

DEVELOPING AN INTEGRATED ORGAN/SYSTEM CURRICULUM WITH COMMUNITY-ORIENTATION FOR A NEW MEDICAL COLLEGE IN JAZAN, SAUDI ARABIA

Mostafa M. El-Naggar, PhD, Hussein Ageely, SBIM, JBIM, Mohamed A. Salih, MD, MPHE, Hamdy Dawoud, MD, Waleed A. Milaat, PhD

Medical Education Unit, Faculty of Medicine, Jazan University, Jazan, Saudi Arabia

مقدمة: تقع منطقة جازان في الجنوب الغربي من المملكة العربية السعودية. وتعاني المنطقة من كثير من الأمراض التي تستلزم احتياجات خاصة للخدمات الصحية. وقد كان من المفترض أن تتبع كلية طب جازان المنهج الدراسي التقليدي. ووجهت انتقادات عديدة للنظام التقليدي بسبب فشل الطلاب في تقدير أهمية ما يدرس من العلوم الطبية الأساسية، مما يؤدي إلى عدم حافز للتعلم عند الطلاب. كما إن كثيراً من المعلومات التفصيلية التي يدرسها الطلاب في مناهج المرحلة قبل السريرية ليس لها علاقة بما يحتاج الطبيب أن يعرفه أو يستعمله في الممارسة السريرية. ولذلك اتجهت الكلية إلى تطبيق المنهج التكاملي.

طريقة الدراسة: أجري هذا البحث في عامي 2004-2005 بكلية الطب- جامعة جازان. بدأ العمل بجمع المعلومات وعقد مجموعة من اللقاءات مع خبراء من جامعات مختلفة. كما تم تشكيل لجنة للمناهج. وقد بادرت اللجنة إلى وضع الأسس التي يجب اتباعها أثناء تصميم المنهج الجديد. تم اتباع أسلوب موحد في كتابه مقررات المنهج. وقد صادفتنا مشاكل عديدة أثناء تصميم المنهج مثل: تحقيق الربط التكاملي الرأسي، وعدم تهيئة أعضاء هيئة التدريس للاشتراك في تدريس المناهج التكاملية المبنية على الأجهزة، وصعوبة وضع امتحان ذو تكامل حقيقي.

المنهج: تمتد الدراسة لمدة 6 سنوات، وتشتمل على 3 مراحل: المرحلة قبل الطبية (السنة الأولى)، المرحلة التكاملية قبل السريرية (السنين الثانية والثالثة)، والمرحلة السريرية (السنوات الرابعة والخامسة والسادسة). ويتبع ذلك سنة امتياز للتدريب العملي. تهدف المرحلة قبل الطبية إلى تطوير مستوى الطلاب في اللغة الإنجليزية وإعدادهم للمرحلتين التاليتين. وتشتمل المرحلة التكاملية قبل السريرية على مقررات الأجهزة التكاملية ومقدمات لها. ويحتوي المنهج على: مقررات اختيارية وكذلك تدريب سريري مبكر، ومقرر في العلوم السلوكية، وآخر في الأخلاقيات الطبية، ومقرر في الإحصاء الحيوي والإحصائيات الطبية، واستعمال الحاسب الآلي، والطرق البحثية. ويشمل المنهج استخدام طرق تدريس نشطة، مثل: مجموعات صغيرة للمناقشة، وأخرى في التعليم المبني على حل المشاكل، دراسة حالة/ أو مشكلة صحية، ندوات، معمل المهارات السريرية، دروس عملية، دروس إيضاحية، وتعليم ذاتي. وتشتمل طرق تقييم الطلاب على التقييم المستمر والنهائي.

الخاتمة: يعتبر المنهج الجديد لكلية طب جازان منهج تكاملي، وذو توجه نحو المجتمع. ويهدف هذا المنهج إلى تخريج أطباء قادرين على التعامل السليم مع الاحتياجات الخاصة للمجتمع المحلي لمنطقة جازان.

الكلمات المرجعية: التعليم ذو التوجه نحو المجتمع – تطوير وتقييم المنهج - المنهج التكاملي - التعليم ذو التوجه نحو حل المشاكل.

Background: Jazan province is located in the south-west of the Kingdom of Saudi Arabia. The province is afflicted with a wide spectrum of diseases and therefore have a special need for more health services. The Faculty of Medicine at Jazan has been following the traditional curriculum since its inception in 2001. The traditional curriculum has been criticized because of the students inability to relate what they learned in the basic sciences to medicine, thus stifling their motivation. It was felt that much of what was presented in preclinical courses was irrelevant to what the doctor really needed to know for his practice. The College therefore, decided to change to an integrated curriculum.

Design: The study was conducted in 2004-2005 in the Faculty of Medicine, Jazan University. It began with a literature survey/search for relevant information and a series of meetings with experts from various institutions. A Curriculum Committee was formed and a set of guiding

Correspondence to:

Dr. Mostafa M. El-Naggar, Faculty of Medicine, Jazan University, P.O. Box 114, Jazan, Saudi Arabia

E-mail: mmnaggar@hotmail.com

principles was prepared to help develop the new curriculum. A standard curriculum writing format was adopted for each module. It was decided that an independent evaluation of the new curriculum was to be done by experts in medical education before submission for official approval. There were several difficulties in the course of designing the curriculum, such as: provision of vertical integration, the lack of preparedness of faculty to teach an integrated curriculum, and difficulties inherent in setting a truly integrated examination.

Curriculum: *The program designed is for 6 years and in 3 phases; pre-med (year 1), organ/system (years 2 and 3), and clinical clerkship (years 4, 5, and 6). This is to be followed by a year of Internship. The pre-med phase aims at improving the students' English language and prepare them for the succeeding phases. The organ/ system phase includes the integrated systems and the introductory modules. The curriculum includes elective modules, early clinical training, behavioral sciences, medical ethics, biostatistics, computer practice, and research methods. The curriculum provides active methods of instruction that include: small group discussion/ tutorials, problem-based learning (PBL), case-study/ clinical presentations, seminars, skills practice (clinical skill lab), practical, demonstration, and student independent learning. Methods of evaluating students include continuous and summative assessment.*

Conclusion: *The new curriculum adopted by the Jazan Faculty of Medicine is an integrated, organ/ system based, community-oriented, with early clinical skills, elective modules, and innovative methods of instructions.*

Key Words: *Community oriented education, Curriculum development/evaluation, Interdisciplinary medical education, Problem-based learning*

INTRODUCTION

The demand on the health services continues to rise with the increasing population in the Kingdom of Saudi Arabia. Well-trained professionals is the means whereby these demands could be met. The population of the Jazan area situated in the south west of the Kingdom, sharing its southern border with Yemen is one and a half million. There is, thus varying geographic and demographic features, mix of population and traditions, and therefore, a wide spectrum of diseases. The main objective of this paper is to describe the development process of an integrated organ/system-based curriculum which is also community-oriented, for the training of physicians raising their awareness of the health problems and the special needs of the local community of the Jazan area.

The College of Medicine and Allied Sciences at Jazan was established in February 2001 under the auspices of King Abdulaziz University, whose Medical College follows the traditional curriculum. The aim of the College of Medicine at Jazan was to raise the standard of health in this area by training health personnel to be involved in community programs, deal with health problems, and work with other health agencies in the region in preventive and curative services.

The traditional curriculum adopted by the College of Medicine-Jeddah was criticized by the

faculty & students. The results of a questionnaire conducted in 2003 showed that both students and faculty were critical of their curriculum. They agreed that the goals of the basic medical sciences and community medicine were not clearly defined. Many of the contents were irrelevant, and the syllabi needed thorough review. They also suggested the introduction of new courses. Approximately 90% of the students were critical of the use of lectures as the main method of instruction and preferred interactive teaching in the form of computer-assisted learning, problem-based learning and small group discussions. Eighty-five percent of the students were in favor of semester exams over annual exams and objective-structured practical or clinical exams over subjective exams.

Similar criticisms have been leveled at the traditional approach to teaching in medical schools by several authors¹⁻³. They indicate that students fail to appreciate the relevance of what they learn in the basic sciences, thus lowering their motivation. Besides, much of what is presented in preclinical courses is irrelevant to what the doctor really needs to know and use in practice.

Jazan College of Medicine seized the opportunity being new with a homogenous staff, to suggest a new curriculum that would eliminate the pitfalls of the traditional curriculum.

LITERATURE REVIEW

The traditional system of education in medical colleges has been criticized for a number of reasons; irrelevant information taught in the basic sciences, lack of student motivation, and overloading of the program.¹⁻³ To improve the quality of medical education, new strategies were adopted including the integration of the curriculum (the integrated organ-system and problem-based curricula) and the community-oriented or community-based training.

Integrated teaching was first introduced at the Case Western Reserve University Medical School, Cleveland, Ohio in 1952 in one course.⁴ The integrated curriculum combines independent disciplines in an integrated approach, usually organized around an organ/system of the body. The pioneer in the UK was the University of Newcastle upon Tyne in 1962⁵. By 1974 it had been introduced in many medical schools in USA and Canada.⁶ Integrated strategies have the advantage of motivating students. It develops a holistic approach to clinical problems, better recall, early clinical training, and development of self-learning skills which are essential in preparing students for continued education beyond the university.

There are many versions of integration and any one of a number of combinations between the basic sciences and the clinical disciplines may be adopted. The integration can be horizontal; between the basic sciences or between the clinical disciplines, or vertical between the basic sciences and the clinical subjects, or both.⁷

Vertical integration between basic sciences and clinical medicine according to the organ-system model has been used by different Medical Schools.⁸⁻⁹ However, vertical integration throughout the entire curriculum require a lot of time and work in planning, organization and execution. The teachers have to be deeply involved and enthusiastic and have to cooperate beyond departmental borders, which may produce positive spin-off effects in teaching and research but also produce conflicts that have to be resolved.⁹

In the horizontal integration, the interdisciplinary approach is mostly applied to the pre-clinical teaching in different Schools of Medicine.¹⁰⁻¹⁴ The Basic Medical Science Faculty along with representatives from the clinical sciences has to hold joint meetings to design a system based integrated curriculum for the first two years of the MBBS class.¹³ Sobral¹⁰ pointed

out that the educational strategy in horizontal integration should be examined in reference to three features: the expected outcomes with regard to the competence of the graduate; the parameters of interdisciplinary integration; and the limiting factors for the development of interdisciplinary integration in medical education. Further, efforts have to be made both to bring clinical relevance to the basic sciences and to strengthen basic science in the clinical years.¹²

There was partial integration in many Schools of Medicine where one or more courses were designed to include interdisciplinary material.¹⁵⁻¹⁷ The Oregon Health Sciences University (OHSU) School of Medicine developed a 2-year longitudinal course, called Principles of Clinical Medicine, integrating input from both basic and clinical science departments.¹⁵ Dauphinee & Martin¹⁶ described the integration of the biomedical and behavioral sciences, particularly to advance the understanding of the human brain. Rudich and Bashan¹⁷ described an interdisciplinary one-week course for the sixth-year medical students. In that course, students were required to conduct an in-depth investigation of a defined clinical topic.

Geffen et al¹⁸ reviewed and evaluated horizontal, vertical, and full integration. He concluded that the fully integrated curriculum has been able to adapt to the changing needs of medical education because its organization is relatively free from the constraints of departmental rivalry over resources. Brynhildsen et al compared the vertical with horizontal integration using student and faculty questionnaire.¹⁴ Students scored horizontal integration significantly higher than the teachers, whereas teachers scored vertical integration higher than students. Both students and teachers considered horizontal and vertical integration as highly important components of the undergraduate medical program.

The assessment of the students in an integrated curriculum is an important task that should be designed to support the objectives of integration. Arnold & Willoughby analyzed the students' scores on comprehensive examinations in an interdisciplinary integration.¹⁹ The analysis suggested that the integrative elements of the curriculum had a counterpart in performance. The type of questions to be used to assess students in an integrated curriculum was a matter for consideration. Moqattash et al found that students performed better in short essays (SEQs) than in

multiple choice questions (MCQs).²⁰ They found also that structured integrated long essays (SILEQs) measured skills similar to those of MCQs and SEQs combined. The authors suggested that it was prudent to use different types of questions to measure students' knowledge and skills when integrated assessments are used for systems-based courses.

CURRICULUM DESIGN PROCESS

The Faculty of Medicine, Jazan University has been following the traditional curriculum since the inception of the college in 2001. The study to convert to the integrated curriculum was conducted during 2004/2005. The work started with the collection of data from the literature and a series of meetings with experts from various institutions in Saudi Arabia. There was communication with the colleges using integrated, system-based curriculum such as; University of Dundee and University of Nottingham, Medical Schools, UK; School of Medicine University of Gezira, Sudan; and School of Medicine University of Suez Canal, Egypt.

A number of committees were formed involving all the members of the faculty. Many faculty members were on more than one committee. A Curriculum Committee, headed by the Dean, was formed and was given the full authority over the design of the curriculum. Course Committees were set up for each of the 9-system modules and the introductory modules. Each committee consisted of a coordinator, and the faculty members of each specialty in the module. An Evaluation Committee to advise on students' assessment and program evaluation and a Revision Committee to review the prepared modules were formed.

The Curriculum Committee prepared the following guiding principles to develop the new curriculum:

1. Reduce factual overload by adopting core modules and option modules.
2. Adopt community-oriented training approach.
3. Provide early clinical and community training.
4. Introduce the study of behavioral sciences, medical ethics, biostatistics, computer practice & research methods.
5. Develop students' self-learning skills for life-long learning.
6. Adopt active learning methods, keeping lectures to a maximum of 2/day.

A standard curriculum writing format was adopted for the presentation of each module. The format included: aims, objectives, instructional methods, module structure, content assessment, & module timetable.

Independent evaluation of the new curriculum is a scientific necessity and it was decided that it should be first evaluated by experts in medical education before being submitted for official approval. The curriculum document together with an evaluating questionnaire was sent to experts all over the world. A chain purposeful sampling distribution of the questionnaire was done, based on the appropriate qualification and/or the long experience of the respondents. It was also decided that the monitoring of the process of implementation of the curriculum was to be handled by the college curriculum committee and the medical education unit, and monitored through periodic external reviews.

THE DEVELOPED CURRICULUM DOCUMENT

The work of the various committees resulted in the writing of a complete undergraduate curriculum document. The program lasting six years was to be in three phases; pre-med, organ/system, and clinical clerkships. This was to be followed by a year of internship training in the hospitals and primary health care centers.

Pre-med Phase (Year 1)

This aimed at improving the students' English language and prepare them for the succeeding organ/ system phase (Table 1).

Organ/ System Phase (Years 2 & 3)

It included the integrated system and the introductory modules. The integrated system modules consisted of nine modules: musculoskeletal; cardiovascular; respiratory; immune; blood & lymphatic; endocrine; reproductive; urinary; gastrointestinal; nervous system & special senses. The areas that could not be studied through the systems or considered prerequisites to the systems were to be covered in the form of introductory modules. The Introductory modules were to precede the integrated system modules. Early exposure of the students to the community and Primary Health Care Centers were planned in the first semester of this phase. This phase also contained PBL sessions, clinical skills laboratory sessions, and elective modules (Tables 2 and 3).

Table 1: Modules studied in the premedical phase (Year 1) and their credit hours

Semester 1	Credit hours	Semester 2	Credit hours
English language I A	6	English language I B	3
Medical Biology A	3	Medical Biology B	4
Medical Chemistry A	2	Medical Chemistry B	3
Medical Physics A	2	Medical Physics B	3
Study skills	1	Information technology	2
Arabic language I	3	Islamic studies I	2
Total	17	Total	17

Table 2: Modules studied in the Organ/System phase (Year 2) and their credit hours

Semester 1	Credit hours	Semester 2	Credit hours
Health and diseases in the community	1	Gene expression	1
Early clinical experience and communication skills	1	General embryology	1
Behavioral sciences	1	Immune, blood and lymphatic system	5
Introduction to Biochemistry	2	Cardiovascular system	5
Basic Pharmacology	2	Respiratory system	4
Basic Microbiology	2	English language II B	1
General Pathology	2	Islamic studies II	2
Musculoskeletal system	5		
English language II A	1		
Arabic language II	3		
Total	20	Total	20

Table 3: Modules studied in the Organ/System phase (Year 3) and their credit hours

Semester 1	Credit hours	Semester 2	Credit hours
Head and neck	3	Nutrition and metabolism	1
Endocrine system	4	Forensic medicine and Toxicology	2
Reproductive system	5	Gastrointestinal system	6
Urinary system	5	Central nervous system and special senses	7
Medical ethics	1	Elective I	1
Islamic studies III	2	Elective II	1
		Islamic studies IV	2
Total	20	Total	20

Table 4: Modules studied in the clinical clerkship phase (Years 4,5,6) and their credit hours (CH)

Year 4	CH	Year 5	CH	Year 6	CH
Medicine I	8	Medicine II	4	Medicine III	8
Surgery I	8	Orthopedics	2	Surgery II	8
Introduction to clerkship	2	Ob/Gyn I	6	Ob/Gyn II	4
Epidemiology, Biostatistics and Computer practice	7	Pediatrics I	6	Pediatrics II	4
Research methodology, field survey and project	3	Ophthalmology	2	Family Medicine	4
Laboratory medicine	2	ENT	2	Intensive care	2
Imaging	2	Primary Health Care	4	Emergency medicine and trauma	2
		Psychiatry	4	Elective V	1
		Elective III	1	Elective VI	1
		Elective IV	1		
Total	32	Total	32	Total	34

Total CH required for graduation = 212, University requirement = 14

Clinical Clerkship Phase (Years 4, 5 & 6)

Clinical Clerkship curriculum development meetings were held with Faculty members, Consultants and Specialists working in the

hospitals of the Ministry of Health and Colleges of Medicine in Jazan, Jeddah and other areas. The recommendations of these meetings included the teaching of the major clinical disciplines

(Medicine, Surgery, Pediatrics and Ob/Gyn) in rotation blocks; no longitudinal courses were to be included in the clinical rotation blocks; and the relevant medical problems in the Jazan area to be addressed in the curriculum. It also recommended to the inclusion of elective clinical courses in the clerkship phase (Table 4).

Methods of instruction

Active methods of instructions were planned. The lectures were limited to two lectures per day. Other methods of instruction included: small group discussions/ tutorials, PBL, case-study/ clinical presentations, seminars, skills practice (clinical skill laboratory), practical, demonstration, and student independent learning.

Students' assessment

Students' evaluation comprised continuous and end of module examinations. Students who failed in any module were to be given the chance to appear in a resit examination at the end of the same academic year. Students who failed in the resit exam of a module had to repeat the year/semester and appear in the module failed in order to improve in that module.

Implementation monitoring

The different activities included in each course necessitate a strict supervisory process to guarantee appropriate planning, implementation, and students' evaluation. The committees formed to design the curriculum remained to monitor its implementation and development. The course committee held several meetings before and during the implementation of the course to prepare the weekly timetable, plan the methods of instructions, and prepare the evaluation questions. The program implementation and evaluation committee was to revise the final examination questions before the administration of the examination to ensure its validity and reliability. Item analysis was to be performed and discussed after the examination to advise on improvement of the questions.

Faculty development program

The medical education unit holds weekly workshops for staff development. A schedule was made to boost the basics of educational planning, instruction methods and students' assessment with special emphasis on integration. Difficulties met with during implementation of the curriculum are discussed.

Integrated organ/system modules

The cardiovascular module is described as an example of the integrated organ/system modules.

Module name: Cardiovascular

Module Code/No.: SYSJ 223

Credit Hours: 5

The objectives of the cardiovascular module are to enable the students to:

1. Understand the structure and function of the normal human cardiovascular system and compare it with abnormal structure and function.
2. Assess the cardiovascular system and understand how its function is altered in common disease states.
3. Understand the principles and concepts applicable to the cardiovascular system in general so as to use them in a professional career.
4. Have the basis for the study of common clinical conditions and disorders, for clinical examination and the performance of simple clinical procedures related to the cardiovascular system and its management.

The contents of this module include the structure, function, biochemistry, and development of the cardiovascular system. The pathology and common diseases of the cardiovascular system and their management are also included. The instructional methods of this module include sessions of the following:

- Lectures: 42
- Tutorial/ Seminar: 3
- Problem Based Learning: 3
- Case Presentations: 2
- Practical lab: 11
- Clinical Skills Lab: 2
- Independent Learning: 11

Student Assessment is based on continuous assessment, and final exam including a practical exam. The mark (100%) is distributed as follows:

- Continuous assessment: 30% (Quizzes 20% & class participation, seminar presentation, etc 10%).
- Final exam: 70% (Written (MCQ and short essays 50% & OSPE 20%).

Elective modules

Elective modules are short courses; one credit hour each, which the student selects according to his area of interest. The student is given the chance to select two elective modules during each of the third, fifth and sixth years. This will give

each student the opportunity for exposure to wider areas of his own interest. The list of the elective modules is revised every year and expanded by the addition of modules according to the availability of the teaching staff and facilities for its conduct. The list of the elective modules now available includes:

- Genetic Basis of Body Functions
- Biological Microtechniques
- Cytopathology
- Basic Molecular techniques
- Immunohistochemistry
- Cell Culture
- Global Health
- Research Project
- Rural Residency
- Ecology
- Physics of Radiotherapy
- Emergency Medicine
- Infectious Diseases

The module of Cell Culture is described as an example of an elective.

Elective Module: Cell Culture

Module code:/No: ELCJ 342

Credit hours: 1

The objectives: By the end of this module the students shall be able to:

1. Describe the basics of cell culture techniques and media preparation.
2. Recognize primary cell lines, maintenance of culture and essentials of spotting.
3. Explain cell culture contamination, cell subculture and storage by cryopreservation in liquid nitrogen vapor.

The course content of this module includes:

- Cell growth and cell feeding
- Cryopreservation
- Cell contamination
- Cell passage, confluent, subconfluent, and superconfluent
- Techniques for cell isolation, enzymatic dissociation
- Aseptic technique, preparation and sterilization, laboratory safety and biohazards
- Cell counting and plating of cells onto culture flask

Methods of instruction:

- Lectures: 10
- Practical lab: 5
- Tutorial/ Seminar: 3

Community-oriented aspect

The curriculum is planned to train physicians who would be involved in community programs and work with other health agencies in the region to offer preventive and curative services. This is achieved through the following:

- The first course taught in the 2nd year is: "Health & disease in the community" (1 credit hour). The objective of this module is to familiarize students with the health care facilities in Jazan and enable them to identify health-related problems in the region. The instructional methods include lectures, seminars, and practical field visits to the various health care systems in the area, which include hospitals, primary health care centers, rehabilitation centers, malaria stations, endemic and tropical diseases centers, and border health units.
- The integrated organ/system modules include case presentations which are achieved through visits to the local hospitals and health care facilities in the area.
- The clinical clerkship phase includes community-oriented modules; such as:
 - i. "Epidemiology, Biostatistics & Computer Practice" (7 credit hours).
 - ii. "Research Methodology, Field Survey & Project" (3 credit hours).
 - iii. "Primary Health Care" (4 credit hours).
 - iv. "Family Medicine" (4 credit hours).
 - v. "Rural residency" elective module (1 credit hour).
 - vi. "Research project" elective module (1 credit hour).
- The training for the clinical modules is done in the local hospitals and the local health care facilities. Faculty members collaborate with the local physicians and specialists to achieve the planned objectives.

An example of a community-oriented module is described below:

Module name: Epidemiology, Biostatistics & Computer Practice.

Module Code/No.: CLCJ 431

Credit Hours: 7

The course is taught in seven credit hours to allow the students to acquire the tools needed by a community-oriented physician. The course introduces the students to epidemiology and to epidemiologic approach to problems of health and disease.

The objectives of this module are:

1. Identify, analyze and offer likely solutions to health problems in the community and population subgroups.
2. Explain the epidemiological importance, pattern, risk factors and prevention/control of important communicable and non-communicable diseases.
3. Select and use appropriate statistical methods.
4. Gain basic computer skills: data entry, analysis and interpretation.

The contents of this module include: foundations of epidemiology, epidemiological concepts, investigation of epidemics, measures of morbidity and mortality, epidemiological studies, epidemiological aspects of communicable and non-communicable diseases, prevention and control of diseases, community nutrition, and basic principles of biostatistics applicable to basic scientific research in the health sciences. It includes also descriptive, inference and relationship statistics and basic skills in computer applications including data entry and the use of SPSS in analysis.

Methods of instruction include:

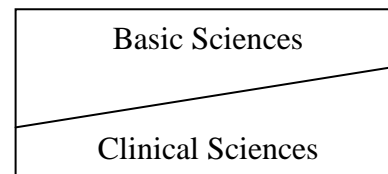
- Lectures: 37
- Field training: 15
- Practical: 3
- Tutorials/ Seminars: 5
- PBL: 1

DISCUSSION

The process of designing a medical curriculum has given the College a chance to test one method of integrating clinical and basic sciences. Integration of structure with function and clinical application is achievable by teaching the preclinical sciences through the proposed nine systems. The areas that are not covered through the systems but considered prerequisites to the systems are covered in the introductory courses. The design of the integrated curriculum was fraught with many difficulties. One of the known limiting factors to developing an integrated curriculum is the unavailability of qualified faculty to participate in an integrated education. Smith et al¹¹ addressed this by suggesting that a basic scientist with a background of integrative physiology, pharmacology, anatomy, and pathology, with special emphasis on pathophysiology, should be suitable to assume an important role in future medical education. However, since all the faculty members of Jazan

College of Medicine are medically qualified, they already have the necessary background required for proper integrated teaching strategy. Another limiting factor is that integration of the preclinical sciences might require some modifications to the teaching of the clinical sciences, as stated by Wartman et al.²¹ This drawback will require special consideration when planning full integration in the future.

Another difficulty in planning vertical integration between basic and clinical sciences was that this new medical school has few qualified clinical teachers and at present has no access at present to hospital sites. Therefore, a wedge structure of integration as suggested by Lowry²² was used. This implies that both preclinical and clinical subjects are taught throughout the curriculum, but with a predominance of preclinical sciences in the early years, increasing time devoted to clinical subjects as the course progresses.



Wedge approach to vertical integration

The wedge structure of integration was adapted from the integration ladder described by Harden²³. In describing the integration ladder, Harden²³ mentioned 11 points on a continuum between the two extremes of medical teaching; isolation, awareness, harmonization, nesting, temporal co-ordination, sharing, correlation, complementary, multi-disciplinary, inter-disciplinary, and trans-disciplinary. The Jazan curriculum is almost a step from the top of the ladder. As one moves up the ladder, the emphasis on the role of disciplines diminishes yielding to an increasing demand for a central curriculum, organizational structure and a demand for greater participation by staff in curriculum discussions and planning.²³

An important feature of the Jazan integrated curriculum is the large proportion of time allocated to elective studies from the third year of the course. Elective courses have been introduced by several Medical Schools.^{8,18,24} Some medical schools emphasize teaching the students by means of a scientific approach in which there are elective

studies and a thesis based on independent study.⁸ While some medical schools allowed elective studies in most years of the course,¹⁸ others allowed elective courses only in the final year.²⁴ The elective courses can be interdisciplinary between the departments aiming at integration, encouraging lifelong learning, using basic science concepts and techniques of discovery in clinical practice.²⁴ Difficulty in designing the elective modules for in depth learning was anticipated and the suggested solution was to make use of the experience of the schools that have elective modules in their curriculum, such as the University of Illinois at Chicago, USA and Dundee Medical School in the UK.

Jazan Medical College is intended to be a community oriented school. A 'holistic' ecological system has been advocated by many writers for this purpose.²⁵ Newly established schools have departed from the traditional hospital-based medical education to adopt a new pre-planned community-based or community-oriented approach. The earliest example is the University of Kentucky College Of Medicine in 1960.²⁶ Jazan Medical curriculum includes an early exposure of the students to the Primary Health Care Centers and the training of the students in community settings. Many medical schools agree to the use of the community as a learning resource,^{8,26-29} but the extent of this strategy differs with various schools. These variations are evident in many components of the program, such as the components of the curricular, training settings and sites, faculty recruitment, student admission criteria and health care delivery approach. However, the Jazan curriculum was designed particularly to suit and reflect the needs of Jazan society and elective courses included many community-based courses.

Implementation of this new curriculum is not expected to be an obstacle-free. Some of the expected problems are related to teachers' capabilities as many lecturers are not familiar with the integrated system. The enthusiasm of others might diminish if they do not teach their own subjects. The solution suggested is that a good strategy for faculty development be adopted and have experienced teachers to properly implement the program. The first step was the planning and conduct of a well-planned faculty development program. This helped to build enthusiasm of college staff in designing the new curriculum and increasing their commitment to future implementation.

CONCLUSION

The new curriculum adopted by Jazan College of Medicine is planned as an integrated, organ/system based, community-oriented, with early clinical skills, elective modules, and innovative methods of instruction. It tries to avoid the disadvantages of the traditional curriculum and strengthen the relevance of both basic and clinical sciences in the minds of the medical graduates.

ACKNOWLEDGMENT

This work was supported by Grant No. 424/615 from King Abdulaziz University, Jeddah, Saudi Arabia

REFERENCES

- Schmidt HG. Problem-based learning: rationale and description. *Med Edu* 1983;17:11-6.
- Des Marchais JE, Bureau MA, Dumais B, Pigeon G. From traditional to problem-based learning: a case report of complete curriculum reformed. *Med Edu* 1992;26:190-9.
- Lowry S. What's wrong with medical education in Britain? *BMJ* 1992;305:1277-80.
- Ham TH. Medical education at Western Reserve University. *New England J Med* 1962; 267:868-74.
- Pickering GW. Quest for Excellence in Medical Education: A Personal Survey. Oxford: Oxford University Press, 1978.
- Cooper JAD. Undergraduate medical education. In: Bower JL, Purcell E, editors. *Awareness in American Medicine: Essays at the Bicentennial*. New York, Joseph Macy, Jr Foundation, 1976.
- Harden RM, Davis MH, Crosby JR. The new Dundee medical curriculum: a whole is greater than a sum of parts. *Med Educ* 1997;31:264-71.
- Lochen ML. University Medical School in Tromso, Norway. *Scand J Soc Med* 1991; 19(3):205-7.
- Dahle LO, Brynhildsen J, Behrbohm Fallsberg M, Rundquist I, Hammar M. Pros and cons of vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum: examples and experiences from Linkoping, Sweden. *Med Teach* 2002, 24(3):280-5.
- Sobral DT. Interdisciplinarity in medical education: 3 aspects of analysis *Educ Med Salud* 1990;24(4):379-88.
- Smith JJ, Koethe SM, Forster HV. A new PhD training track: a proposal to improve basic science teaching. *Am J Physiol* 1997; 272(6 Pt 3):S36-46.
- Schmidt H. Integrating the teaching of basic sciences, clinical sciences, and biopsychosocial issues. *Acad Med* 1998; 73(9 Suppl):24-31.
- Sandila MP, Siddiqui NA, Bawa MT, Huda N. An integrated curriculum for MBBS. *J Pak Med Assoc* 2001;51(2):60-3.
- Brynhildsen J, Dahle LO, Behrbohm Fallsberg M, Rundquist I, Hammar M. Attitudes among students and teachers on vertical integration between clinical medicine and basic science within a problem-based undergraduate medical curriculum. *Med Teach* 2002; 24(3):286-8.
- Fields SA, Toffler WL, Elliot DL, Garland MJ, Atkinson RM, Keenen TL, Jaffe AC. Principles of clinical medicine: an interdisciplinary integrated 2-year longitudinal course. *Med Educ* 1995;29(1):53-7.
- Dauphinee D, Martin JB. Breaking down the walls: thoughts on the scholarship of integration. *Acad Med* 2000; 75(9):881-6.
- Rudich A, Bashan N. An interdisciplinary course in the basic sciences for senior medical and PhD students. *Acad Med* 2001;76(10):1072-5.
- Geffen LB, Birkett DJ, Alpers JH. The Flinders experiment in medical education revisited. *Med J* 1991;155(11-12):745-50.

19. Arnold L, Willoughby TL. Curricular integration at the University of Missouri-Kansas City School of Medicine. *Percept Mot Skills* 1993;76(1):35-40.
20. Moqattash S, Harris PF, Gumaa KA, Abu-Hijleh MF. Assessment of basic medical sciences in an integrated systems-based curriculum. *Clin Anat* 1995;8(2):139-47.
21. Wartman S, Davis A, Wilson M, Kahn N, Sherwood R, Nowalk A. Curricular change: recommendations from a national perspective. *Acad Med* 2001;76(4 Suppl):140-5.
22. Lowry S. *Medical Education*. London: BMJ Publishing Group;1993; p. 34.
23. Harden RM. The integration ladder: a tool for curriculum planning and evaluation. *Med Educ* 2000;34(7):551-7.
24. Stalburg CM, Stein TA. An interdisciplinary course in women's health integrating basic and clinical sciences: clinical anatomy and women's health. *Am J Obstet Gynecol* 2002; 187(3 Suppl):49-52.
25. Engel GL. The need for a medical model: A challenge for biomedicine. *Science* 1977; 196:129-36.
26. Dueschele KW. Organizing preventive health programs to meet health needs. *Annals of the American Academy of Political and Social Science* 1961;337:36-45.
27. Richards RW. *Community-based medical education in a post-expansionary period*. Chicago: Center for Educational Development, University of Illinois at the Medical Center, 1981.
28. Stone DH. Public health in the undergraduate medical curriculum-can we achieve integration? *J Eval Clin Pract* 2000;6(1):9-14.
29. Oswald N, Alderson T, Jones S. Evaluating primary care as a base for medical education: the report of the Cambridge Community-based Clinical Course. *Med Educ* 2001; 35(8):782-8.