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SPECIAL CONTRIBUTION

The Preclinical-Clinical Divide: Building Bridges

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الشرخ بين المرحلتين السريريّة وما قبلها: بناء الجسور

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Medical education is evolving. It has become a real challenge as it tries to keep pace with the ever-accelerating developments in communications and digital innovations. Within the last few decades, medical education has witnessed radical changes in both content and methodology. The discipline-based traditional teaching of medicine was replaced by the system-based curriculum, which questioned the total autonomy of departments to control the content and methods of instruction. A greater challenge is now, almost universally, posed by the problem-based curriculum, which radically dismantled the preclinical-clinical divide, and takes advantage of advances in digital and virtual media. It is believed that such innovations render curricula more interactive.[1,2] The outcome of good clinical practice and professional competency depends largely upon curricular design and evaluation.[3] This basically revolves around three axes: content, methodology and environment.[4]

Content is driven by many factors, among which are expert opinion, social expectations, scientific development and educational standards as defined by various accreditation bodies. Ever since the Flexner report[5] introducing basic medical sciences as an educational necessity, medical curricula have gone through changes manifested first in the sequential two-phase model. This is a discipline-based model, which was subsequently modified by integrating basic sciences within the pre-clinical first phase. This, until recently, has been practiced and used to be referred to as the 'system-based' or the 'organ-based' model. However, evolving societal expectations of the modern day physician are expressed in newly articulated competencies. Traditional methods were supplanted by didactic methods (lectures and practical laboratory classes). The start of the new millennium sees a mixed economy of curriculum models with some medical schools retaining the traditional structures, but many turning to hybrid approaches with varying amounts of problem-based learning and systems-based integrated courses. The impact of problem-based learning (PBL) has been witnessed during the last two decades with important implications for the content of educational blueprints.

Environmental factors affecting curricular design are numerous and may be categorized broadly as health care delivery systems, economy, politics and technological advances. Ongoing key issues that face curriculum designers include the continued integration of basic and clinical sciences and the adoption of the appropriate strategies to meet the demands of the new and expected competencies. With this in mind, some educational centres half moved to an integrated developmental student-centred curriculum that emphasizes bedside teaching and role modelling and promotes fundamental clinical skills using a competency-based college approach.[6] This is achieved by assigning each student a core mentoring clinical faculty member for the duration of his or her medical school career, who provides an ongoing personal faculty contact and spends substantial time continuously teaching and reflecting with the student on clinical skills development and professionalism and working intensively with him/her at the bedside.

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Figure 1: ***Clinical Skills Resource Centre (College of Medicine and Health Sciences, Sultan Qaboos Univeristy)***

EVOLVING CURRICULUM AT SQU

At the College of Medicine and Health Sciences (CM&HS), Sultan Qaboos University (SQU), Sultanate of Oman, the current medical curriculum is two-phased. The 4-year first phase is pre-clinical where students are exposed to integrated, system-based basic medical sciences, after which they attain the BSc degree in Health Sciences. The second phase is clinically-based and lasts for a further 3 years after which they attain the professional MD degree. Until recently, and we believe that this is the experience of many other medical schools, students went through adjustment difficulties when progressing from one phase to another.[7] This was mainly due to the preclinical-clinical divide, each phase having different modalities, approaches and content. Although most medical schools are increasingly adopting 'problem-based' learning, cognitive and psychomotor skills would somewhat still be lacking. Consequently, students would still lack self-confidence when suddenly find themselves in the clinical ward. The curriculum is evolving to consolidate the educational ideology of practice-based learning. Such learning experiences are believed to address competency expectations[3] and are approached integratively revolving around three pre-clinical courses:

APPLIED BASIC MEDICAL SCIENCES

This is based on a case and problem solving approach. The course provides the students with a chance to acquire problem-solving skills that will help them during the clinical years and even after they graduate. The students are expected to use a problem-based approach to integrate the knowledge of basic medical sciences as it applies to some examples of common clinical problems and be able to interpret clinical and laboratory data and relate them to the pathophysiology of disease.

During the course, groups of students are given a clinical case scenario and are required to prepare a

Figure 2: ***Clinical Skills Resource Centre (College of Medicine and Health Sciences, Sultan Qaboos Univeristy)***

presentation in which they discuss the pathophysiology of the disease condition presented in the scenario. Resources are mainly web-based; however, in addition to that, tutors are specifically allocated to each case to act as resource persons.

COMMUNICATION SKILLS

This course focuses on the cognitive approach to patient management. It aims at developing the ability to communicate with patients during clinical encounters. It emphasises the need to be able to pass on accurate information to patients and/or relations using simple language ('bridge the communication gap'). It uses real and/or simulated patients in the teaching of doctor-patient communication

CLINICAL METHODS

This course has hands-on experience, based on a series of modular themes, which focus on psychomotor skills. Each of these core themes revolves around basic clinical examination techniques in a system-based approach, which prepares students for bedside physical examination during the clinical phase of the curriculum.

By bridging the preclinical-clinical gap, these three courses together aim to enhance clinical competence and to provide basic academic and professional skills to equip students for lifelong medical practice on behalf of the patients, the community and the health service.[3]

In this paper, we elucidate and focus on the early introduction of 'Clinical Methods' with e-learning support and how students react to such learning practices.

CLINICAL METHODS

The three bridging courses mentioned above provide students with opportunities to learn and practice skills in history taking, good communication practices, physical examination, basic data interpretation and practical procedures, identifying radiological

Table 1: ***Time table for Clinical Methods Course***

Clinical Methods
Spring Semester (8)

2:00 PM - 4:00 PM				Venue: Skill Lab (Annex Building, Ground Floor)		
	Sun	**Mon**	**Tue**	**Skill Topics**	**Leading Department**	**Contributing Department(s)**
Week 1	Jan 30	31	Feb 1	Introduction	Human & Clinical Anatomy	Biochemistry Clinical Physiology
Week 2	6	7	8	General Physical Examination & Vital Signs	Medicine	FAMCoH* Nursing
Week 3	13	14	15	Examination of Ear, Nose & Throat Oral Cavity	Surgery (ENT)	Oral Health FAMCoH*
Week 4	20	21	22	Cardiovascular Examination- I	Medicine	Clinical Physiology Human & Clinical Anatomy
Week 5	27	28	Mar 1	Cardiovascular Examination- II	Clinical Physiology	Medicine
Week 6	6	7	8	Examination of he Respiratory system	Medicine	Clinical Physiology Child Health
Week 7	13	14	15	Chest wall & Abdominal Examination	Surgery	Medicine
Week 8	20	21	22	**Self Study**	**Self Study**	**Self Study**
Week 9	27	28	29	**In-course Assessment**	**In-course Assessment**	**In-course Assessment**
Week 10	April 3	4	5	Examination of the Genitourinary system	Obstetrics & Gynaecology	Surgery
Week 11	10	11	12	Examination of the Musculoskeletal system	Medicine (Rheumatology)	Human & Clinical Anatomy Accident & Emergency Physiotheraphy
Week 12	17	18	19	Examination of the Nervous System - 1	Medicine	Clinical Physiology Opthalmology Child Health
Week 13	24	25	26	Examination of the Nervous System - 2	Medicine	Nursing Radiology Human & Clinical Anatomy
Week 14	May 1	2	3	Side room tests & Imaging	Biochemistry	Nursing Radiology Human & Clinical Anatomy
Week 15	8	9	10	**Self Study**	**Self Study**	**Self Study**

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anatomy, undertaking basic function tests and demonstrating the use of a variety of instruments. Clinical Methods is a 'hands-on' course based on series of modular themes. Each of these core themes revolves around basic techniques in system-based practices, which prepare students for the clinical phase of their curriculum. This should make them feel at ease as they move on to clinical training.[6] This foundation provides students with confidence and competence to interact with patients during the latter part of their preclinical studies.[7] Furthermore, the skills may be practiced iteratively in a non-threatening environment, without fear of embarrassment or of harming a patient. In the semester-based curriculum, the 15 week period allows preclinical students, prior to their commencement of the clinical component of the MD programme, to have weekly contact with clinical tutors when they can practice what are considered to be basic and fundamental techniques, which they will require for their every day clinical training and practice in the management of patients.

The course is divided into two parts, a compulsory practical part where students attend in small groups to examine and/or practice certain skills on surrogate models performing as patients. Activities are pre-arranged each week and clinical departments take a leading role in organising, coordinating and standardising techniques with other participating departments. Each student will have to perform each of the practical activities in a manner that is based on sound and standardised techniques before leaving the weekly session. This is then recorded on the student's log-book to certify that such a skill has been performed properly. This will be counted as part of the student's continuous assessment and is part of the final total mark of the course.

These activities take place in a purpose-built skills resource centre/laboratory [Figure. 2], which is well equipped and staffed. Clinical tutors are provided by the clinical departments from the near-by University Teaching Hospital. Students have full access to the laboratory to practice, train and use equipment while it is otherwise not in use.

E-LEARNING SUPPORT

The door to the digital future is just ajar. Opportunities for medical curricula to make use of digital support media are vast and are not beyond reach. E-learning, when it is available, offers important advantages to medical education, [8-13] and an opportunity for implementing flexible patterns of teaching. In this era of growing health consumer awareness, patients are also perceived as the target audience for medical digital libraries that are accessible to everybody to view and be enlightened.

The CM&HS at SQU has adopted e-learning as a useful and important enhancement to more traditional forms of learning. To accustom the students to using electronic formats for accessing information, course descriptions, objectives, schedule details and faculty information are posted on course-management software (Web **C**ourse **T**ools or web-CT) that is accessible by the students and staff alike, both on the intranet and the world-wide web. In addition to these mandatory weekly practical sessions, online resources are used for cognitive learning of these clinical skills. When we planned the layout of the course on web-CT, we had to consider the pace of change that will inevitably occur and, therefore, allow for maximum flexibility and accessibility by our students. The digital layout was designed to reflect the theoretical background of the course modules. These modules follow a particular theme and are built on the basic sciences content of the BSc Health Sciences curriculum. These modular themes were laid down [Table 1] to consolidate the relationship between them and their practical application in clinical skills sessions. Synchronisation with other bridging course modules is accommodated as much as practically possible. Groups of students who are not engaged in the practical classes can attend the computer laboratory and access the skills' website and prepare or revise the skills demonstrated to them in text and various digital media formats (sound, animations, videos, etc). Included on the website, are course information, timetables, text-based learning aids and links to interactive material. Other site facilities include chat and email tools that provide students with an effective means of communication between themselves and faculty members. They are able to email each other, sign up for attachments and special subject modules and provide feedback to faculty on the teaching and management of the course. Later on in their course (years 5-7), students return to the Clinical Skills Resource Centre (CSRC), where the course is conducted, to consolidate skills learned including advanced resuscitation and other practical procedures [Figure 1].

The most significant difficulties encountered were

student motivation to participate in electronic discussions and feed-back from the tutors. It is difficult to find equilibrium between the time spent at the Clinical Skills Resource Centre and the web-based cognitive learning. Further experience by both staff and students and careful planning, together with the use of present and future technologies that improve interaction and discussion, will increase the quality of this new mode of learning.

ASSESSMENT

In today's culture of clinical governance and litigation, it is imperative that some form of assessment is developed to consolidate standards and protect patients, staff and hospital trusts. Consequently, in addition to the log-book records as a form of continuous assessment (15%), other formal assessment of the course is done on two occasions. A halfway in-course assessment counts for at least 35% of the total mark and a final assessment carries a minimum of 50% of the total mark. Both are Objectively Structured Clinical Examinations (OSCE). Clinical tutors assess students on those clinical competencies they have already practiced, taking into account their preclinical background.

STUDENT FEEDBACK

Student feedback is very positive, as indicated by formally and informally conducted surveys. We look forward to monitoring their performance and competencies as they progress in their training. It is envisaged that feedback will also be provided by our clinical colleagues, who are mentoring these cohorts of students. We also would like to enhance our e-learning facilities in basic medical sciences, [14] to include a virtual hospital/clinic and interact with other medical centres. This can prove to be of value even in developing countries with limited facilities where educational resources can be enhanced by the introduction of such e-learning modules in the medical curriculum[15] and even in the clinical services.[16]

CONCLUSION

Despite their difficulties, students do eventually adjust to 'cultural differences' between the classroom and clinical settings. However, as educators, we believe that we should shoulder our responsibility and acknowledge the unsatisfactory situations that can stifle students' progress. The building of bridges to close the gap between the preclinical and clinical arenas is a worthwhile undertaking. This may start by careful consideration of students' recommendations, such as the gradual transition and better integration of the preclinical and clinical phases, all of which are consistent with recommendations in the literature.[17, 18]

With e-learning we are experiencing how a more effective modular structure creates a form of knowledge architecture in a learning module so that skills, knowledge and learning, both cognitive and psychomotor, can be integrated for enhanced professional development.

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