, it is important that it be applied rigorously and correctly, and that the validity and reliability are proven.

● **Predictive validity of measurements in medical education**

An important aspect related to quality and measurement of outcomes in medical education is the predictive value of these measurements in relation to on-the job performance (Hamdy, 2002).

Selecting students for medical school is a world-wide problem. There is evidence for and against different selection methods. Some studies show a relationship between interview scores and medical school performance, and some find no significant difference between the academic performance of students admitted on the basis of interviews and those admitted without (Linblom & Lonka, 1999).

Secondary school achievement is an important predictor of immediate academic achievement but is not enough for predicting the applicants' future learning potential (Linblom et al, 1996; Sternberg, 1998). This was explained on the basis that different study phases may require different kinds of study skills (Glaser et al, 1992). In addition, the secondary achievement tells us only about knowledge and skills that applicants already possess.

Lindblom & Lonka (1999) indicated that entry level tests should emphasis those cognitive skills which enhance knowledge processing and knowledge construction. To

success in various domains the learning task would demand deep level of learning to be able to apply knowledge or solve problem (Lindblom et al, 1996).

Medical schools train students for a wide variety of professions. The objective should be to select students who do well both in studying and in the profession (Linblom et al, 1996).

Glaser et al (1992) found that science problem solving scores best predicted success in the basic scientific component of medical education. The reading skills scores of applicants to medical school were a better indicator of later physician competence. Flaherty et al (1982) demonstrated that the best predictors of students' clinical performance were their entry- level skills, specifically reading and writing abilities."

The development of expertise in medicine requires not only declaration, knowing that, but also procedural knowledge, knowing how Diagnostic reasoning skills are an important form of procedural knowledge in medicine. Thus, studying which aims at integrating information with previous knowledge, i.e. forming situation models, is crucial in the development of physician competence that consists of knowledge, skills and attitudes (Gilhooly, 1990).

Assessment of competence therefore requires several measurement instruments, each representing different aspects of competence. However, no evidence exists that measurement of competence would predict performance in actual practice. And it is still a controversial issue in the literatures (Gonnella & Hojat, 1983; Hojat et al, 1993).

Competence is viewed as possession of a series of desirable attributes including knowledge of appropriate sorts, skills and abilities such as problem solving, analysis, communication, pattern recognition, etc. and attitude of appropriate kind (Hajer & Gonczi, 1996). Competence is more than a demonstration of isolated competencies, possessing factual knowledge, or ability to solve problems with clear-cut solutions; it is defined by the ability to manage ambiguous problems, tolerate uncertainty, and make decisions with limited information (Epstien & Hundert, 2002).

Training and assessment would be seen in terms of these separate attributes. “Unfortunately, the categories recorded for assessment of trainees in many programmes have used general terms. They are too general to be measured precisely and be predictive of candidate’s future performance” (Hamdy, 2002).

The limited value of the individual assessment was explained for three reasons (Gonnella et al, 1993): (1) the nature and variety of the problems on which performance must be sampled in order to be able to generalize to the relevant universe of practice; (2) lack of stable measure of the quality of an individual’s decisions with respect to a particular diagnostic category; (3) the inadequate documentation of the relationship between specified diagnostic and or therapeutic procedures and patient outcomes. The assessment of medical student has tended to focus on the base of Miller pyramids that are “knows” and “knows how”. This might be appropriate in early stages of medical curriculum (Wass et al, 2001), but at the end of the programme, higher levels should be assessed “shows how” as learning outcome which should take place at the maximum possible level of simulation to actual practice “performance” (Hamdy, 2002).

The presumptive continuum between knowledge and skills obtained in medical school and competence in providing care has not been consistently supported by empirical studies. This issue has long been debate because research findings are inconsistent.

Early studies found little or no correlation between undergraduate grades and postgraduate performance ratings (Price et al, 1964; Wnograd & Williamson, 1973). These studies were limited by the types of measures used to predict performance in practice. More recently, studies have used a broader range of assessment procedures, including clinically based measures, to investigate the association between academic performance and competence during the early postgraduate years (Gonnella & hojat, 1983). At worst, these studies reveal weak relationships between medical school grades and later performance in practice. At best, researchers have established a moderate relationship between medical school and practice performance, with higher correlations when an attribute is evaluated by a similar assessment method (Hojat et al, 1993).

There have been many explanations for the weak relationship between medical school and postgraduate performances including conceptual and methodological elements that produce “noise” (Gonnella et al, 1993). ‘The conceptual element includes deficiencies in traditional grading systems or an inherent inability of grades to indicate the transformation of potential into the workplace, the effect of intervening experience between the time of academic training and subsequent career evaluation, and the failure of the selection processes of traditional medical schools to identify students with the characteristics which might be prerequisite for successful performance at work environment (Pearson, 1998)’.

The methodological element that might affect the correlations between measures of performances before and after graduation from medical school was explained by (Gonnella et al, 1993). It includes the negative skewed of the rating that affects the value of the correlation when tested by Pearson correlation. The skewed distributions may result in a departure from “homoscedasticity”; therefore, the results based on correlation analysis will underestimate the extent of relationships between variables. The correlation coefficient is highly dependent upon the range and variability of measured values in the sample, the less the variability of range in the scores, the lower the correlation. In addition, another problem arises when using multiple-regression techniques where the predictors are highly inter-correlated is “multicollinearity”.

Recent studies have used a broader range of assessment procedures, to investigate the association between academic performance and competence during the early postgraduate years. Assessment methods, particularly those for clinical studies, have been developed towards measuring both knowledge and competence. An example of such an examination is OSCE. (Martin & Jolly, 2002) reported a strong relation between OSCE taken early in the clinical course and later clinical performance. (Pearson, 1998) found a strong relationship between different measures including patient interview, written assessment that examine critical reasoning, OSCE, modified essay questions and performance as an intern.

Hojat (1993) indicated that performances during medical school and in residency are multidimensional concepts and that conceptually similar measure yield stronger associations than dissimilar ones. In addition, the strength of associations varied for

different performance measures and in different areas of specialization and at different levels of performance. The association can be improved by refining the assessment instruments.

Rethan et al (1990) have shown that there is a difference between competence and performance of doctors. And according to him, quality of care in actual practice should not be assessed on the basis of standards alone. They found a good correlation between what a doctor actually does in daily practice (performance) and what he or she is capable of doing only when efficiency and consultation time are taken into consideration.

In addition, Stephen (1993) found strong correlation between graduates' performances as first- year residents with their performances as medical students, when using performance- based assessment using standardized patients. This would suggest that performance based assessment using standardized patients is better than traditional methods of evaluating medical students in predicting their performance as residents.

It appears that a system that enhances deep learning and motivates students to learn would have a higher degree of prediction and the higher the content and construct validity of an assessment instrument the higher the degree of prediction.

Chapter Three -----3

Methodology

• Context of the study

The undergraduate programme of the College of Medicine and Medical Science at AGU (Arabian Gulf University) as described by Hamdy et al (2001) implements a problem-based curriculum as the principal educational strategy. The average annual student intake is about 100 students per year.

It is a six-year curriculum, followed by an internship year. It is divided into three phases. Phase 1 (year one) is a premedical year. Phase II (years 2, 3, 4) consists of organ/ system units integrating basic medical science, clinical science, and community health problems. Phase III (years 5, 6) is the clinical clerkship phase where the students rotate between different clinical disciplines in primary and secondary care (Figure 11).

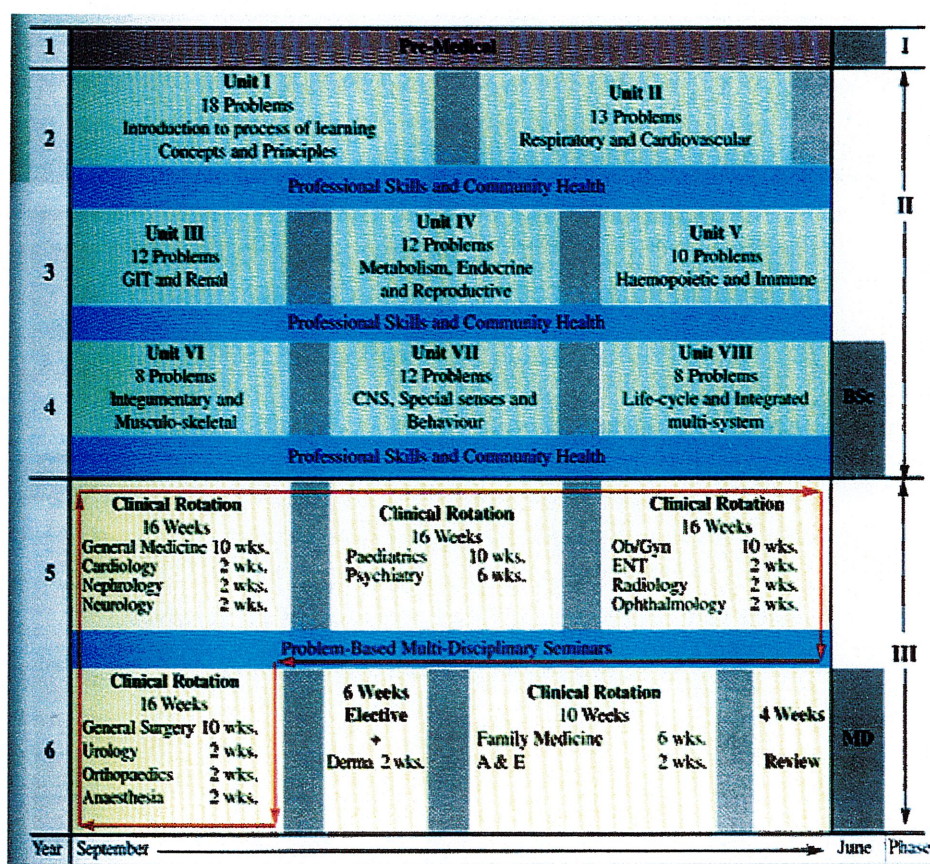


Figure (11): AGU curriculum

The problem-based learning starts in the second year and continues till year four (phase II). Through out this period the instruction is integrated between basic science and clinical science. The instruction takes place in small group tutorials comprising eight students and a faculty member who serves as a facilitator. The tutorials are supplemented by resource sessions (lecture format), regular practical and demonstrations, attendance at anatomy resource center and one afternoon per week of clinical skills training. To reinforce the role of the medical students as a community health advocate, students are experiencing a community perspective to the clinical problems as they encounter in their tutorial through out phase II. The programme is organized in a sequential fashion; within unit one of the problem based learning “concepts and principles”, key concepts are presented within specific community health problems, and through the medium of a research workshop. Thereafter, students are assigned to research project teams in the field that involves the application of the research tool.

From the beginning the curriculum has emphasized the acquisition of clinical skills and procedural skills, which are learned in the Professional Skills Programme (PSP). The (PSP) at AGU is designed to enhance the efficacy of clinical skills teaching to medical students.

The programme aims at preparing the students to function adequately and comfortably in the clerkship phase.

The objectives of the programme are as follow:

1. To enable students to communicate effectively with patients through accurate history taking and sensitive delivery of information;
2. To prepare students to conduct physical examination in a respectful, sensitive and effective manner;
3. To prepare students to approach diagnosis with a relevant knowledge of disease presentation, the rational use of laboratory tests and the ability to use clinical reasoning in the processing of data collection and synthesis;
4. To prepare students in appropriate diagnostic and therapeutic procedures;

5. To prepare students in critical appraisal of literature skills in preparation for practicing Evidence-Based Medicine;
6. To prepare students to recognize the importance of management skills that will allow him/her to employ effective responses to work challenges, stress and economic constraints;
7. To prepare students to be skilled in accurate, responsible and respectful communication with other personnel involved in health care delivery.

The training takes place in the Professional Skills Lab. It is a purpose designed large open area with beds and couches for training of physical examination on simulated patients.

A second open area that is equipped with different models for learning different procedural skills and resuscitation skills. A side room that is equipped with an audio-visual equipment and X-ray view boxes for learning resources. In addition, there are tutorial rooms, which are dedicated to small group learning activities and communication skills sessions.

The administrative structure has a Programme Director, Programme Coordinator, Skill Laboratory Coordinator and a part time Executive Secretary. Many full time and part time tutors are involved during learning process including demonstrating to small groups and supervising student practice. In addition, some of them are involved in tutorial sessions for PBL and act as an expert resource when students are undertaking self-directed learning.

- *The Professional Skills Programme design*

From the second year, the medical students attend the professional skills lab once each week, and it is continued until the end of the fourth year.

The clinical skills session is planned to run in parallel with the PBL modules to help the students understand the links between practical skills and theoretical knowledge. A study guide provides the students with a list of clinical skills to be practiced.

The following domains are covered:

- Communication and interviewing;

- History taking and clinical reasoning;
- Physical examination;
- Diagnostic and laboratory investigation;
- Research skills, critical appraisal and evidence-based medicine;
- Patient –centered programme;
- Management skills.

Hamdy et al (2001) has described the programme as follow:

- *Communication Skills Programme*

The programme integrates a hierarchy of interviewing and communication skills. Training takes place in year two, for six weeks, largely in the laboratory setting using role-play, and also requires students to conduct a structured patient interview in a hospital or a health center setting.

- *Clinical reasoning and history taking skill programme*

The programme extends over a period of 12 weeks in year two. Students are introduced to the theoretical bases of reasoning and hypothesis generation using written simulated problems. Learning is facilitated by small-group discussions under the guidance of experienced teachers. This is followed by practical experience of interviewing patients.

- *Physical examination skills programme*

This programme is coordinated with the problems in the organ/system units in phase II (year 2, 3, 4). The physical examination skills for each system are standardized by the use of checklists, which describe both steps in examination and expected findings.

The training involves different modalities of simulation from models, videos, demonstration, role-plays and simulated patient. Exposure to real patients takes place after completing the training and after the students feel that they are comfortable to take history and examine a patient. This adds realism to the students' training. Exposure to real patients takes place at the end of each system (figure 12 & 13).

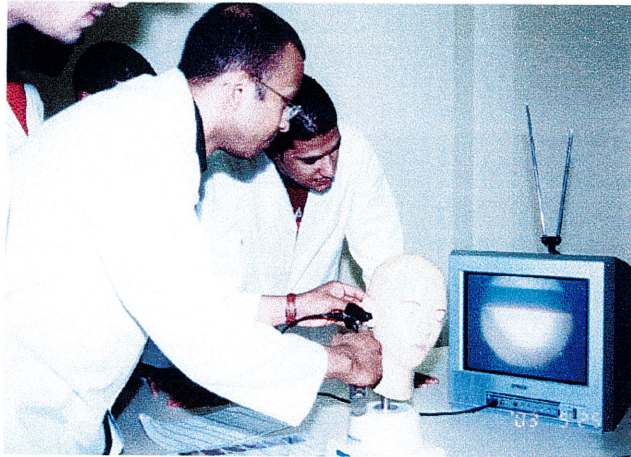


Figure (12): Students practicing skills at PS lab at AGU



Figure (13): A student practicing physical examination
on simulated patient at PS lab at AGU

- *Procedures skills programme*

The students are trained on models in the following procedures: venous canulation, IM, IV, SC injections, suturing of wounds, intubations, PAP smears, catheterization and basic life support procedures (figure 14).

In addition, the programme introduces the students to the principles of research methodology and management skills.



Figure (14): Students practicing intubation's on a manikin's at PS Lab/ AGU

- *Students' assessment in the pre-clerkship phase*

Different modalities of students' assessment of this phase are used to ensure clinical competence. It is in the form of continuous and summative assessment. The continuous assessment takes place at the end of each unit and includes students' performance in tutorials, written exam at the end of organ system-unit examination and PSP assessment for clinical skills on simulated patients, in addition to community health programme evaluation. While the summative assessment, which is held at the end of phase II (final BSc examination) is a written examination in the form of single answer MCQ and integrated short answer questions. In addition, there is an Objective Structural Practical Examination (OSPE) and an Objective Structural Clinical Examination (OSCE).

(OSCE) is used in evaluating different components of the PSP including communication skills, history taking and physical examination skills. It requires that each student complete history taking, physical examinations and case write up on simulated patients. The students are required to interview a simulated patient (who is usually the examiner) for two different problems separately. This is followed by performing physical examination on a simulated patient for two body systems selected by the students in relation to the patient problems. The assessment is carried out by direct observation for the following abilities: communication skills, ability to take comprehensive history for a given patient problem and focused system physical examination skills. To complete the task, students must formulate some hypothesis for the patient problems and document all the information obtained from the simulated patients in a case write up.

- *Students' assessment during Clerkship phase*

Assessment during the clerkship phase consists of continuous assessment during each rotation, end of rotation examination and a portfolio. The end of rotation exam conducted only in the five major disciplines (Medicine, Surgery, Pediatrics, Obs/Gyn and Family Medicine). The examination takes place during the last week of each clerkship rotation.

It includes written exam that consists of multiple choice questions type A, short answer questions and patient management problems. In addition, students undertake OSCE stations assessment and clinical examination on two real patients. The clinical examination is assessed by direct observation. The students are required to interview a real patient, perform focused physical examination and be able to solve patient problem by the appropriate interpretation of the investigation requested and suggest some treatment modalities. The students' are judged on their ability to perform focused clinical skills, critical appraisal skills, attitude and behavior.

• Study's design

The study has three research questions, for each one an appropriate study design was developed.

The first was to determine students' perception of PSP in preparing them for the clerkship phase. For that a questionnaire was developed and administered in a cross-sectional survey to two cohorts of the clerkship phase students' at AGU medical school.

The second was to study the validity of students' scores on the final PSP exam in predicting the scores on the clerkship end of rotation examinations. While, the third was to study the effect on the predictive validity of the final PSP examination after adjusting for the scores of the written exam at final BSc on the performance at the clerkship phase.

For them a correlation study was used to determine the relationship between the scores of students at the PSP assessment with or without the scores of the written examination at the BSc level and the scores of different components at the clerkship phase. The degree of correlation was assessed using correlation coefficient, regression analysis and canonical correlation.

• Variables

To accomplish the above-mentioned purposes, the following variables were used:

Research question number one:

1. perception of PSP (dependent);
2. level of student education (independent);
3. students' sex (independent);
4. themes of PSP(independent).

Research question number two and three:

- i. scores of PSP assessment (independent);
- ii. scores of the written exam at the B.Sc. assessment (independent);
- iii. scores of the various components at the end of unit assessment (written exam, clinical and OSCE) at the clerkship phase (dependent).

● **Students' perception of PSP**

Subjects and Methods

A students' survey was conducted using self developed questionnaire. A focus group discussion was used to identify the key factors in the PSP that could influence students' clinical practice at the clerkship phase. These key factors guided the development of the questionnaire.

The focus group consisted of twenty clerkship students' (year 5 & 6) of the academic year 2001-2002 who passed successfully the Professional Skills Programme at AGU. 14 of them were selected through a verbal request from the researcher to participate in the focus group discussion. In addition six more clerkship students volunteered to join the group. Thirteen of them were female and seven were male.

All the participants attended the meeting. They were divided into two groups, 8 and 12 students' respectively. Each group was met separately. The participants of both groups were put at ease and explained the purpose of the focus groups discussion that is to form a questionnaire to help in identifying areas for improvement in Professional Skills Programme at AGU. The meeting was conducted by the researcher who functioned as group moderator, observer, in addition to writing notes of the discussed issues. Two meetings were held; each meeting lasted for two hours.

The discussion was structured according to the four main themes of PSP (communication skills, history taking, physical examination, and procedural skills).

In the first meeting the students' opinion were gathered in a written report. The researcher tried to avoid a question and answer session and tried to observe non-verbal communication. Some of the phrases like "can you tell me more about--?" "Interesting point, but how about---?" were used.

The first written report was categorized. In the second meeting the same topics were discussed. Consensus was sought within the two groups into generally accepted statements.

At the end of the second meeting, the second group was asked to write any applicable comments about PSP in relation to the four main themes of the programme. All the reports were compiled into one.

Questionnaire

The developed questionnaire was used after minor modification based on literature review. It had six parts to identify students' perception about the different aspects of PSP including communication, interviewing (history taking), physical examination, critical reasoning, procedural skills and ethics. A copy of the questionnaire is provided in **Appendix 1**.

The questionnaire was piloted on 15 students graduated from PSP who were either at second level of the clerkship period or practicing in the hospital as an intern. The reliability of the questionnaire was assessed using Cronbach's alpha. The validity was determined by the face validity through consultation of the curriculum guides and tutors of the programme.

This tool was chosen for the following reasons:

1. It is a simple method for data collection;
2. It is more reliable than the interview because it is anonymous and encourages greater honesty;
3. It is more economical than for example the interview;
4. The investigator overcame its disadvantages of low percentage of return, by the use of coding system for close follow up.

A cover letter was written explaining the purpose of the study and requesting the students to cooperate in filling the questionnaire. A meeting was arranged in a small group for some of the students to review the questions with them. This was to ensure that the questions were well understood.

The questionnaires were submitted with the help of the secretary and collected by hand to ensure that all were received.

Response was anonymous, but a code number was used for the junior group of the students. The code number was utilized for the purpose of follow-up.

All the students were briefed about the purpose of the study and the details of the questionnaire. They were told that their response would be confidential and be used for the programme development. The participants were requested to answer each question by putting a tick mark opposite every statement categorizing their response according to the Likert scale as strongly agree, agree, undecided, disagree, or strongly disagree.

All 110 clerkship students of the year 2002-2003 including those who participated in the focus group discussion were enrolled in the study. These students were divided into two groups. Group one is the sixth year students who had completed successfully two or more clerkship rotations (medicine, pediatrics, surgery, and OB/GYN) after graduation from PSP. These will be considered a senior group. The other group is the fifth year clerkship students who had just completed one month at one of the major rotation after graduation from PSP. These will be the junior group. The students were invited to give their perception about the Professional Skills Programme at AGU by completing the questionnaire.

Statistical design

The data from the questionnaire were processed using Statistical Packages for Social Sciences (SPSS - V 10.0).

The responses strongly agree and agree were combined as agree. Similarly the responses strongly disagree and disagree were combined as disagree. The percentage of agreement and disagreement was calculated for each item.

● **Correlation & predictive validity study of PS examination scores**

The second and the third research questions stated earlier were to study the correlation between students' scores for the different components of the PSP exam, including or excluding the BSc written exam as a predictor of the subsequent performance at the clerkship phase.

Subjects and methods

The study sample consisted of 135 students from AGU who passed the PSP assessment with a satisfactory performance for two academic years (1999-2001). The scores of two years were combined because of their similarity in the format and the process.

The following measures were obtained for each student:

1. The scores of the various components of Professional Skills Programme assessment as a predictor factor (independent variable). It includes two components:
 - A. history taking from a simulated patient;
 - B. physical examination on a simulated patient.
2. The scores of the written exam at the B.Sc. level were also included as independent variable;
3. The scores of the various components at the end of the first major clerkship rotation (medicine, surgery, pediatrics, and OB/GYN) as a criterion measure (dependent variable). It includes the following components:
 - a. written examination (MCQ, short answer, and patient management problem);
 - b. OSCE (Objective Structural Clinical Examination);
 - c. Clinical examination (history taking and physical examination on a real patient).

A correlation study of students' scores on PSP and the scores on the B.Sc. to that of the clerkship phase was performed.

Statistical design

The study concerns the correlation between students' scores of the different components of the PSP exam, including or excluding the BSc written exam, and their subsequent performance at the clerkship assessment.

The data were analyzed using (SPSS W version 10.0). For each component, descriptive statistics was calculated. The predictive value of the PSP assessment and the written exam at BSc level for the performance in clerkship assessment was assessed by calculating the bivariate correlation (Pearson). Independent predictive ability was assessed using multiple regression analysis (R & R square) with the different components of clerkship assessment (written, OSCE, clinical) as dependent variables and scores on the knowledge tests at BSc level and scores at different components of the PSP assessment (history taking and physical examination) as independent variables.

Further more, canonical correlation analysis was used to examine the relationship between two sets of dependent and independent variables. A comparison between the results of the multiple regression and canonical correlation was done.

What is canonical correlation?

George and Scott (1997) explained the canonical correlation as follow: it is the correlation of two canonical variates, one representing the set of independent variables, the other, the set of dependent variables. There would be more than one such linear correlation relating the two sets of variables with each other, such correlation representing a unique link between the two sets of variable. The canonical correlations, taken together, exhaust all the information embedded in the matrix of correlations between the two sets of variables.

Canonical correlation analysis, in a manner, is similar to regression analysis. In the latter, the analysis finds the linear composite of the independent variables, which have the maximum correlation with the dependent variables.

In canonical correlation analysis, a linear composite of each of the set of dependent variables and independent variables are derived in such a way as to maximize the

correlation between the two composites. This correlation is called the first canonical correlation; the linear composites are called the first canonical variates. The coefficients, which defined the linear composites, are usually referred to as the canonical coefficients. However, a more important set of coefficients is the correlations between the original variables in each set and the canonical variate in the set. These coefficients, which are used to interpret the nature of canonical variate, are called canonical loadings, although some authors refer to them as canonical structure coefficients.

The above was about the first pair of canonical variates and first canonical correlation. The analysis, however, goes on to extract another pair of canonical variates, which have the largest possible correlation after the first canonical correlation. This pair of variables is also subject to the condition that it is uncorrelated with the previous pair. In this sense, canonical correlations provide independent pieces of information about the links between the sets of independent and dependent variables. Extraction of canonical variates and computation of canonical correlations continues until the number of variates extracted is equal to the smaller number of variables in either set.

Therefore canonical correlation analysis provides not only indications of the strength of the relationship between a set of independent variables and a set of dependent variables, but also some information about the nature and source of the multiple links between the two sets.

Chapter Four -----4

Study Results

A. Development of the questionnaire using focus group discussion

The aim of the focus group was to identify key factors related to strength and weaknesses of the PSP. This helped in identifying different items to be included in the questionnaire and increased its validity. The reliability of the questionnaire was 0.88 by Cronbach's alpha.

The 20 students who attended the two meetings were actively involved. The Discussion was clustered around five areas related to the PSP.

1. Programme objectives and organization

The objectives of the programme were clear for the majority of the students. However, some of the students felt that tutors were unaware of the programme objectives.

The students expressed the presence of mismatch between student assessment and the programme objectives. This reflected in the following statement that is mentioned by one of the students. "I was asked to demonstrate the signs of appendicitis at the final Professional Skills exam".

They believe that learning would be better if the learning sessions are conducted in the morning. In addition, they recommend having further practical sessions on anatomy prior to clinical training sessions.

2. Communication skills

Most of the students agreed that communication skills are key to history taking skills. The majority felt that refreshment course before clerkship would be useful. This is reflected by the student in this statement "communication skills were only emphasized at the beginning of the programme (year 2), yet we actually practiced that at the clerkship phase (year 5)".

3. History taking skills

The majority mentioned that their training in history taking was deficient. Students recommended practicing history taking under supervision with each system introduced. They pointed out that they need more training in recording the data gathered in a written report. One student had mentioned the following statement “we need to be trained to ask the relevant questions for each problem, to be able to reach to a hypothesis”.

4. Physical examination skills

Most students perceived their training in physical examination skills as very good. However they did not realize its importance till clerkship phase. They felt that giving weight in the continuous assessment would motivate students to participate actively in the sessions.

The checklist of normal and abnormal physical finding of each system found to be helpful and practical.

5. Procedural skills

The majority enjoyed their training on the procedural skills and wished that more procedural skills be introduced to the programme.

B. Students' perception of the PSP in preparing them for the Clerkship phase

● Demographic Data

110 clerkship students during the academic year 2002-2003 enrolled in the study. The respondents were 68.5% female and 31.5% were male (figure 15). Eighty eight (80.9%) completed the questionnaire. Fifty two (58.4%) completed the first major

clerkship rotation (pediatrics, OB/GYN, surgery and medicine) (figure 16). Thirty six (40.4%) students completed three major clerkship rotation of PSP (year six). The response rate was 52 (80%) from year five and thirty six (65%) from year six respectively..

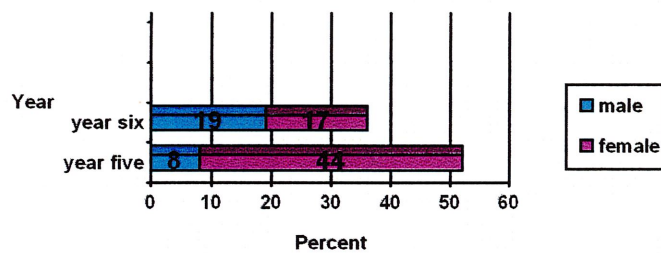


Figure (15): Sex distribution of participants

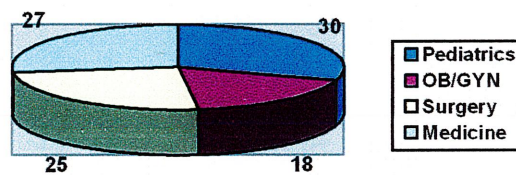


Figure (16): Number of participants in each department

Communication skills (Figure 17)

Seventy six (85.4 %) of respondents perceived the communication skills programme (CSP) as helpful in preparing them to the clerkship phase.

Five question items (appendix 1, part II) were used to determine the students' opinion on communication skills programme in preparing them to communicate effectively with the patients during clerkship. 89.6% and 91.5% of the respondents agreed that the programme helped them dialogue with patients and act with confidence respectively. However, only 61.5% of the participants agree that their training was enough to be able to practice at the clerkship and 74% recommended repeating the training just before the clerkship.

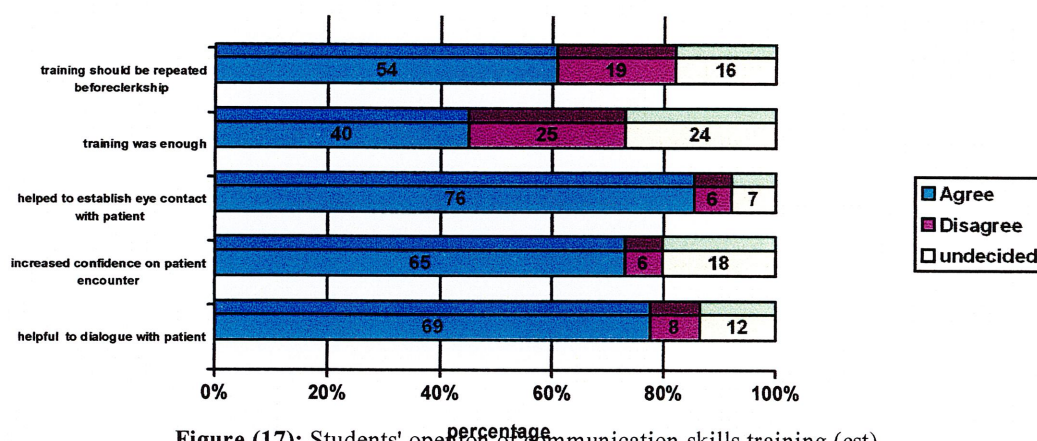


Figure (17): Students' opinion of communication skills training (cst)

History taking skills (Figure 18)

Respondents opinion about their training in history taking at PSP was elicited through nine different questionnaire items (appendix 1, part III).

The study showed that 57 (64%) students were satisfied about training in history taking.

70.4% of the respondents viewed the training in history taking as sufficient to practice on real patients at the clerkship phase. 90% of the respondents thought that there was a need for training in history taking with each new system unit that is introduced.

However, 83.1% of the respondents agreed that the programme helped them to ask relevant questions during history taking. In addition, 91.4% prefer to practice history taking on real patients before clerkship.

At the same time 92.3% of the respondents agreed that training of history taking from history scenario would be helpful for later practice on real patient. 67.9% and 74.3% of the respondents reported that the training at PSP was helpful in enabling them to present data collected from a patient and to document it in an informative written report respectively.

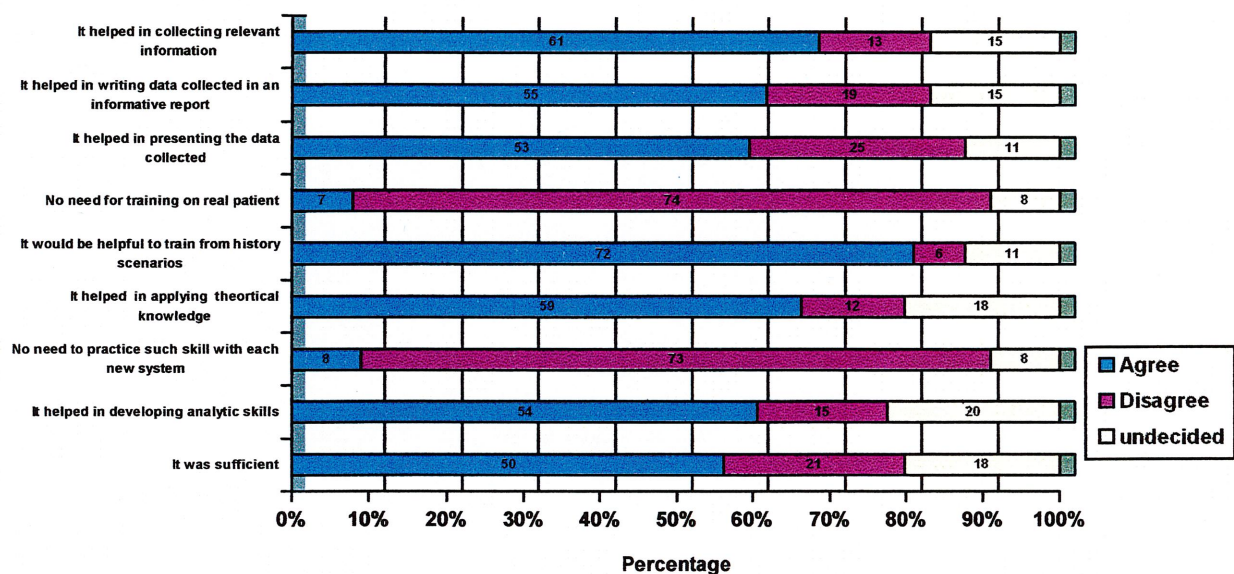


Figure (18): Students' opinion of history taking skills training

Physical examination (figure 19)

There were nine questionnaire items to perceive students' opinion about physical examination training (appendix 1, part IV).

The results have shown that 65 (73%) of the students viewed their training in physical examination training as helpful experience to prepare them to practice at the clerkship phase.

80.3% of the respondents viewed that training of physical examination on simulated patients helped them to detect both normality and deviation. 91.4% of the respondents viewed the scheduling of the unit system with the training of clinical skills as helpful in consolidating the theoretical knowledge and also motivated them to learn more about the clinical skills. (88.1%) of the respondents disagree that there is no need for basic theoretical knowledge of a system to start learning clinical skills. Also the majority of the students (91.6%) disagree with the statement of no need for training of physical examination on real patients before clerkship.

When the participants were asked about giving weight to the clinical skills exam at the end of unit exam, 68.3% agree that there is no need for such a thing. 65.7% of the respondents agreed that their training in PSL helped them to present the physical finding in complete sentences.

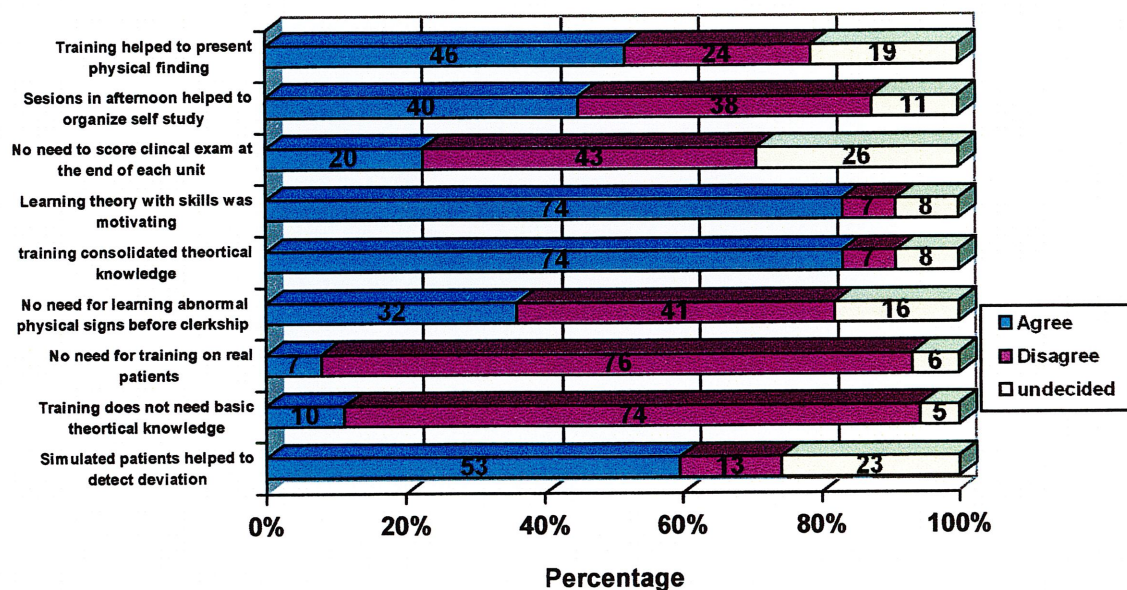


Figure (19): Students' opinion of physical examination skills training

Clinical reasoning skills (figure 20)

There was three questionnaire items to perceive students opinion about clinical reasoning (appendix 1, part V).

The results show that a high proportion of participants (71.9%) agreed that their training in PSP helped them to generate hypothesis for a patient problem. But only 56.2% agreed that their training in PSP prepared them to synthesize data of a particular patient problem into summarize statements.

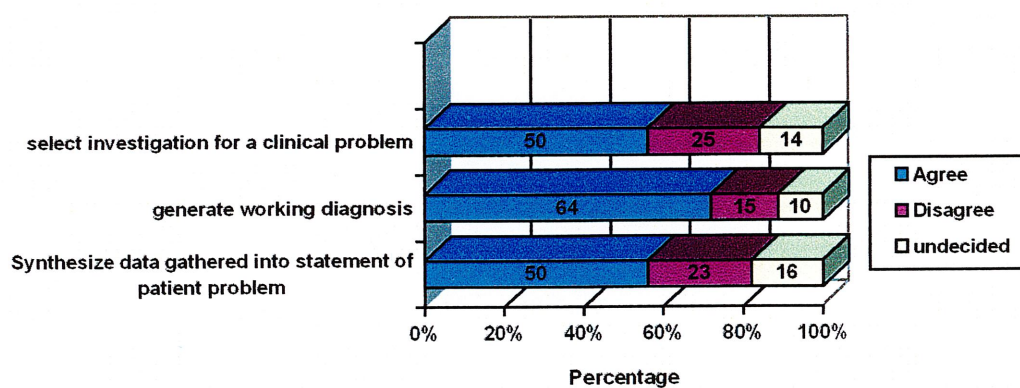


Figure (20): Students' opinion of clinical reasoning training

Ethics (figure 21)

Only two questionnaire items viewed the opinion of students regarding their training in some of the ethical issues during patients' interview.

92.2% and 90.1% of the participants agreed that the training in PSP helped them to respect patient right and patient privacy respectively. However some students mentioned in the comment section that more ethical issues are needed to be introduced to the training programme, like dealing with difficult patients, delivering bad news to patients and issues related to brain dead patients.

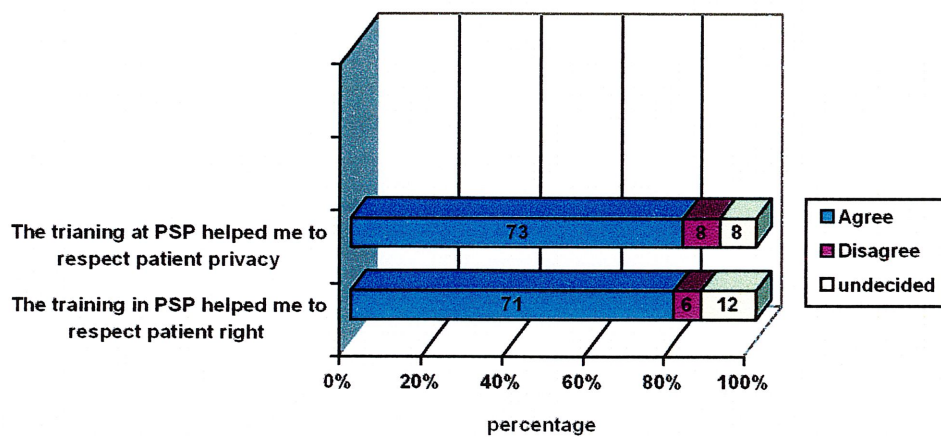


Figure (21): Students' opinion of ethics training

Procedural skills (figure 22)

78.2% of respondents perceived the training in procedural skills as helpful to be able to practice on real patients. But only 43.9% agreed that there was enough time to learn the skills. And 83% of the participants suggested including more procedural skills to the training programme.

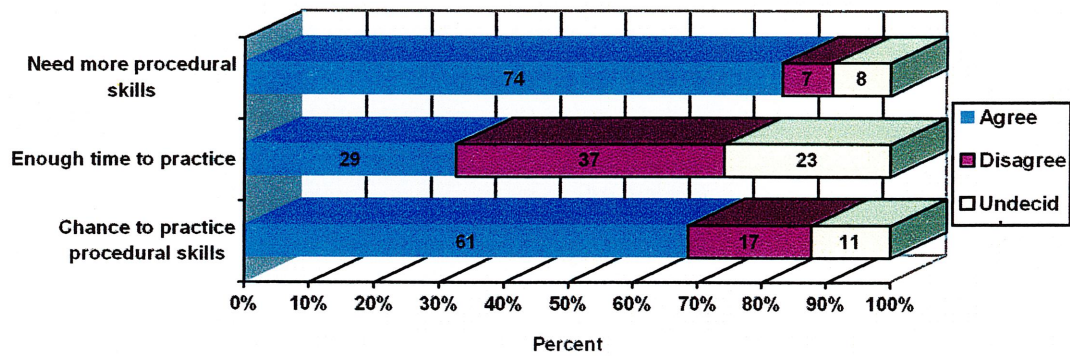


Figure (22): Students' opinion of procedural skills training

C. Correlation study and predictive validity of the PSP examination scores and scores of the written examination at the B.Sc. level with scores at the clerkship phase

● **Descriptive statistics of the examination's components**

Scores of 135 students were included. The range, mean raw scores and standard deviation for different components of the Professional Skills Exam (history taking and physical examination), B.Sc. written, and clerkship rotation (clerk written, clinical and OSCE) are presented (table 4).

Table (4): The mean and standard deviation of students' scores on the various components of various examinations

Exam	Range	Mean	SD
PS history	40-100	76.45	14.24
PS examination	46-100	77.94	11.88
BSc written	51.2-88.02	65.32	8.9
Clerk written	35-100	66.45	12.71
Clerk clinical	40-90	73.21	11.08
Clerk OSCE	44-100	75.66	14.58

PS: Professional Skills

The correlation coefficient (Pearson) between various components of PS, B.Sc. written and clerkship components are displayed in (Table 5).

Table (5): Correlation coefficient: PS history, physical examination & B.Sc. written scores as independent variables, clerkship components scores as dependent variables

	Clerkship Clinical	Clerkship Written	Clerkship OSCE	PS History	PS Physical	B.Sc. Written
PS history	.382 P (.000)	.050 P (.566)	.034 P (.697)	1	.542 P (.000)	.303 P (.000)
PS physical	.365 P (.000)	.095 P (.271)	.174 P (.044)	.542 P (.000)	1	.357 P (.000)
BSc written	.480 P (.000)	.372 P (.000)	.282 P (.001)	.303 P (.000)	.357 P (.000)	1
Clerkship clinical	1	.225 P (.009)	.122 P (.157)	.382 P (.000)	.365 P (.000)	.480 P (.000)
Clerkship Written	.225 P (.009)	1	.289 P (.001)	.050 P (.566)	.095 P (.271)	.372 P (.000)
Clerkship OSCE	.122 P (.157)	.289 P (.001)	1	.034 P (.697)	.174 P (.044)	.282 P (.001)

PS: Professional Skills,

• Multiple regression analysis

Multiple regression analysis was used twice to determine which of the components of the pre-clerkship examination correlate independently with clerkship performance. First, the independent variables were scores of the PSP assessment (history taking and physical examination) and B.Sc. written exam scores; the dependent measures the scores of the clerkship exam components (written, clinical, OSCE). The results are presented at (Table 6).

Table (6): Multiple regression analysis: students' scores of clerkship examination components as dependent variable, students' scores on PS history taking, PS physical examination and B.Sc. written as independent variables

	Clerkship Clinical		Clerkship Written		Clerkship OSCE	
	R square= .302		R square= .143		R square= .311	
	coefficient	P	coefficient	P	coefficient	P
PS history	.203	.022	-.064	.513	-.127	.206
PS physical	.121	.178	-.011	.910	.147	.151
BSc written	.376	.000	.395	.000	.268	.003

PS: Professional Skills

Second, multiple regression analysis was repeated using scores of professional skills components (history taking and physical examination) excluding BSc written as independent measures and the clerkship components as dependent measures. The results are presented on (Table 7).

Table (7): Multiple regression analysis: students' scores of clerkship examination components as dependent variables, scores on PS history taking and PS physical examination (excluding B.Sc. written) as independent variables

	Clerkship Clinical		Clerkship Written		Clerkship OSCE	
	R square= .182		R square= .009		R square= .035	
	coefficient	P	coefficient	P	coefficient	P
PS history	.261	.006	-.003	.979	-.085	.402
PS physical	.224	.018	.097	.349	.220	.032

PS: Professional Skills

• Canonical Correlation

The first part of the canonical correlation analysis included components of the clerkship assessment (clinical, written and OSCE) as dependent variables, and components of Professional Skills Programme assessment (history taking and physical examination) and written exam at the B.Sc. assessment as independent variables. The analysis was repeated by excluding the written exam of the B.Sc. assessment from the independent variables while keeping the dependent variables the same. This was done to answer the research question which concerns the relationship between all the independent variables of professional skills assessment and written B.Sc. scores and all the dependent variables of clerkship achievement.

Inter-correlation between the dependent and independent variables were shown in (Table 5).

Table 8 & 9 show the value of the canonical correlation, and their statistical significance.

Table (8): Canonical correlations between clerkship achievement (dependent variables) and professional skills examination components including the written examination at B.Sc. (independent variables)

NO	Canonical Correlation	Chi-Square	DF	P
1	.602	68.418	9	.000
2	.243	9.713	4	.046
3	.117	1.796	1	.180

DF: Degree of Freedom

Table (9): Canonical correlations between clerkship achievement (dependent variables) and Professional skills examination components excluding the written exam at B.Sc. (independent variables)

NO	Canonical Correlation	Chi-Square	DF	P
1	.432	30.121	6	.000
2	.151	3.028	2	.220

Table 8 & 9 indicate that the first canonical correlation was the highest and most significant, and thus reflects most of the relationships between the two sets of variables. The second correlation was also significant when the written scores at the B.Sc. examination were included, and that was not so when the written components at the B.Sc. examination were excluded.

Table 10 & 11 show the standardized canonical coefficients that indicate the contribution of each variable towards forming the canonical variates of the dependent and independent set of variables. As mentioned earlier, these canonical variates are the sums of the products of the standardized canonical coefficients and the corresponding original variables.

It is important to note that one can reverse the signs of these coefficients without affecting the results and their interpretation. For the purpose of interpreting these results, the third canonical variate in the case on including the BSc written examination will be ignored because the third canonical correlation was not significant. Similarly, the second canonical variate in the case of excluding the B.Sc. examination will be ignored. When the B.Sc. written examination was

included, the clinical clerkship exam scores mainly defined the first canonical variate of the dependent variables. This can clearly be seen by noting that the coefficient of the clerkship clinical exam was .797 whereas the coefficient, for the other two components were .294 and .272 (see table 10).

Using a similar argument, it can be stated that the BSc written examination scores mainly defined the first canonical variate of the independent variables.

The composition of the second canonical variates was not as simple as that of the first canonical variates. As table 10 shows, there are two salient coefficients, and these coefficients have opposite signs. On the basis of these coefficients scores on the second canonical variate of the dependent variables tend to be high when the clerkship written examination scores are high and the scores on the clerkship clinical scores are low. Similarly, scores on the second canonical variate of the dependent variables tend to be high when the scores on the B.Sc. written examination are high and the scores on the PS history taking are low.

Table (10): Standardized canonical coefficient (including B.Sc. written)

Type of Variable	Variable	Canonical Variate		
		1	2	3
Dependent	Clerkship clinical	-.797	.647	-.054
	Clerkship written	-.294	-.757	-.691
	OSCE	-.272	-.359	.945
Independent	PS History taking	-.181	.928	-.741
	PS Physical exam	-.221	.141	1.197
	B.Sc. written	-.811	-.627	-.343

Table 11 shows that when the B.Sc. examination was excluded, the clerkship clinical exam scores mainly defined the canonical variate of the dependent variables. However, the composition of the canonical variate of the independent variables was not as simple. The coefficients of the PS history taking and physical examination were approximately equal, indicating that they contribute equally towards defining the independent variables canonical variates.

Table (11): Standardized canonical coefficient (excluding BSc exam)

Type of Variable	Variable	Canonical Variate	
		1	2
Dependent Variable	Clerkship clinical	-.980	-.291
	Clerkship written	.080	.095
	OSCE	-.181	.967
Independent Variables	PS History taking	-.557	-1.051
	PS Physical exam	-.582	1.037

Table 12 shows the canonical loadings when the written B.Sc. examination is included. According to this table the correlation between the clerkship clinical component and the first canonical variate of dependent variable is close to 0.90, while the correlations for the clerkship written and OSCE components are considerably smaller (0.55 & 0.45 respectively). The correlation between B.Sc. written and the first canonical variate of the independent variable is 0.9, while the correlation for PSP history taking is (0.5) and PS physical examination is (0.6).

The second link between the dependent and independent variables, though statistically significant, was considerably weaker compared to the first link. The interpretation of this link is more complex than that of the first link. The canonical loading of the second canonical variate in table 13 indicates that the dependent variable is positively correlated with clerkship clinical component (0.43) and negatively correlated with both the clerkship written (-.71) and OSCE component

(-.49). This could be interpreted as a relationship between clinical skills at B.Sc. level and clinical skills at the clerkship phase. This can be seen in the canonical loading of the clerkship exam and the positive canonical loadings at PSP assessment.

Table (12): Canonical loading for the clerkship and professional skills (PS) examination score (canonical structure) (Written exam included).

Type of variable	variable	Canonical Variate		
		1	2	3
Dependent	Clerkship clinical	-.897	.433	-.093
	Clerkship written	-.551	-.715	-.430
	OSCE	-.454	-.498	.739
Independent	PS History taking	-.546	.814	-.197
	PS Physical exam	-.609	.419	.673
	B.Sc. Written	-.945	.296	-.140

Table 13 shows the canonical loading when B.Sc. written exam scores are excluded. It would be recalled that in this case there was one significant correlation whose value indicates the presence of moderately strong links between the dependent and independent variables. The canonical coefficient of clerkship clinical exam being close to 0.98 indicates that the first canonical variate of the dependent variables reflects clinical competency. The canonical loading of PS history taking and physical exam are approximately equal, and both are above

0.85. Thus it would seem that the link of moderate strength relates clinical competency at the clerkship level and skills reflected by the PS components.

Table (13): Canonical loading for the clerkship and professional skills (PS) examination score (canonical structure) (Written exam excluded).

Type of Variable	Variable	Canonical Variate	
		1	2
Dependent Variables	Clerkship clinical	-.193	-.152
	Clerkship written	-.193	.309
	OSCE	-.278	.958
Independent Variables	PS History taking	-.872	.489
	PS Physical exam	-.884	.468

Discussion and Conclusions

● Discussion

In the last two decades the inclusion of clinical skills training into medical education has seen a tremendous growth. Curriculum reforms included the creation of clinical skills centers, use of simulation devices and computer technology and the development of outcome measures that more accurately and reliability assess clinical competence (Barry, 2002).

Studies of clinical learning suggest that students have anxieties in practice, often relating to a lack of practical skills, fear of making mistakes. This has led to the emergence of skills laboratories in many medical schools (Lam et al, 2002). The General medical council of UK has recommended a reduction in factual overload and the promotion of problem based and self directed approaches to learning in undergraduate curricula. As a result, many of the new medical curricula have enhanced integration and re-emphasized the teaching and learning of clinical skills. These changes are not limited to undergraduate education (GMC, 1993).

For the provision of quality service, professional education must provide not only knowledge and practical skills, but also appropriate personal development and effective communication skills. The development of clinical centers is perceived as being one way to address these needs. Clinical skills centers provide a setting for structural skills learning with feedback as well as assessment of competence.

This thesis aimed at evaluating the quality of Professional Skills Programme at AGU. The quality of outcomes of an educational programme is a reflection of the characteristics of the input and processes used in the programme. Assessment of educational programme quality will necessitate evaluating all the elements of quality, i.e. fitness for purpose as viewed by different stakeholders involved and affected by the programme, input, process, output and outcomes (Hamdy, 2002). Students' focus group discussion and opinion about the programme are important measurements of quality.

The first question to be answered was: 'how students perceive the Professional Skills Programme in preparing them for the clerkship phase of undergraduate curriculum?

Focus group discussion was used to identify key issues, which can reflect students' opinion about training on the Professional Skills Programme. This helped questionnaire development and provided face validity to the questionnaire. The pilot study was used for the validation of the questions and eliminated irrelevant questions. The reliability of the questionnaire was high (0.881) (Cronbach alpha). However the comprehension of the questions may have a bearing on the study. The students in this study were pleased to have had an opportunity to express their views about their education.

Survey of students' opinion is considered a reliable and valid method for evaluating any educational programme (Cohen, 1981). The 65% response rate of sixth year medical students could be a biased towards more motivated students, but this low rate of participants could be the results that this group of students was busy with their end unit exam. However the high response rate of the fifth year (82%) would probably decrease the bias. The lower response rate of male in comparison to female is the result of increase ratio of female to male students in the college. A limitation of this study is the undecided responses in the questionnaire, which were considered as missing values in data analysis, but as all items in the questionnaire have been completed, this could have added to the interpretation of the results. In addition, the consistency in the finding obtained using focus group discussion with the finding the survey study might have increased the confidence in the results. Arie and Raja (1983) mentioned "to increase the confidence in the finding of a programme evaluation, it is necessary to seek information from a variety of sources using different methods".

The survey results showed that (77.7%) of respondents agreed that PSP was helpful for their continuing training with clerkship phase. However the degree of agreement varied between the different domains of the programme.

- *Communication skills*

Hamo et al (1994) mentioned that communication skills are vital for good data collection and for both patient satisfaction and compliance to management. In this study the students viewed the training of communication skills as helpful in building rapport with the patients (85.4%). This is supported by their positive response about ability to establish eye contact, listening, asking open –ended questions and acting with confidence with the patients.

61.5% of students found that training of communication skills for one course and at the beginning of the curriculum was not enough. Retention of the communication skills as students grow in the diagnostic skills during their subsequent training is an important issue which should be considered in communication skills training. San Son et al (1991) showed that acquiring diagnostic skills by the students is associated with a reduction of communication skills effectiveness. This is important because it might necessitate the expansion of the programme over a longer period of time of the curriculum. Van Dalen (1989) found that greater medical knowledge seems to shift attention from communication skills and the students should learn to integrate these domains; i.e. knowledge (what to say) and communication skills (how to say). Van Dalen also observed that the clinical teacher takes a more directive and leading approach to patients, pay less attention to psychosocial aspect, he suggested the need for clinical teacher development in the area of communication skills training.

- *History taking*

History taking skills introduced in the programme in year two through a series of workshops and encounter with simulated patients and real patients. Later in the programme important aspects related to common presentation in relation to each body system are presented and discussed. Actual training on history taking skills related to each system did not take place.

In this study (64 percent) of the students reported that their training in history taking was helpful for their performance at the clerkship phase. Students' asked for more training on history taking skills, presentation skills and writing the data collected from real patients with each body system. The majority agreed that learning of history taking skills from history scenario using simulated patients would be helpful.

Students' dissatisfaction of some aspects of history taking skills could be explained on the basis that, the programme is focused in the second year of the pre-clinical phase with minimal revisit after words. Second, there is inadequate supervision and feedback by the tutor while students are performing history taking. Third, the training of history taking is basically dependent on videotape demonstration. Use of simulated patients and history scenarios probably enhance students' ability in formulating relevant questions. Das et al (1998) reported that over 90 percent of their students' felt that parallel teaching of theory and Professional Skills helped them to ask the relevant questions during history taking from patients.

Ivey (1983) described three chronological phases, which are desired for communicative behavior during patient interview: (1) problem clarification; (2) medical history; (3) giving advice. Each phase involves different abilities. Morgan (1996) claimed that medical knowledge is necessary for training of these phases. Further more, Kramer (1989) suggested that immediate feedback by the simulated patients in the laboratory enabled students to overcome inhibition and to develop their own style of patient – centered interview.

- *Physical examination skills*

Students agreed that training of physical examination helped them to perform physical examination in the clerkship phase (74%). practicing physical examination on simulated patients helped them acquire the skills and to recognize normal finding (80%). This is in consistent with other research (Das et al 1998). The majority of the students' (91.4%) found that learning theory in parallel with physical examination skills as implemented in AGU (problem-based curriculum) emphasized the relevance of the knowledge and increased its retention. These would be considered as major advantages of the programme. Students agreed that there was no need for training on real patients prior to clerkship phase (81%). Simulations are not as good as practicing on real patients but are certainly a useful stepping-stone to some of the more complex or intimate skill areas. Skills centers provide a different context for learning, which can never capture the real setting (Clair and Christine, 1999).

The availability of computer simulation and other advance simulator (e.g. cardiology patient simulator) would probably help the students to recognize abnormal physical finding more readily. Ewy et al (1987) compared the level of bedside technical skills and cognitive knowledge of students' taught using cardiology patient simulator (CPS) with students taught in a conventional patient –dependent programme. The results indicated that the fourth year medical students who used the CPS during training acquired more cognitive information and were better skilled in bedside cardiac examinations than there counterparts who were trained in the traditional manner. Simulation may be enhanced in many ways; the typology by Miller (1997) might help to recognize the different types of simulation, which can be added to the programme. This typology incorporates the elements of the clinical experience, and describes how these elements interact with the user. He used four elements, which were represented as four “Ps” including; mannequins, computer simulation, interactive simulation and expert system. Each element of the simulation can be passive (p), active (a), or interactive (i). A passive element is usually provided to enhance the setting or “realism” of the simulator. Active elements change during simulation in a programmed way. These elements enhance the simulation, and can provoke responses from the student. Interactive elements change in response to actions taken by the students or by any other element of the simulation.

Logistics of implementation as timing, group size are important factors which can influence students' opinion and satisfaction from the programme. Paul & Gerry (1999) stated that the time available for the sessions, quality of resources and materials, whether learning objectives were clearly stated or tutor support, all show a major impact on students' responses of their programme evaluation. However, generalisability of this finding to AGU remained to be studied.

- *Clinical reasoning skills*

The acquisition of skills of patient data writing, summary presentations and clinical reasoning are important skills that medical students should acquire through training. GMC (1993) recommended that medical students should be able to demonstrate an ability to synthesize the patient data and present a good quality written report.

Clinical reasoning skill is an integral part of the problem based learning curriculum of the AGU and is used weekly when the problems are introduced and studied by the students. In the PSP clinical reasoning skills and diagnostic hypothesis generation are introduced early and training takes place through workshop in year two. Although (72.7%) of the students agreed that the programme helped them to improve their clinical reasoning skill and case write up, there is still a need to organize it in a more structured form all along the programme.

- *Ethics*

Medical ethics is considered as a core subject in the medical curriculum. In addition it was mentioned that although the undergraduate medical curriculum is a good time to introduce medical ethics, students might learn best when faced with ethical dilemmas in clinical practice (GMC, 1993).

In this study students' agreed (91.1%) that their training in the PSP was helpful in understanding of patient rights and respecting patients' privacy. Though our questionnaire was limited to these two issues, however many other ethical issues are taught at AGU in the informal "hidden" curriculum, which are not part of the professional skills programme. This domain needs to be further studied.

- *Procedural skills*

Training in procedural skills was helpful for the students practice at the clerkship phase (78.2%). They suggested the need to expand this component of the programme (83%). Das et al (1998) had reported a similar finding. The high approval rating of this aspect of the programme could be explained by the well equipped skill lab of the AGU and relevance of the skills to the practice of medicine. These provide better opportunity to the student to practice procedural skills. Taylor (1992) proposed, "The availability of mannequins and models has opened up an excellent opportunity for training of procedural skills. The risks associated with many invasive procedures preclude direct practice on patients. Similarly practicing breast, vaginal, genital, and rectal examinations raises ethical issues. Using mannequins, students may perfect

these skills and can approach real patients at a later stage with more confidence” (p. 452).

- *Predictive validity of scores on the Professional Skills (PS) exam and clerkship examination scores*

Two other questions, the thesis addressed: 1) can students’ assessment at the end of the Professional Skills Programme predict their performance in the end of clerkship examination. 2) What is the predictive validity of the written exam scores as it is testing knowledge and PS scores as it is testing skills in relation to the clerkship examination scores?

Measurement of outcomes in medical education and the predictive value of these measurements in relation to on-the-job performance are fundamental issues in medical education (Hamdy, 2002). Medical education has the unique feature of being composed of two components, the basic sciences and the clinical sciences. In a majority of medical schools these components are separated chronologically under the assumption that the clinical components must be built upon a firm foundation of basic sciences. Ironically, while this connection between basic medical sciences and clinical sciences in medical school is taken for granted, the relationships of academic attainments in the basic science and achievement in the clinical science have been questioned (Joseph et al, 1993).

At AGU clinical skills are introduced early in the curriculum integrated with basic medical science. The whole curriculum in the pre-clerkship phase (year 2, 3, and 4) is problem-based. The problems are clinical emphasizing clinical reasoning and relevance to practice. The BSc written exam includes MCQ and short answer questions which are based on clinical scenarios. This indicates the strong link between basic medical science and clinical science in this curriculum.

The first clerkship rotation in year five was chosen intentionally to study the correlation for the following reasons: first, it is close to the training on the PSP. The exposure to clinical training during the clerkship may contribute to the students’

performance in that period particularly skills of history taking, physical examination and ability to reason. Second, the PS exam and clerkship exam have similar constructs that is history taking, physical examination and clinical reasoning. These two factors would reduce contaminants such as the time interval; construct dissimilarity and the phenomenon of decay of learning of learning as a function of time (Joseph et al, 1993). Hojat and Veloski (1984) also proposed that retention of knowledge is a function of the interval between its acquisition and its retrieval.

In this study multiple regression analysis and canonical correlation were used looking for the degree of correlation between PS exam scores, scores on the BSc written examination and scores on the different components of the end of first clerkship examination.

Statistically researches have shown that multi-co-linearity arises when using multiple regression technique in studying the correlation between dependent variables and a set of independent variable, where the predictors are highly correlated, (Darlington, 1968). Though multi-co-linearity has no adverse effect on test of significance regarding multiple correlation, it creates unstable estimate of the partial regression coefficient with high standard errors, as a result test of significance of these estimate are not dependable (Freund and Minton, 1979).

The other problem proposed for the lack of a relationship between performance measure in preclinical year and subsequent performance is clustering of the variables under one factor. This creates mathematically independent factors that simplify either the rows of a factor matrix or the column of the matrix "Orthogonal rotation" (Price et al, 1964).

In this study the results of the multiple regression analysis showed only one significant correlation when the B.Sc. written was included that was between the scores of the written examination at B.Sc. and the scores of the clerkship clinical component of the clerkship examination and no significant correlation with the PSP examination components.

When the B.Sc. written was excluded both PSP assessment components showed a significant correlation only with the clerkship clinical component while, the written and OSCE components of the clerkship examination did not reveal a significant

correlation. The nature of this relationship could not be explained further and this is a limitation of multiple correlation analysis.

When canonical correlation analysis was used it revealed a link of moderate strength relates clinical competency at the clerkship level and skills on PSP examination components. The relationship was stronger when B.Sc. written exam component was included. This was in contrast to the simple correlation that showed a weak relationship. This is an instance of the general notion that multivariate analysis, such as canonical correlation analysis, reveals the strength of relationships between variables, whereas a series of univariate analysis may fail to do so (Tatsuoka, 1971). Thus univariate analysis may lead to errors when a multivariate analysis is the appropriate procedure.

This study support views that canonical correlation analysis is an appropriate statistical method as it deals with situations that involve many to many variables relationships. It exhausts all the information embedded in the matrix of correlation between the two sets of variables. In addition, it provides not only indications of the strength of the relationship between a set of independent variables and a set of dependent variables, but also some information about the nature and source of the multiple links between the two sets.

When the B.Sc. written examination was included as a predictor in the canonical correlation analysis, there were two important links between clerkship assessment with the B.Sc. written and PSP variables as reflected in two significant canonical correlations relating two sets of variables (0.6 and 0.24 respectively). Each one of them represents an orthogonally separate pattern of relationships between the two sets of variables.

Several authors cautioned against the interpretation of the links between the variables by using standardized canonical coefficient (Levine, 1977). They argue that the appropriate means for such interpretation are the canonical loadings (structure coefficient), which are in fact the correlations between the original variables and the canonical variates. It was concluded from the canonical loadings that the first and strongest link between PS examination scores including B.Sc. written and clerkship assessment reflects the relationship between clinical competence (-.897) and

knowledge achieved at the B.Sc. level as reflected on the B.Sc. written examination score (-.945).

The educational interpretations of these results could be that clinical examination performance in the clerkship is largely a reflection of testing knowledge. Another explanation is that the performance in clinical exam indirectly reflects general ability in problem solving skills where basic knowledge is a requirement.

The second link between B.Sc. assessment and clerkship assessment was interpreted as a relationship between skills of the PSP at B.Sc. level and clinical skills at the clerkship phase. However, it was noted that the standardized coefficient and canonical loading had opposite signs. The coefficient related to clinical skills was positive within each assessment (.647), while those related to clerkship written test (-.757) and OSCE (-.359) had negative signs. This statement would assume that OSCE reflects knowledge rather than skills. The explanation of this finding could be related to the format of the OSCE at AGU because it is mainly interpreting diagnostics studies or answering questions, which reflect knowledge rather than skills. The signs of the coefficient indicate that the higher scores on the canonical variate are indicative of high clinical skills and poor knowledge, both at B.Sc. and clerkship level. The possible explanation for such finding includes the following: first, that the curriculum has put so much emphasis on learning skills in contrary to learning knowledge. The second explanation could be related to validity and reliability of the assessment measures, which was not assessed in this study. The third possible explanation is the error in rating of the direct observation of clinical skills. This error could be due to "leniency effect" (Gonnella and Hojat, 1983), which is the reluctance of raters to assign unfavorable ratings.

The results of this study might fit the 'lump theory', stating that observed achievements on different tests are caused by one and the same competency, comparable to the g-factor in intelligence (Iain and Brian, 2002). In a previous study it was concluded that knowledge tests are much better predictors of strength and weaknesses in actual performance (Ram et al, 1999).

Regarding ability of professional skills assessment when the B.Sc. written achievement was excluded to predict future clinical performance at the clerkship phase, there is no doubt that there is a link, which was of moderate strength (0.42)

with the clerkship clinical assessment as tested by canonical correlation. This is expected because of the construct similarities between the two assessments. Such finding would support the decision of the college that considered a satisfactory performance at Professional Skills Programme is a gateway to the clerkship. In addition, the canonical coefficient of the OSCE was very small indicating that this component does not contribute significantly to the canonical variates. This finding supports our conclusion that OSCE exam at AGU assess knowledge rather than clinical skills.

There is generally a paucity of good quality studies of predictive validity in health education field (Renger and Meadows, 1994). Various investigations have found a moderate link between measures of performances in medical school and performance after graduation (Hojat et al, 1993). However there is limited literature investigating the relationship between the performance on the Skills Training Programme and subsequent performance in medical schools and beyond.

Iain and Brian, (2002) assessed the ability of OSCE exam to predict later performance. The authors found that the performance in an OSCE taken early in the clinical course strongly predicts later clinical performance ($r=0.477$). Norman et al (1982) reported a strong correlation between performances on simulated patients with real patients in the amount of data gathering activity or in the diagnostic formulations and planned investigation.

The research questions suggested that clinical skills lab at AGU provides a wide range of clinical skills training effectively. We also found that early clinical experience is a motivating force for the students and helped students' understand the relevant underlying basic science (Bradley and Hunphris, 1999).

The fact that we could not show strong correlations between training at PSP and later performance highlights the need for assessment of retention of the early learned skills in the programme. In addition, there is a need to determine the validity and reliability of the assessment measures used in the programme.

Further study is needed to have a complete picture of the effectiveness of clinical skills programme on subsequent performance. This effect could be measured with

adequate research designs using other measuring instruments, such as teacher judgments, in practice observation, portfolio review and other valid and reliable measures. The measurements of performance should be on different levels, including the actual performance in daily practice and patient outcomes.

● Summary

This thesis reports an evaluation of clinical skills training at the medical school of AGU as outcome measures of an educational programme. The thesis attempted to answer three questions. The first; what is the students' perception of the Professional Skills Programme in preparing them for the clerkship phase? The second; can students' assessment scores at the end of the Professional Skills Programme predict their performance in clerkship phase? The third; What is the relation between students knowledge base as determined by the written exam scores and scores on the PSP to predict the performance on the clerkship phase?

The literature review in the introduction provided a conceptual understanding of clinical skills program. In the first part a description of clinical skills programme was presented. It describes the principles to ensure success of clinical skills training programme. Skills training should start early in the curriculum, to increase in complexity gradually. A spiral curriculum is a useful approach that is appropriate to clinical skills training; the core clinical skills are revisited throughout the entire medical curriculum at numerous levels of difficulty. Explicitly, identifying the competency at each stage of learning will guide students learning and faculty instruction. The clinical skills learning facilities provide an environment in which students' can receive training in clinical skills safely using effective educational strategies. However, several factors might affect retention of skills learned early in the curriculum. These factors should be considered by the programme organizer.

In the second part of the literature review the discussion was focused on simulator-based learning and its educational impact. Using simple classification of simulators into standardized patients, model based and computer based helped to describe the recent development in this field.

The third part discusses an important component of clinical skills programme that is the assessment using valid outcome measures. A combination of different methods in assessment is probably the most valid and reliable approach. It was suggested that students learning outcome could be assessed at three levels (knows, knows how, show how) and practice outcomes level need to be assessed at two levels (does, impact).

The predictive values of assessment measures obtained in medical schools and future performance is still an issue of debate in the literature. The studies reviewed were limited by the type of measures and methods used to study this relationship.

Finally, a strong monitoring system should accompany any educational programme. Different models for quality evaluation have been described. These models differentiated between intended curriculum, learned curriculum and used curriculum.

The subsequent sections of this thesis, the answer of the research questions were reported. The first research question was to identify students' perception of PSP in preparing them for the clerkship phase. A focus group discussion was used to identify key factors in the PSP that could influence students' clinical practice at the clerkship phase. Students' view about communication, history taking, physical examination, clinical reasoning, procedural skills and ethics were investigated. The results indicated that prior training in the PSP was helpful to the clerkship practice. The finding could have a direct implication for further development of the programme.

The second research question was to assess the validity of the PSP assessment as a predictor of students' performance at clerkship phase. To study this correlation, canonical correlation and multiple regression analysis were used. The results showed a link of moderate strength relating clinical competency at the clerkship level and skills of the PS components.

The third research question was to study the effect of students' knowledge-base as determined by written exam scores when included as a predictor of the relationship

between PSP assessments on the performance at clerkship phase. The results showed that the relationship was stronger which might indicate that the achievements on different tests are caused by one competency comparable to the g-factor in intelligence.

● Conclusions

1. Clinical Skills Training should be integral to the curriculum and relevant to educational training requirement.
2. Skills training should start early and increase in complexity gradually.
3. Spiral curriculum is a useful approach that is appropriate to clinical skills training.
4. Clinical skills facility could significantly enhance the teaching and learning of many clinical skills.
5. The development of skills centers should include ongoing educational evaluation of outcomes.
6. It is important to select a reliable and valid method when measure students' learning outcomes.
7. Programme evaluation should be continuous and integral part of the educational programme. It requires an evaluation of input, process, output and outcome measures.
8. The positive as well as the negative part of the students' feedback about PSP at AGU supports further development of the programme.
9. Performance in clinical skills programme could predict subsequent students' performance at the clerkship phase. However, this value is less pronounced than the predictive value of a knowledge test for the performance at the clerkship exam.
10. The high predictive value of a knowledge test could be explained by "Lump Theory" stating that the achievements on different tests are caused by one competency comparable to the g-factor in intelligence.

• Recommendations

Although, only one aspect of the Professional Skills Program has been studied, some suggestions could be discussed.

Teaching goals and strategies:

1. Teaching goals must be explicit to all teaching staff.
2. Communication Skills Programme should be extend all though the pre-clerkship phase.
3. Practicing history taking in regard to data collection, presentation of data and documenting the data obtained and to be introduce with each system.

Assessment strategies:

1. Students' assessment should be in line with the programme objectives.
2. It may be helpful to introduce assessment-using portfolio.
3. Assessment using OSCE may have some educational advantages.

Further research:

1. An evaluating of the Professional Skills Programme using teachers' opinion.
2. An evaluation of the validity of the assessment method used.
3. A correlation study between the scores at written test and scores of the PSP assessment.

● References

- Ali, J., Adam, R., Gana, T. J., Pierre, I., Bedaysie, H. et al. (1996) Teaching effectiveness of the advanced trauma life support program as demonstrated by an objective structured clinical examination for practicing physicians. *World Journal of Surgery*, **20**(8), 1121-1125.
- Anderson, J. (1979) Controversy: for multiple choice questions. *Med Teacher*, **1**, 37-42.
- Annet, J. (1977) Training in transferable skills. In: Patrick, J. (eds) *Training: Research and practice*. San Diego. p. 75-105.
- Annett, J. (1997) Retention of interviewing skills learned by first-year medical students: a longitudinal study. *Medical Education*, **26**, 276-281.
- Arie, R. & Bandaranayka, R. (1983) Plan and conduct programme evaluation. *Medical Teacher*, **5**(4), 127-131.
- Ausubel, D., Novak, J. and Hanesian, H. (1978) *Educational psychology; A cognitive view*, Holt, Rinehart and Winston, New York.
- Badger, L. W., deGruy, F. V., Hatman, J., Plant, M. A., Leeper, J., Ficken R. et al. (1995) Stability of standardized patients' performance in a study of clinical decision making. *Family Medicine*, **27**(2), 126-131.
- Ball, C. (1985) *What the hell is quality? In: Fitness for purpose*. Guildford, UK, Society for research into higher education.
- Barro, A. R. (1973) Survey and evaluation of approaches to physician performance measurement. *J Medical Education*, **48**, 1051-1093.
- Barrows, H. S. (1987) Simulated (Standardized) Patients and other human Simulations. *Academic Medicine*, **68**(6), 443-451.
- Barrows, H. S. (1993) An overview of the uses of standardized patients for teaching and evaluating clinical skills. *Academic Medicine*, **68**, 443-451.
- Bligh J. (1995) The clinical skills unit. *Postgraduate Medical Journal*, **71**, 730-732.
- Boulay, du C. & Medway, C. (1999) The clinical skills resource: a review of current practice. *Medical Education*, **33**, 185-191.
- Boushuizen, HPA, Schmidt, HG. (1995) In: Remmen, R. (1999) *An evaluation of clinical skills training at the medical school of the University of Antwerp*. Unpublished dissertation, University of Antwerp.

Bradely, P. and Hunphris, G. (1999) Assessing the ability of medical students to apply evidence in practice: the potential of the OSCE. *Medical Education*, **33**, 815-817.

Carney, P. A., Dietrich, A. J., Freeman, D. H., and Mott, L. A. (1993) The periodic health examination provided to a symptomatic older woman: An assessment using standardized patients. *Annals of Internal Medicine*, **119**(2), 129-135.

Clayman, G. et al. (1999) Computer-Based case simulations from medicine: Assessing skills in patient management. In: Ara Tekian et al. *Innovative simulations for assessing professional competence*. Chicago, Illinois (ed). P.29-42.

Cohen, PA, (1981) Students' rating of instruction and student achievement: A meta-analysis of multisection validity studies. *Review of Educational Research*, **51**, 281-309.

Coles, CR & Grant, JR. (1985) Curriculum evaluation in medical and health care education. *Medical Education*, **19**, 228-41.

Collins, G. F. & Harden, R. M. (1998) AMEE Medical Education Guide No. 13: Real patients, simulated patients and simulators in medical education. *Medical Teacher*, **20**, 508-21.

Covell, D.G., Ulman, G.C., and Manning P.R. (1985) Information needs office practice: are they being met? *Annals of Internal Medicine*, **103**, 596-9.

Cox, K. (1987) Knowledge which cannot be used is useless. *Medical Teacher*, **9**, 145-54.

Crig, J. L. (1992) Retention of interviewing skills learned by first-year medical students: a longitudinal study. *Medical Education*, **26**, (276-281).

Mandria, D., Anthony, T., Hasan, M.Y. (1998) The views of senior students and young doctors of their training in a skills laboratory. *Medical Education*, **32**, 143-149.

Dawson, S. L. & Boston, MA. (2002) A critical approach to medical simulation. *Bulletin of the American College of Surgeons*, **87**(11), 12-18.

De Nio, J. N., et al. (1975) Evaluation of internal medicine clerkship students. In: Neufeld VR. Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p. 119-141.

Diane, B. W. and Penny, A. J. (1997) The medical skills center at the University of Calgary Medical School. *Medical Education*, **31**, 45-48.

Ekwo, E. E. & Loening, B. V. (1979) Clinical problem solving and knowledge. *Medical Education*, **13**, 251-256.

Epstein, M. R. & Hundert, E. M. (2002) Defining and assessing professional competence. *JAMA*, **287** (2), Jan. **9**, 226-235.

Erviti, V., Fabrey, L. J., Bunce, J. V. (1979) The development of rating scales to assess the clinical performance of medical students. In: Neufeld VR, Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p. 119-141.

Eway G. A., Felner J. M., Juul D., Mayer J. W., Sjid A. W., Waaugh R. A (1987) Test of cardiology patient simulator with students in fourth- year electives. *Journal of Medical Education*, **62**, 738-43.

Feinstein, AR. (1967) Clinical judgment. Cited in Barry, S. (2002) Clinical skills training – practice makes perfect. *Medical Education*, **36**, 210-211.

Fitts and Posner (1967) Learning and skill acquisition, In: Patrick, J. (eds) *Training: Research and practice*. San Diego. p. 19-74.

Flaherty, J.A., Rezler, A., McGuire, C. (1982) Clinical reading and writing skills of junior medical students. *J. Medical. Education.*, **57**, 848-853.

Gagne, R.M. (1962) Simulators. Training research and education. In: Patrick, J. (1992) *Training: Research and practice* (eds). San Diego. p.487-511.

Gange, R. (1985) Cognitive perspectives on teaching and learning. In: Quinn, Francis M., (ed) *Principles and practice of nurse education*. London, University of Greenwich. p. 66-109.

Gardener, B. (1973) Overall student performance as a measure of internship performance. In: Neufeld VR, Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p. 119-141.

Gardin, G.R. & Sitterley, T.E., (1972) Retention of interviewing skills learned by first-year medical students: a longitudinal study. *Medical Education*, **26**, (276-281).

General Medical Council Education Committee. *Tomorrow's doctors: recommendations on undergraduate medical education* (1993), London, General Medical Council.

Gentry, J. W., Suraj, C., Burns, A. C., John, R. D., (1998) *The second components in business simulation and experiential learning* (eds.) Nancy Leonard and Sander 62-86.

George, A. M. & Scott, L. H., (1997) *Multivariate statistical methods A first course* (eds) Mahwah, New Jersey, 133-161.

Gilhooly K.J. (1990) Cognitive psychology and medical diagnosis. *Applied Cognitive Psychology*, **4**, 261-272.

Glaser K., Hojat M., Veloski J.J., Blacklow R.S., Goepf E.C. (1992) Science, verbal, or qualitative skills: Which is the most important predictor of physician competence?. *Educational and Psychological Measurement*, **52**, 395-406.

Goldberg, L. R. (1972) Global rating scale. In: Neufeld VR. Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p.119-141.

Gonnella, J.S. & Hojat, M.(1983) Relationship between performance in medical school and postgraduate competence. *J. Medical Education*, **58**, 679-685.

Gonnella, J.S., Hojat, M., Erdmann, J.B., Veloski, J.J. (1993) A case of mistaken identity. Signal and noise in connecting performance assessment before and after graduation from medical school. *Academic Medicine*, **68**, S9-16.

Greenblat, C. S., (1975) Teaching with simulation games. A review of claims and evidence. In Greenblat C. S. and Duke R. C. (Eds.) *Gaming- simulation: Rational, Design, and Applications*. New York. Halsted.

Grossely, J., Humphris, G., Brian, J. (2002) Assessing health professional. *Medical Education*, **36**, 800-804.

Hajer, P. & Gonczi, A. (1996) What is competence. *Medical Teacher*, **18**(1), 15-18.

Hamdy H., Grealley, M., Grant, I.N., El Shazli, H., Nayar, U., Rajab, K., Al-Rommi, K., Mohammad, A M., AL-Awadi, A., Al-Refai, A M. (2001) Professional Skills Programme in a problem based learning curriculum:experience at the College of Medicine and Medical Sciences, Arabian Gulf University. *Medical Teacher*, **23**(2), 214-216.

Hamdy, H. (2002) *Measurements in medical education: Implications for quality*. M.ED. dissertation, University of Groningen.

Hamo, I M, Das M., Lanphear, J. (1994) The skills laboratory as viewed by medical students. *Annals of Community-Oriented Education*, **7**, 309-15.

Harden, R. M., Stevenson, M., Downie, W., Wilson, G. M. (1975) Assessment of clinical competence using objective structured examination. *British Medical J.*, **911**, 447-451.

Harden, R. M., & Gleeson, F. A. (1979) Assessment of clinical competence using an objective structured clinical examination. *Journal of Medical Education*, **13**,41-54; 448-457.

Harden, R.M., Sowden, S. and Dunn, W.R. (1984) Educational strategies in curriculum development: the SPICES model. *Medical Education*, **18**, 284-297.

Harney, L. & Grenn, D. (1993). Defining quality. *Assessment and evaluation in higher education* **18**(1), 9-34.

Hart I., (2001) Objective clinical examinations, In: Dent A. John, Harden M. Ronald, *A practical guide for medical teachers* (ed) Churchill Livingstone.

Heard, K. Jenne, A., Ruth, M., Cason, J. G., Cantrell, M., Patrick, W. T. (1998) Practical issues in developing a program for the objective assessment of clinical skills. *Medical Teacher*, **20** (1), 15- 21.

Higher Education Quality Council (1996) *Guidelines on Quality Assurance*, HEQC, London.

Hojat, M., & Veloski, J. J. (1984) Subset scores of a comprehensive examination of medical knowledge as a function of retention interval. Cited in: Joseph, S. G., Hojat, M., James B. E., Veloski, J.J., (1993) A case of mistaken identity: signal and noise in connecting performance assessments before and after graduation from medical school. *Academic Medicine*, **68**(2), s9-s16.

Hojat M., Gonnella J.S., Veloski J.J., Erdmann J.B. (1993) Is the glass half full or half empty? A re-examination of the association between assessment measures during medical school and clinical competence after graduation. *Academic Medicine*, **68**, S69-76.

Iain, G. M., & Brian, J., (2002) Predictive validity and estimated cut score of an objective structured clinical examination (OSCE) used as an assessment of clinical skills at the end of the first clinical year. *Medical Education*, **36**, 418-425.

Issenberg, S. B. & McGaghie, C. W. (2002) Clinical skills training-practice makes perfect. *Medical Education*, **36**(3) 210-211.

Issenberg, S. B. & McGaghie, C. W. (1999) Assessing Knowledge and skills in the health professions: A continuum of simulation fidelity. In: A. Tekian et al. *Innovative simulations for assessing professional competence*. Chicago, Illinois (ed). P.125-146.

Jolly, B.C. & Macdonald, MM. (1989) Education for practice: The role of practical experience in undergraduate and general clinical training. *Medical Education*, **23**, 189-95.

Joseph, S. G., Hojat, M., Erdmann, B. J., Veloski, J. J., (1993) A case of mistaken identity: signal and noise in connecting performance assessments before and after graduation from medical school. *Academic Medicine*, **68**(2), s9-s16.

Kent, R. N. & Foster, S. L. (1977) Direct observation. In: Neufeld VR. Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p. 51-70.

Keynan, M., Ftiedman, M., Benbassat, J. (1987) Reliability of global rating scales in the assessment of clinical competence of medical students. *Medical Education*, **21**, 477-481.

Kneebone, R.L. (1999) Twelve tips on teaching basic surgical skills using simulation and multimedia. *Medical Teacher*, **21** (6), 571-575.

Kneebone, R. (2003) Simulation in surgical training: educational issues and practical implications. *Medical Education*, **37**(3), 267-282.

Kraan, H.F., Cringen, A.A.M., De Vriwe, M.W., Zuidweg, J., Imbos, J., Van Der Vleuten, C.P. (1990) To what extent are medical interviewing skills teachable? *Medical Teacher*, **12**, 315-28.

Kramer, D., Ber, R., Moore, M. (1989) Increasing empathy among medical students, *Medical Education*, **23**(2), 168-73.

Ledingham, McA. & Harden, RM. (1998) Twelve tips for setting up a clinical skills training facility. *Medical Teacher*, **20**(6), 503-507.

Lindblom-Y. S. K. & Lonka, E. L. (1999) On the predictive value of entry level skills for successful studying in medical school. *Higher Education*, **37**, 239-258.

Lindblom-Y. S. K., Lonka, K. L., Leskinen, E. (1996) Selecting students for medical school: What predicts success during basic science studies? A cognitive approach. *Higher Education*, **31**, 507-527.

Linn, B. S., Arostegui, M., Zeppa, R. (1975) Performance rating scale for peer and self assessment. *Brit J Medical Education*, **9**, 98-101.

Linn, L. R. & Gronlund, E. N. (eds) (1995) *Measurement and Assessment in Teaching*. Columbus, Ohio.

Macintosh, M. C., & Chard, T., (1997) Pelvic manikins as learning aid. *Medical Education*, **31**, 194-6.

Mandira, D., Anthony, T., Hassan, M Y. (1998) The views of senior students and young doctors of their training in a skills laboratory. *Medical Education*, **32**, 143-149.

Martin, G. I. & Brian, J. (2002) Predictive validity and estimated cut score of an objective structured clinical examination (OSCE) used as an assessment of clinical skills at the end of the first clinical year. *Medical Education*, **36**, 418-425.

Mathieu, R., Nendaz, Tekian, A. (1999) Assessment in Problem –Based Learning medical schools: a literature review. *Teaching and Learning in Medicine*, 11(4), 232-243.

McGaghie, W. C. (1999) Simulation in professional competence assessment: Basic considerations. In: Tekian, A., et al(ed) *Innovative Simulations for Assessing Professional Competence*. University of Illinois at Chicago. p. 7- 23.

Matttsch, J. L. (1980) Written examination. In: Neufeld VR. Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p. 94-118.

McAleer s. (2001) Choosing assessment instruments. In: Dent, A. J., and Hrden, R. M. (eds) *Apractical guide for medical teacher*. Churchill Livingstine, p.303-313.

McGuire, F. (1998) Simulation of healthcare. In: Jerry Banks (eds) *Handbook of simulation: principles, methodology, advances, applications, and practice*. Engineering and Management Press.

McGuire, H. C. (1999) Simulation: Its essential nature and characteristics. Cited in: Tekian, A. et al (eds). *Innovative simulations for assessing professional competence*. University of Illinois at Chicago. p. 3-29.

McKenna, S.P. & Glendon, A.I. (1985) Transfer and retention of skills. In: Patrick, J. (eds) *Training: Research and practice*. San Diego. p. 75-107.

McGaghie, C. W. (1999) Simulation in professional competence Assessment: Basic considerations. In: Ara Tekian et al. *Innovative simulations for assessing professional competence*. Chicago, Illinois (ed). P.7-22.

Miller, G. (1997) A typology of simulators for medical education [Online]. Available at: <http://www.medsim.com>. [Accessed on Dec., 2002].

Miller, G. E. (1963) *Evaluation in medical education: A new look: presented at the 47th Annual Meeting of Association of American Medical Colleges, Chicago, University of Illinois College of Medicine*. Chicago, University of Illinois.

Morgan, ER. & Winter, RJ. (1996) Teaching communication skills. An essential part of residency training. *Arch Ped. Adolesc Med*, 150(6), 638-42.

Nelson, M., Jacobs, C., Cuban, L. (1992) Concepts of curriculum (editorial). *Teaching and Learning in Medicine*, 4, 202-5.

Neufeld VR. & Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer.

- Newble, D. I. (1992) Assessing clinical competence at the undergraduate level. *Medical Education*, **26**, 504-511.
- Newble, D.I. & Jeager, K. (1983) The effect of assessments and examinations on the learning of medical students. *Medical Education*, **17**, 165-71.
- Newble, D. I. (1988) Eight years' experience with a structured clinical examination. *Journal of Medical Education*, **22**, 200-204.
- Norcini, J. J., Swanson, D. B., Grosso, L. J., Webster, G. D. (1985) Reliability, validity and efficiency of multiple choice question and patient management problem item formats in assessment of clinical competence. *Medical Education*, **19**, 238-247.
- Norcini, J. (1999) Assessment Issues in the Use of Simulation for Testing Professionals: Test Development, Test Scoring, Standard Setting. In: Tekian, A. et al (eds). *Innovative simulations for assessing professional competence*. University of Illinois at Chicago. p. 195-212.
- Norman, G.G. & Tugwell, P. (1982) A comparison of resident performance on real and simulated patients. *J Medical Education*, **57**, 708-715.
- Norman, G. R. & Feightner, J. W. (1981) A comparison of behavior on simulated patients and patient management problems. *Medical Education*, **15**, 26-32.
- Norman, L., & Sammatti, P. (1986) In: Patrick, J. (eds) *Training: Research and practice*. San Diego. p. 19-74.
- Patrick, J. (1992) *Training: Research and practice*. San Diego. p. 487-511.
- Peary, T. L. History of medicine [online]. Available at: www.ea.pvt.k12.pa.us. [Accessed at Dec. 2001].
- Pearson, S-A, Rolfe, I. E., Henry, R. L. (1998) The relationship between assessment measures at Newcastle Medical School (Australia) and performance rating during internship. *Medical Education*, **32**, 40-45.
- Petranck, et al (1992) Using simulation to promote learning in higher education. [Online] available at: www.health.gld.gov [Accessed on Feb., 2002]
- Pololi, L. H. and Potter, S. (1996) Behavioral change in preventive medicine. An efficacy assessment of a physician education module. *Journal of General Internal Medicine*, **11**(9), 545-547.
- Price, P. B., et al. (1964) Measurement of physician performance. Cited in: Pearson, S., Rolfe, I. E., Henry, R. L. (1998) *The relationship between assessment measures at Newcastle Medical School (Australia) and performance ratings during internship*. *Medical Education*, **32**, 40-45.

Price P. B, et al. (1964) Measurement and predictors of physician performance. In: Gonnella, J. S., Hojat, M., Erdmann, B. J., Veloski, J. (1993) *A case of mistaken identity: signal and noise in connecting performance assessments before and after graduation from medical school*. *Academic Medicine*, **68**(2), s9-s16.

Quinn, M. F. (2000) *Principles and practice of nurse education* (Ed.). University of Greenwich, London. p. 200-246.

Ram, P., van der Vleuten C., Rethans, J.J., Grol, R., Artez K. (1999) Assessment of practicing family physicians: comparison of observation in a multiple station examination using standardized patients with observation of consultations in daily practice. *Academic Medicine*, **74**, 62-9.

Ramalingaswami V. (1994) Medical education and changing public expectation. *Medical Education*, **28**(1), 27-9.

Rees, L. & Jolly, B. (1998) Medical Education into the next century. In: Rees L., Jolly B. (Editors). *Medical Education in the millennium*. Oxford University Press.

Regehr, G. & Norman, G.R., (1996) Issues in cognitive psychology: Implications for professional Education. *Academic Medicine*, **71**, 988-1001.

Remmen, R. (1999) *An evaluation of clinical skills training at the medical school of the University of Antwerp*. Unpublished dissertation, University of Antwerp.

Renger, R. & Meadows, L.M. (1994) Testing for predictive validity in health care education research: a critical review. *Academic Medicine*, **69**, 685-7.

Rethans, J.J., Van Leeuwen, Y., Drop, R., Van Der Vleuten, C., (1990) Competence and performance : two different concepts in the assessment of quality of medical care. *Family Practice*, **7**, 168-74.

Rhem (1995) Using simulation to promote learning in higher education. [Online] Available at: www.creativeteachingsite.com [Accessed on Feb., 2001].

Rothman, A. I. & Kerenyi, N. (1980) The assessment of an examination in pathology consisting of multiple-choice, practical and short essay questions. *Medical Education*, **14**, 341-344.

Sachdeva, A. K., Wilson, P. J., Blair, P.G., Gillum, D. R., Gracely, E. J., and Friedman, M. (1997) Impact of a standardized patient intervention to teach breast and abdominal examination skills to third-year medical students at two institutions. *American Journal of Surgery*, **173**(4), 320-325.

Sackett, D.L. (1992) A primer on the precision and accuracy of the clinical examination. *Journal of American Medical Association*, **267**, 2638-44.

Sallie-Ann Pearson, Isobel E Rolfe, Richard L Henry (1998) The relationship between assessment measures at Newcastle Medical School (Australia) and performance ratings during internship. *Medical Education*, **32**, 40-45.

Sanson-Fisher R.W., Redman S., Wlash R., Mitgell K., Ram A.L.A., Perkins J.J. (1991) Training medical practitioners information transfer skills: the new challenge. *Medical Education*, **2**, 322-333.

Schmidt, R. C. (1975) Learning and skill acquisition, In: Patrick, J. (eds) *Training: Research and practice*. San Diego. p. 19-74.

Schmidt, HG., Norman, GR., Boshuizen H.P.A., (1990) A cognitive perspective on medical expertise: Theory and implications. *Academic Medicine*, **65**, 611-21.

Schuwirth, L. W. T., Van de Vleuten, C.P.M., De Kock, C.A., Peperkamp, A.G.W., Donkers, H.H.L.M. (1996) Computerized case-based testing: a modern method to assess clinical decision making. *Medical Teacher*, **18**, 295-300.

Senior, J. R. (1976) Defining competence: a methodological review. In: Neufeld VR. Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer, p. 3-35.

Simpson (1972) Learning and skill acquisition, In: Quinn, M. F. (2000) *Principles and practice of nurse education* (Ed.). University of Greenwich, London. p. 437-440.

Sisson J. C., Swartz R. D., Wolf F. M. (1992) Learning, retention and recall of information. *Medical Education*, **26**, 454-461. St. Clair, E. W., Oddone, E. Z., Waugh, R. A., Corey, G. R., Feussner, J. R. (1992) Assessing housestaff diagnostic skills using a cardiology patient simulator. *Annals of Internal Medicine*, **117**, 751-6.

St. Clair, E. W., Oddone, E. Z., Waugh, R. A., Corey, G. R., Feussner, J. R. (1992) Assessing housestaff diagnostic skills using a cardiology patient simulator. *Annals of Internal Medicine* **117**, 751-6.

Stephen, R. S. (1993) Relations between graduates' performance as first year residents and their performance as medical students. *Academic Medicine*, **68**(8), 633-634.

Sternberg, R.J. (1998) Abilities are forms of developing expertise. *Educational Researcher*, **27**, 11-20.

Stillman, L. P., (1993) Technical issues: Logistics. *Academic Medicine*, **68**, 464-468.

Swanson, D. B., Norman Geoffery R., and Linn Robert L. (1995) Performance-based assessment: Lessons from the health professions. *Educational Research*, 24(5), 5-11.

Swanson, D. B., & Norcini, J. J. (1989) Factors influencing reproducibility of tests using standardized patients. *Teaching and Learning in Medicine*, 1, 158-166.

Tamblyn R. & Barrows H. (1999) Data collection and interpersonal skills: the standardized patient encounter. In: Tekian, A., et al. (1999) (eds.) *Innovative Simulations for Assessing Professional Competence*. University of Illinois at Chicago. p. 73-77.

Tamblyn, R. M., Klass, D. J., Schanable, G., and Kopelow, M. (1991) Sources of unreliability and bias in standardized patient rating. *Teaching and Learning in Medicine*, 3(2), 74-85.

Tamblyn, R., Berkson, L., Dauphinee, W. D., Gayton, D., Grad, R., Huang, A. et al. (1997) Unnecessary prescribing of NSAIDs and the management of NSAID-related Gastrophly in medical practice. *Annals of Internal Medicine*, 127(6), 429-438.

Taraporewalla, K. Simulation in education [Online]. Available from: www.health.gld.gov. [Accessed on Dec., 2002].

Tatsuoka, M. M. (1971) *multivariate analysis: Techniques for educational and psychological research*. Cited in: George A. Marcoulides and Scott L. Hersberger (1997) *Multivariate statistical methods a first course* (ed.) Mahwah, New Jersey. P. 133-161.

Taylor L, D. Vergidis, A. Lovasik, P. Crockford (1992) A skills programme for preclinical medical students. *Medical Education*, 26, 448-453.

Van Dalen J., Zuidweg J., Collet J. (1989) The curriculum communication skills teaching at Maastricht Medical School. *Medical Education*, 23, 55-61.

Van Der Vleuten C. & Swanson D. (1990) Assessment of clinical skills with standardized patients: state of the art. *Teaching and Learning in Medicine*, 2(2), 58-76.

Van der V. CPM (1996) The assessment of professional competence: developments, research and practical implications. *Adv Health Sci Edu*, 1, (41), 41-67.

Van Der V. C. P. M., and Swanson, D. B., (1990) Assessment of clinical skills with standardized patients: State of the Art. *Teaching and learning in medicine*, 2(2), 58-76.

Wakefield, J. G. & Norman, G. R., (1977) Direct observation. In: Neufeld VR. Norman GR (1985) *Assessing clinical competence* (Eds.). New York: Springer. p. 51-70.

Wass, V., Van der Vleuten, C., John, S., Roger, J. (2001) Assessment of clinical competence. *Lancet*, 357, 945-49.

Weiner, S, Nathanson M. (1976) Physical examination. Frequently observed errors. *Journal of the American Medical Association*, 236, 852-5.

Williams, G. R. (2000) *Purposes of assessment in health professions education programs*. University of Illinois at Chicago.

Wnogard, J. R. & Williamson, J. W. (1973) *Grades as predictors of physicians' career performance. An evaluative literature review*. Cited in: Sallie-Ann Pearson, Isobel E Rolfe, Richard L Henry (1998) The relationship between assessment measures at Newcastle Medical School (Australia) and performance ratings during internship. *Medical Education*, 32, 40-45.

Appendix

22nd June 2002

Dear students:

Enclosed you will find a questionnaire. It is a part of the research that I am conducting for master degree in Health Profession Education.

The research is to study your perception about the training at Professional Skills programme to prepare you to practice at the clerkship phase.

I would appreciate your kind effort to fill this questionnaire. Your response is confidential and will be used only in identifying potential areas for improvement in professional Skills Programme at AGU.

Thank you, so much in advance.

Emtethal Al-Jishi
Consultant Pediatrician

**Professional Skills Programme/ AGU
Students Survey**

The aim of the professional skills programme is to prepare you to practice on real patients at the clerkship phase.

Please tick the appropriate box as applied to your opinion for the questions listed below.

Remember to base your answers in relation to your training at professional Skills Programme.

Part 1: Individual Information

1. What is your sex?

- ☐ Male
- ☐ Female

2. What is your current rotation?

- ☐ Pediatrics
- ☐ Surgery
- ☐ Medicine
- ☐ OB/GYN

3. How many patients have you clerked since the start of your rotation?

- ☐ < 2
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ > 5

Part II: communication skills

How do you perceive your training at Communication Skills Programme to prepare you to communicate effectively with your patient during clerkship?

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1	2	3	4	5

- ☐ My training helped me to dialogue (التحاور) with the patient.

1	2	3	4	5
---	---	---	---	---

- ☐ My training helped me to act with confidence during patient interview

1	2	3	4	5
---	---	---	---	---

- ☐ My training helped me to establish eye contact with the patient

1	2	3	4	5
---	---	---	---	---

- ☐ My training on communication skills was enough to be able to practice at the clerkship

1	2	3	4	5
---	---	---	---	---

- ☐ Training on communication skills should be repeated just before clerkship

1	2	3	4	5
---	---	---	---	---

Part III, History talking:

How do you perceive your training in history talking at Professional Skills Programme?

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1	2	3	4	5

- ☐ My training in history taking was sufficient to practice on real patients at clerkship phase
- ☐ Symptoms analysis helped me to develop analytical skills
- ☐ No need to practice history taking with each system unit that is introduced
- ☐ My training helped me to use my theoretical knowledge to ask relevant questions during history taking
- ☐ The training of history taking from history scenario would be helpful
- ☐ No need to practice history taking on real patients before clerkship
- ☐ My training helped me to present the data collected in a summarize form
- ☐ My training helped me to write the data collected in an informative written report
- ☐ I am able to collect the relevant information during history taking to help me in listing some differential diagnosis

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4	5
---	---	---	---	---

Part IV, Organ system examination

How do you perceive your clinical skills training at professional Skills Programme to prepare you to practice at the clerkship phase?

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1	2	3	4	5

- | | | | | | | |
|--|--|---|---|---|---|---|
| ☐ My training simulate patients (normal) helped me to recognize normality and defect deviation. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ No need for basic theoretical knowledge of a system to start learning clinical skills. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ No need for training no real patients before clerkship. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ Clerkship offers opportunity to learn abnormal physical sign without training at Professional Skills Programme. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ Scheduling the unit system with the training of clinical skills was helpful in consolidating (Powerful learning) the theoretical knowledge. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ The link between unit system and clinical skills training motivated me to learn the skills. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ No need to score the clinical skills exam at the End of each unit system. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ Having the clinical skills training sessions in the afternoon helped the process of self study (e.g fixing appointments with the resource persons in the morning) | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |
| ☐ My training helped me to present the physical Finding in a complete sentences. | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> | 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 | | |

Part V, Clinical reasoning

My training in Professional Skills Programme prepared me to-----

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1	2	3	4	5

- ☐ Synthesize the data gathered into summarize statements of patient problem.

1	2	3	4	5
---	---	---	---	---

- ☐ Generate initial working diagnosis.

1	2	3	4	5
---	---	---	---	---

- ☐ Select the appropriate test to investigate a clinical problem.

1	2	3	4	5
---	---	---	---	---

My training in Professional Skills Programme made me aware of:

1) Ethical issues during patient interview

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1	2	3	4	5

- ☐ Respect the patient right as individual having personal & community values

1	2	3	4	5
---	---	---	---	---

- ☐ Respect the patient privacy

1	2	3	4	5
---	---	---	---	---

Part VII, Procedural skills:

How do you perceive your training of procedural skills during professional Skills programme?

Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1	2	3	4	5

My training helped me to practice some procedural skills on a real patients.

1	2	3	4	5
---	---	---	---	---

There was enough time procedural skills training in skill lab.

1	2	3	4	5
---	---	---	---	---

More procedural skills training should be introduce

1	2	3	4	5
---	---	---	---	---

Please suggest some points to improve the training in professional Skills Programme.

Thank you for your time & effort

ملخص

هدفت هذه الدراسة إلى التحقق من وجهة نظر طلبة المرحلة السريرية في كلية الطب بجامعة الخليج العربي، حيث تشكل اتجاهات الطلبة ومعتقداتهم و ما يمتلكون من مهارات رئيسية و مهمة في التعليم الطبي و الرعاية الصحية. و يمكن الاستفادة من نتائج الطلبة على اختبارات قياس مستوى أداء المهارات المكتسبة في تصميم برامج التدريب الخاصة بتلك المهارات.

كما هدفت هذه الرسالة إلى التحقق من الخصائص السيكومترية (و من ضمنها الصدق والثبات وقابلية الاستعمال) إلى جانب قدرتها على التنبؤ بأداء الطلبة المستقبلية في ضوء أدائهم الحالي على هذه الأداة.

و للإجابة عن أسئلة الدراسة تم تطبيق أداة الدراسة على أفراد العينة، و من ثم تم تجميع علاماتهم على تلك الأداة و تحليلها باستخدام الرزم الإحصائية المحسوبة و التحقق من الفرضيات و الإجابة عن أسئلتها.

و في ضوء نتائج التحليل الأحصائي توصلت هذه الدراسة إلى أن الأداة تتمتع بدرجة عالية من الصدق و الثبات إلى جانب قدرتها على التنبؤ بالأداء المستقبلي.

و توصي الباحثة بأجراء مزيد من البحوث و الدراسات حول برنامج تدريب المهارات في مرحلة ما قبل السريرية.

إهداء.

مع كل المحبة إلى ...
من علموني معنى الحياة و الأمان و الطموح
والذي المغفور له بإذن الله
وعالتي الحبيبة

إلى أكبر مصدر العزيمتي
زوجي الحبيب

إلى من أتمنى أن يكونوا أفضل مني
أبنائي الأعزاء

و إلى كل من يؤمن بدور العلم في إثراء الحياة

برنامج التعليم الطبي



جامعة الخليج العربي
كلية الطب و العلوم الطبية

برنامج المهارات الإكلينيكية في جامعة الخليج العربي
آراء الطلبة و قدرة البرنامج على تقدير أداء الطالب المستقبلي

دراسة مقدمة ضمن متطلبات الحصول على درجة الماجستير في التعليم الطبي

إعداد
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والإحصاء

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والتعليم الطبي

مملكة البحرين

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