

Chapter Four

Trends of Health Education in the Developed Countries and Recommendations for Health Education in the Kingdom Of Saudi Arabia

INTRODUCTION

The Kingdom of Saudi Arabia has experienced a global development and substantial improvement in the living style of the Saudi nationals and residents. Health services specifically benefited very much from this development. This expansion (quality and quantity wise) in the health services in the Kingdom of Saudi Arabia was challenged by availability of national work force in the different health specialties that is necessary to maintain the desired quality and quantity of these services. One way of getting around this challenge is to revise the health education system after reviewing the international experiences in this area. This study aims to look into these experiences and find the most suitable solutions for the case of the kingdom in view of the changes and variables in the market place, developmental plans, and the social and cultural background of the kingdom.

The scope of this study is the university education (Bachelor level), including the education in nursing, pharmacy, medicine, dentistry, and the different specialties of applied health sciences. Health education less than bachelor degree (e.g. diploma) and postgraduate education after bachelor (master, PhD, Fellowships and boards) are out of scope.

Objectives of the Study

To study the trends in university health education in the developed countries and recommend ambitious future trends and directions for the university health education in the Kingdom of Saudi Arabia for the coming 25 years in view of the job market needs and development plans of the Kingdom.

Procedures

1. The study team was selected to represent all health specialties included in the scope of the study¹.
2. The representative of each one of the five specialties reviewed the international literature, reports, statistics, national researches, and websites of international universities, scientific and professional societies, and accreditation bodies. The references utilized in this study are listed at the end.

¹ The names of the study team and their specialties are listed at the end of this report.

3. Wide geographic distribution was considered when selecting international experiences for analysis aiming to find the most suitable ideas and solutions for the case of the Kingdom of Saudi Arabia.
4. The representative of each one of the five specialties summarized the prominent international trends in his specialty.
5. Minimum of two workshops for each specialty were conducted with group of experts and specialized people to discuss the international trends and recommend ones for health education in Saudi Arabia in view of the available data about the job market needs. Experts represented different scientific and academic backgrounds to enrich the discussion of international experiences as much as possible.
6. The entire study was presented to and discussed with the main project study team.
7. The entire study was presented in the grand workshop about the future of university health education in Saudi Arabia.

This study will address the five specialties in the following order:

1. Nursing
2. Pharmacy
3. Medicine
4. Dentistry
5. Applied Health Sciences

A summary of the common recommendations will then follow.

Study Limitations

The study team faced several difficulties and obstacles during the work, which are summarized in the following:

1. Paucity of national studies addressing the quality of outcome products of the university health education in the past twenty years and the advantages and disadvantages of the current programs.
2. Lack of vision in the development plans in the health field for the coming 25 years.
3. Lack of accurate and reliable statistics about the work force in the governmental and private sectors.

I. NURSING

Introduction

The most important elements in development of the nursing profession both on the Arabic and the international levels are the university nursing education and the proper training of nursing students. However, the previous and the ongoing developments in the medical and health fields, and the multitude of variables on the scientific, economic and socio-cultural arenas have a pronounced effect not only on the high enrollment rates but also on the continuous endeavors to improve educational programs of this discipline to parallel the level of quality nursing care that should be provided to patients in all care settings.

Consequently, the excellence in nursing care is highly correlated with the "quality" and "level" of nursing programs offered for the students. These programs may differ in their levels depending on the job market needs and the nature of work. The sponsors of these programs are required to design studies and strategic plans to ensure the provision of high quality educational programs, which, in turn, will have positive impact on the level, and competencies of students and consequently on the quality of future nursing care they will provide to their patients.

At the dawn of the third millennium, the real challenge started to emerge in front of the nursing educational institutions responsible for the preparation of future generations of highly qualified male and female nurses. The development process in view of many variables became an urgent necessity and the important question is not only "what we should teach" but also "how to teach".

The objective of this study is to review and analyze the most important international trends in university nursing education and to come up with appropriate recommendations to improve and upgrade nursing education in the Kingdom of Saudi Arabia.

Study Methodology:

1. The study team reviewed the literature, reports, documents, statistics, and national studies provided by the "Literature Review Committee" as well as review of other

resources, including websites of international universities, scientific and professional societies, and accreditation bodies and organizations.

2. The team has conducted several workshops to discuss the current situation of nursing education locally and internationally, in addition to discussion of the local job market and its future needs. The team members were:
 - Dr. Muneeb Mohammad Al-Zaghloul- College of Nursing, Kind Saud University
(Ph.D. From Manchester University, UK)
 - Mr. Adnan Ahmad Hassan Ahmad- College of Nursing, Kind Saud University
(Master in clinical nursing from The Jordanian University)

In addition to the study coordinator, Dr. Adbullah Salim Al-Howaimel

Assistant Professor in the college of Applied Health sciences and vice Dean of College Nursing, Kind Saud University

3. The study team conducted a brain-storming sessions to speculate the advantages and disadvantages of the current nursing education and to devise ways to develop it in order to comply with the requirements of the future trends and the educational environment in the Kingdom of Saudi Arabia.
4. A group of professionals reviewed the study draft and provided valuable comments and recommendations. This group included:
 - Mrs. Muneera Hamdan Alosaimi, Director of the General Directorate of nursing, Ministry of Health.
 - Mrs. Nada Al-Khamis, Lecturer in the college on nursing, King Saud University.
 - Mrs. Rajaa Jad Alhaqu, Director of nursing in Jeddah, Ministry of Health.

Current Situation:

This study depended on discussion of several factors according to their effect on the university nursing education. The intended university education under discussion in this study is the bachelor degree in nursing. We emphasize the existence of international trends and other programs that are offered in developed countries depending on their needs. These factors are:

Population Growth and Acute Shortage in Nursing Staff:

Globally, according to the report of the International Nursing Organization for the year 2005, there are wide variations in the ratio of nurses to population. On the individual country level, the reports point out that the range is approximately between less than 10 nurses per 100,000 populations as in the Republic of Central Africa, Liberia and Uganda to more than 1,000 nurses per 100,000 populations as in Norway and Finland. Also in Europe the average ratio is 10 fold greater in "high ratio areas" than that found in "Low ratio areas". Similarly, in North America, this ratio is 10 fold higher than the existing ratio in South America. Studies revealed that the number of nurses relative to the total population in high-income countries is 8 fold higher than that in low-income countries.

For more accurate account, and to lay the foundation for a futuristic perspective for the Kingdom's need of male and female nurses within the next 25 years, some examples will be given. These examples hailed from a group of countries that could be considered as an appropriate reference for pinpointing the percentage of nurses that is comparable to the international percentage. These countries are:

- | | |
|---------------------------------|------------------------|
| 1. Sweden, Finland, Netherlands | 1 nurse/120 population |
| 2. Italy, Bahrain, UAE. | 1 nurse/350 population |
| 3. United States | 1 nurse/129 population |

In Saudi Arabia as in other parts of the world, the population growth has a great impact on healthcare priorities. As the population growth rate is considered relatively on high side, future estimates states that the population of the Kingdom of Saudi Arabia will jump by 56.6% during the period 1420/1421 H – 1440/1441 H. In addition, the projections revealed that population of Saudi citizens will increase by 89.2% accompanied by a decrease in expatriates by 33%. The total population of Saudi Arabia in 1420/1421H was 21.4 million where Saudis accounted for 15.7 million and expatriates 5.7 million.

The population according to preliminary results of the census conducted by Ministry of Planning in 1425H (2004 G) reached 22,673,538 where Saudi citizens accounted for 16,529,302 and expatriates 6,144,236 people. Therefore, the projected population in 1440/1441H is estimated to be 35.506 million (31,414,698 Saudis and 4,091,302 expatriates). Regarding the current situation of nursing workforce according to the study of Dr. Al-Rabaa presented in the fourth Gulf Medical Associations Conference (12-14 March 2005), the statistics (derived from the latest annual report for the Ministry of Health 1423H) revealed that the ratio of nurses to population is 1 nurse per 318 population

(for a total population of 21,455,000 in 1423H), and 1 nurse per 330 population "if the number of male and female nurses remained constant" for a total population of 22,673,538 in 1425H.

It is evident from these figures that this ratio was postulated based on the ratio of the total nursing workforce in Saudi Arabia in all health sectors of the kingdom (68,763 nurses) to the total population. If we include the total number of male and female nurses (Saudis and expatriates) relative to the total population then the ratio will be 1 nurse per 330 population. It is noteworthy that the number of Saudi nurses represents only 21.5% (14,784 male and female nurses) of the total nursing workforce. Unfortunately, most of the Saudi nurses assumed administrative functions and consequently deserted the health arena altogether. In addition, it is crucial to know that most of current Saudi nurses hold diploma degree and only very small percentage of them have bachelor degree.

Despite the efforts made to satisfy the shortage of Saudi nurses in the health sector, the official national statistics estimate that the needs till 1445H in this regard will be twice the present needs. It is well known that the present nursing workforce is predominantly composed of expatriates. In contrast, the number of Saudi graduates is very small compared with the projected health needs based on the population growth and the expansion in health services. The Ministry of Health strategies and future plans in health field include the establishment of specialist hospitals in all regions of the kingdom, an increase in bed capacity and building of 2,000 health centers. On the other hand, it is expected that the percentage of Saudi nursing workforce will not exceed 30% of the total operating nursing workforce in the kingdom in 2025 with the consideration of a loss rate of nurses due to the following factors:

1. The social and familial situations especially for female nurses where there are long work hours and night shifts.
2. Low salaries and incentives where nurses are given only 20% bonus while they are required to cover work along the entire 24-hours.
3. The concentration on female nursing staff is a major reason for the fluctuation in the percentage of nurses in hospitals despite the fact that many departments require male nurses and the international trends encourage males to join the nursing profession.
4. The lack of attention to the nurse role in the multidisciplinary medical team despite its increase on the international level and physician dependence on nursing staff in observing patients and executing therapeutic instructions. In addition, the nurses

have an important supportive role in the medical team to the extent that some studies have considered them as the cornerstone in the efficiency of the hospital and adequacy of health services provided to patients.

The other side that should be considered in parallel with population growth and change is the effect of this change on "the priorities of health care in general, and the practice of nursing profession in particular". In the United States, as a result of progress in general health and clinical care, the life expectancy has increased considerably. It is expected that those aged over 65 years will constitute 20% of the population by the year 2020. This means that the increase in the average life expectancy for patients with chronic and acute diseases will pose a challenge for the capability of the health care system to adequately respond for the continuous provision of an efficient and effective health care. Therefore if we take the United States as an example, the practice of nursing profession, university nursing education and nursing research should respond to these demographic variables. The focus of nurses should be on the spiritual, physiological and psycho-social aspects of population that should be ultimately reflected on the students through university study plans and curriculum.

International Trends:

Information Technology and Informatics:

Internationally, the nursing information technology (nursing informatics) became a novel specialization discipline that has its own solid and growing basis in contemporary nursing sciences. Nowadays, most of the nurses are utilizing information technology and informatics during their study and practice. Nursing informatics has been defined as combination of computer science, information science and nursing science, designed to assist in the management and processing of nursing data, information, and knowledge to support the practice of nursing and the delivery of health care in all parts of the world.

In the time at which this discipline is considered as an important part of health care delivery in general, it is of particular importance for the practice of nursing profession. Informatics will render the nursing profession trends more evident and popular on both the domestic and the international levels. In addition, information technology is considered as

an important component in decision-making process and in augmenting awareness and understanding of nurses to various health care issues.

The fast advancements in information technology have a profound impact on health care delivery and nursing education. The progress in data processing and the speed of information transmission as well as the change in wireless communication and availability of personal computers have a great impact on the applications of informatics. Also the developments in digital technology lead to increasing interest in telemedicine applications. As for the nursing staff in the 21st century, they are required to improve their skills in the field of informatics and computers. Therefore, it is imperative to emphasize distant learning and connecting students with their faculty and school from various regions. It is also equally important to concentrate on electronic simulation technology that provides a realistic and safe training inside laboratories before indulging in the real-life field training.

Developments in Nursing Sciences & Research:

The nursing research is highly important in the improvement of health status of any nation. Nursing research provides scientific basis of patient care, therefore, it should be continuously adopted by all nurses in the kingdom taking into consideration the urgent need to developing the skills of novice researchers in order to improve their competencies in conducting scientifically-meritorious research. University nursing schools has a pioneering and perpetual role in stressing scientific research concepts for students and supporting research endeavors of their faculties. In addition, scientific conferences should be encouraged on the national, regional and international levels for their importance in sustained self-development and exchange of expertise. This will be reflected on the quality of nursing care provided to patients in all care settings.

Available Educational Levels in the International University Education:

The nursing education curriculum is not significantly different in many countries either in Asia, Europe or America except in technological development.

Program

The available programs internationally are:

- Associate nursing program which entitles the graduates to carry a diploma in nursing. It is a two-year program that emphasizes the graduation of a nurse, who is capable of performing non-interventional tasks such as the measurement of vital signs, bedspread change, making beds, wound

dressings, monitoring changes in patients and catheters under the supervision of an accredited and registered nurse or the physician.

- Accredited nursing program: A program with average study duration of four years, i.e., 120-140 credit hours including a training period and internship. Teaching in this program is more intense and comprehensive compared with the diploma program. Internship (professional pathway) is composed of 12-15 credit hours before graduation, and should be included in the total credit hours of the program under the supervision of the college.

Curriculum

The course distribution within the curriculum should involve all nursing departments such as internal medicine, surgery, pediatrics, obstetrics and gynecology, mental health and community health. The theme of the program is general nursing and no specialty should dominate over the others when distributing courses. Instructional methods are interactive where the student assumes an active role in learning. Also teaching is directed toward the dependence of the student on scientific research, evidence-based practice, critical thinking and problem solving. This method of teaching should motivate and encourage the student to be independent, developed and distinguished. In addition, the curriculum considers comprehensive holistic approach to human, physiologically, psychologically, emotionally, mentally and socially, when formulating courses for students. The study plan follows nursing curriculum rather than the medical curriculum that prevailed in the past.

Local Nursing Education

The current situation of nursing education in the Kingdom of Saudi Arabia is not significantly different from the respective nursing education in developed countries. As far as program is concerned, Saudi Arabia has adopted the two-year associate/diploma nursing program and the four-year B.Sc. in nursing program. Regarding the study plans and nursing curricula in Saudi Arabia, they are relatively similar to those in developed countries but they need some development and modifications. The following points are observed in this regard:

- There is no coordination between teaching in the diploma program and the B.Sc. program that make it possible for the student to move from one program to another (bridging).
- There is a one-year internship period after graduation making the total duration of the nursing program five years.
- The course distribution in the study plan is not consistent between disciplines.
- The study plans still use the medical curriculum in teaching rather than the nursing curriculum.
- The study plans do not motivate students to be independent, developed, distinguished and innovative.
- The instructional methods are traditional and depend on the teacher whereas the student is always in the receiving side.
- There is a very remarkable deficiency in the provision and use of technology in nursing education including electronic learning, simulators, and models.

Recommendations

The nursing programs are not only based on the curriculum and information in the medical and health fields, but also on qualifying the student to perform some vital roles. These roles that will impart job support combined with other mutually-dependent nursing roles can be summarized as follows:

- **Teaching and Education:** the nurse acts as a tutor when dealing with patients and their families.
- **Family Supplement:** the nurse is the sole person that is capable of maintaining the continuity of the relations and behaviors that patient accustomed with prior to his sickness. He/she will help the patient to get rid of his fears and his feelings of being detached from family and his own social environment.
- **Confidence:** the nurse helps the patient to restore his weakened morale due to disease.

In this context, one should point out that the required numbers of male and female nurses cannot be made available without pursuing a comprehensive educational policy. The study of international trends identifies several levels of nursing programs, but all

countries realized that there is no alternative to B.Sc. program in general nursing. However, some countries do not object to the coexistence of other levels and specialties imposed by the local circumstances and needs of these countries. The followings are some suggestions that might contribute to solving this problem in Saudi Arabia:

1. Increasing the number of bachelor programs in Saudi Arabian universities to satisfy domestic needs and to comply with the international trends. The resources made available for these programs should go in parallel with the number of enrolled students.
2. Supporting the nursing colleges with the technologically-advanced facilities that are necessary for improving the function and outcome of these colleges.
3. Allowing the associate nursing diploma students to be bridged to the bachelor program and giving them the opportunity for career promotion, and consequently increasing the enrollment rate in the nursing profession and increasing the number of nurses with bachelor degree as it is the international trend.
4. Conducting a comprehensive and periodic review of curriculum to comply with variables that reflect the concepts and trends of contemporary nursing education. In addition, the curriculum should encompass the following major concepts and principles:
 - The programs and the study plans should distinctively reflect the nursing side not by denominations only, but also through the practices and contents pertinent to the nursing profession that will bestow an autonomous identity apart from other health specialties, while maintaining the collaborative professional relationship with these specialties.
 - The curriculum should reflect the concept of total nursing care where the focus in patient care will be on the physiological, psychological, emotional, mental, spiritual, social and cultural dimensions.
 - The curriculum should reflect the concept of nursing care in both health and sickness.
 - The curriculum should reflect the effective communication skills and constructive interaction with others.
 - The curriculum should reflect the primary health care skills.
 - The curriculum should reflect concepts based on critical thinking throughout the learning process and fostering interactive techniques where the student

assumes an active role in the learning process as previously mentioned. Also the curriculum should encourage the student to embrace scientific research, evidence-based practice, critical thinking and problem solving.

5. Giving priority to information technology (informatics) and electronic learning as an advanced trend in health education in general, and in nursing education in particular.
6. Emphasizing ways to increase the number of qualified M.Sc. and doctorate degrees holders, and encouraging specialization in the future due to the fast advancements in various health fields and to improve nursing education as well as provide nursing leader to fulfill the needs and demands of governmental and private health institutions and the needs of educational sector.
7. Improving scientific research in the field of nursing through national programs to provide authentic and reliable database that allows implementing revolutionary steps directly touching the needs of Saudi community.

II. PHARMACY

Introduction

The current available pharmacy services are not parallel to the comprehensive renaissance that the health sector in the Kingdom of Saudi Arabia is enjoying. Pharmacy services are still incapable of complying with this progress and the reason is the suffering of this sector from the severe shortage in the number of pharmacists. A recent study² emphasized that the Saudi job market will need more than 50,000 pharmacists to work in various health sectors till the year 1440 H, and the job market is also suffering from the lack of Saudi cadres specialized in pharmaceutical sciences, where the percentage of Saudi pharmacists in both the governmental and private sectors does not exceed 25% of the total number of pharmacists. Another specialized study³ revealed that the number of Saudi pharmacists must increase, at least, five folds to reach the target number in 1445 H, i.e., 17,350 pharmacists according to the recommendation of the Saudi Pharmaceutical Society, which is one pharmacist per 2,100 population.

The reason for this shortage is that there was only one college of pharmacy in the Kingdom of Saudi Arabia at King Saud University over the last 43 years. This has led to the establishment of another 11 new governmental and private colleges of pharmacy during the last 4 years, but no graduates from these colleges till now since they were just recently inaugurated.

Therefore, it is necessary to expand in the enrollment of new students and in the inauguration of additional new college of pharmacy to bridge the gap. It is imperative to join hands between institutions and health care sectors, and to make resources available for the expansion of enrollment capacity of the existing colleges of pharmacy. To accomplish the general goals in graduating qualified pharmacists to practice various pharmacy professions, it is necessary to renovate curricula and teaching methods by emulating the experience of developed countries in the field of pharmacy education, and identifying the appropriate educational trends for Saudi Arabia in a way that complies with the genuine needs of the job market. The present study will address these issues.

² A study conducted by the Dean of Ibn Sinaa (Avicenna) College for Medical Sciences in Jeddah Dr. AbdulKarim Telmisani.

³ A study by Dr. Othman Al-Rabaa entitles: The Current Situation of Health Workforce in the Kingdom of Saudi Arabia and Future Trends.

Methodology:

1. The objective of the study was postulated as: "the study and analysis of university pharmacy education trends in developed countries in the fields of pharmaceutical sciences and determining special trends pertaining to pharmacy education in the Kingdom of Saudi Arabia based on the analysis of the current situation of demand and requirements of the job market, and developmental inclinations".
2. Based on the abovementioned objective, the help of experts in the College of Pharmacy at King Saud University in various specialties and educational expertise was sought as follows:

| Name | Country of graduation | Specialty | Job Title |
|--------------------------|-----------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Prof. Saleh Bawazir | U.K. | Clinical Pharmacy | Professor, Department of Clinical Pharmacy, Vice-president of the Saudi Food and Drug Administration (SFDA), Ex-Consultant for the Minister of Health |
| Prof. Tarek Abul-Fadl | Egypt/Japan | Pharmaceutical Chemistry | Professor, Department of Pharmaceutical Chemistry |
| Dr. Adnan Al-Rehaily | U.S.A. | Pharmacognosy | Associate Professor, Department of Pharmacognosy |
| Dr. Abdul-Hakim Al-Majed | Canada | Pharmacology | Associate Professor, Department of Pharmacology |
| Dr. Mohammad Al-Omar | U.K. | Pharmaceutical Chemistry | Assistant Professor, Department of Pharmaceutical Chemistry |
| Dr. Khalid Al-Kharfy | U.S.A. | Clinical Pharmacy | Assistant Professor, Department of Clinical Pharmacy |

3. Conducting an extensive study of pharmacy education trends in developed countries of the world (United States, Canada, Europe and Southeast Asian countries) through reviewing of the objectives and study plans of the reputed universities in these countries. The recommendations of scientific associations specialized in pharmacy available online in their respective websites were also reviewed. In addition, literatures pertaining to pharmacy education and other relevant sources were retrieved.

4. Exploring the job market in the abovementioned developed countries and preparing a perspective for the pharmacy education trends in these countries.
5. Investigating the nature and needs of the Saudi job market in the field of pharmaceutical services as well as the developmental inclinations in Saudi Arabia. This was achieved through reviewing published literature in this field and inspecting the strategies of workforce development in the pharmaceutical sector. The specialized studies and the available statistics in the field of pharmacy education were also considered.
6. Formulating a long-term future plan for pharmacy education system in Saudi Arabia that covers the next 25 years based on pharmacy education trends in developed countries. This plan will account for the job market, needs and the developmental and cultural directions in the Kingdom.
7. Two workshops for consultants of the project were held to discuss the study scheme and the emerging results. The viewpoint of each participant was solicited according to his specialty and educational expertise.

Pharmacy Education in Developed Countries:

1. Pharmacy Education in the United States of America:

There are 89 colleges of pharmacy of pharmacy in the United States accredited by the Accreditation Council for Pharmacy Education (ACPE). These colleges enroll 44,000 undergraduate students, 3,300 graduate students and 4,200 faculty members. Approximately 75% of these schools are under the umbrella of the governmental sector whereas the rest belongs to the private sector. The entry-level degree bestowed on graduating students is the Doctor of Pharmacy degree (Pharm.D.) which is eventually the sole academic degree that entitles the graduates to work as pharmacists in various sectors. This degree just recently replaced the B.Sc. degree in 2004. These colleges of pharmacy in collaboration with the ACPE worked to develop this program to graduate pharmacists who are highly qualified scientifically and professionally to contribute in raising patient care to higher levels within the framework of the medical team. The condition for enrollment in the Pharm.D. program is to finish pre-pharmacy course requirements of approximately 60 credit hours (2-3 years) in mathematics, biology, chemistry, physics and liberal arts. In addition, students are required to pass the Pharmacy College Admission Test (PCAT) to be eligible for enrollment in the college of pharmacy. The duration of the study in the

Pharm.D. program is four years where the student acquires basic sciences and expertise that will qualify him to practice pharmaceutical care and actively contribute to drug therapy for patients. The final year of the program is devoted to clerkships in various health care settings. The total credit load of the program is about 200 credit hours.

The statistics point out that 43% of the Pharm.D. program graduates are inclined to work in community pharmacies, whereas 35% of the graduates work in hospitals and the remaining 22% work in other sectors such as pharmaceutical companies and research centers. For the graduate to commence his pharmacy practice in the United States, he must also pass the North American Pharmacist Licensure Examination (NAPLEX[®]). In this respect, the number of pharmacists operating in the United States is approximately 227,000 pharmacy practitioners with a ratio of 77 pharmacists per 100,000 population.

Also, some universities are offering a dual-degree program, namely, Pharm.D./Ph.D. where the student registers in both degrees in order to save the time consumed by registration in each degree separately. Some other universities offer different combined programs such as Doctor of Pharmacy and Master of Business Administration, i.e., Pharm.D./ MBA for those who are interested in administrative pharmacy careers, and Doctor of Pharmacy and Doctor of Jurisprudence program, i.e., Pharm.D./JD (Juris Doctor) for pharmacists interested in working in law offices.

In addition to the Doctor of Pharmacy degree, some American colleges (about 9 colleges) award a Bachelor of Science in Pharmaceutical Sciences (BSPS) upon the completion of a four-year program comprised approximately 130 credit hours. Sixty of these credit hours are shared with the Pharm.D. program. In the last year, the students are offered several pathways (tracks) including pharmacy practice, pharmaceutical chemistry, toxicology, pharmacy administration, pharmacology, natural products and pharmaceuticals. The pharmacy practice pathway is a requirement to pursue studies in the Pharm.D. program. In addition, students are required to go through an internship program during summer in pharmaceutical manufacturing and pharmaceutical research laboratories after two or three years of the commencement of the study. In this training session, there is an emphasis on courses related to pharmaceutical sciences that qualify graduates to work in research centers, drug manufacturing firms and drug quality control laboratories. It is recognizable that this degree is not a professional degree and does not allow the graduate to work as practicing pharmacist in various health fields.

Teaching in colleges of pharmacy in the United States is accomplished by the use of conventional methods adopted in the universities of most developed countries with an

increasing use of modern techniques depending on the nature of some courses and the expertise of faculty members. In this context, the faculty depends on increasing effective understanding and participation in courses through the following:

1. Problem-based learning (PBL)
2. Small-group discussions.
3. Posing multiple choice questions (MCQ) to students unexpectedly and allowing each student to discuss his answers with the neighboring student and consequently trying to justify their answers.
4. Using the Internet and computer-assisted instructions (CAI).
5. Using video-taped materials produced by companies specialized in health education particularly pharmacy education in some courses.
6. Involving the students in small groups to conduct simple scientific projects, and displaying their results through poster presentations.
7. Conducting a common scientific workshop for students.
8. Arranging field visits as a sort of study for certain coursework in real-life situation (i.e., simulations) and reporting these visits in writing.
9. Collaborating with their peers in the profession to deliver lectures in some courses in order to transfer their practical experience to students.

2. Pharmacy Education in Canada:

There are 10 colleges of pharmacy offering a bachelor degree (B.Sc.) in pharmacy. The Doctor of Pharmacy (Pharm.D.) program in Canada is a two-year program after graduation from the college of pharmacy. The B.Sc. program duration is five years. In the first year (Pre-Pharmacy), the student studies general preparatory courses in basic sciences such as biochemistry, general chemistry, anatomy and physiology in the college of science. The student's grade point average (GPA) should be, at least, 3.5/4.0 to be admitted in pharmacy program where he can study various pharmacy specialties. The programs in Canadian universities were designed on the basis of self-directed learning and teaching skills using the following techniques:

1. Integration format.
2. Skill-building activities.
3. Self-directed learning abilities.

Recently, emphasis in Canadian universities was placed on the study of courses and subjects that furnish the students with clinical pharmacy skills, where students acquire the following skills:

- a. The ability to promote health services.
- b. Disease management.
- c. Ensuring effective drug therapy outcome.
- d. Primary health care.

Most of the graduates of Canadian universities work in the United States of America in several areas including hospitals, community pharmacies, academic institutions, drug manufacturing, health care institutions and health insurance companies.

3. Pharmacy Education in Europe:

A. Pharmacy Education in the United Kingdom:

There are currently 16 colleges of pharmacy in the United Kingdom. These colleges have two directions in pharmacy education:

First Direction: Master of pharmacy (M. Pharm.) which is equivalent to the bachelor degree. Most of the universities in Britain grant this degree to replace the old Bachelor of pharmacy (B. Pharm) degree which was abolished in 1997 where the student studied for 3 years after the completion of the A-level.

The duration of study in the M. Pharm. program is four years. The enrollment in the program requires the completion of A-level in three subjects, namely, chemistry and other two subjects to be selected from physics, biology or mathematics. The cumulative grade in these subjects should not be less than an average of "B". It is also required that the student complete the General Certificate of Secondary Education (GCSE) in English language with, at least, "C" grade, and mathematics with, at least, "B" grade. Foreign students or those who did not complete the A-level or GCSE are required by most universities to go through a one-year study period prior to the commencement of the pharmacy program. The pharmacist with bachelor degree in pharmacy has no right to practice the profession unless he successfully completed a pre-registration year prior to being granted the practice license. Currently, 74% of the pharmacists of the bachelor degree holders become community pharmacists, 26% become hospital pharmacists, and 12% go into industry or academia.

Second Direction: Clinical pharmacy (D. Pharm) degree. A small number of British universities grant this degree. Clinical pharmacy is taught in the United Kingdom as a part of the bachelor of pharmacy program where clinical pharmacy courses are offered. This degree is not awarded to the bachelor of pharmacy degree and is limited to the Master of Pharmacy and Ph.D. degrees, or the diploma in clinical pharmacy. Some universities confer a one-year Postgraduate Diploma upon the bachelor degree holders. In addition, there are other programs offered by British universities such as Postgraduate Diploma in clinical pharmacy. The duration of this program is 30 months, two days/week for part-time students. Teaching of pharmacy is achieved through educational modules in addition to a training period in a hospital, community pharmacy or pharmaceutical industry.

B. Pharmacy Education in Germany:

There are 25 universities in Germany that offer pharmacy as a discipline. The study of pharmacy in Germany is closely similar to that in Britain where German universities confer the bachelor degree in pharmacy (M.Pharm.) after a study period of four years that covers all pharmacy specialties. Some universities include an 8-week field training in hospitals, community pharmacy or pharmaceutical industry during the summer vacation. Other universities mandate a one-year internship after graduation where the students spend 6 months in community pharmacy and the rest is spent in hospitals or pharmaceutical industry. To be enrolled in the college of pharmacy, the student should successfully complete high school (secondary school) and there is an admission authority that controls students' enrollment depending on their grades.

It is worth mentioning that the European Union nowadays tends to adopt unified criteria for the mutual recognition of pharmacy programs across its countries. This system is inclined to confer the Master of Pharmacy (M.Pharm) or Doctor of Pharmacy degree after 6 years of study, in addition to a one-year internship period, to become a unified system of licensure for the practice of pharmacy profession across Europe.

4. Pharmacy Education in Southeastern Asian Countries:

A. Pharmacy Education in Japan:

Pharmacy education in Japan has been founded in 1873, where it encountered many developments in various eras. The number of colleges of pharmacy in Japan till 2004 is 56 colleges, 14 in governmental, 3 in public and 39 in private universities. These colleges admit more than 8,000 students annually.

The requirement for admission to the study of pharmacy is the successful completion of secondary school certificate or the completion of 12-year schooling period prior to enrollment. The applicants are also required to pass the qualifying admission exams depending on the specialty. The student earns his bachelor degree in pharmaceutical sciences in four years with one-month training period in hospitals or community pharmacies. The undergraduate students also participate in one of the research projects with their teachers in collaboration with postgraduate students to produce a research paper as a prerequisite for graduation.

In 1975, clinical pharmacy was introduced in the curricula of some universities, and in April 2006 a six-year pharmacy education program rather than a four-year program has begun in Japan, where the internship training period in hospitals or community pharmacies was increased from one month to five months. This new system is closely similar to the Pharm.D. program as it is known in the United States.

To practice the profession of pharmacy in Japan, the graduate should pass the national licensure exam which is held by the Japanese Ministry of Health every year. Pharmacists are distributed in the Japanese job market including community pharmacists, hospitals and clinics, education and research, and drug factories.

B. Pharmacy Education in Malaysia:

The pharmaceutical education in Malaysia depends on a minimum of four-year program (8 semesters) or a maximum of 14 semesters in order for the student to earn the bachelor degree in pharmacy. Prior to admission, the student is required to obtain the secondary school certificate with high grades in chemistry, biology and mathematics, and the application to admission is accomplished through the Malaysian Ministry of Education. The bachelor of pharmacy curriculum comprises the following:

- Basic pharmaceutical sciences.

- Major pharmaceutical sciences.
- Elective pharmaceutical sciences which is similar to specialization in various disciplines of pharmacy.

The graduate obtains the license to practice pharmacy from the Department of Pharmacy affiliated to the Malaysian Ministry of Health after passing the Council of Pharmacy exam.

Suggested Trends for Pharmacy education in the Kingdom of Saudi Arabia:

Based on the previous description of universities in developed countries in the field of pharmacy education, it was found that there are two distinct trends for obtaining the degree that qualify the graduate to practice the profession of pharmacy. These are the Doctor of Pharmacy (Pharm.D.) degree and the Bachelor of Pharmaceutical Sciences (B.Sc).

1. Doctor of Pharmacy (Pharm.D.):

It is obvious from the previous study that the Doctor of Pharmacy degree is present only in the United States as an entry-level degree. On the other hand, in most of the countries that offer this degree, it is only conferred on graduates of Bachelor of Pharmacy after approximately 2 years of study as a degree equivalent to M.Sc. degree. This degree aims at graduating qualified pharmacists to practice the profession to enable them to cooperate with the health care team in their endeavors to help the patient achieve the expected outcome of drug and treatment.

This educational trend (i.e., Pharm.D.) must be adopted in pharmacy education, and its programs should be expanded for the next 25 years in colleges of pharmacy of Saudi Arabia for the following reasons:

1. To secure the academic accreditation by the American Council of Pharmacy Education (ACPE) where all the kingdom's universities tend to get accredited. This accreditation will not be achieved without the availability of the Pharm.D. program in these universities according to specified criteria.
2. Scarcity of practicing clinical pharmacists in kingdom's hospitals and community pharmacies where the percentage of clinical pharmacists does not exceed 2% of the total number of pharmacists.

3. The hospitals are in great need for pharmacists who are capable of participating in appropriate drug selection for patients and therapeutic drug monitoring to ensure effective, safe and economic pharmaceutical care.
4. The substantial demand of various health care sectors for pharmacists capable of solving medication-related problems, and making clinical decisions relating to efficacy, anticipated drug interactions and expected therapeutic outcomes.
5. shortage of faculty members of the Pharm.D. degree holders in colleges of pharmacy of the Kingdom of Saudi Arabia especially after the great expansion in inauguration of colleges of pharmacy that confer the Pharm.D. degree.
6. The published scientific studies in medical journals praise the positive role played by the clinical pharmacists in safeguarding society against detrimental effects and problems of drug therapy.
7. The positive development incurred to pharmacy practice and pharmacy education in the United States due to the changes in curricula toward the Pharm.D. degree, and the proven positive role fulfilled by the Saudi pharmacists practicing in some governmental hospitals who obtained their Pharm.D. qualification from the United States.
8. The demand of the kingdom for qualified clinical pharmacists is greater than that of developed countries due to the important role that should be played by the pharmacist in developing societies.

The Doctor of Pharmacy degree (Pharm.D.) qualifies the graduate to work in governmental hospitals, community pharmacies, drug and poison information centers and other patient-related sectors. The pharmacist who is holding a Pharm.D. degree is dubbed as practicing pharmacist.

The study of pharmacy should extend to 6 academic years where the student studies in the first two years basic sciences such as chemistry, physics, biology, biochemistry, mathematics and biostatistics in the College of Science. The pre-pharmacy student should also study anatomy and physiology in the College of Medicine, in addition to the study of Islamic sciences, liberal arts and professional ethics prior to the entry into the program. In the remaining four years, various pharmacy specialties are offered with emphasis on courses and skills that qualify the student for the provision of pharmaceutical care to patients.

In the future, after graduation of students with Pharm.D. degree, and after ensuring the success of this program and its suitability to the Saudi job market, the dual-degree program (i.e., Pharm.D./Ph.D.) can be offered in an analogous fashion to that in the United States. This dual-degree program is usually offered for students who are willing to join academia to save time and effort. Additionally, another dual program, namely, Doctor of Pharmacy and Master of Business Administration (Pharm.D./MBA), for pharmacists who wish to pursue a career in pharmacy administration. In the future after the ratification of medical insurance laws in Saudi Arabia, the Doctor of Pharmacy and Doctor of Jurisprudence program, i.e., Pharm.D./JD (Juris Doctor), can be offered for those who are willing to work in drug-related law offices.

2. Bachelor of Pharmaceutical Sciences (B.Sc).

From the previous study, it is evident that most of countries of the world are still offering the Bachelor degree in pharmacy as B.Pharm. or M.Pharm. This degree qualifies the graduate to work as practicing pharmacist, except in the United States where the bachelor degree in pharmacy is not a professional degree, i.e., it does not qualify the graduate to practice pharmacy in hospitals unless he pursues his studies toward the Pharm.D. degree.

This study emphasizes that the Saudi job market is still in need for the continuation of bachelor degree in pharmacy, in addition to the Pharm.D. degree, for the following reasons:

1. The job market in Saudi Arabia is in drastic need for graduates with the bachelor of pharmaceutical sciences to work in governmental and private sectors where the Pharm.D. degree graduates are not needed, such as pharmaceutical industry, quality control laboratories, the Saudi Food and Drug Administration, forensic laboratories, departments of the Ministry of Health, the Directorate of Health Affairs in various regions of the kingdom and customs outlets.
2. The highest percentage of shortage of personnel is in pharmaceutical companies and industry sectors where statistics indicate that 95% of working pharmacists in these sites are expatriates.
3. The importance of bachelor degree in pharmaceutical sciences (B.Sc.) is clearly evident in postgraduate studies in departments of pharmaceutics, pharmaceutical chemistry, pharmacognosy and pharmacology. The colleges of pharmacy need graduates with B.Sc., especially after the expansion in inauguration of new colleges of

pharmacy (both governmental and private) in the kingdom. The total number of colleges of pharmacy is 11 colleges which will increase the demand on Master and Ph.D. programs to provide qualified academic staff members in all pharmacy disciplines.

4. The importance of bachelor degree in pharmacy lies in qualifying competent pharmacists capable of conducting scientific research in drug discovery and development where the Arab countries, including Saudi Arabia, are lacking progress in this field.

In this regard, it is suggested that the appropriate duration for the study of pharmacy should be 5 years for the Bachelor of Pharmaceutical Sciences. Students pursuing toward this degree should study in their first year basic sciences; such as general chemistry, physics, biology, biochemistry and mathematics (the site of the study is the College of Science prior to indulging in pre-pharmacy program). During the remaining four years, the student should cover various pharmacy specialties where the student, in his senior year, is offered a number of pathways (tracks) such as pharmaceutics, pharmaceutical chemistry, natural products, pharmacology and toxicology, and industrial administration. In addition, an internship program in drug industry and pharmaceutical research laboratories during the summer should be offered after 3 to 4 years of the commencement of the study.

This degree will qualify the graduate to work in pharmaceutical industry, drug quality control laboratories, Saudi Food and Drug Administration, forensic laboratories, departments of the Ministry of Health, Directorates of Health Affairs in various regions of the kingdom or customs outlets. On the other hand, this degree will not qualify the graduate to work in hospitals or community pharmacies as practicing pharmacist unless he pursued his studies toward the Pharm.D. degree. If the college of pharmacy adopts both programs simultaneously, then common courses in both programs should be specified to save the time and effort of faculty.

Recommendations:

1. It is necessary to expand in students' admission and in inauguration of new colleges of pharmacy to bridge the gap in the shortage of Saudi pharmacists, with the emphasis on assembling committees from the Ministry of Higher Education for evaluating and reforming these programs. In addition, the resources made available for these colleges should match with the number of students.

2. Adopting the Doctor of Pharmacy degree (Pharm.D.) as the sole degree that allows the practice of pharmacy in the kingdom.
3. The colleges of pharmacy that do not offer the Doctor of Pharmacy degree (Pharm.D.) at present should review their academic plans to offer this degree in addition to the Bachelor of Pharmacy degree.
4. A one-year internship or training program should be ratified for all colleges of pharmacy as a requirement for receiving the licensure from the Saudi Council of Health Specialties and working as practicing pharmacist.
5. In addition to its current Bachelor of Pharmacy degree, any new college of pharmacy that does not offer the Pharm.D. program in its academic plan should not be licensed or inaugurated.
6. The continuation of the Bachelor of Pharmacy degree should only be allowed for those who are choosing pharmaceutical industry or quality control laboratories as their future careers, which have no direct patient-related activities.
7. A residency program in clinical pharmacy should be created by the Scientific Council of Pharmacy for Bachelor of Pharmacy degree holders to promote their clinical practice.
8. The current curricula should be updated to comply with contemporary pharmaceutical requirements.
9. New and innovative teaching methods should be instituted such as problem-solving, small-group discussions, scientific workshops and other previously mentioned methods. Also, the students should be trained on how to use various information-retrieval resources to promote teaching programs, systems and curricula.
10. The electronic teaching project should be embraced to raise the educational prospects to a new ground for health colleges in general, and the colleges of pharmacy in particular as the case in developed countries.
11. The colleges of pharmacy in the Kingdom of Saudi Arabia should adopt an ongoing and perpetual plan for the development of academic plans and curricula through the formulation of permanent committees of competent experts representing various pharmaceutical and public sectors. These committees will embark upon regular revision of the framework, contents, processes and outcomes of curricula. Also, the committees will evaluate and rank-order the programs of colleges of pharmacy

based on specified criteria, and eventually publish the evaluation results in scientific journals and newspapers to provoke competition between colleges.

III. MEDICINE

Introduction

During the last three decades the Kingdom of Saudi Arabia has experienced a sharp improvement in its economic status and development. Health services in particular, developed to a greater extent as witnessed by accessibility and coverage indicators. This is combined with improvement in all health indicators such as mortality, morbidity and life expectancy. However, national health manpower development is not coping with the same momentum and developmental growth. For instance, the percentage of Saudi nationals who work in the health field is only 25%. These figures are very low even when compared to other sectors such as education and agriculture. Currently, there are 13 medical schools in the Kingdom. Almost 40 years is required to fill the gap in physicians if the population growth continues at the same pace.

On the other hand, most of the existing curricula of medical schools are following traditional approaches. These approaches are criticized by being less community-oriented; using teaching and learning strategies that are teacher-centered with a passive role of students; knowledge delivered is fragmented and disintegrated, in addition to the dichotomy between education and health services. The need for expansion in health profession education to fill the big gap in health manpower is well justified. The need for changing medical education and medical practice to accommodate recent educational advance is even strongly justified to produce health personnel in the required quantity and quality, at the right time, to work in the appropriate place.

The high level concerns expressed in many local reports and research articles are that the design, content, and conduct of undergraduate and graduate medical education programs have not kept pace with: advances occurring in the biomedical sciences; the introduction of new approaches for the diagnosis and management of disease; changes in the organization, financing, and delivery of health care services; and changes in society's expectations of medicine. These concerns are not limited to the case of Saudi Arabia. Recent reports in the USA, Australia and UK spell out the same concerns. But to develop strategies for addressing those general concerns, specific shortcomings in the ways doctors are being educated –shortcomings that exist across the continuum of undergraduate,

graduate, and continuing medical education – must be acknowledged. For example, despite growing concerns about the quality of medical education, few medical schools in Saudi Arabia have implemented fundamental changes in their clinical curricula. Actually these changes only started in new medical schools. Well established medical schools are still using the traditional models of medical education. However serious initiatives are underway in many of them.

Methodology

We have done a comprehensive review of the medical education literature that address international trends in medical education including issues of introducing innovative methods of undergraduate medical education and the importance of changing medical education to cope with changing health problems, health priorities, health needs and rising community expectations. We reviewed literature from North America, Latin America, Our region, Australia and the few literature in this field from the Kingdom of Saudi Arabia.

In addition, we conducted focus group discussions and in-depth interview with experts in the field including medical educators, medical practitioners, community representatives, residents and medical students.

In our search, we look to the followings sources

- PUBMED
- American Association of Medical Colleges reports
- General Medical Council reports (United Kingdom)
- Australian Medical Council Reports
- European Medical Associations Reports
- World Federation of Medical Education Reports
- Network towards Unity For Health reports
- Deans Council reports (GCC)
- Unpublished local literature

We reviewed the literature according to the following key words
Innovative approaches to medical education, health system and medical education, Multidisciplinary education, problem-based learning, Student assessment, program

evaluation, curriculum development. The next step is that we have done a quick critical appraisal of the literature according to the following criteria:

- Relevance of the article/topic to our report objectives
- Comprehensives and coverage of different issues related to innovation
- Relevance to our local situation
- Presence of documented evidence of effectiveness
- Applicability, feasibility and practicability

Accordingly, we ranked the literature findings according to the following hierarchy:

1. Commissioned published articles form respectable organization in the field, such as the American Association of Medical Colleges, GMC (UK), or World Federation of Medical Education and World Heath Organization.
2. Published reports of effectiveness of the recommendations proposed by these renowned organizations based on empirical multi-centers studies which addressed the concerns of our report.
3. Published systematic reviews in any one innovation such as problem-based learning.
4. Published reports which encourage innovations and propose changes to medical education as planning stages such as GMC tomorrow's doctor.
5. Individual randomized control studies.
6. Local descriptive studies.
7. Unpublished local articles and conference presentations.
8. Opinion of experts.

The study team included:

- Dr. Michael Seefeldt
Head Evaluation unit, Department of medical education, College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Previously Senior coordinator to the curriculum committee, Department of Medical Education, Head of community-based and Program Evaluation Division, Univesity of Illinois at Chicago, USA.
- Dr. Mohammed Alkhazem

Head Department of Physiotherapy, College of Applied Medical Sciences, King Faisal University.

- Prof. Mohammed Awadallah Salih

Head of the medical education unit, College of medicine, Jizan University.

In addition to the study coordinator Prof. Mohi Eldin Magzoub, Chairman Department of Medical Education, King Saud bin Abdulaziz University for Health Sciences

The final draft of the study was reviewed and commented on by Prof. Bashir Hamad.

Professor of Medical Education, Founding Dean of the Colleges of Medicine, Gezira University in Sudan and Al Ain University in UAE.

This report will discuss trends in medical education according to the following structure

- Curricular design, structure, content and delivery
- Teaching and learning
- Faculty development
- Student assessment
- Student selection and admission

Trends in Medical Education

Curricular design, structure content and delivery

During the last three decades, there are major advances in curricular design, structure content and delivery. The following developments has been noted from the literature.

Curricular Design

The curriculum is designed with a clear mission statement, vision, values, goals, objectives, curricular contents, student assessment system and program evaluation. The objectives are based on the national health priorities, the qualities of the graduate to respond to these priorities, the requirement of the health system and community expectations. In addition these objectives are dynamic and flexible to accommodate the changing health problems and the changing patients' expectations. The tomorrow's doctor report of General Medical Council, which shaped the current medical education in the United Kingdom, determined clear medical education objectives which are based on “good medical practice”

GMC report. Similarly the American Association of Medical Colleges (AAMC) reports is based on the high quality medical care. The standards set by the World Federation of Medical Education and the GCC Deans' Council went in the same direction. In addition, these objectives should be well communicated to students as well as faculty which guide curricular review, updates and development. In this regard, many accrediting organizations in many countries such as Australia established a system through which they can regularly monitored the implementation of these standards. They have a workable system of rewards and sanctions. The minimum essential requirement that guides medical education objectives are summarized from these reports, which include and not limited to the followings.

- a. Basic and clinical sciences
- b. Patient care
- c. Evidence-based practice and research
- d. Personal and professional behavior

In Saudi Arabia, most educational curricula lack clear written mission, vision, values and objectives. When they are existing they are not matching curricular contents. Additionally and in most cases the mission, vision, values and objectives of the curriculum are not well communicated to faculty and students.

Curricular Content

In the past three decades major innovations were evident in curricular contents. These include the inclusion of evidence-based medicine, medical ethics, personal and professional behavior, communication skills, clinical skills training in the clinical skills lab ... etc. These innovations were supported by strong evidence that match good medical practice and prepare doctors to provide high quality patient care. For instance, tomorrow's doctor report of the GMC in UK is strongly encouraging medical schools in the UK to accommodate these contents. Similarly, the Australian medical Council went in the same direction. Medical schools responded dramatically to these recommendations. For instance, Sydney University (like several medical schools in UK) divided the contents of its curriculum into the following themes

1. Basic and clinical sciences theme that include 50% of all curricular activities
2. Patient doctor theme compromising all clinical skills and contribute 25% of the curricular contents;

3. Community doctor theme which include 12.5% and,
4. Personal and professional development theme including evidence based and medical ethics that constitute 12.5% of the curricular contents.

The situation in some Saudi medical schools is not matching these major advances as basic and clinical sciences include almost 90% of the curricular contents.

Curricular Structure

Different curricular structures are existing in many parts of the world, the dominant mode is the traditional one which is based on Flexner model in 1910. Post Flexner era experienced major advances in curricular structure including the following:

1. The *organ-system approach* (e.g., cardiovascular system; gastro-intestinal system). In this approach, medical subject-matter is organized around the major systems that comprise the human body.
2. The *priority health problem approach* (e.g., cancer; heart failure, malnutrition, malaria). A curriculum based on the priority health problems of a region organizes its content around major problems derived from essentially an epidemiological analysis.
3. The *life-cycle approach* (e.g., embryo, baby, child, adolescent, elderly). The life phases a human being goes through are the organizing elements of such curriculum.
4. The *pathophysiological principles approach*. Such approach concentrates on the limited set of biological principles that govern the emergence of disease (e.g., infection, hyperplasia, degeneration).
5. The *chronic diseases approach*. In this curriculum chronic diseases are emphasized as they are representing the core of health problems nowadays. The new Maastricht Curriculum as an example of such approach.

In practice most of the modern curricula apply a combination of these principles.

The other advances are that the curriculum is arranged around integrated blocks or modules which allow student to focus in one area rather than covering fragmented subject-matter. This focus in relevant subjects also reduces the duration of the curriculum by almost one year in many innovative medical schools. In addition, students move faster and more secured compared to other traditional approaches. This is measured by the proportion of drop-out from the program which is less in the case of innovative approaches. The other

innovation in curricular structure is that the curriculum have a core and student-selected components (SSCs).The core curriculum take up most curricular time. It is expected that in a standard five-year curriculum between 25% and 33% would normally be available for SSCs.

Delivering the curriculum

Curriculum delivery, as well, experienced major advances in the last few years following the boom and explosion in information technology. More recently, the curriculum is delivered using a web-based delivery using effective soft-ware such as Blackboards and Web Course Tool (WebCT) or partial delivery using electronic learning.

Medical practice is increasingly dependent on the efficient and effective use of computers. Many medical colleges has implemented an intranet which links all of the teaching sites including the Medical Library, Anatomy and Pathology museums, and various clinical teaching sites. Many students have Internet access from home and make use of the facilities day and night. It is essential that all students become comfortable with the technology from the start of their education.

Information for students through the web includes timetables, bio-sketches of students and tutors, learning topics, references, and outlines of lectures and other teaching sessions, materials for the problems, laboratory and imaging data and various learning resources. Moving beyond chalk as a basic instructional tool, the contribution of modern IT is particularly obvious wherever teaching and learning resources can be stored in digital format. For many types of teaching and learning, and for medical education in particular, there are many important materials, which do not yet fall into this category (such as real patients), but resources capable of digital representation are abundant. They include:

- *Text documents (lecture notes including power point presentations, learning topics, journal articles, excerpts from textbooks).*
- *Images (radiology, anatomy, pathology).*
- *Sounds (heart and breath sounds).*

In these cases, electronic storage and delivery using standard web technology leads to a number of important benefits:

- *Students and Faculty have access from any site at any distance.*

- *Students can use the materials whenever they wish. For example, the online formative assessment system is used at all hours of the day and night.*
- *All curriculum documents are available for Faculty review at any time. In many paper-based curricula, the students are the only people who ever see the entire curriculum.*

In Saudi Arabia major advances also are already implemented in some medical schools and in its way in the rest.

Teaching and learning

Numerous innovations have been made possible through the influence of modern educational theories such as adult education and constructivism theories. As a result several new effective methods of learning are used beside traditional lectures. These methods include the followings.

1. Problem-based learning
2. Community-based education
3. Contractual learning
4. Project-based learning
5. Discovery learning
6. Student as a teacher
7. Small group teaching
8. Early clinical exposure

We will describe in some details two major innovations in instructional methods, which are *problem-based learning* and *community-based education*

Problem-based learning

Set of considerations that call for a re-orientation of basic medical education have to do with the nature of learning expected from students and the informational context in which this learning occurs. First, medical education has to face the information overload. The body of medical knowledge has grown exponentially over the last century and the life span of current concepts tends to get shorter. Consequently, attempts to comprehensively cover all relevant disciplines in an undergraduate medical curriculum are in vain. Therefore, in the curriculum the emphasis should shift somewhat from acquisition of

today's facts to knowing how to retrieve and manage information using current technologies. Another consequence of the shortening life span of concepts is that our graduates must prepare for life-long learning. The self-study skills needed to install an attitude for continuous professional development should be developed already in the undergraduate program by stimulating self-directed learning.

Second, the insight has grown that medical students are better prepared for professional practice if during their studies they learned how to approach problems in a multidisciplinary fashion. Moreover, also in the health system nowadays more complex problems are tackled by a team of experts from various relevant disciplines.

These two considerations, and added to that new insights in cognitive psychology, provide a rationale for problem-based learning in tutorial groups. Students learn to co-operate in task-oriented small groups and to collect by self-study activities new information from various disciplines pertinent to the problem. We wish our students to become active and independent learners. In addition, we wish them to become good problem-solvers who have acquired a scientific and systematic approach to solving problems. Problem-based learning, which emphasizes small-group discussion of important problems; intrinsic motivation to learn and contextual relevance, has been demonstrated to provide an excellent environment for reaching those goals. If we want excellence in education, problem-based learning is the way to go.

Community-based education

Early exposure to the realities of health care in the community, and training "on-site" is essential because clinical training in tertiary care hospitals provides medical students with a distorted perspective on the nature of the problems encountered later in professional life and on the facilities available for diagnosis and treatment. It has been argued that, in academic centres, medical students see only two percent of the total range of problems encountered later; and mostly the most serious or difficult ones as well. In addition, the technological outlook of medicine in these environments is not what is to be found in regional hospitals, nor will the technology be available to the same extent in primary care. In addition, health promotion and prevention are far more important to the health status of a certain community than is the application of expensive technological resources. A medical curriculum, thus, should be community-based. It is important to note here that community-based education is useful only if it is a regular and frequently used part of the curriculum. In addition, the use of a variety of health care facilities, not only

hospitals, is essential for medical training. The students' activities will include issues in prevention, health education and promotion, and health research and will involve the community in improving its own health status.

Today, the above proposals are no longer revolutionary ideas that only lend themselves for experimentation. Over the last half of the 20th century, the ideas first gained strength and next have been successively implemented by medical and health sciences schools in many countries all over the world. Both at global and national level, authoritative documents outlined these new avenues for medical education and currently some 400 schools worldwide have implemented community- and problem-based educational programs. In Saudi Arabia, Four new medical schools implemented PBL.

Faculty Development

Many medical schools all over the world established strong programs for faculty Development. These programs are justified by the fact that faculty are selected based on their professional rather than their academic or educational experience. These programs are proved to be effective in increasing the educational skills of the faculty. Some schools went to the extent that they incorporate participation in faculty development activities as one of the most important criteria for promotion.

The situation in Saudi Arabia is that many schools already stated introducing faculty development program. However these programs are ad hoc and not contributing to faculty promotion.

Assessing student performance and competence

In recent years, there are major advances in the way medical students are assessed. There are many instruments available for measurement of the qualities needed by a good practicing physician. However more research is needed in designing instruments that measure professional behavior such as communication skills, critical thinking, leadership and problem-solving skills. These instruments include the followings:-

1. Use of portfolios
2. OSCE
3. Modified essay questions
4. Peer and self assessment
5. reports production

6. Advances in MCQs such as R type and problem-oriented A type.

A system for quality assurance were established in many schools such as establishing a centralized unit for assessment, staff training in item writing, item review and analysis. In Saudi Arabia, examination conduction and item storage are still the responsibility of various departments. Professional behavior is not well assessed, however, there is awareness of the importance of improving assessment and many faculty were trained in writing high quality items

Student selection

Student section system should ensure that only those who are fit to become doctors are allowed to enter medical school. Medical schools in North America are selecting graduate students only. In Europe there are strong move to select graduate students in addition to high secondary school leavers. In Australia, both groups are selected.

Recommendations for medical education in Saudi Arabia

Medical schools are mindful of the shortcomings in their educational systems and have begun to address them. Although the quality of the education received by medical students is clearly important, it is during residency training that physicians acquire the detailed knowledge, the special skills, and the professional attitudes needed to provide high quality care in medical practice.

The quality of medical education will improve only if each of the components of the Kingdom's medical education system – medical schools and teaching hospitals, health system, accrediting bodies, certifying bodies, licensing authorities, and professional societies and organizations – is committed to making progress toward achieving an ideal medical education system. The goal is the achievement of a system that provides excellent medical education throughout a physician's career. The lack of a mechanism for coordinating policies and positions across institutions and organizations is a major obstacle to achieving that goal. Creating such a mechanism is one of the greatest challenges facing those in leadership positions in the institutions and organizations composing the system.

Curriculum

- *Design*

1. Curricular design should reflect clearly the mission and the objectives of the curriculum.
2. Each medical school should prepare a detailed modified study plan that include a clear mission, vision, values, goals and objectives, teaching and learning strategies, detailed curricular contents, a system of student assessment and program evaluation. This study plan should be evidence-based participatory flexible to accommodate changing priority needs and rising community expectations.

- *Content*

1. Medical schools must include basic behavioral and social sciences in the curriculum.
2. Students must be prepared to know about biological variation, and have an understanding of scientific methods, including both the technical and ethical principles..
3. Student must know about and understand the principles of treatment including the following.
 - a. How to evaluate effectiveness against evidence.
 - b. How to take account of patients' own views and beliefs when suggesting treatment options.
 - c. The effective and safe use of medicines as a basis for prescribing, including side effects, harmful interactions, antibiotic resistance and genetic indicators of the appropriateness of drugs.
 - d. Rehabilitation, and care within institutions and the community.
 - e. Relieving pain and distress.
 - f. Palliative care, including care of the terminally ill.
4. The curriculum must be intellectually challenging and place greater demand on students as they progress. Students should have time for reflection and personal growth, to catch up on elements they have missed because of illness, or other good reasons. In this regard the content should include, time management, organization skills, leadership development and community interaction skills.

5. Students must be prepared to communicate clearly, sensitively and effectively with patients and their relatives, and colleagues from a variety of health and social care professions. Clear communication will help them carry out their various roles, including clinician, team member, team leader and teacher. Students must have opportunities to practice communicating in different ways, including spoken, written and electronic methods. There should also be guidance about how to cope in difficult circumstances. Some examples are listed below.

- a. Breaking bad news.
- b. Dealing with difficult and violent patients.
- c. Communicating with people with mental illness, including cases where patients have special difficulties in sharing how they feel and think with doctors.
- d. Communicating with and treating patients with severe mental or physical disabilities.

- *Structure*

1. Curriculum structure should be based on priority health problems of the country, the requirement of the health system and community expectations.
2. Integration of basic and clinical sciences must be encouraged by all medical schools in the Kingdom
3. Together the core curriculum and SSCs must allow students to meet the curricular outcomes. This will make sure that graduates have the necessary knowledge, skills and attitudes to practice as interns and residents. Medical schools must determine the way in which the curricular outcomes are met.
4. SSCs support the core curriculum and must allow students to do the following:
 - a. Learn about and begin to develop and use research skills.
 - b. Have greater control over their own learning and develop their self-directed learning skills.
 - c. Study, in depth, topics of particular interest outside the core curriculum.
 - d. Develop greater confidence in their own skills and abilities.
 - e. Present the results of their work verbally, visually or in writing.
 - f. Consider potential career paths.

- *Delivery*

Advances in information technology should be utilized for curriculum delivery. This should not replace face to face contact or bed-side teaching but should be complementary to traditional delivery

Teaching and learning

1. Modern educational theory and research must influence teaching and learning. Medical schools should take advantage of new technologies to deliver teaching.
2. The clinical and basic sciences should be taught in an integrated way throughout the curriculum utilizing priority health problems.
3. Clinical education must reflect the changing patterns of healthcare and provide experience in a variety of environments including hospitals, general practices and community medical services.
4. From the start, students must have opportunities to interact with people from a range of social and ethnic backgrounds. This might involve posting student in rural and provincial hospitals or visiting elderly or disabled in states or taking part in community projects that are not necessarily medically related. Such contact with patients encourages students to gain confidence in communicating with a wide range of people, and can help develop their ability to take patients' histories and examine patients. During the later years of the curriculum, students should have the opportunity to become increasingly competent in these skills and in planning patient care.
5. Students must have different teaching and learning opportunities that combine an appropriate balance of teaching in large groups with small groups, practical classes and opportunities for self-directed learning. Medical schools should explore and, where appropriate, provide opportunities for students to work and learn with other health and social care professionals. This will help students understand the importance of teamwork in providing care.

Faculty Development

1. Every faculty or a doctor who comes into contact with medical students should recognize the importance of role models in developing appropriate attitudes and behavior towards patients and colleagues.

2. Medical schools must make sure that every person involved in educating medical students has the necessary knowledge, skills and attitudes. Staff-development programs should promote teaching and assessment skills. All staff should take part in such programs.
3. The quality of teaching must be monitored through a number of different systems, including staff appraisals, student feedback and reviews of teaching by peers.
4. Combining educational expertise within a medical education unit can help this process.

Assessing student performance and competence

1. Schemes of assessment must support the curriculum and allow students to prove that they have achieved the curricular outcomes. This means assessment must allow students to demonstrate the breadth and depth of their knowledge, and to show what they can do. Professional attitudes and behavior must also be assessed.
2. Medical schools should use a range of assessment techniques that are appropriate for testing the curricular outcomes. Medical schools should determine the most appropriate scheme of assessment for their curriculum. However, schemes must meet best practice in assessment, and medical schools must be able to provide evidence that the schemes are valid and reliable, and that they have processes for setting standards and making decisions about student performance.
3. When students get close to graduating, their knowledge, skills, attitudes and behavior must be thoroughly assessed to determine their fitness to practice.
4. Schemes of assessment must be open, fair and meet appropriate standards. Medical schools must make sure that:
 - a. there is a clear indication of how the scheme of assessment deals with all the curricular outcomes;
 - b. there is a clear indication of how individual assessments and examinations contribute to the overall assessment of the curricular outcomes;
 - c. when they design individual examinations and assessments, there is a clear indication of how the targeted curricular outcomes have been met;

- d. students have clear guidance about what is expected of them in any examination or assessment;
- e. examiners are trained to carry out their role and to apply the medical school's assessment criteria consistently;
- f. examiners have clear guidelines for marking assessments, which indicate how performance against targeted curricular outcomes should be rewarded.

Student selection

Medical schools should put in place open, objective and fair selection procedures. They should also publish information about the admission system, including guidance about the basis on which places at the medical school will be offered and the selection process. The staff responsible for selecting students should include individuals with a range of expertise and knowledge. All those involved in selecting students should be trained to apply guidelines about entry requirements consistently and fairly.

As far as admission of graduate students or school leaver is concerned, both systems has its own advantages and it is more appropriate to have both systems in Saudi Arabia as the case in many countries.

IV. DENTISTRY

Introduction:

The primary goal of dental education is to provide qualified dental practitioners to fulfill oral health needs of the community. Effective dental education programs must meet the current and future demand for oral health care. Indeed, dental education must be responsive to changes in current and projected disease demographics, to advances in technology, and changes in societal culture affecting patient demand for treatment (1, 2). The two most common oral diseases are dental caries and periodontal disease. Currently, we are faced in Saudi Arabia with a high prevalence of dental caries (3, 4), whereas developed countries have seen a decline in dental caries experience (5, 6, 7). Periodontal disease, on the other hand, affects sixty percent of adults in the United States in their lifetime (5) with about 90% of Saudi population (over the age of 25 years) affected by periodontal disease (8). The end result of these two diseases is tooth loss with statistics of our country showing 46% of the population over 65 are completely edentulous (9) and over 65% of the adult population are partially edentulous (10). The differences in disease patterns between our country and developed countries necessitate modifying the focus of dental education in order to meet the specific needs of our country. We are faced with the problem of low dentist/population ratio compared to countries with high standards of oral health care. The ratio of dentist (4900) in the kingdom of Saudi Arabia to population (22.6 million) is currently at 2 to 10000 which is low compared to the standard of developed countries of 4-15 dentists per 10000 and falls in the low range of developing countries of 0.7 to 7.4 dentists to 10000 people (11,12, 13). It is expected that the current population number of over 22.5 million will increase to more than 36 million by 1445 H (11). Indeed, the number of dentists needed in 1445 H could be estimated at over 18000 dentists up from the current figure of around 4900 (11, 13) considering a reasonable dentist population ratio of 5 dentists per 10000 population. Of the 4900 dentists working in Saudi Arabia only about 22 % are Saudis (13). This fact adds to the challenge of dental education planning where we have to consider expansion in the output of qualified oral health care providers while maintaining quality, focus on community needs, and working with available financial resources. The current trends in dental education in countries with advanced oral health care systems will be presented and then a suggestion for a dental education plan that fits our specific needs will be formulated.

Study goals:

- Review dental education trends in developed countries.
- Determine future directions for dental education in Saudi Arabia

Study methodology:

This research was based on searching the literature for future directions in dental education in the United States and Canada, Sweden in Europe, and Australia. The Recommendations of this study were developed through an expert panel that met to shape the recommendations for future directions. The experts involved are:

1. Prof. Abdallah Saad Al-Yahya, B.D.S., Endo. Cert., M.Sc. Professor, Department of Restorative Dental Sciences, Vice Dean for Academic Affairs, College of Dentistry, King Saud University.
2. Dr. Khalid Ali Al-Wazzan. B.D.S., Prosthodontics Cert. M.Sc. Associate Professor, Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University.
3. Dr. Ra'ed Ibrahim Al-Sadhan. B.D.S., M.Sc., OMF Rad. Board Diplomate. Assistant Professor, Department of Maxillofacial and Diagnostic Dental Sciences, College of Dentistry, King Saud University.
4. Dr. Hassan Solaiman Halawany. B.D.S., M.P.H., M.S., M.H.S.A., DrPH. Assistant professor, Department of Preventive Dental Sciences, College of Dentistry, King Saud University.
5. Hesham Saleh Khalil, B.D.S., MSc. MFDSRCS, Ph.D. Assistant Professor, Department of Maxillofacial and Diagnostic Dental Sciences, College of Dentistry, King Saud University.

The final proposal was reviewed and improved by comments from:

Dr. Gerald Glickman
Professor and Chair, Dept. of Endodontics
Baylor College of Dentistry
3302 Gaston Ave, Dallas TX 75246, USA

Dr. Saleh Al-Shamrani, Vice Dean for Academic Affairs, Riyadh Dental and Pharmacy College.

International Directions in Dental education:

Prerequisites for admission:

- The general direction in the U.S., Canada, Some universities in Australia (14) is to have dental education as a graduate level education, i.e. to have some university level education prior to admission to the dental school.
- The trend in Canada and Some universities in Australia is to have an admissions test that includes psychomotor skills (14, 15).

New concepts of Dental education:

- Oral-physician concept or the tooth-doctor role (5):

Some dental educators now advocate an oral physician model as the desired future shape for the profession, with more training in systemic disease pathophysiology and an expanded practice scope beyond teeth and supporting structures.

Dentists are health care providers who are trained to assess and treat diseases and abnormalities of the orofacial region, which is a well-defined region anatomically and functionally similar to the anatomical or functional practice domains for other medical specialties. Dental training should be assimilated to the training of students preparing for careers in other areas of medical specialization. Multidisciplinary approach to address high-morbidity diseases and abnormalities of the orofacial complex is essential for effective management. For example, evidence suggest that reducing maternal reservoirs of mutant streptococci, preventing transmission of bacteria from mothers to infants, and enhancing the child's resistance to bacterial implantation are practical approaches to the prevention of primary caries. Effective implementation of those preventive measures and education of the public about the infectious transmission of caries requires teamwork between pediatricians, dentists, and public health workers.

- Demographic changes (16)
Dental schools must be sensitive to changes in demography as it relates oral and craniofacial health. Changing and emerging disease patterns must be monitored and reflected in the curriculum.

- The biologic sciences vs the clinical sciences (17)
To maintain its status as co-equal to medicine in health service to the public, dentistry must educate its practitioners to the same or very similar standard and depth of knowledge in the biomedical sciences as medicine.

- Overcrowded predoctoral education vs. fundamental reformat (17).
With advances in dentistry it has become increasingly difficult to educate students to high levels of clinical proficiency in restorative dentistry while at the same time educate the students in all the specialty fields of dentistry. To help solve this issue it is suggested to add one year of postdoctoral education or internship prior to independent practice to help cover more advanced topics in dental education and provide more time in the curriculum for basic skills and training.

- Limited vs broadened public service role (17).
The profession of dentistry must pay attention to the problem of oral health disparity and involve the students in community service settings.

- Prevention (18, 19).
The term “oral health” should be promoted instead of Dentistry to emphasize the commitment towards the prevention of disease and promotion of health. The oral ecosystem conceptual model should be promoted to convey the idea that prevention and treatment of periodontal diseases and caries aims at establishing equilibrium of the processes occurring in the oral cavity.

- Life-long learning (14, 18, 20).
Emphasis should be placed on clinical reasoning with the seeking of information as required in a self-directed manner (14). Learning attitude should be cultivated to promote life-long learning (18). Problem-based, and access to web-based materials challenge students abilities, generate independent learning, develop the power of critical assessment and encourage commitment to life-long learning.
- Holistic patient care (total patient care) (14, 19, 21).
Patient care as providing care for the individual rather than as providing quantitative items of dental treatment. One student is responsible for the total care of all his/her patients. By assuming responsibility for the total care of every patient, students approach clinical training from an interdisciplinary perspective, and their learning experiences are derived from the formulation of strategies, tailored to solve clinical problems they encounter in their patients (21).
- Medical ethics (21)
Medical ethics training sessions should run throughout the entire curriculum starting early in the curriculum.
- Communication skills (21)
Communication skills should run throughout the entire curriculum starting early in the curriculum.

New trends in dental education curriculum:

- Competency-Based Curriculum (CBC) (5):

This method is based on three questions that faculty must answer to develop a competency-based health professions education curriculum:

*What knowledge, skills, and professional/personal values should the student possess at the time of graduation so he or she will be ready for the next level of training (e.g., a postgraduate year one) or be prepared to serve as an independently functioning entry-level general practitioner?

* What learning experiences will enable students to acquire these competencies?

*How do faculty know whether students have attained these competencies—what proof, or evidence, is needed to establish that a student has attained competency?.

Competency-based curriculum (CBC) has three features that are different from what most health professions educators have experienced:

- (1) Top-down planning based on analysis of contemporary and predicted future health care needs of the public and the associated responsibilities of practitioners in the field,
- (2) A readiness-based model in which students advance through the curriculum at different rates from each other based on their individual capabilities, and
- (3) A horizontal curriculum structure in which students progress through competency modules hierarchically sequenced by difficulty level, and characterized by tight time proximity between laboratory learning and clinical experience.

An important feature of the hierarchical CBC model is that interrelated preclinical experiences (e.g., developing basic technical skills in a laboratory) and clinical experiences with patients both occur within learning modules throughout the curriculum rather than via the traditional system of limiting laboratory work to the first half of the educational program and clinical work to the third and fourth years.

- Top-down Planning (5):

Top-down planning leads to what is called a needs-based curriculum. The curriculum is designed by assessing expected practitioner tasks and responsibilities and structuring learning activities to meet these responsibilities.

- Readiness-based Model (5):

In a traditional time-based curriculum, it is assumed that spending a fixed number of years in training will ensure competency. In the readiness-based model of the CBC, students proceed through the educational program at different rates depending on individual capabilities. The student remains in training until he or she demonstrate the ability, through competency assessments, of using the designated skill in patient care without assistance.

- Horizontal Curriculum Structure (5):

Horizontal curriculum structure attempts to coordinate information obtained across disciplines. This is frequently called lined-up” curriculum that coordinates morphology, anatomy, physiology, pathology, and treatment both for the head and neck region (craniofacial) and for the organ systems of the human body.

- Horizontal and vertical integration (22).

Vertical integration is the integration of basic knowledge and skills, such as biology, in clinical context. Horizontal integration is the integration of knowledge and skills between the clinical subjects that relates to the comprehensive and holistic (total) patient care.

- Self-assessment: (19, 23).

“The involvement of students in identifying standards and/or criteria to apply to their work and making judgments about the extent to which they have met these criteria and standards” (23). Students tend to perform better in tests (24, 25), increase their motivation to learn (26), and change their attitude to learning from on of “how I performed?” to the of “how can I get better?” (19). It should be applied as a pedagogic goal rather than for the purpose of grading (19)

- Problem Based Learning (18,19).

An educational strategy based on evidence from cognitive psychology. It is based on three conditions:

- a. Activation of prior knowledge will facilitate subsequent processing of new information.
- b. Encoding specificity, matching context facilitates recall and learning.
- c. Elaboration on knowledge at the time of learning will enhance subsequent retrieval.

- Modules (5,22):

In the module system, the students are assembled into learning teams of six to eight students led by an instructor who is assisted by one or more senior students who serve as teaching assistants (TAs). The group of students, instructor, and TAs work together every day in the lab and also move together from the laboratory into the clinic. Upon successful demonstration of competency, students enter a new module where they are reorganized into new learning squads, meet new instructors and TAs, and repeat the process. .

- Evidence based dental education: (20, 27)

Evidence based dentistry is the process of making decisions based on the best known evidence. The goal of evidence based dental education is to train students to become dental practitioners who are able and willing to look for and make sense of evidence available in order to apply it to everyday clinical problems.

- Computer-assisted (based) learning (14, 28):

Self-directed learning as a prelude to life-long learning requires appropriate information technology facilities. Computer and Internet support, comprehensive library support, and educational software and necessary (14). Computer patient simulators and computerized learning modules containing demonstrations of procedures that usually go on in the class are examples of computer-assisted learning (17). It allows for the important

aspects of education to be investigated when the student wishes and not when it is convenient for faculty.

Reform Agenda recommended by the United States Commission on Dental Accreditation (5):

In the United States there are attempts to reform dental education. The new dental school reform agenda to meet the accreditation standards of the Commission on Dental Accreditation, consist of the following items (5):

1. Redesign the curriculum to incorporate competency-based learning principles and evaluation methods.
2. Decompress the curriculum by eliminating outdated and peripherally relevant material.
3. Increase educational collaboration between dentistry and the other health professions, featuring more curricular emphasis on the interaction of dental and medical problems.
4. Redirect basic science course work toward disease pathophysiology taught by problem-based techniques.
5. Expose students to patients and their oral health and systemic medical problems from the first days of the curriculum to the last.
6. Revitalize the science underlying clinical decision making via evidence-based approaches.
7. Organize group-practice teams in the clinical years to promote more continuity in faculty—student relationships and expand peer teaching by students working together in clinical teams.
8. Increase the use of community-based clinics as training sites for students.
9. Include in the final year of the curriculum, or in a post-graduate internship year, a clinical experience that replicates the comprehensive care environment of the general dental practitioner.
10. Utilize computer-based and Web-based information technology to enrich students' learning.
11. Rededicate dental school clinics to serving the oral health needs of the public rather than primarily viewing patients as educational material for students.

Recommendations:

An education system for an oral health care professional should prepare a general dentist who is able to provide prevention, assessment, and treatment services for current and anticipated health care problems of the served community (5).

Oral health problems that must be addressed by oral health care provider are:

1. Dental caries.
2. Periodontal disease.
3. Health problems associated with oral diseases.
4. Craniomaxillofacial trauma.
5. Oral health care of medically compromised patients with focus on the most prevalent problems in the community.
6. Infant and pediatric oral health care including craniofacial developmental disturbances.
7. Oral rehabilitation.
8. Orofacial pathology.
9. Chronic facial pain and temporomandibular joint dysfunction.
10. Tobacco and substance abuse-related oral health problems.
11. Geriatric oral health care.

To prepare a qualified oral health care provider to meet the current and anticipated future needs of the country the following criteria must be considered:

Admission:

Keeping the current admission policy of high school rather than graduate level entry to avoid prolonging the time needed to qualify an oral health care provider.

Length of study:

Keeping the current study length of 6 years of dental education (including 1 year of pre-dental education), in addition to 1 year internship (with focus on a well-structured

advanced dental education and training program during the internship to make up for the time devoted to basic sciences and basic skills).

Reform items to improve Dental education

Reform items for immediate implementation:

- Prevention must be emphasized as a primary goal in dental education throughout all disciplines.
- Communication skills must be introduced early in the curriculum and continue throughout the curriculum.
- Professional ethics and Islamic values must be introduced early in the curriculum and emphasized throughout the whole curriculum.
- Computer-assisted (based) learning and easy access to online literature databases and other educational resources must be provided.
- A comprehensive dental library with easy student access must be available.
- Holistic patient care (total patient care) approach to patient care should be implemented.
- A final comprehensive professional exam at the end of the 6th year should assess the ability of graduating dental students to practice dentistry.

Comprehensive reform:

- **After five years of planning for established Dental Colleges.**
- **Immediate implementation in all newly established Dental Colleges.**

A comprehensive reform of the dental education system should be implemented following 5 years of a meticulous planning phase for established Dental Colleges. On the other hand, Dental Colleges that are in the planning stage, should implement these reforms immediately. The new curriculum should be designed to meet the oral health care needs of the community, in a top to bottom plan, and through consultations with dental curriculum design experts based on the following new trends of dental education in addition to the suggestions mentioned earlier for immediate implementation:

- Redesign the curriculum to incorporate competency-based learning principles and assessment methods.

- Decompress the curriculum by eliminating outdated and peripherally relevant material.
- Increase educational collaboration between dentistry and the other health professions, featuring more curricular emphasis on the interaction of dental and medical problems. Evaluate the applicability and practicality of the oral-physician model.
- Redirect basic science course work toward disease pathophysiology taught by problem-based techniques.
- Expose students to patients and their oral health and systemic medical problems from the first days of the curriculum to the last.
- Emphasize basic biomedical sciences and revitalize the science underlying clinical decision making via evidence-based approaches.
- Organize group-practice teams in the clinical years to promote more continuity in faculty—student relationships and expand peer teaching by students working together in clinical teams.
- Increase the use of community-based clinics as training sites for students.
- Utilize computer-based and Web-based information technology to enrich students' learning.
- Rededicate dental school clinics to serving the oral health needs of the public (as stated earlier, in the recommendation section, in order of priority) rather than primarily viewing patients as educational material for students.
- Develop a well-designed measurement and evaluation criteria for consistent monitoring of student progress and educational outcome.
- Self-assessment should be promoted as a pedagogic (educational) tool.
- Employ life-long learning in the educational model.
- Include Dental practice management in the curriculum.
- Provide educational strategies to promote optimum health for all patients.
- Training and motivation of faculty members to adopt the new education system though investment in faculty development programs is a must for successful educational program.
- The Dental education system should be revised periodically (every 3-5 years) to accommodate changes in oral health care needs of the community, adopt new educational methodology, and to improve the quality of dentists. A systematic

process using standardized consistent measures for continuous monitoring of community oral health needs and the ability of graduated dentists to meet these needs must be implemented to ensure a dynamic interaction between the educational institute and the community needs.

V. APPLIED MEDICAL SCIENCES

Introduction

The statistics of the Saudi Council of Health Specialties point out that the number of registered medical doctors and health practitioners in applied health sciences till 1427H is 42,440 and 2,296 practitioners, respectively. This indicates that the ratio of physicians to population is approximately one doctor for 534 populations and the ratio of health practitioners to population is approximately one practitioner for 6677 populations. One of the local studies (Al-Rabeaa, 2005) revealed that Saudi Arabia will be self-sufficient in 2024 regarding health practitioners, but the deficiency in the number of physicians will persist longer. Applied health sciences are in fact group of health specialties that share several common denominators, but in the same time they are different from many aspects. For example, the number of professional needed in the radiology and laboratory sciences is far more than that needed in genetic counseling and the nature of training in these specialties is quite different as well.

Methodology:

1. Revision of recommendations and criteria of the organizing bodies for applied health sciences such as the American Association of Schools of Allied Health Professions (AASAHP), Health Professions Council (HPC)-UK and American Council for Higher Education Accreditation (ACHEA).
2. Study and revision of the accredited professional and academic criteria available on the websites of the professional scientific associations of various applied health sciences specialties.
3. Revision and analysis of the objectives, study plans and curricula used by some universities in the United Kingdom, the United States of America and Canada.
4. Revision and analysis of published research articles about the job market needs and the developmental trends in the Kingdom of Saudi Arabia.
5. Conduction of a workshop for applied health sciences specialists to discuss the global trends in this regard. The participants in this workshop were:
 - Dr. Abdulaziz Bin Mohammad Al-Othman,
Ph.D., Clinical nutrition, University of Edinburgh, Britain

Assistant Professor, Department of Community Health, College of Applied Health Sciences, King Saud University.

- Dr. Essam Hussein Matar,

Ph.D., Radiology, University of Southampton, Britain

Assistant Professor, Department of Radiological Sciences, College of Applied Health Sciences, King Saud University.

- Dr. Turki Mohammad Al-Mubarrad,

Ph.D., Optometry, Manchester University, Britain

Assistant Professor, Department of Optometrical Sciences, College of Applied Health Sciences, King Saud University.

In addition to the Coordinator of this study Prof. Sami Bin Saleh Al-Abdulwahab.

International Trends in Applied Health Sciences:

The knowledge explosion in the medical field and the huge technical advancement that occurred in the last two decades have led to reevaluation of the programs that qualify health professionals in the field of applied health sciences to work in health institutions in a way that the professional level is guaranteed in view of these developments. The followings are the main international trends and developments in applied health sciences education:

1. It was observed that there is a wide variety of applied health sciences specialties in the United States of America, Britain and Canada compared with very limited specialties offered in Saudi universities.

2. Programs

USA:

- The applied health specialties such as physical therapy, functional therapy, vertebral moving therapy, clinical nutrition, audiology and speech, were converted to doctorate degree in each respective specialty.
- The allied health specialties such as clinical laboratory science and radiological technology were converted to subspecialties such as hematology, virology, histology, microbiology, therapeutic radiation, magnetic resonance imaging and sonography.

Britain:

- The applied health specialties did not change and there are no significant developmental suggestions in this regard.
- The allied specialties were divided into subspecialties similar to those found in American universities.

Canada:

The professional level of graduates is the M.Sc. degree for most of the applied and allied health sciences specialties, or the doctorate degree in some specialties.

3. Curriculum

The last few years were characterized by substantial revolutionary changes in the curricula of applied health sciences similar to what happened in other medical specialties. These are summarized in the following:

- Adoption of the problem-based learning system as this way is the closest to the day to day practice of health practitioners in the field of applied health sciences.
- Self assessment and reflection to give the student the opportunity to verify meeting the course/study objectives.
- Stressing and practicing the concept of working within a multidisciplinary team and

Suggested Domestic Trends in Applied Medical Sciences:

1. The specialties that are not currently available in Saudi Arabian universities should be offered within the next ten years since the Saudi job market is in great need for them such as functional therapy, clinical physiology, genetic counseling, cardiovascular irrigation and podiatry. Other new specialties should be considered later.
2. All therapeutic applied medical sciences specialties, such as optometry, physical therapy and therapeutic nutrition, should be shifted to the clinical doctorate degree in each respective specialty.
3. All diagnostic applied medical sciences specialties, such as clinical laboratory science and radiology, etc, should be divided into definite subspecialties to qualify the graduates to perform accredited diagnostic tasks where students are expected to

specialize in one of these subspecialties in the last academic year of the B.Sc. program.

4. The syllabus of applied medical sciences courses should be re-evaluated and re-written to comply with the country's needs. These courses should be based on clear practice concepts such as evidence-based medicine, community-based medicine and problem-solving medicine.

COMMON RECOMMINDATIONS

As this study has shown, the five health specialties (Nursing, Pharmacy, Medicine, Dentistry, and Applied Health Sciences) are different in their programs, length of study, and admission criteria. However, these programs share, in a great deal, several international developments and trends that appeared in the few years in the curriculum component. It might be obvious that most of these developments and trends have been mentioned repeatedly in more than one specialty. In this section of the study, we will summarize the major trends that are recommended for health education in Saudi Arabia while taking in consideration that the need for these recommendations varies from one specialty to another and from one college to another depending on the external and internal environment of each college.

1. Comprehensive review and update of curricula to include:

Restructuring the curricula in a way makes:

- Objectives specific and clear
- Curriculum elements are linked and integrated
- Community health problems are under focus and well-addressed
- Students have early clinical experience

Involving the student in the learning process thought:

- Problem based learning
- Electronic learning
- Self-study
- Elective

Skills training such as:

- Effective communication
- Leadership skills
- Teamwork skills
- Self-evaluation
- Critical thinking
- Utilization of health informatics
- Research

Attitudes and concepts such as:

- Ethics of practice
- Comprehensive (holistic) patient care
- Multidisciplinary teamwork
- Evidence-based health care

Improving assessment tools

Multiple different assessment tools with high validity and reliability should be used and should be directed to the educational objectives.

2. Instituting faculty development programs

This should include:

- Training on the several instructional methods
- Training on the several assessment tools
- Student mentoring and support
- Research and publication in the field of health education
- Training on curriculum design and course development and evaluation
- Training on better utilization of technology in education
- Development of skills of dealing with electronic learning

3. Making adoption of innovative curricula and new programs compulsory on newly established colleges

This is because it is more likely that implementation on new trend and innovations will be successful in newly established colleges as they might not face the obstacles known when attempting to change an established system. However, the new colleges will not be able to achieve this with having the necessary resources available as the new trends mandate a specific infrastructure and strong collaboration with the various health care providers as well as faculty staff who are committed to change.

In summary, the health education objective of graduating students who are able to fill the continuing need in the health institution in the Kingdom of Saudi Arabia in the desired quantity and quality mandated by the projected future development of the country is fulfilled only through improving the health education programs in the Saudi universities in the following respect:

1. Curricular reform including design, instructional methods, and assessment.
2. Stressing the important concepts in health care.
3. Adequate training on the important skills
4. Attention to faculty development programs

REFERENCES

A. NURSING

Arabic references:

1. المملكة العربية السعودية وزارة الاقتصاد والتخطيط مصلحة الإحصاءات العامة (النتائج الأولية للتعداد العام للسكان والمساكن 1425 هـ 2004 م).
2. المملكة العربية السعودية ديوان الخدمة المدنية لائحة الوظائف الصحية وملحقاتها وسلم الرواتب.
3. مكانات وأدوار الممرضين والممرضات في النسق الطبي د . عبدالعزيز بن علي خازلي – الأردن.
4. العوامل المؤثرة على اختبار الفتاة السعودية لمهنة التمريض – بحث ميداني د. أميمه حمدي والدكتور عبدالمحسن الحيدر 1416 هـ.
5. الوضع الراهن لقوى العاملة الصحية في المملكة و اتجاهات المستقبل. د. عثمان عبدالعزيز الربيعة , المؤتمر الرابع للجمعيات الطبية الخليجية 2/ صفر/ 1426 هـ
6. www.alyaum.com الدكتورة صباح ابوزنادة 1423/7/16 هـ ندوة خليجية للتمريض بالتخصصي (الندوة الخليجية الخامسة للتمريض)
7. www.alriyadh.com/ الدكتور محمد المجلي 1423/5/20 نسبة السعودة في مهنة التمريض.
8. لماذا نسبة التمريض في بلادنا لا تتجاوز 17% - عبدالله صالح الحمود - صحيفة الجزيرة العدد 10840 – الأثنين 22_3_1423 هـ

English references:

1. Ajuwon GA. Computer and internet use by first year clinical and nursing students in a Nigerian teaching hospital. BMC Medical Informatics and Decision Making 2003; 3:10.
2. Anderson AL and Gilliss CL. Nurse practitioners, certified nurse midwives, and physician assistants in California. West J Med 1998; 168:437-444.
3. Anecita Gigi Lim and Michelle Honey. Integrated undergraduate nursing curriculum for pharmacology. Nurse Education in Practice 2006; 6: 163-168
4. Bartels JE. Educating nurses for the 21st century. Nursing and Health Sciences 2005; 7: 221-225

5. Becker EA and Godwin EM. Methods to improve teaching interdisciplinary teamwork through computer conferencing. *Journal of Allied Health*. 2005;34(3):169-176
6. Belanger, J. Nursing Informatics on the Move. *Online Journal of Nursing Informatics*, February 2006.
http://www.eaa-knowledge.com/ojni/ni/10_1/belanger.htm
7. Ben-Zur H, Yagil D and Spitzer A. Evaluation of an innovative curriculum: nursing education in the next century. *Journal of Advanced Nursing* 1999; 30: 1432-1440
8. Betsy F, Adams MH , Edelstein J , Speakman E and Shelton M. Community-Based Nursing Education of Prelicensure Students: SETTINGS AND SUPERVISION. *Nursing Education Perspectives*. 2005;26:283-286
9. Bittle M, Duggleby W and Ellison P. Implementation of the essential elements of service learning in three nursing courses. *Journal of Nursing Education*. 2002;41:129-132
10. Board of governors, National League for Nursing. Position Statement: Transforming Nursing Education. *Nursing Education Perspectives*; 2005; 26(3):195-197
11. Bowen M, Lyons KJ and Young BE. Nursing and health care reform: implications for curriculum development. *Journal of Nursing Education*. 2000;39:27-33
12. Broussard L. School Nursing: Not Just Band-Aids Any More! *Journal for Specialists in Pediatric Nursing* 2004; 9: 77-83
13. Candela L, Dalley K and Benzel-Lindley J. A case for learning-centered curricula. *Journal of Nursing Education*. 2006; 45: 59-66
14. Chan S and Wong F. Development of basic nursing education in China and Hong Kong. *Journal of Advanced Nursing* 1999; 29:1300-1307.
15. Chavasse J. Curriculum evaluation in nursing education: a review of the literature. *Journal of Advanced Nursing* 1994; 19:1024-1031
16. Chen S-L, Witucki J, Melcher P and McKibben MA. Use of nursing homes in Baccalaureate nursing education. *Nursing and Health Sciences* 2001; 3: 57-61
17. Clancy J, McVicar A and Bird D. Getting it right? An exploration of issues relating to the biological sciences in nurse education and nursing practice. *Journal of Advanced Nursing* 2000; 32: 1522-1532
18. Cohen B, Timour JA. A Clinical Program for In-Service Nurses: A Preliminary
19. Corbett K. The captive market in nurse education and the displacement of nursing knowledge. *Journal of Advanced Nursing* 1998; 28: 524-531.
20. Effken JA and Carty B. The era of patient safety: Implications for nursing informatics curricula. *J. Am. Med. Inform. Assoc.* 2002; 9:S120-S123
21. Ervin NE, Bickes JT and Schim SM. Environments of care: a curriculum model for preparing a new generation of nurses. *Journal of Nursing Education*. 2006;45:75-80
22. Fick GR. Integrating bibliographic instruction into an undergraduate nursing curriculum. *Bull. Med. Libr. Assoc.* 1988; 76: 269-271.
23. Freeman LH, Voignier RR and Scott DL. New curriculum for a new century: beyond repackaging. *Journal of Nursing Education*. 2002;41:38-40
24. Furlong E and Smith R. Advanced nursing practice: policy, education and role development. *Journal of Clinical Nursing* 2005; 14: 1059-1066.
25. Gerrish K, McManus M and Ashworth P. Creating what sort of professional? Master's level nurse education as a professionalising strategy. *Nursing Inquiry* 2003; 10: 103-112.
26. Grisetti O, Jacono B and Jacono J. The nurse educator's clinical role. *Journal of Advanced Nursing* 2005; 50: 84-92.
27. Haddad L, Kane D, Rajacich D, Cameron S and Al-Ma'aitah R. A Comparison of Health Practices of Canadian and Jordanian Nursing Students. *Public Health Nursing* 2004; 21: 85-90.

28. Hannigan B. A discussion of the strengths and weaknesses of 'reflection' in nursing practice and education. *Journal of Clinical Nursing* 2001; 10: 278-283
29. Hanson S. Teaching health care ethics: why we should teach nursing and medical students together. *Nursing Ethics*. 2005;12:167-176
30. Harpaz I, Balik C and Ehrenfeld M. Concept mapping: An educational strategy for advancing nursing education. *Nursing Forum* 2004; 39: 27-36
31. Heller BR, Oros MT, Durney-Crowley J. The Future of Nursing Education: Ten Trends to Watch. <http://www.nln.org/nlnjournal/infotrends.htm>
32. Herdman EA. The illusion of progress in nursing. *Nursing Philosophy* 2001; 2: 4-13.
33. Isaacson JJ and Stacy AS. Nursing students in an expanded charge nurse role: a real clinical management experience. *Nursing and Health Care Perspectives*. 2004;25:292-296
34. Jacobs PM and Koehn ML. Curriculum evaluation. Who, when, why, how? *Nursing and Health Care Perspectives*. 2004;25:30-35
35. Jairath N and Stair N. A development and implementation framework for Web-based nursing courses. *Nursing and Health Care Perspectives*. 2004; 25: 67-72
36. Jean A Dyer. Multidisciplinary, interdisciplinary, and transdisciplinary educational models and nursing education. *Nursing Education Perspectives*; Jul/Aug 2003; 24(4):186-188
37. Jerlock M, Falk K and Severinsson E. Academic nursing education guidelines: Tool for bridging the gap between theory, research and practice. *Nursing and Health Sciences* 2003; 5: 219-228
38. Johnson-Crowley N. An alternative framework for teacher preparation in nursing. *Journal of Continuing Education in Nursing*. 2004;35:34-43
39. Jones S, Dunn D and Coffey D. Strengthening the nursing curriculum: an interdisciplinary course addressing agricultural health and safety. *AAOHN Journal*. 2004; 52:397-400
40. Kyrkjebo JM. Teaching quality improvement in the classroom and clinic: getting it wrong and getting it right. *Journal of Nursing Education*. 2006;45:109-16
41. Layton B and Hahn K. The librarian as a partner in nursing education. *Bull. Med. Libr. Assoc.* 1995; 83: 499-502.
42. Linderman CA. The future of nursing education. *Journal of Nursing Education*. 2000;39:5-12
43. Manninen E. Changes in nursing students' perceptions of nursing as they progress through their education. *Journal of Advanced Nursing* 1998; 27:390-398
44. Martin P, Yarbrough S and Alfred D. Professional values held by baccalaureate and associate degree nursing students. *Journal of Nursing Scholarship*. 2003;35:291-296
45. Mawn B and Reece SM. Reconfiguring a curriculum for the new millennium: the process of change. *Journal of Nursing Education*. 2000;39:101-108
46. Moore P and Hart L. Strategies for teaching nursing research online. *International Nursing Review* 2004; 51: 123-128.
47. Moore P and Hart L. Strategies for teaching nursing research online. *International Nursing Review* 2004; 51: 123-128
48. Nehls N and Vandermause R. Community-driven nursing transforming nursing curricula and instruction. *Nursing and Health Care Perspectives*. 2004;25:81-5
49. Nursing Home Administrator Licensure Qualifications: 2006-2007.
50. Nursing Work Force: Emerging Nurse Shortages Due to Multiple Factors. United States general Accounting Office, July 2001.
51. Oweis AI. Bringing the professional challenges for nursing in Jordan to light. *International Journal of Nursing Practice* 200; 11: 244-249.

52. Papastrat K and Wallace S. Teaching baccalaureate nursing students to prevent medication errors using a problem-based learning approach. *Journal of Nursing Education*. 2003;42:459-464
53. Report. *Bull. Med. Libr. Assoc.* 1980; 68:293-294.
54. Reutter L and Williamson DL. Advocating healthy public policy: implications for baccalaureate nursing education. *Journal of Nursing Education*. 2000;39:21-6
55. Rodehorst TK, Wilhelm SL and Jensen L. Use of Interdisciplinary Simulation to Understand Perceptions of Team Members' Roles. *Journal of Professional Nursing* 2005; 21: 159-166
56. Ross F and Southgate L. Learning together in medical and nursing training: aspirations and activity. *Medical Education* 2000; 34: 739-743
57. Scott ES, Moye JP. Leadership initiative for nursing education. *Preparing Tomorrow's Nurses for leadership*. February 2002
58. Summary of the Global Shortage of Registered Nurses (International Council of Nurses), 2005, 3, place Jean-Marteau, 1201 Geneva, Switzerland.
59. Swenson MJ, Salmon ME, Wold J, and Sibley L. Addressing the challenges of the global nursing community. *International Nursing Review* 2005; 52: 173-179.
60. Sztembis B. The past, present and future of nurse education in Poland: stages, conditions and activities. *International Nursing Review* 2006; 53: 102-109.
61. Teeley KH, Lowe JM, Beal J and Knapp ML. Incorporating quality improvement concepts and practice into a community health nursing course. *Journal of Nursing Education*. 2006;45:86-90
62. Tholcken M, Clark MC and Tschirch P. Case management in the undergraduate curriculum. *Journal of Nursing Education*. 2004;43:45-8
63. Varga-Atkins T and Cooper H. Developing e-learning for interprofessional education. *Journal of Telemedicine and Telecare*. 2005; Supplement 1:102-104
64. Wiesenthal D. the future role of the health sciences library in the Department of Veterans Affairs. *Bull. Med. Libr Assoc* 1993; 81: 129-134.
65. Wong FKY, Chan S and Yeung S. Trends in nursing education in China. *Journal of Nursing Scholarship* 2000; 32: 97-99
66. Wozar JA and Worona PC. The use of online information resources by nurses. *J. Med. Libr. Assoc.* 2003; 91: 216-221
67. Zabalegui A, Macia L, Márquez J, Ricomá R, Nuin C, Mariscal I, Pedraz A, German C and Moncho J. Changes in nursing education in the European Union. *Journal of Nursing Scholarship* 2006; 38: 114-118
68. Zabalegui A, Macia L, Márquez J, Ricomá R, Nuin C, Mariscal I, Pedraz A, Germán C and Moncho J. Changes in Nursing Education in the European Union. *Journal of Nursing Scholarship* 2006; 38: 114-118.
69. Zahner SJ and Block DE. The road to population health: using Healthy People 2010 in nursing education. *Journal of Nursing Education*. 2006;45:105-8

International societies, organizations and universities:

1. Center for nursing education mission statement. <http://www.ucdmc.ucdavis.edu/cne/aboutus/>
2. Heller BR, Oros MT, Durney-Crowley J. The Future of Nursing Education: Ten Trends to Watch. <http://www.nln.org/nlnjournal/infotrends.htm>
3. Missouri State University. Department of Nursing, Mission and Philosophy. <http://www.missouristate.edu/nursing/misson.htm>

B. PHARMACY

Arabic references:

1. المؤتمر الرابع للجمعيات الطبية الخليجية 2- 4 صفر 1426هـ (12- 14 مارس 2005م) والوضع الراهن للقوى العاملة الصحية في المملكة واتجاهات المستقبل د. عثمان عبدالعزيز الربيعه.
2. معايير رسالة كليات الصيدلة والتخطيط والتقييم، كلية الصيدلة جامعة الملك سعود، 1426 هـ، ترجمة الدكتور هشام أبو عودة.
3. الكتاب الإحصائي السنوي لعام 1424هـ المملكة العربية السعودية وزارة الصحة - إدارة الإحصاء .
4. معايير رسالة كليات الصيدلة والتخطيط والتقييم . كلية الصيدلة - جامعة الملك سعود 1426 هـ / 2005م .
5. تقرير التنمية البشرية عام 2003م وزارة الإقتصاد والتخطيط - المملكة العربية السعودية.
6. نظام مزاولة المهن الصحية الذي أقره مجلس الوزراء في جلسته المنعقدة بتاريخ 3 ذي القعدة 1426هـ <http://www.rkh.med.sa/ar/healthawareness/ethics.htm>
7. مجلس القوى العاملة الأمانة العامة الرياض استراتيجية تنمية القوى العاملة في القطاع الصحي 1423هـ.
8. المملكة العربية السعودية وزارة الإقتصاد والتخطيط مصلحة الإحصاءات العامة (النتائج الأولية للتعداد العام للسكان والمساكن 1425هـ 2004م).

English references:

1. Al-Bekairi AM. Future Trends in Pharmaceutical Education and Research. College of Pharmacy, King Saud University, Riyadh, Saudi Arabia. 2 pages.
2. Barbara A. , Donelle A., Multi-Cohort Learning: Teaching Pharmacy Students About Compliance, Counseling and Mentoring, American Journal of Pharmaceutical Education, 62, 1998, 342-346.
3. Barford J and Weston C. The use of video as a teaching resource in a new university. British Journal of Educational Technology 1997; 28: 40-50.

4. Brueggemeir RW. Perspectives on the future of graduate education in medicinal chemistry and pharmacognosy. *Amer. Journal of Pharm. Educa.*, 1998; 62: 463-467.
5. Cooper H, Carlisle C, Gibbs T and Watkins C. Developing an evidence base for interdisciplinary learning: a systematic review. *Integrative Literature Reviews and Meta-Analyses* 2001; 228.
6. Cox AR, Marriott JF, Wilson KA and Ferner RE. Adverse drug reaction teaching in UK undergraduate medical and pharmacy programs. *Journal of Clinical Pharmacy and Therapeutics* 2004; 29: 31-35.
7. Harrold MW and Newton GD. Development and evaluation of computer-based tutorials in biochemistry and medicinal chemistry. *American Journal of Pharmaceutical Education* 1998; 62: 24. 7 pages.
8. Hughes FN. The changing picture of Canadian pharmacy. Read at the 58th Annual Meeting of the Medical Library Association, June 15-19, 1959, Toronto, Canada. *Bull Med Libr Assoc.* 1960; 48:162-167.
9. Ibrahim MIM, Awang R and Razak DA. Introducing social pharmacy courses to pharmacy students in Malaysia. *Medical Teacher* 1998; 20:122-126.
10. Jordan S. Educational input and patient outcomes: exploring the gap. *Journal of Advanced Nursing* 2000; 31: 461-471.
11. Leslie SW. Pharmacy Faculty Workforce: Increasing the numbers and holding to high standards of excellence. *American Journal of Pharmaceutical Education* 2005; 69(5) Article 93.
12. Michael H., Matthew J., 21st Century Issues in Pharmacy Education in the United Kingdom. *American Journal of Pharmaceutical Education*, 2003; 67 : 4, Article 122.
13. Odedina, Folakemi T., Multifaceted active learning approach to teaching pharmacy health care and behavior, *American Journal of Pharmaceutical Education*, http://www.findarticles.com/p/articles/mi_qa3833/is_200110/ai_n8962272/print.
14. Peter J., Angela. B., Brad J. , Jeffrey. L., Clinical Pharmacists and Inpatient Medical Care, *Arch. Intern. Med.*, 2006, 3, 955-964.
15. Robert A., American Pharmaceutical Education, 1952-2002, *Journal of the American Pharmaceutical Association*, 2002, 42, 542-544.
16. Robin, C et al, University education of medicinal chemist: comparison of eight countries, *Eur. J. Med. Chem.*, 2000, 35, 163-174.
17. Roger W., Clinical pharmacy: Is it a credible academic discipline?, *Pharmaceutica Acta Helvetiae*, 1996, 71, 367-371.
18. Summers R, Haavik C, Summers B, Farhana M, Lowes M and Enslin G. Pharmaceutical Education in the South African Multicultural Society. *American Journal of Pharmaceutical Education* 2001; 65: 150-154.

Universities:

1. University of Washington, School of Pharmacy – Vision for the Future. 2006; <http://depts.washington.edu/pha/future.html>
2. School of Pharmacy at Temple University. Mission, Vision and Strategic Goals. <http://www.temple.edu/pharmacy/about.htm>
3. University of Maryland School of Pharmacy. Mission, Vision and Goals. <http://www.pharmacy.umaryland.edu/psc/mission.htm>
4. University of Maryland, School of Pharmacy. About the School. <http://www.pharmacy.umaryland.edu/about/mission.htm>
5. University of Colorado, School of Pharmacy about the School of Pharmacy. http://www.uchsc.edu/sop/general_info/about.htm
6. University of Texas at El Paso, College of Pharmacy. Mission/Vision/Goals. <http://www.academics.utep.edu/Defaults.aspx?tabid=32082>
7. Idaho State University, College of Pharmacy. Mission. http://www.pharmacy.isu.edu/live/Fs/ST_plan.pdf
8. University of Washington, School of Pharmacy, Admission, Retention and Graduation Standards. <http://www.pharmacy.washington.edu/students>
9. University of Alberta. Faculty of Pharmacy and Pharmaceutical Sciences 2003-04, Annual Report. <http://www.uofaweb.ualberta.ca/vpfinancerp//pdf/AnnualReport0304PHARMACY.pdf>
10. John P., Is a Career in the Pharmaceutical Sciences Right for Me?, Purdu University BSPS Frequently Asked Questions, <http://www.pharmacy.purdue.edu/students/prospective/Careers.php>.
11. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta, <http://www.pharmacy.ualberta.ca/>
12. Faculty of Pharmacy, University of Toronto, Bachelor of Science in Pharmacy, <http://phm.utoronto.ca/undergrad/>
13. The Robert Gordon University, School of Pharmacy, UK (<http://www.rgu.ac.uk/pharmacy/>)
14. University of Bath, School of Pharmacy & Pharmacology (<http://www.bath.ac.uk/pharmacy//home/index.shtml>)
15. The Queen's University of Belfast, School of Pharmacy (<http://www.qub.ac.uk/schools/SchoolofPharmacy/index.html>)
16. University of Bradford, School of Pharmacy (<http://www.brad.ac.uk/acad/lifesci/pharmacy/>)

17. University of Brighton, School of Pharmacy & Biomolecular Sciences (<http://www.bton.ac.uk/pharmacy/>)
18. King's College London, Department of Pharmacy (http://www.kcl.ac.uk/kis/schools/life_sciences/health/pharmacy/top.html)
19. University of London, The School of Pharmacy (<http://www.pharmacy.ac.uk/>)
20. University of Manchester, School of Pharmacy and Pharmaceutical Sciences (<http://pharmacy.man.ac.uk/>)

International societies and organizations:

1. AACP commission to Implement Change in Pharmaceutical Education <http://www.aacp.org/Docs/MainNagivatgion/EducationalResources/3586-BackgroundPaper1.pdf>
2. AACP Commission to Implement Change in Pharmaceutical Education Entry-level in pharmacy: A commitment to change. <http://www.aacp.org/Docs/MainNagigation/EducationalResources/3588-Backgroundpaper3.pdf>
3. ACPE. The Evaluation Team Report of the Professional Program leading to the Doctor of Pharmacy Degree, University of Iowa. College of Pharmacy, 2004. <http://www.pharmacy.uiowa.edu/about/pdfs/ACPEEvaluationReport%202004.pdf>
4. Pharmacy Choice, Pharmacist Career information, <http://www.pharmacychoice.com/careers/pharmacistcareer.cfm>.
5. AACP, Testimony of the American Association of Colleges of Pharmacy, March 31, 2006.
6. The Bachelor of Science in Pharmaceutical Sciences (BSPS) Program, School of Pharmacy and Pharmaceutical Sciences, College of Pharmacy, Nursing and Health Sciences, <http://www.pharmacy.purdue.edu/academics/bsps>
7. US Department of Labor (www.bls.gov)
8. Canadian Pharmacist Association, http://www.pharmacists.ca/about_cpha/

Arabic periodicals:

1. الميثاق البحرينية، العدد 510، التاريخ 2005/9/25.
2. جريدة المدينة المنورة، العدد 15598، التاريخ 2005/1/5.

3. البيان الإماراتية، العدد 9341، التاريخ 2006/1/14.
4. جريدة الشرق الأوسط، العدد 9888، التاريخ 2005/12/24.
5. جريدة الشرق الأوسط، العدد 9994، التاريخ 2006/3/9.
6. جريدة الرياض، العدد 13823، التاريخ 1427/3/30 هـ.
7. جريدة الوطن السعودية، العدد 1398، التاريخ 1425/6/11 هـ.
8. جريدة عكاظ، العدد 14371، التاريخ 1426/11/29 هـ.
9. جريدة اليوم، العدد 11919، التاريخ 1427/1/2 هـ.
10. رسالة الجامعة (جامعة الملك سعود)، العدد 892، التاريخ 1427/4/15 هـ.
11. جريدة المدينة المنورة، العدد 15649، التاريخ 2006/2/26.
12. جريدة البلاد، العدد 17977، التاريخ 2006/1/16.
13. جريدة الأهرام المسائي، العدد 5350، التاريخ 2005/12/20.
14. مجلة عالم الاقتصاد، العدد 166، التاريخ 2005/11/1.
15. جريدة الرياض، العدد 12894، التاريخ 1424/8/13 هـ.

C. MEDICINE

1. Accreditation Council for Graduate Medical Education (ACGME) (1999) Outcome Project & General Competencies.
2. Accreditation and the Liaison Committee on Medical Education (1998) Functions and Structure of a Medical School, Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree (Washington, D.C., Association of Medical

- Colleges and the American Medical Association).
3. American Medical Association (1993) The Potential Impact of Health System Reform on Medical Education (Working Group on Medical Education and Health System Reform, Office of Medical Education).
 4. Association of American Medical Colleges (1984) Physicians for the Twenty-First Century, The GPEP Report, Report of The Panel on the General Professional Education of the Physician and College Preparation for Medicine (Washington, D.C., AAMC).
 5. Association of American Medical Colleges and American Medical Association (1997) Guide to the Institutional Self-Study - Program of Medical Education Leading to the MD Degree (Chicago, IL and Washington, D.C., Liaison Committee on Medical Education).
 6. Association of American Medical Colleges and American Medical Association (1998) The Role of Students in the Accreditation of U.S. Medical Education Programs (Chicago, IL and Washington, D.C., Liaison Committee on Medical Education).
 7. Association of American Medical Colleges and American Medical Association (1998) Rules of Procedure (Chicago, IL and Washington, D.C., Liaison Committee on Medical Education).
 8. Association for Medical Education in Europe (1999) A Critical Appraisal of Medical Education. Abstracts of AAME Conference, Linköping, Sweden, 29 August to 1 September 1999 (Dundee, Scotland, AMEE).
 9. Association for Medical Education in Europe (1996) AMEE Education Guide No. 7: Task-based Learning: An Educational Strategy for Undergraduate, Postgraduate and Continuing Medical Education (Dundee, Scotland, AMEE).
 10. Association for Medical Education in Europe (1999) AMEE Education Guide No. 14: Outcome-based Education (Dundee, Scotland, AMEE).
 11. Australian Medical Council Inc. (1992) The Assessment and Accreditation of Medical Schools by the Australian Medical Council (Australian Medical Council Incorporated).
 12. Bandaranayake, R. (2000) The Concept and Practicability of a Core Curriculum in Basic Medical Education, *Medical Teacher* 22(6), p. 560.
 13. Boelen, C. (1995) Prospects for Change in Medical Education in the Twenty-first Century, *Academic Medicine* 70(7), p. S21 (WHO/ECFMG Conference, October 3-6, 1994, Geneva, Switzerland).
 14. Branch, W.T. (2000) The Ethics of Caring and Medical Education, *Academic Medicine* 75(2), p. 127.
 15. CanMEDS 2000 (1996) Project Skills for the new millennium: report of the societal needs working group, The Royal College of Physicians and Surgeons of Canada's

- Canadian Medical Education Directions for Specialists 2000 Project (Ottawa, Ontario, Canada).
16. CanMEDS 2000 (2000) Extract from the CanMEDS 2000 Project Societal Needs Working Group Report (2000), *Medical Teacher* 22(6), p. 549.
 17. Chaves, M.M. et al. (1984) Cambios en la education medica. Analisis de la integracion docente asistencial en America Latina (Caracas, Venezuela, Federacion Panamericana de Asociaciones de Facultades y Escuelas, No. 3).
 18. DeAngelis, C.D. (Ed.) (1999) *The Johns Hopkins University School of Medicine Curriculum for the Twenty-first Century* (Baltimore, The Johns Hopkins University Press).
 19. DelVecchio Good, M. (1995) *American Medicine: The Quest for Competence* (Berkeley, University of California Press).
 20. Education Committee of the General Medical Council (1993) *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education* (London, General Medical Council).
 21. Eitel, F. and Steiner, S. (1999) Evidence-based learning, *Medical Teacher* 21(5), p. 506.
 22. Federacion Panamericana de Asociaciones de Facultades (Escuelas) de Medicina No. 13 (1986) *Cooperacion internacional para el desarrollo de la education medica* (Caracas, Venezuela).
 23. Federacion Panamericana de Asociaciones de Facultades (Escuelas) de Medicina No. 17 (1990) *Medical Education in the Americas. The challenge of the nineties, Final Report of the EMA project.* p. 240 (Caracas, Venezuela).
 24. Flexner, A. (1910) *Medical Education in the United States and Canada. A Report to the Carnegie Foundation for the Advancement of Teaching.* (Boston, MA, D.B. Updike, The Merrymount Press).
 25. Gastel, B.A. (1995) *Toward a Global Consensus on Quality Medical Education: Serving the Needs of Populations and Individuals: Summary of the Consultation, Academic Medicine, 70(7), p. S3 (WHO/ECFMG Conference, 3-6 October, 1994, Geneva, Switzerland).*
 26. GCCMedical Colleges Deans' Committee. *Recommendations and Guidelines on Minimum Standards for Establishing and Accrediting Medical Schools in the Arabian Gulf Countries.* April 2001.
 27. General Medical Council (1998) *Good Medical Practice* (General Medical Council, London).

28. Goldie, J. (2000) Review of ethics curricula in undergraduate medical education, *Medical Education*, 34, p. 108.
29. Gonnella, J.S., Hojat, M., Erdmann, J.B. (1993) What we have learned, and where do we go from here? *Academic Medicine*, 68(2), p. S79.
30. Halpern, R. et al. (2001) A Synthesis of Nine Major Reports on Physicians' Competencies for the Emerging Practice Environment, *Academic Medicine*, 76(6), p. 606.
31. Hamilton, J.D., Vandewerdt, J.M. (1990) The accreditation of undergraduate medical education in Australia, *Medical Journal of Australia*, 153, p. 541.
32. Hamilton, J.D. (1995) Establishing Standards and Measurement Methods for Medical Education, *Academic Medicine*, 70(7), p. S51.
33. Henry, R. (1997) Undergraduate programme objectives: the basis for learning and assessing by domain, in: R. Henry, K. Byrne and C. Engel (Eds.) *Imperatives in Medical Education*, pp. 18-23 (Callaghan, NSW., Faculty of Medicine and Health Sciences, The University of Newcastle).
34. Institut d'Estudis de la Salut (1997) *Professional Competencies on Health Sciences. Future scenario for the health professionals* (Barcelona, Spain).
35. Karle, H., Nystrup, J. (1996) *Evaluation of Medical Specialist Training: Assessment of Individuals and Accreditation of Institutions*. Association for Medical Education in Europe Occasional Paper No. 1 (Dundee, Scotland, Centre for Medical Education).
36. Kern, D.E. et al. (1998) *Curriculum Development for Medical Education: A Six-Step Approach* (Baltimore, The Johns Hopkins University Press).
37. Lloyd, J.S. (Ed.) (1982) *Evaluation of noncognitive skills and clinical performance* (American Board of Medical Specialties, Chicago, Illinois).
38. Ludmerer, K.M. (1999) *Time to Heal - American Medical Education from the Turn of the Century to the Era of Managed Care*. (New York, Oxford University Press).
39. Medical School Objectives Working Group (1999) *Learning Objectives for Medical Student Education-Guidelines for Medical Schools: Report I of the Medical School Objectives Project*. *Academic Medicine*, 74(1), p. 13.
40. National Association of Medical Students (1994) *Today's Students on "Tomorrow's Doctors" A Guide to Implementing the General Medical Council Recommendations on Undergraduate Medical Education* (National Association of Medical Students).
41. O'Neill, P.A., Metcalfe, D., and David, T.J. (1999) The core content of the undergraduate curriculum in Manchester, *Medical Education*, 33, p. 121.

42. Paice, E. (Ed.) (1998) *Delivering the New Doctor*. (Edinburgh, Scotland, Association for the Study of Medical Education).
43. Rabinowitz, H.K. et al. (2001) Innovative approaches to educating medical students for practice in a changing health care environment: the National UME-21 Project, *Academic Medicine*, 76(6), p. 587.
44. Sajid, A. et al. (Eds.) (1994) *International Handbook of Medical Education* (Westport, CT, Greenwood Press).
45. Schwarz, R.M. (1998) On moving towards international standards in health professions education. *Changing Medical Education and Medical Practice* (WHO, Geneva, Switzerland).
46. Scott, C.S. et al. (1991) Clinical behavior and skills that faculty from 12 institutions judged were essential for medical students to acquire, *Academic Medicine*, 66(2), p. 106.
47. Sprafka, S. (1999) Defining and using professional behavior standards: an approach underway at the University of New England, *Education for Health*, 12(2), p. 245.
48. Stobo, J.D., Blank, L.L. (1998) *Project Professionalism: Staying Ahead of the Wave* (American Board of Internal Medicine, Philadelphia, Pennsylvania).
49. Swanson, A.G., Anderson, M.B. (1993) Educating medical students, assessing change in medical education - the road to implementation, *Academic Medicine*, 68(6), Supplement.
50. Tosteson, D.C., Adelstein, S.J., Carver, S.T. (Eds.) (1994) *New Pathways to Medical Education* (Cambridge, MA, Harvard University Press).
51. University of Dundee Medical School (n.d.) *Teaching Tomorrow's Doctors in Dundee - A five-year strategy 1999-2003* (Dundee, Scotland, University of Dundee Medical School).
52. U.S. Department of Health and Human Services (1992) *Council on Graduate Medical Education, Third Report: Improving Access to Health Care Through Physician*.
53. Wojtczak, A. and Schwarz, M.R. (2000a) *International standards and medical education: discussion document*.
54. Wojtczak, A. and Schwarz, M.R. (2000b) Minimum essential requirements and standards in medical education, *Medical Teacher*, 22(6), p. 555.
55. World Federation for Medical Education Executive Council (1998) *International standards in medical education: assessment and accreditation of medical schools*, *Medical Education*, 32, p. 549.
56. World Federation for Medical Education Task Force (2000) *Defining international standards in basic medical education, Report of the Working Party*, Copenhagen 1999,

57. World Federation for Medical Education (1994) Proceedings of the World Summit on Medical Education. Ed. Henry Walton, Medical Education, Vol. 28, Suppl. 1.
58. World Health Organization (1992) Towards the Assessment of Quality in Medical Education (Geneva, Switzerland, WHO).
59. World Health Organization (1993) Increasing the Relevance of Education for Health Professionals - Report of a WHO Study Group on Problem-solving Education for the Health Professionals (Geneva, Switzerland, WHO).
60. World Health Organization (1996) Doctors for health: A WHO Global Strategy for Changing Medical Education and Medical Practice for Health for All. (Geneva, Switzerland).

D. DENTISTRY

Arabic references:

1. عثمان عبدالعزيز الربيعة. الوضع الراهن للقوى العاملة الصحية في المملكة واتجاهات المستقبل. المؤتمر الرابع للجمعيات الطبية الخليجية. 2005.
2. النتائج الأولية لتعداد العام للسكان والمساكن 1425 هـ (2004). وزارة الإقتصاد والتخطيط ، مصلحة الإحصاءات العامة.
3. القوى الصحية العاملة بالمملكة لعام 1425 هـ. وزارة الصحة

English references:

1. Abrams RG, Kelley ML. Student self-evaluation in a pediatric-operative technique course. J Dent Educ. 1974 Jul;28(7):385-91.
2. Al- Shammery A, Guile E, El-Backly M, Lamborne A. An oral health survey of Saudi Arabia: Phase I (Riyadh). General Directorate of Research Grants Programs-King Abdulaziz City for Science and Technology. 1991.
3. Al-Dosari AM, Wyne AH, Akpata ES, Khan NB. Caries prevalence and its relation to water fluoride levels among schoolchildren in central province of Saudi Arabia. Int Dent J.2004;54:424-8.

4. Al-Ghannam NA, Al-Shammmary AR, Wyne AH, Khan NB. Prosthetic dental treatment needs in northern Saudi Arabia. *Saudi Med J.* 2002, 23:975-980.
5. Al-Malik MI, Rehbini YA. Prevalence of dental caries, severity and pattern in age 6 to 7-year-old children in a selected community in Saudi Arabia. *J Contemp Dent Pract.* 2006;7:46-54.
6. Bertolami CN. Rationalizing the dental curriculum in light of current disease prevalence and patient demand for treatment: form vs. content. *J Dent Educ.* 2001 Aug;65(8):725-735; discussion 736-43.
7. Cote S, Geltman P, Nunn M, Lituri K, Henshaw M, Garcia RI. Dental caries of refugee children compared with US children. *Pediatrics.* 2004; 114: 733-740.
8. Ericson D, Christersson C, Manogue M, Rohlin M. Clinical guidelines and self-assessment in dental education. *Eur J Dent Educ.* 1997 Aug;1(3):123-8.
9. Formicola AJ. A new format for dental education. *J Am Coll Dent.* 2002 Summer;69(3):32-8.
10. Geissler PR. Student self-assessment in dental technology. *J Dent Educ.* 1973 Sep;37(9):19-21.
11. Henbest RJ, Fehrsen GS. Preliminary study at the Medical University of Southern Africa on student self-assessment as a means of evaluation. *J Med Educ.* 1985 Jan;60(1):66-8.
12. Hendricson WD, Cohen PA. Oral health care in the 21st century: implications for dental and medical education. *Acad Med.* 2001 Dec;76(12):1181-206.
13. Holst A, Braune K, Kjellberg M. Changes in caries experience among 6-year-olds in Blekinge, Sweden between 1994 and 2000. *Swed Dent J.* 2004; 28:129-35.
14. Johnson G. A comprehensive care clinic in Swedish dental undergraduate education: 3-year report. *Eur J Dent Educ.* 1999 Nov;3(4):148-52.
15. Klineberg I, Massey W, Thomas M, Cockrell D. A new era of dental education at the University of Sydney, Australia. *Aust Dent J.* 2002 Sep;47(3):194-201.
16. Niederman R, Badovinac R. Tradition-based dental care and evidence-based dental care. *J Dent Res.* 1999 Jul;78(7):1288-91.
17. Ranney RR. Future priorities for a successful dental school. *Eur J Dent Educ.* 1999;3 Suppl 1:104-10.
18. Richards D, Lawrence A. Evidence based dentistry. *Br Dent J.* 1995 Oct 7;179(7):270-3.
19. Rohlin M, Petersson K, Svensater G. The Malmo model: a problem-based learning curriculum in undergraduate dental education. *Eur J Dent Educ.* 1998 Aug;2(3):103-14.

20. Schwarz E. Challenges and opportunities for dental education, research, and service in the 21st century. *J Am Coll Dent.* 2002 Summer;69(3):47-52.
21. Snyman WD, Kroon J. Vertical and horizontal integration of knowledge and skills - a working model. *Eur J Dent Educ.* 2005 Feb;9(1):26-31.
22. The world oral health report 2003. Continuous improvement of oral health in the 21st century the approach of the WHO global health programme. World Health Organization, Geneva, Switzerland.
23. Thompson G. Eighty years of dental education in Canada. *J Am Coll Dent.* 2002 Spring;69(2):26-9.
24. Wetherell J, Mullins G, Hirsch R. Self-assessment in a problem-based learning curriculum in dentistry. *Eur J Dent Educ.* 1999 Aug;3(3):97-105.
25. Wilson NH. The future of the dental profession: a personal perspective. *Dent Update.* 2003 Nov;30(9):474-6.

E. APPLIED MEDICAL SCIENCES

Arabic references:

1. عثمان الربيعه (2005) الوضع الراهن للقوى العاملة الصحية في المملكة واتجاهات المستقبل ، المؤتمر الرابع للجمعيات الطبية الخليجية .
2. وزارة الاقتصاد والتخطيط ، مصلحة الإحصاءات العامة : النتائج الأولية للتعداد العام للسكان والمساكن 1425 هـ .
3. الهيئة السعودية للتخصصات الصحية – السجلات الحاسوبية لإدارة التسجيل – 2006 م .

English references:

1. American Speech-Language-Hearing Association. Standards for Accreditation of Graduate Education Programs in Audiology and Speech-Language Pathology. 2004.
2. Anderson SC. Curricula alternatives in diagnostic laboratory techniques. Clinical Laboratory Science. 2000;13:16
3. Babyar SR, Rosen E, Sliwinski MM, Krasilovsky G, Holland T and Lipovac M. Physical therapy students' self-reports of development of clinical reasoning: a preliminary study. Journal of Allied Health. 2003;32(4):227-239.
4. Barbara L, Susan N and Denise MN. Introducing a problem-based unit into a lifespan nutrition class using a randomized design produces equivocal outcomes. American Dietetic Association. Journal of the American Dietetic Association. 2003;103(8):1020-1025
5. Brian T, Kimberly W, Marie D and Colleen S, et al. Longitudinal and horizontal integration of nutrition science into medical school curricula. The Journal of Nutrition. 2003;133:S567-S572
6. Camellia ESt J and Kanuth MS. Student Laboratories as a Component of a Web-based Curriculum. Clinical Laboratory Science [serial online]. 2006;19:117-121
7. Chauvin SW, Anderson AC and Bowdish BE. Assessing the professional development needs of public health professionals. Journal of Public Health Management and Practice. 2001;7:23-37
8. Dolores G Clement, Impact of the Clinical Doctorate from an Allied Health Perspective, AANA Journal; Feb 2005; 73(1):24-28.

9. Educational Programs for the Clinical Laboratory Scientist/Medical Technologist. <http://www.naacls.org/approval/ca/standards.asp>
10. El Ansari. Educational partnerships for public health: do stakeholders perceive similar outcomes? *Journal of Public Health Management and Practice*. 2003;9(2):136-156
11. Fertman CI, Dotson S, Mazzocco GO and Reitz SM. Challenges of preparing allied health professionals for interdisciplinary practice in rural areas. *Journal of Allied Health*. 2005;34:163-168
12. Gina Maria Musolino. Fostering Reflective Practice: Self-Assessment Abilities of Physical Therapy Students and Entry-Level Graduates. *Journal of Allied Health*; Spring 2006; 35(1):30-42
13. Harriett B, Cummings DM and Dreyfus KS. Evolution of an interdisciplinary curriculum. *Journal of Allied Health*. 2003(4); 32: 285-290
14. Helitzer D and Wallerstein N. A proposal for a graduate curriculum integrating theory and practice in public health. *Health Education Research* [serial online]. 1999;14:697-706
15. Jin G, Bierma TJ and Broadbear JT. Critical thinking among environmental health undergraduates and implications for the profession. *Journal of Environmental Health*. 2004; 67:15-20
16. Joint Review Committee on Educational Programs in Nuclear Medicine Technology. Essentials and Guidelines for an Accredited Educational Program for the Nuclear Medicine Technologist. 2003.
17. Karni KR and Duckett L. Curriculum design: Questions to ask. *Clinical Laboratory Science*. 1998;11:78
18. Kim Y, Clasen C and Canfield A. Effectiveness of service learning and learning through service in dietetics education. *Journal of Allied Health*. 2003;32(4):275-278.
19. Kutz MR. Necessity of Leadership Development in Allied Health Education Programs. *The Internet Journal of Allied Health Sciences and Practice*. April 2004.
20. Lynn Foord-May. A Faculty's Experience in Changing Instructional Methods in a Professional Physical Therapist Education Program. *Physical Therapy*; Feb 2006; 86(2):223-235
21. National Accrediting Agency for Clinical Laboratory Sciences. Standards of Accredited
22. Richter RR and Ruebling I. Model for development of outcome assessment surveys for allied health educational programs. *Journal of Allied Health*. 2003;32:179-84

23. Ryman DG and Leach DL. Determining clinical laboratory science curriculum for the 21st century. *Clinical Laboratory Science*. 2000;13:93-79
24. Saarinen-Rahiika H and Binkley JM. Problem-based learning in physical therapy: a review of the literature and overview of the McMaster University experience. *Physical Therapy*. 1998;78:195-207, discussion 207-11
25. Saleh SS, Williams D and Balougan M. Evaluating the Effectiveness of Public Health Leadership Training: The NEPHLI Experience. *American Journal of Public Health*. 2004;94:1245-1249
26. Sandra Hubbard. Disability Studies and Health Care Curriculum: The Great Divide. *Journal of Allied Health*; Fall 2004; 33(3):184-188
27. Schaber PL. Incorporating problem-based learning and video technology in teaching group process in an occupational therapy curriculum. *Journal of Allied Health*. 2005;34(2):110-116.
28. Sherrill WW and Keels-Williams F. Mapping competencies for the multiskilled health care professional: an allied health curriculum reform project. *Journal of Allied Health*. 2005;34:185-191
29. Su WM, Masoodi J and Kopp M. Teaching critical thinking in the clinical laboratory. *Nursing Forum* [serial online]. 2000;35:30-35
30. Tanenhaus RH, Meyers AR and Harbison LA. Disability and the curriculum in US graduate schools of public health. *American Journal of Public Health*. 2000;90:1315-1316
31. The Joint Review Committee on Education in Radiologic Technology (JRCERT). Standards for an Accredited Educational Program in Radiologic Sciences 2001. www.jrcert.org
32. Threlkeld AJ, Jensen GM and Royeen CB. The clinical doctorate: a framework for analysis in physical therapist education. *Physical Therapy*. 1999;79:567-581
33. Van Moorsel G. Library-sponsored instruction improves core informatics competencies among allied health students: a research-based case study. *Journal of Allied Health*. 2005;34(3):145-152
34. Varga-Atkins T and Cooper H. Developing e-learning for interprofessional education. *Journal of Telemedicine and Telecare*. 2005; Supplement 1:102-104
35. Woeste L. Clinical Laboratory Science Curriculum: A Method for Introduction of Cultural Competency. *Clinical Laboratory Science*. 2004;17:75
36. Wright MS , Miller SA. Critical reading and writing across the curriculum in clinical laboratory science. *Clinical Laboratory Science*. 1999;12:161-166

International societies, organizations and universities:

1. the American Occupational Therapy Association, www.aota.org
2. the American Physical Therapy Association, www.apta.org
3. the American Speech – Language – Hearing Association, www.asha.org
4. Arkansas State University, www.astate.edu/
5. Association of School and Colleges of Optometry, www.opted.org
6. Cardiff University, www.cardiff.ac.uk
7. Association of Schools of Allied Health, www.asahp.org
8. Health Professions Council, www.cpsm.org.uk
9. Council for Higher Education Accreditation, www.Chea.org
10. American Society of Radiologic Technologists www.asrt.org
11. American Society for Clinical Laboratory Science www.ascls.org
12. Canadian Society for Medical Laboratory Science www.csmls.org
13. Canadian Association of Occupational Therapy, www.caot.ca