Selection of medical students and their specialty choices

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Dissertation for the University of Groningen, the Netherlands, with references and summary in Dutch. The study presented in his thesis was carried out at the Graduate School for Health Research SHARE of the University of Groningen, within the programme of Research in Medical Education (RME).

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Chapter 1

Introduction

Introduction

The evolution of a medical specialist from a secondary school graduate involves a long and winding road through medical school and postgraduate training. At several points important hurdles have to be cleared, starting with the medical school selection process – which can actually be considered the first step along the road for a secondary school graduate interested in medicine and seeking to become a doctor. After graduation, the road continues, with another major step being the young doctors' choice of postgraduate specialist training. Both the medical school selection procedure and the choice of a postgraduate medical specialty involve very important choices and decisions on the road to specialization.

The medical school selection procedure has a significant impact on the composition of the student population, and the criteria adopted are of immense significance to the entire process of medical education. The main intent of a medical school admissions procedure is to select candidates who will perform well as undergraduates and become good physicians, while excluding those who will fail to finish their training or bring the profession into disrepute (Lumsden et al. 2005). In recent years, there has been much scrutiny of medical school admissions procedures (McGaghie 1990). This has shown that in Europe and the US a number of admissions procedures are in use, which vary from weighted lotteries to tough selection procedures measuring cognitive and/or non-cognitive capacities of the applicants (Mitchell 1990; Ferguson et al. 2002; Tutton & Price 2002; Gough 2004; Reiter et al. 2007; Urlings-Strop et al. 2009). Although a perfect system is yet to be established, in most admissions procedures academic performance at the secondary school level is considered to be an essential factor in the selection of medical students. Interestingly, many studies have produced somewhat conflicting results, with some reporting a substantial predictive validity of HSC (High School Certificate) grades such as A-levels for later academic performance. However, while good pre-entry performance predicts success in tertiary (university) study in general (Rosenfeld et al. 1992; Baig 2001; McManus et al. 2003, 2005; Cohen-Schotanus et al. 2006), a few studies have also shown that as students progress through a medical course this correlation decreases (Collins et al. 1995; Reede 1999; Huda et al. 2001).

Thus, the relationship between academic grades and subsequent performance as a good doctor remains an intriguing topic, but to date it has been difficult to obtain solid data concerning this relationship, not least because a general definition of a 'good doctor' is lacking. More specifically, in Arab countries there is little scientific data about the relationship between pre-entry performance and academic performance at medical school, though a study undertaken within the Kingdom of Saudi Arabia in 1987 found no evidence of such a relationship (El-Hezmi et al. 1987).

Career options for graduating medical students were traditionally quite simple and straightforward. In the recent past, however, new discoveries in science, advancements in medical care and high-tech innovations have paved the way for a growing number of medical specializations. Consequently, there are now a great number of specialties and subspecialties in medicine, and narrowing the choices down to one is more challenging than ever. To achieve this, today's medical student needs a clear understanding of the great variety of medical specializations and their content as well as an awareness of the practical consequences of choosing a particular specialism. These consequences involve the medical practice itself but also concern conditions such as working hours, frequency of duties, and the opportunity to combine work with family responsibilities. Interestingly, the literature also shows that many students have strong preferences for certain medical careers or oppose others long before graduation (Schwartz et al. 1990; Xu & Veloski 1991; Zeldow et al. 1992; Mahoney et al. 2004; Vaidya et al. 2004; Wright et al. 2004). However, without the opportunity to experience a range of medical specializations, these early preferences are not based in realistic perspectives. In the Western world, many medical residents cease their specialist training or decide to change their field because they are unhappy with their choice or because they do not seem suitable for that particular specialism (Freeman et al. 2004). Taking into account the high costs of medical specialist training and the need to allocate postgraduate training positions as efficiently as possible, there is a great requirement for appropriate career counselling from the earliest stages of undergraduate medical education.

Outline of the thesis

The studies presented in this thesis aimed to provide a detailed insight into both the academic selection criteria for undergraduate medical students and how the students make their decisions about their future specializations.

The first study of this thesis (Chapter 2) responded to a clear need to determine optimal selection procedures and the relationship between pre-entry academic grades and study duration, particularly in relation to a subcontinent where very unique factors might be at play. The aim was to research what optimum weight should be allocated to secondary school results in the selection process by critically analysing the data obtained. It was considered that such an analysis may in turn provide valuable insight into the pitfalls of the current screening system in Saudi Arabian medical schools. To identify predictors of performance at medical school, the relationship between admissions criteria and academic performance was studied.

The second study (Chapter 3) deals with trends and preferences in the specialism choices of undergraduate medical students. Research on medical specialization selection is an important area of medical education research as it affects several important determinants of health services delivery. In-depth study of the phenomenon of career choices can provide vital information which can assist in educational planning and administration, assigning priorities and planning for the provision of proper health care. To date the literature has usually addressed specific aspects of specialization selection, such as psychological determinants, controllable lifestyle factors and the attitudes of students towards specific specialties (Goldacre et al. 1997). A shortage of information on students' perceptions of specialty choice and the effect of these perceptions on their actual choice generated a need for research into this significant subject so the effects could be better understood.

The third study in this thesis (Chapter 4) addresses the important issue of personality profile in relation to the specialty choices of medical students. While a number of attempts have been made to develop personality profiles of medical students to predict their final specialty choice and project the likely number of specialists in each field, it was considered that these may not fully apply to present-day medical graduates. New personality assessment instruments have been developed and these demand further comprehensive research in relation to this multifaceted topic. In this regard, the Zuckerman-Kuhlman personality questionnaire (ZKPQ-50) is currently a valid instrument used to determine personality contours. Literature about the relationship between personality and specialty selection has produced diverse results. Some studies report marked differences between male and female students, while others report special attributes for surgeons and other distinctive specialists such as those involved primary health care or gynaecology and obstetrics (Zeldow & Daugherty 1991; Hojat 2007; Maron et al. 2007; Tyssen et al. 2007; Zuckerman 2007; Hoffman et al. 2010). Given the substantial need to answer questions pertaining to this topic and some conflicting results from previous research, a study was undertaken on trends and perceptions with respect to specialty preferences among undergraduate medical students. To our knowledge, this study was the first of its kind in the Arab world.

The fourth study (Chapter 5) deals with the career support and guidance system for newly qualified doctors, keeping in mind the importance of career advice for medical graduates who are about to make a specialty selection decision. Career counselling may be vital for suitable specialty selection. A constant and steady need for improvements in career advice and the support system was advocated by Allen (1988, 1989 and 1994) as a result of a series of studies of doctors and their careers during postgraduate training. Access to impartial career advice from

suitably trained professionals was also raised as an important issue in the British Medical Association (BMA) report of 2004. A literature review highlighted the importance of well-informed career decisions and assisting students and junior doctors in this regard.

The fifth study in this thesis explores the perceptions and attitudes of medical students concerning research and a research career (Chapter 6). There is a clear threat to the scientific community worldwide of a significant decline in research scientists. Several factors, such as insufficient attention to research and poor training in research skills during medical training, higher financial returns from clinical careers, and the reduction of research budgets, with increased competition for research funding, may have contributed to this decline. Advances in biomedical research during the last decade have highlighted the necessity of attracting greater numbers of physicians to careers that include research components (Bansal 1996; Houlden et al. 2004; Zier et al. 2006). This is not only because we need more physician-scientists, but also because doctors must be able to distinguish between good and bad research. Therefore, it is important to confront students with the relevance of research during their medical training and to encourage them to participate in research projects. The literature reveals that in the Middle Eastern and Gulf regions there is a lack of information about the awareness, perceptions and practices of medical students with respect to research. Consequently, the fifth study was designed to obtain information on this topic in a Middle Eastern context.

As can be deduced from the above, the journey from secondary school to medical specialization is far from straight forward, with many twists and turns, and many forks in the road. To guide a secondary school graduate on this journey towards the desired goal is a challenge which requires vigilance and oversight.

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Chapter 2

Predictors of performance in a medical school

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Abstract

Background: Review of medical literature from non-Western countries does not reveal much about the ability of pre-entry grades to predict academic performance and length of study in a medical school.
Methods: A retrospective longitudinal study was conducted in which students *(n=539)* admitted between 1998 and 2004 were included. High school certificate (HSC) scores were correlated with grade point average (GPA) and study duration. Statistical analysis using Pearson's correlation and regression test was carried out using a fixed effect model.
Results: HSC significantly increased over time. A positive correlation was observed between HSC scores and cumulative GPA ($p < 0.001$). There was also a positive correlation between HSC and study duration ($p<0.001$). However, HSC scores could predict GPA only up to 24% and study duration up to 9%.
Conclusions: HSC grades are able to select good-quality medical students. Although HSC scores only constitute 60% of the selection process, they are an important parameter for the prediction of the performance of medical students at college level. The observed improvement in student performance could represent a changing socio-cultural situation in the Kingdom.

Introduction

In the last twenty to thirty years the methods used to select students for medical schools has been the subject of intense discussion. In Europe and the United States of America policies have varied, ranging from weighted lotteries to strong selection procedures measuring the cognitive or non-cognitive abilities of candidates (Tutton & Price, 2002; Reiter et al., 2007; Urlings-Strop et al., 2009). While an ideal system has yet to be defined, in most policies previous academic performance is considered an essential factor for the selection of students in the majority of medical schools (Ferguson et al., 2002). Studies of the predictive value of high school results for study performance in medical schools in non-Western countries are limited as most of the available data is derived from work done in Western countries.

Several studies which have analysed the relationship between pre-university academic requirements and the students' subsequent performance in medical school have produced conflicting results, at times reaching provocative conclusions.

Some researchers reported that high school certificate (HSC) grades have substantial value in predicting academic performance at university level (Mitchell, 1990; McManus et al., 2003). A study conducted by the Higher Education Statistics Agency in England and Wales, which studied students entering university in 1997-98 and followed them through until 2001-02, showed a clear relationship between A-level grades and higher education achievement (HEFCE, 2003). Rosenfeld et al. elucidated a modest correlation between prior academic achievement and success in medical school (1992).

Cohen-Schotanus et al. (2006) conducted research demonstrating a negative correlation between high school performance and study duration.

In 2001, while assessing the predictive validity of HSC scores, Baig concluded that these grades could successfully predict performance for the initial three years; however, they did not predict the students' performance in the years thereafter (2001). Similarly, when evaluating medical college test scores, Reede found pre-university scores to correlate well with performance in basic science subjects (pre-clinical) but not so well with achievement in the clinical years (1999). In agreement with the above study, Collins et al. stated that the level of correlation between HSC scores decreases as students progress through a degree programme (1995).

In an interesting and contrasting study on the performance of male and female medical students at King Saud University (Riyadh), El-Hezmi et al. reported that there was no relationship between HSC scores and academic performance in the university (1987). In agreement with the above, Huda et al. also found no relationship between HSC scores and academic performance (2001). The question thus arises whether the use of HSC in Saudi is defensible.

The present study was fuelled by a substantial need to answer questions regarding the optimal selection procedure and determining the relationship between pre-entry academic grades and study duration, particularly in a subcontinent where unique factors could be at play.
The optimum weight allotted to high school results in the selection process needs to be reviewed by critically analyzing the data obtained, which may in turn provide valuable insight into the pitfalls of the current screening system.
The current study deals with three research questions:

1. Is there a relationship between the pre-entry academic grades (HSC scores) and academic performance of students at medical school?
2. Is there a relationship between the HSC scores and study duration in medical school?
3. Is there a relationship between academic grades in medical school (expressed as GPA) and study duration?

Situational context

Admission procedures at medical schools in Saudi Arabia
In the Kingdom of Saudi Arabia, the government is responsible for selecting medical students. Students qualify for enrolment in medical schools after completing 12 years at school. The first public medical school in the Kingdom was established at King Saud University, Riyadh, which started its MBBS (Bachelor of Medicine and Bachelor of Surgery) programme almost 37 years ago. There has been a rapid increase in the number of medical schools during the last decade. Currently, there are 27 medical schools, 21 of which are provided by the public sector, and 6 by the private sector. The Saudi Society for Medical Education (SSME) is the regulatory authority which has accorded 60% weight to HSC grades alongside the students' performance in two admission tests assessing (40% weight) (a) competence in physics, chemistry and biology and (b) general IQ. The tests are administered simultaneously across the Kingdom, providing a basis for the selection of students. The placement of the applicants is arranged on the basis of the scores they achieve in these exams and the availability of places in a particular school. At present, the number of places available per year for undergraduate medical training in Saudi Arabia is about 2300.

King Khalid University
The College of Medicine of King Khalid University is located in Abha, which is on the south-west coast of Saudi Arabia. It was founded in 1998 and the University has about 8000 students, around 900 of whom are medical students. Each year the medical college offers 100-150 places to new applicants, though this is not a fixed number. The University has a strong regional position and is among the

best in Saudi Arabia. The college employs a traditional curriculum and strategies wherein medical students follow a six-year curriculum for the degrees of Bachelor of Medicine and Bachelor of Surgery (MBBS), followed by one additional clerkship year. The main objective of this training programme is to educate and train future doctors and surgeons to render effective and exemplary healthcare appropriate to the needs of the urban and rural populations of Saudi Arabia.

Methods

Study population

This is a retrospective longitudinal study based on the results of seven cohorts of undergraduate medical students at the College of Medicine, King Khalid University. The study population consists of all the students from these cohorts who graduated between 2003 and 2009.

The students' scores were collected from the admission office of King Khalid University. The study conditions, such as admission procedure, study programme and assessment, remained unchanged for the whole period. The biomedical entrance test results were not made available for inclusion in this study. Under Saudi Arabian law, educational studies using anonymous data are exempt from institutional Board Review.

Independent variable

High School Certificate (HSC) scores (maximum score 100): An HSC certificate is awarded to students after successful completion of twelve years of education.

Dependent Variables

Grade Point Average: After the successful completion of medical education, the results obtained during the MBBS course were measured using each student's cumulative Grade Point Average (GPA, maximum score 5).

Study Duration: Study duration is expressed as the number of years taken by each student to receive the MBBS certificate. The minimum time required to graduate in King Khalid medical college is 6 years (12 semesters), followed by a one year clerkship.

Statistical Analysis

Variation of HSC scores, cumulative GPA and study duration were observed over time. The primary interest was to determine the effect of HSC scores as an independent variable on the dependent variables. Correlation between HSC scores, Cumulative GPA and study duration was obtained using a general linear ANOVA model. The regression coefficients were constructed to ascertain the impact of a

preadmission independent variable (HSC scores) on dependent variables (GPA and study duration). The practical importance of the coefficient was evaluated by looking at the effect size indication for correlations, whether small (0.10), moderate (0.30) or large (0.50) (Hojat & Xu, 2004). SPSS-13 software was used for statistical analysis.

Results

The academic performance of students (*n*=539) studying at the College of Medicine, King Khalid University, who graduated between 2003 and 2009 were recorded and analysed. A total of seven cohorts of students were included with starting years from 1998 to 2004. The size of the cohorts varied between 53 and 90. Mean HSC scores ranged from 94.59 to 97.02 (Table 1).The average cumulative GPA ranged from 3.01 to 3.50, and the study duration from 6.05 to 7.34 years.

Table 1. Students' HSC scores

	cohort							All students
	1998	1999	2000	2001	2002	2003	2004	
n	68	88	90	87	84	53	69	539
HSC score mean	94.59	95.52	96.54	96.42	97.02	97.02	96.52	96.23
SD	2.46	2.02	1.80	1.87	1.77	1.71	1.71	2.07

ANOVA showed a significant linear relation between HSC scores ($p<0.001$) and the cohort's mean cumulative GPA ($p<0.001$) and study duration ($p<0.001$).

Study duration was prolonged for a substantial (*n*=258; 47.8%) number of students in the seven cohorts considered in this study (Table 2). The number of delayed students significantly decreased over the years (r= -0.789; p value=0.035).

A general linear model was constructed using HSC scores as an independent variable and GPA and study duration as dependant variables. Since HSC score gradually increased over the years cohort was taken as covariate. In this model HSC scores significantly predicted GPA as well as study duration (table 3).

Table 2. Description of students with prolonged study periods (n=253)

Years	***Total Students***	***Delayed students***	***Percentages***
1998	68	42	61.8
1999	88	60	68.2
2000	90	64	71.1
2001	87	26	29.9
2002	84	40	47.6
2003	53	19	35.8
2004	69	7	10.1
Total (7 years)	539	258	
Percentage	100%	47.8%	

(r= -0.789; p value= 0.035)

Table 3. Regression Analysis using a fixed-effect model to estimate variations in GPA Model Summary

Variables	*R*	*R square*	*p value*
HSC vs GPA	0.49	0.24	<0.001
HSC vs Study duration	0.30	0.09	<0.001

The regression model shows that HSC scores can predict GPA up to 24% and study duration up to 9% (table 3 and figure 2).

Figure 1. HSC vs GPA

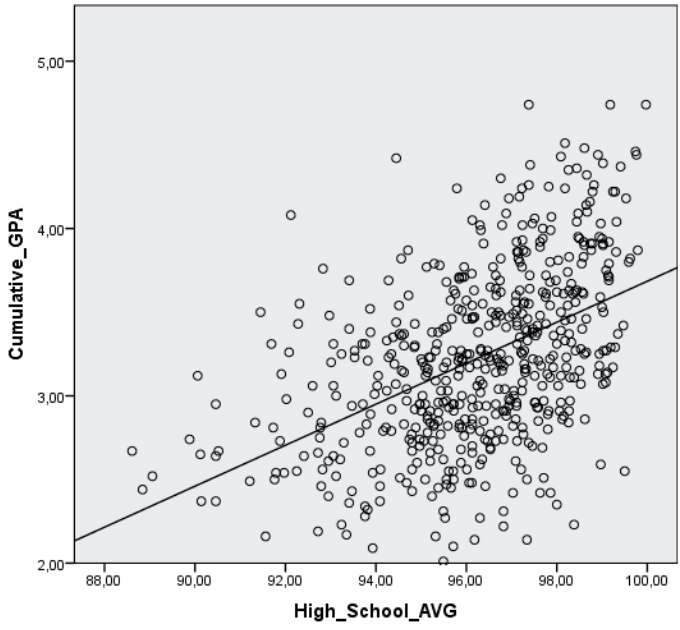
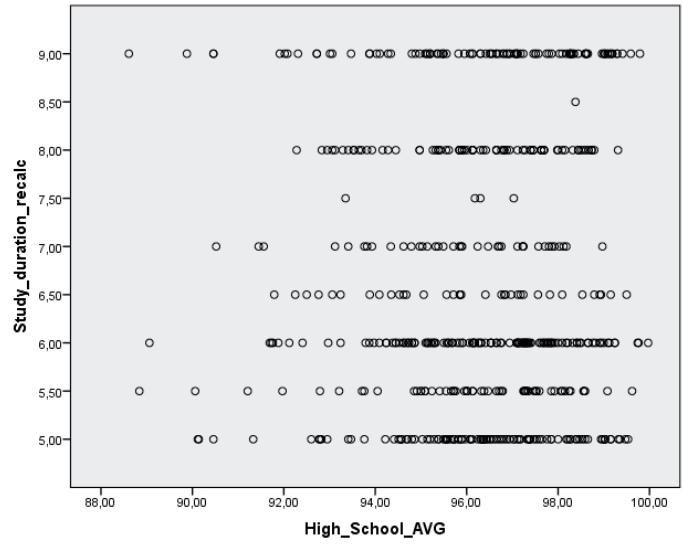


Figure 2. HSC vs study duration



Discussion

In the late eighteenth century, the predominant criterion for medical school selection was the ability to pay the tuition fees (Papa & Harasym, 1999). Since early in the last century, the subject of medical school selection has gained greater importance and new selection methods have been introduced. However, the main focus in the selection of entrants for medical school has traditionally been academic achievement, such as HSC grades or admission test scores. Some threshold academic ability is indeed required to pursue a successful medical career.

At present, the admission system in Saudi Arabia is that HSC constitutes 60% of the admission procedure. The other 40% is constituted by scores awarded in a national test of physics, chemistry and biology, and a general IQ test, which invites us to enquire whether such an admission procedure selects the right students. As the data for Saudi Arabia are either conflicting or negative about the predictive value of HSC for study success (El-Hezmi et al., 1987; Huda et al., 2001), a retrospective, longitudinal study of 539 medical graduates was undertaken to determine the relationship between the admission criteria and subsequent performance at the College of Medicine of King Khalid University. Although the results analysed in this study were from only one medical school, experience drawn from one medical school and seven cohorts of students is valid for comparison.

Over time, significant increases in HSC scores were observed among the seven cohorts included in this study. This could be due to a significant increase in interest in the study of medicine over this period, which allowed the authorities to make the recruitment process more competitive and to select students of a higher academic calibre. The increase over time in cumulative GPA was also statistically significant, which fits with our previous finding of increasing academic capabilities among students and reiterating that the majority of students performed consistently through the transition from premedical school to their clinical years.

On closely examining the time required for completion of medical studies, it was observed that the change in the seven cohorts was statistically significant (p value=0.001). A greater number of students from earlier cohorts included in the study (1998-2000) took longer to graduate when compared to students from later cohorts. Again, the better pre-entry academic performance could explain this finding. Furthermore, unique socio-cultural factors were possibly at play in bringing about this transition over the seven-year period. In conservative Saudi society, early marriage used to be a norm for boys and even more so for girls. Increasing family responsibilities caused distractions and diversions over a prolonged period of medical study. Over the last decade, a decline in this trend has been observed across the Kingdom. Another contributing factor is heightened exposure to a plethora of new instructional innovations in the form of multimedia, e-books, library facilities and e-learning software, which has encouraged and motivated students to actively participate successfully and complete the

learning process early (Alebaikan & Troudi, 2010). The college has also recruited experienced teaching staff and introduced some positive changes to the curriculum after evaluating it over the last ten years (Mehmood et al., 2011). A sense of positive competition and a will to achieve better grades has encouraged the students to graduate on time when compared to the past, leading to the observed significant fall in the failure rate.

The finding of a positive correlation between HSC scores and academic performance in medical school, expressed as GPA, is consistent with other research reports on this subject (Fergusan et al., 2002; McManus et al., 2003; Rosenfeld et al., 1992; Tomlinson et al., 1977; Lipton et al., 1988; Weiss et al., 1988; Montague and Odds, 1990; McManus et al., 2005).

Ferguson et al. (2002), explained that A-levels predict university achievement mainly because these measure the knowledge and ideas that provide the conceptual scaffolding required to build the more advanced study of medicine. In a more recent study conducted in the United Kingdom, McManus et al. have stated three reasons important to constructing the predictive power of A-levels for future performance: cognitive ability (which indirectly measures intelligence), substantive content (inclusive of a broad array of facts, ideas and theories about basic disciplines) and motivation/personality. They reiterated that the predictive value of A-levels most likely results either from their substantive content or the motivation to succeed, or both, and that cognitive ability alone cannot be its main basis. McManus et al. confirmed a positive association between A-level grades and career progress. According to them, A-levels have validity in the selection process, but despite their predictive ability, they are probably not the only predictors and should not be the sole basis of selection (McManus et al., 2005)

We also found HSC to correlate significantly with study duration. This finding is in agreement with previous research conducted in the Netherlands, where it was observed that higher premedical school entry grades were associated with significantly less time for graduation (Cohen-Schotanus, 2006). We only found a small correlation. However, other factors influencing the correlation between HSC grades and study duration should be considered, including early marriage, early family responsibilities, marital stress, and the unexpected distractions faced by the students from earlier cohorts.

When calculating the predictive power of HSC scores, this study reveals that these had a moderate predictive validity and were able to predict 23% of the GPA scores, whereas the prediction of study duration was not significant. Consequently, HSC scores contribute to the prediction of study success, but their predictive value for GPA scores is modest.

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Chapter 3

Specialty preferences: trends and perceptions among Saudi undergraduate medical students

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Abstract

Background: The exploration of specialty choices by medical students is a hot debate as it affects several important determinants of health care delivery. This study was carried out to determine variation in specialty preferences during medical school training and the perceptions that affect students' specialty choice.
Methods: A cross-sectional questionnaire-based study was performed on 590 students with a 93.22% response rate and covered queries on demography, specialty choices and perceptions influencing specialty choices. Class wise analysis of specialty choices was carried out.
Results: The most preferred specialty expressed by male students was surgery, followed by internal medicine and orthopaedics, while most preferred by female students were surgery, followed by pediatrics and ophthalmology. Male students' emphasized factors like less competitive field, shortage of specialists and diversity of patients while the prestige of specialty and teaching opportunities had a greater impact on female students.
Conclusions: Surgery, internal medicine, pediatrics, orthopaedics and ophthalmology were the most preferred specialty choices. Gender preference was observed to affect choices of few specialties such as orthopaedics and obstetrics/gynaecology. Perceptions which have an impact on specialty selection of male and female students may reflect a different tempo of growing up in men and women.

Introduction

During medical education, undergraduate students are confronted with a wide range of medical specialties. Their experiences have a major impact on the decision about further education and training once they have finished their basic medical studies. The reasons why medical students choose their careers are complex (Wright et al. 2004). While these preferences of graduating medical students have a significant impact on several important determinants of health care delivery, the values and motivations that underlie these decisions remain still partially understood. Much research has been devoted to analyzing and characterizing these values, some within particular fields (Rosenblatt et al. 2005; Xu et al. 1991), others between two types of specialties or across the spectrum (Newton et al. 2003; Vaida et al. 2004). Schwartz et al. (1989, 1990) proposed a factor to account for some of the trends in medical student specialty choice, the "controllable life style" factor. Based on their classification, radiology, neurology, pathology, psychiatry, ENT, dermatology, anaesthesiology and emergency medicine comprise a group of controllable life style specialties in which doctors are able to control their work hours in ways that other medical professionals are not. Although there is no need for medical students to make their career choices before they are approaching the moment of graduation from medical school, many medical school students and even medical school applicants often have strong preferences for or against some medical careers longtime before graduation (Zeldow et al. 1992; McManus et al. 1996; Wright et al. 2004).

The choice of medical students and doctors for their postgraduate medical specialist training has an important influence on future work force in health care system, especially in times of shortage or oversupply of physicians. Consequently, studying the process of career choices can provide important information to help in educational planning and administration, assign priorities and plan for provision of proper health care. "Career counseling" as a specialty area has been recognized since the early 1980s with the establishment of career counseling competencies and credentials. The issue of career counseling for medical students and doctors during their training has been identified by a number of research studies. A study published in 2004 suggested that early career advice and support during medical school and immediately after graduation might encourage doctors who were considering careers in specialties in which there are shortages to pursue careers in these specialties (Mahoney et al. 2004). Lambert and Goldacre (2007) while analyzing the views of doctors in training on the importance and availability of career advice reported that a great majority of junior doctors want career advice after qualification.

Research on career choice for medical students has been focused much on psychological determinants or controllable lifestyle factors (Paris & Frank 1983; Crimlisk & McManus 1987; Dorsey et al. 2005; Saigal et al. 2007). Some other

researchers have paid attention on behaviors and attitudes of students towards some specific specialties such as family medicine, anesthesia and psychiatry (Reeve 1980; Parkhouse & Ellin1990; Feifel et al. 1999), on careers of particular group such as women physicians (Dorsey et al. 2005) and on fundamentals statistics necessary for planning the workforce of future doctors (Lambert et al. 1998).
However, there is little understanding of how different medical specialties are perceived by students and the impact of this perception on their career choices. Furthermore, the number of research studies concerning this subject is very limited in the GCC (Gulf Cooperation Council) region and in Saudi Arabia. This study was performed to answer the following research questions:

- How do the specialty preferences vary during the course of undergraduate medical training?
- Which perceptions contribute to affect the specialty preferences of medical students?

Methods

Setting and participants

A cross-sectional study was performed at King Khalid University, College of Medicine including 590 students from the first to fifth year. The College of Medicine at King Khalid University is a public school located in Abha, which is on the south-west coast of Saudi Arabia. It was founded in 1998 and the University has about 8000 students, of whom about 900 are medical students. Each year the college has the capacity to enroll 100 male and 50 female students following an entrance test examination. Male and female students are instructed separately in two colleges. Students are not required to pay fee as the higher education in the Kingdom is being rendered free of cost. The University has a strong regional position and is among the best of Saudi Arabia. The college is using a traditional curriculum in which medical students are trained in a six year curriculum for degrees in Bachelor of Medicine and Bachelor of Surgery (MBBS) with one preparatory year and one additional year of internship after graduation. The main objective of this training programme is to educate and train future doctors and surgeons who will render effective and exemplary healthcare appropriate to the needs of urban and rural populations of Saudi Arabia.

Questionnaire

The first part of the questionnaire comprised of queries regarding demographic details and a list of medical specialties which students were likely to choose later in their careers. Students were asked to choose from 14 specialties and select the most preferred specialty. Specialties enlisted were: internal medicine, surgery, pediatrics, obstetrics and gynaecology, radiology, orthopaedics, ophthalmology,

otolaryngology (ENT), psychiatry, emergency medicine, neurology, dermatology, family medicine and anaesthesiology. A separate group of "other" specialties was constructed to include subjects as anatomy, physiology, biochemistry, pathology, microbiology and forensic medicine. We restricted the preference options to the 14 most popular ones in Saudi Arabia. Subspecialties were not included in this study as choices for a subspecialty are usually not made before finishing the residency in major specialties. Another category of "multiple specialty" was created to elicit responses from students who would like to specialize in more than one subject. In the second part of the questionnaire, students were asked to indicate the degree to which 24 factors influenced their first-ranked choice. The questionnaire included 4 additional questions about the impact of the chosen specialty for the community and about the need for career counseling in the process of choosing the specialty during medical education. The selection of these factors, of which the majority represent "perception" factors, were chosen based on literature reviews (Kruijthof et al. 1992; Al Faris et al. 1997; Wright et al. 2004; Khader et al. 2008) and discussions with medical students, interns, residents and educational leaders. Subsequently, the questionnaire was tested with three classes of medical school in 2010 and subjected to a validation process which included submitting the questionnaire to medical students, interns, residents and experts to check for item appropriateness and comprehensiveness (face and content validity). Responses were rated on a five-point Likert scale ranging from 1 (not significant) to 5 (very significant).

Data analysis

The statistical package for social sciences software (SPSS), version 11.0 was used to analyse the data. Tests of significance such as Chi-square test and unpaired *t*-test were used to analyse the observations and Pearson's correlation was used to establish correlations between responses. A $p < 0.05$ at 95% confidence interval (CI) was considered to be significant.

Results

This study was carried out on medical college students at King Khalid University, Abha involving 590 students studying in the medicine course. The students spend one year in the preparatory school before entering the medical college where they study basic science subjects and English language. The students studying in the preparatory school were not included in this study.

Table 1a presents the distribution of respondents versus non-respondents. Out of 590 students to whom questionnaires were provided, 550 answered providing an enthusiastic response rate of 93.22%. Among this group 348 (58.98%) students were males and 202 (34.24%) were females.

Table 1a. Distribution of respondents vs. non respondents

	Number	Percentage
Respondents*	550	93.22
Males	348	58.98
Females	202	34.24
Non-respondents*	40	6.77
Total	590	100

** Respondents = students who submitted responses on feedback forms; Non-respondents = students who did not submit responses on feedback forms.*

Table 1b shows the distribution of respondents by year of enrollment and gender. The number of male students was higher than the number of female students (gender ratio=1.7:1).

Table 1b. Distribution of responders by year of enrollment and gender

Years	Males (n)	Percentage	Females (n)	Percentage	Total (n)
1st year	100	69.44	44	30.55	144
2nd year	70	53.03	62	46.96	132
3rd year	56	55.44	45	44.55	101
4th year	47	62.66	28	37.33	75
5th year	75	75.53	23	23.46	98
Total	348	100	202	100	550

The age and gender wise distribution of male and female students included in the study is presented in Table 2. The mean age for males was 21.6 years while for females it was 20.2 years. Higher percentage of students belonged to the age groups of 18-19 years (26.43% males; 49% females) and 22-23 years (41.37% males; 28.71% females) respectively.

Table 2. Age and gender wise distribution of study group

Age Group (Years)	Males (n=348)	Percentage	Females (n=202)	Percentage
18-19	92	26.43	99	49.00
20-21	35	10.05	29	14.35
22-23	144	41.37	58	28.71
24-25	68	19.54	16	7.92
26-27	1	0.28	0	0
28-29	8	2.29	0	0
Total	348	100	202	100

Specialty preferences

Specialty preferences were filled in by 80.18% students who gave their opinion regarding the preferred subjects. However, 19.81% of the students (n=109) remained undecided regarding the choice of a medical specialty (Table 3a). The percentage of students with a definite specialty choice was significantly higher among female students than among male students (p=0.025).

Table 3a. Gender-wise distribution of students who preferred a specialty vs. undecided students (n=550)

	males		females		total	
	n	%	n	%	n	%
Specialty chosen	269	77.29	172	85.14	441	80.18
Undecided	79	22.70	30	14.85	109	19.81
Total	348	100	202	100	550	100

Pearsons χ^2=4.96; p value=0.025; risk ratio=1.41; odds ratio=1.68; CI(95%)=(1.02-1.96

The preferred specialty choices of students are presented in Table 3b and Figures 1a and 1b. The most preferred specialty among male students was surgery (26.39%) followed by internal medicine (9.66%), orthopaedics (8.17%) and ophthalmology (7.43%). Among female students the most preferred specialties were surgery (16.27%) followed by pediatrics (8.72%), ophthalmology (7.55%) and internal medicine/neurology (6.97%). In this study, 16.35% male and 25% female students opted for more than one specialty at the time of the study, while 4.83% male and 5.81% female students opted for specialties other than the ones listed. Anaesthesiology (0.45%), radiology (0.68%), emergency medicine (1.8%), psychiatry (2.04%), obstetrics & gynaecology (2.04%) and family medicine (2.7%) were the least preferred choices.

Apparent gender preferences were observed in specialties such as surgery and orthopaedics being chosen by males predominantly while obstetrics and gynaecology being preferred by females only

Table 3b. Gender-wise comparison of preferred specialty

	Males (n=269)		**Females (n=172)**	
Specialty	*Frequency*	*%*	*Frequency*	*%*
Internal medicine (n=38; 8.61%)	26	9.66	12	6.97
Surgery (n=99; 22.45%)	71	26.39	28	16.27
Paediatrics (n=33; 7.48%)	18	6.69	15	8.72
Obstetrics/ gynaecology (n=9; 2.04%)	0	0	9	5.23
Radiology (n=3; 0.68%)	3	1.11	0	0
Orthopaedics (n=25; 5.66%)	22	8.17	3	1.74
Ophthalmology (n=33; 7.48%)	20	7.43	13	7.55
ENT (n=13; 2.94%)	9	3.34	4	2.32
Psychiatry (n=9; 2.04%)	3	1.11	6	3.48
Emergency medicine (n=8; 1.81%)	4	1.48	4	2.32
Neurology (n=26; 5.89%)	14	5.20	12	6.97
Dermatology (n=21; 4.76%)	12	4.46	9	5.23
Family medicine (n=12; 2.72%)	8	2.97	4	2.32
Anaesthesiology (n=2; 0.45%)	2	0.74	0	0
Other specialty (n=23; 5.21%)	13	4.8	10	5.81
Multiple specialty (n=87; 19.73%)	44	16.35	43	25
Total (n=441; 100%)	269	100	172	100

Figure 1a. Most frequently preferred specialties among male students.

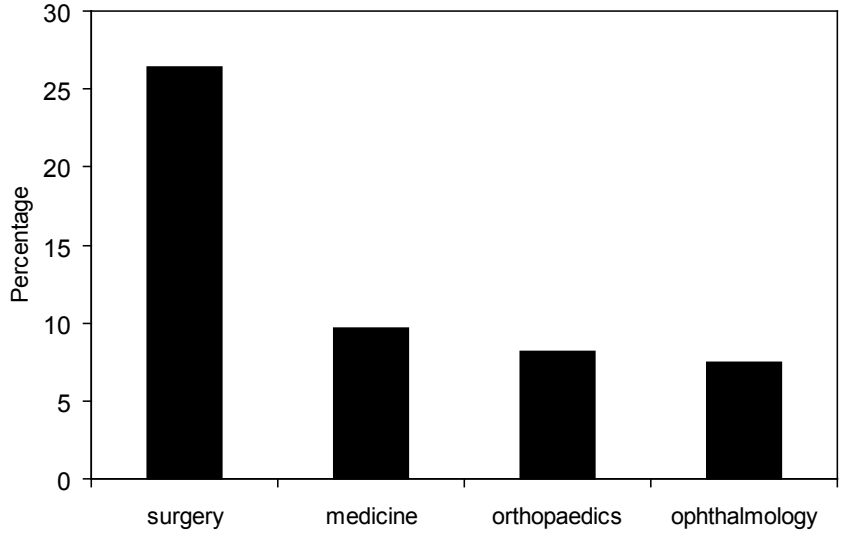

Figure 1b. Most frequently preferred specialties among female students.

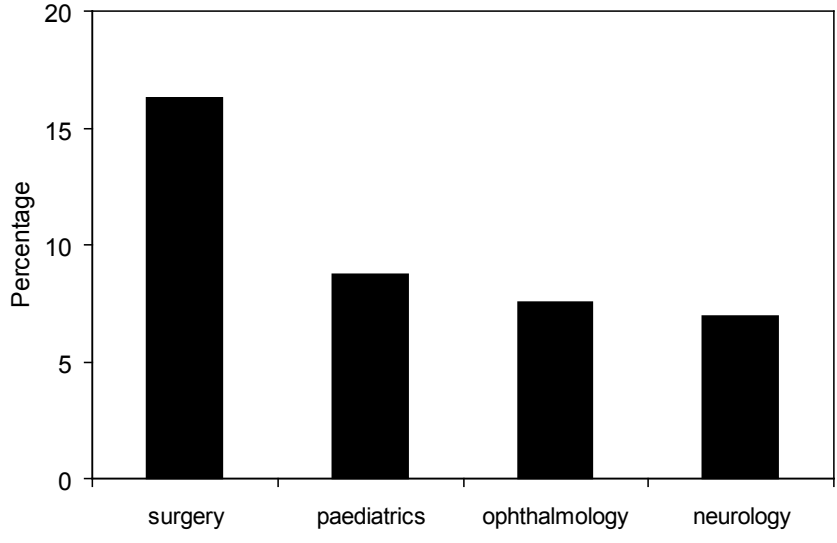

Table 4a depicts a year-wise distribution of descending order of specialty preferences among the respondents (n=354)**.** The students who preferred to choose "multiple specialty" option (n = 87; 19.73%) were not included in the table. More preferred specialties were surgery, internal medicine, orthopaedics, neurology, pediatrics and ophthalmology over the whole study group. Less preferred subjects were anaesthesiology, dermatology, emergency medicine, family medicine and radiology.

Figure 2 shows an agglomerated view of the specialty preferences as observed for five different classes of students. It was observed clearly that the choices of preferred specialties did not change significantly as conveyed by the student responses.

Figure 2. Variation of specialty preferences across five batches of students (n=354).

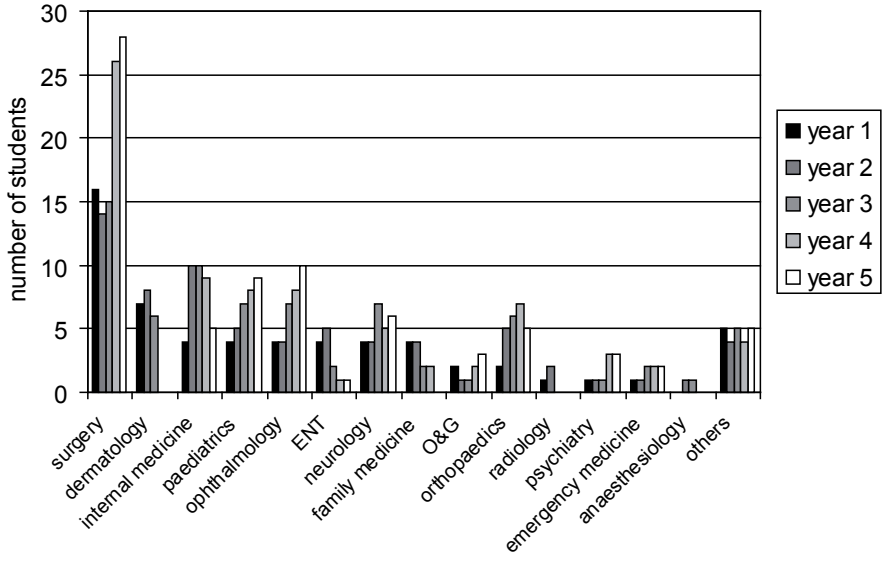

Table 4a. Year-wise distribution of descending order of specialty preferences among the respondents (n=354)

Preferences Grading	Specialty	Year 1	Specialty	Year 2	Specialty	Year 3	Specialty	Year 4	Specialty	Year 5
1	Surgery	16	Surgery	14	Surgery	15	Surgery	26	Surgery	28
2	Dermatology	7	IM	10	IM	10	IM	9	Ophthalmology	10
3	Others	5	Dermatology	8	Pediatrics	7	Pediatrics	8	Pediatrics	9
4	IM	4	Pediatrics	5	Ophthalmology	7	Ophthalmology	8	Neurology	6
5	Pediatrics	4	Orthopaedics	5	Neurology	7	Orthopaedics	7	Orthopaedics	5
6	Ophthalmology	4	ENT	5	Orthopaedics	6	Neurology	5	IM	5
7	ENT	4	Ophthalmology	4	Dermatology	6	Others	4	Others	5
8	Neurology	4	Neurology	4	Others	5	Psychiatry	3	Obs & Gynae	3
9	Family Med.	4	Family Med.	4	ENT	2	Obs & Gynae	2	Psychiatry	3
10	Obs & Gynae	2	Others	4	Emergency Med	2	Emergency Med	2	Emergency Med	2
11	Orthopaedics	2	Radiology	2	Family Med.	2	Family Med.	2	ENT	1
12	Radiology	1	Obs & Gynae	1	Obs & Gynae	1	ENT	1	Radiology	0
13	Psychiatry	1	Psychiatry	1	Psychiatry	1	Radiology	0	Dermatology	0
14	Emergency Med	1	Emergency Med	1	Anaesthesiology	1	Dermatology	0	Family Med.	0
15	Anaesthesiology	0	Anaesthesiology	1	Radiology	0	Anaesthesiology	0	Anaesthesiology	0
16	Total	59		69		72		77		77

(Chi square test= 0.37; p value>0.05)
(Abbreviations: IM=Internal Medicine; ENT=Otolaryngology, Family Med=Family medicine; Obs & Gynae= Obstetrics & Gynaecology; Emergency Med.=Emergency medicine; Others= includes specialties as Anatomy, Physiology, Biochemistry; Pathology, Microbiology or Forensic Medicine)

Pearson's correlation was used to establish correlation between the specialty preferences of the five classes of students (Table 4b). Highly significant positive correlations could be established between the preferences of all the five classes ($p < 0.001$). The change of specialty preferences as seen over the cross-section of respondents was not significant ($p = 0.37$).

Table 4b. Pearson's correlation matrix for establishing the correlation between specialty preferences among the five levels of respondents (n=354)

Year of students		1st year	2nd year	3rd year	4th year	5th year
1st year	Pearson's R	1	0.875	0.817	0.820	0.829
	Sig. (2-tailed)		0.0000	0.0001	0.0001	0.0001
2nd year	Pearson's R	0.875	1	0.897	0.778044	0.697
	Sig.(2-tailed)	0.0000		0.0000	0.0006	0.0030
3rd year	Pearson's R	0.817	0.897	1	0.882	0.835
	Sig.(2-tailed)	0.0001	0.0000		0.0000	0.0001
4th year	Pearson's R	0.820	0.778	0.882	1	0.975
	Sig.(2-tailed)	0.0001	0.0006	0.0000		0.0000
5th year	Pearson's R	0.829	0.697	0.835	0.975	1
	Sig.(2-tailed)	0.0001	0.0038	0.0001	0.0000	

Table 5 shows gender-wise distribution of students' perceptions influencing their choice of specialty. The mean Likert score for responses elicited from students was analysed for significance between the two gender groups. A statistically significant difference ($p < 0.05$) was observed between male and female student responses to most of the listed reasons except for inclination, chance to serve people, location of practise, short training and independent working.

The majority of students (87%) felt that their choice is influenced by the needs of the community (Table 6). Furthermore, 62% of the students reported that their specialty choice was affected by obtaining good marks in that particular subject. With respect to the questions about the need for support in the process of choosing, the majority was either satisfied or neutral, while 26% of the students would have preferred support during medical education. Finally, 88% of students wanted a workshop on career counselling before starting the residency programme. For all four questions in Table 6, the answers of male and female students were not significantly different from each other.

Table 5. Gender-wise distribution of students' perceptions influencing their choice of specialty

Factors Influencing the specialty choices	Mean score of Likert Scale			
	Male Mean±S.D	Female Mean±S.D	Unpaired t-test	P-value
Personal Interest	4.4±3.27	2.8±2.00	6.30	0.0001
Marital Status	3.5±1.40	3.8±0.21	3.02	0.0026
Number of Children	4.1±4.26	2.65±0.14	4.83	0.0001
Family' Expectation	4.35±3.58	2.25±1.25	8.05	0.0001
Teachers Advice	4.5±2.25	2.85±2.44	8.03	0.0001
Friend Advice	3.47±3.5	2.5±2.55	3.44	0.0006
Less Competitive field	4.5±3.01	1.8±2.58	10.67	0.0001
Future Job opportunities	4.8±3.25	2.9±2.55	7.13	0.0001
Prestige of specialty	2.98±1.25	3.96±1.58	8.02	0.0001
Shortage of specialists	3.65±2.68	2.41±1.08	6.28	0.0001
Diversity of Patients	4.21±2.35	2.95±1.25	7.06	0.0001
Option to practice abroad	4.66±0.02	4.02±3.40	3.51	0.0005
Good clerkship experience	3.28±0.12	3.8±3.58	2.70	0.0071
Research Opportunities	4.56±1.25	3.95±3.58	2.89	0.0041
Teaching opportunities med. college	2.01±2.25	4.45±3.55	9.85	0.0001
Perceived ability (inclination)	4.5±3.98	4.12±3.86	1.09	0.2756
Effect of a role model	3.4±2.25	3.95±3.45	2.25	0.0244
A chance to serve people	4.4±2.25	4.25±3.48	0.61	0.5403
Location of practice	2.98±2.02	2.95±0.25	0.21	0.8337
Work related risks	3.96±3.02	4.4±0.02	2.06	0.0393
Work stress	2.85±0.12	2.58±0.00	30.68	0.0001
Short period of training	2.35±1.25	2.35±0.00	0	1
Work independently	4.25±3.25	4.01±0.21	1.04	0.2963
High income potential	3.12±3.65	2.35±0.25	2.99	0.0029

Table 6. Responses to additional questions

In your opinion how significant is your chosen specialty to the community?	
Significant	87%
Not significant	5%
Not Sure	8%
Is obtaining marks in a particular subject influence your specialty choice?	
Yes	62%
No	38%
How satisfied are you with opportunities during medical college tenure to explore potential career choices?	
Satisfied	42%
Neutral	32%
Dissatisfied	26%
Do you want a workshop on career or specialty counseling before starting the residency after completion of undergraduate studies?	
Yes	88%
No	12%

Discussion

The objectives of this study were to examine Saudi medical students' career intentions, observing the variation in specialty preferences during their medical training and identifying students' perceptions contributing to the specialty choice of medical students at King Khalid University. These issues are important for medical workforce planners particularly in times of shortage of doctors.

Male to female student ratio was skewed towards the male students (1.7:1) as the number of seats available for males was higher. In Saudi Arabia coeducation is not practiced as yet and hence the teaching, training and colleges of the male and female students are separate. The response rate of 93.22% was surprisingly high. Possibly this was caused by the fact that the questionnaire was translated in Arabic language besides English for easy comprehension. Mean age of the male students was marginally higher than the females and a larger group of students was in the age groups of 18-19 and 22-23 years. Similar study demographics have been reported by Al-Faris et al. (1997) and Khader et al. (2008) from the Middle East region.

It was observed on the analysis of the questionnaire that 80.18% of the students had selected one or the other specialty preference which he/she would likely pursue in the future. Female students responded more decisively (85.14%) to this query of specialty selection than males (77.29%), probably because female students plan earlier to take up a suitable career path. Contrary to this, 19.81% students failed to reply with a definite choice of specialty selection. Al-Faris et al. (1997) while conducting a study on Saudi students, reported a 27% figure for undecided students.

When analyzing the figures of specialty choices observed in male and female students together, surgery (22.45%), internal medicine (8.61%), ophthalmology and pediatrics (7.48%), neurology (5.89%) and orthopaedics (5.66%) were the most significantly preferred specialties. In a similar study conducted in Saudi Arabia, it was reported that internal medicine (17%), surgery (16%), paediatrics and obstetrics & gynaecology (14%) were the most sort after specialties (Al-Faris et al. 1997). The findings of this study are congruent with other research studies conducted in Europe (Avgerinos et al. 2006; Mariolis et al, 2007). Compton et al. (2008) reported from USA after conducting a survey of 942 students that pediatrics (20%) and surgery (18%) were the most preferred specialties, while preventive medicine and psychiatry were the least attractive specialties (1% each). In our present study, emergency medicine (1.8%), radiology (0.68%) and anaesthesiology (0.45%) happened to be the least preferred choices conforming to the findings of Al Faris et al., who reported family medicine (2%), psychiatry (2%) and radiology (1%) to be the least preferred.

In both male and female students surgery was the most popular specialty. Interestingly, the percentage of students opting for surgery was significantly

higher among male than among female students ($p<0.02$). Besides surgery, the other three high ranked choices for male students were internal medicine (9.66%), orthopaedics (8.17%) and ophthalmology (7.43%), but for female students these were pediatrics (8.72%), ophthalmology (7.56%) and internal medicine (6.98%) in a descending order. These findings are consistent with the results of studies conducted in non-western universities such as the one conducted by Khader et al. (2008) in Jordan. In that study surgery (52%), internal medicine (15%) and orthopaedics (8%) are listed as the most preferred choices for males and obstetrics & gynaecology (31%), pediatrics and surgery as the most preferred choices by female students. The observed popularity for surgery among female students reflects the worldwide decreasing dominance of men in this specialty (Blakemore et al. 2003; Fysh et al. 2007).

Interestingly, in contrast to observations in other studies conducted in Saudi Arabia (Al-Faris et al. 1997), European countries (Turner et al. 2006) and the study of Khader et al. (2008) from Jordan, in the present study obstetrics/gynaecology was not in the most preferred list of female students (5.23%). This relatively unwillingness of females to enter obstetrics/gynaecology may be attributable to concerns about a demanding professional obligation *vis-a-vis* family commitments, workforce planning and career progression problems, rather than any lack of enthusiasm for the specialty. This is an area of future research in the Kingdom. In our study male students did not intend to work in obstetrics and gynaecology ($p = 0.00018$, when compared to female students' interest). In contrast to this Figueiredo et al. (1997), reported a preference of 18% and 16% by two cohorts of male students from Brazil. From Saudi Arabia, Al Faris et al. reported a small liking by men for obstetrics and gynaecology (4%) while Khader et al. from Jordan reported a preference of only 1%. Possibly, this very low interest in obstetrics and gynaecology by male students reflects the conservative socio-cultural environment in Saudi Arabia.

The category of "other specialties" was inclusive of subjects as anatomy, physiology, biochemistry, pathology, microbiology and forensic medicine. But preference for these medical branches was cumulatively 5.21% only. A possible explanation for this could be the availability of educational funds, facility to travel to other countries for pursuing higher education in clinical branches and a general enthusiasm to treat patients directly and gain repute thereof. The other category of "multiple specialty" was chosen by 19.73% students predominantly males. This category was not included in the analysis as the students selecting this may not have decided upon a single specialty or may wish to pursue training in more than one during post-graduation tenure.

In particular, the observation that family medicine was a low popularity specialty choice among the medical students needs further attention as the current deficiency

of trained Saudi primary health care physicians is likely to continue until targeted strategies to produce more primary care specialists are undertaken (Albar 1999). Only 2.97% male and 2.32% female students participating in the study considered family medicine as their first career choice. Despite the importance of family physicians to the health care system and the numerous training opportunities that exist in the field, medical students' interest in primary care has decreased (Pugno et al. 2001). Preference of family medicine as a career choice has declined from 1997 to 2002 in US from 17.3% to 10.5% (Senf et al. 2003). Such a low interest in family medicine is noteworthy because a students' initial career choice is an important predictor of whether the student ultimately chooses a career in family medicine; furthermore, students tend not to switch into family medicine if it was not being considered at the time of studying at the medical school (Rabinowitz 1999). The low popularity of family medicine and some other specialties in Saudi Arabia implies that such specialties may still have to depend in future on foreign manpower of physicians. The ratio of general practitioners to population was significantly associated with better health outcomes, fewer unnecessary deaths and lower costs of specialized health care (Starfield et al. 2005). Although Starfield's work does not include the GCC countries, it is applicable to other health settings in US, UK, Germany, Netherlands, Spain, Brazil, Costa Rica and few African countries.

Year-wise analysis of specialty preferences revealed that specialty preferences correlated significantly over all the year classes of students ($p < 0.001$). It indicates that the choices made by students are fairly consistent and stable from a fresher of the first year to a relatively experienced pre-graduate of the final year. A longitudinal study monitoring individual student's choices during the course of medical tenure is needed to confirm this finding. However, Scott et al. (2007) reported after conducting a study on 845 students from eight medical schools in Canada that specialty choices remained the same for 80% of the eligible medical respondents after three years.

Students were enquired about the impact of several factors which might influence their perception of their future profession. Although it appears in general that the mean Likert scores of female students were lower than the scores of males, in both the sexes, the students' perceptions such as "option to practice abroad", "research opportunities", "perceived ability" and a "chance to serve people" had the highest impact on their choice. The significant differences brought forth by analysis reveals that gender differences were prevalent in choosing the perceptions for the choice of specialties.

Male students attributed "personal interest", "number of children", "family expectations", "teacher's advice", "less competitive field", "future job opportunities", "diversity of patients" and "work independently" as the more

significant perceived reasons for choice of specialty. Female students in contrast perceived "teaching opportunities," "work related risk," and "prestige of a specialty" as the chief contributing reasons for choice.

The finding that male students choose a career in a less competitive field than female students is of great interest. In an affluent society of Saudi Arabia, students are commonly observed to pursue careers or professions which are more rewarding and less demanding. The present finding suggests a sense of rising competition among female students especially after the induction of new courses and opening up of new institutions across the Kingdom in recent years complemented with a need to pursue a successful career in future. Millan et al. (2005) reported from a study conducted in western world among high school pupils and young adults that women are more ambitious than men. However, among students who were approaching the final phase of their academic education, men became much more ambitious than women. This gender difference justifies further study, although the impact of teaching opportunities as a factor for job satisfaction in medical doctors has been reported (Hojat et al. 2010).

Our data suggest that idealistic and society-driven aspects may play a greater role in the process of choosing a career among male students than in female students. As with the observed lower competitive attitude of male students at this age, this difference may reflect a different tempo of growing up in men and women. Definitely, additional studies are required to confirm these gender differences.

The influence of role models was substantial in our study, but was not among the most influential factors. The positive impact of role models and mentors on specialty selection has been described previously in medical education (Osborn 1993; Rubeck et al. 1995; Henderson et al. 1996; Burack et al. 1997; Saigal et al. 2007). Furthermore, a clinical role model can also affect the students in a negative manner and drive them away from certain specialties (Ambrozy et al. 1997). Sometimes, residents as role models have been cited as influential in determining the students' specialty choices (Burack et al. 1997; Buddeberg-Fischer et al. 2006). However, in contrast to our study, those studies have been retrospective so it was difficult to determine whether their data arose from actual influence or from students' fond memories.

With respect to the need for career counseling, this study shows that a great majority of students would appreciate that kind of support. Faculty members of the Medical College provide periodic career counseling to the students as and when required. However, apparently, this unstructured effort is not sufficient to resolve the dilemmas faced by students during the process of specialty selection. Therefore, we recommend the establishment of a separate centre for career counseling in our college.

The strength of this study is that it presents data about students' choice of postgraduate medical specialist training in an Arab country. The unequal distribution of Saudi doctors and the shortage of doctors in different specialties especially in family medicine indicate a need to produce more primary care specialists. This study can contribute to a better understanding of the process of choosing a career. A possible weakness of this study is that it was a cross-sectional study without monitoring students' individual opinions through the years of their medical education. However, the great number of participants and the high response rate help to us to establish that the data are relevant.
Based on the present findings, it may be concluded that a set of multiple factors operating before, during and after medical school are involved in any individual's career decision. Future studies should consider the factors influencing the specialty choice of students from multiple institutions and over a period of time to see the evolution in individual students' perceptions about their specialty choice. Future studies should also consider the influences on the specialty choice of students across several clerkships.

Conclusions

This study has brought forth a significant observation in the context of this medical college that, student's specialty preferences did not vary from a first year student's perspective to a relatively experienced final year pre-graduate. Gender preference was observed to affect choices of few specialties such as orthopaedics and obstetrics/ gynaecology. A plethora of perceptions for selecting a specialty were graded by students of which the salient ones were, "personal interest," "teachers advice," "option to practice abroad," "shortage of specialists," "prestige of a specialty," "research and teaching opportunities" "and a 'chance to serve people".

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Chapter 4

Personality types and specialist choices in medical students

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Abstract

Background: Research on the correlation between personality and students' specialty choice is helpful in their career counselling process and in predicting the future distribution of the specialties in a country.
Aims: This study is the first of its kind in the Arab world. The research questions were: (1) What is the influence of gender on the personality profiles of medical students? (2) What are the personality profiles of students categorized according to their preferred specialist choices? (3) What are the preferred career choices of students categorized according to the stage of their medical education?
Method: A cross-sectional study was performed at King Khalid University medical school including 590 students during the academic year 2010/2011. A long version of the Zuckerman-Kuhlman personality questionnaire measuring five personality factors was used. Students were also asked for their specialty interests. Students were asked by means of a written questionnaire.
Results: Study response was 92.5%. Surgery was the single most popular specialty amongst both male and female students. Males had significantly higher scores on the 'impulsive sensation seeking' scale and students preferring a surgery specialty had the highest score on the 'impulsive sensation seeking', 'neuroticism-anxiety', 'aggression-hostility' and 'sociability' scales. Hospital based, surgical and primary care specialties became more popular as students progressed through their undergraduate years.
Conclusions: Different personality types have distinct preferences in medical students' choice of careers. Personality and specialty choice research can enhance career counseling of medical students and fresh graduates. This also has implications for predicting the specialty distribution of the future health careers.

Background

Medicine is a diverse field in which the distinctive specialties are associated with differences in doctors' responsibilities, the clinical scenarios they face and their encounters with patients (Linn et al. 1985; Ramirez et al. 1996; Bergus et al. 2001). Therefore, from the perspective of medical students, the selection of medical specialty is based on many determinants related to health care delivery. The understanding of this process is complex and only partially deciphered and understood - due to the various factors involved.

A wide variety of specialities are chosen based on personal, cultural, national and international values and motivations reflecting distinctive personalities in each field along with some modifiable and non-modifiable factors such as academic achievements, finances, lifestyle and available role models.

There have been attempts to develop personality profiles of medical students either at the outset or during the course of medical education to predict their final selection of specific specialty and project the likely number of specialists in each field (Schumacher 1963; Wasserman et al. 1969; Yufit et al.1969; Babbott et al. 1990; Zeldow et al. 1990, 1991, 1992; Kassebaum et al. 1994, 1996; Martini et al. 1994; Vaidya et al. 2004) however these previous attempts may not fully apply to contemporary medical graduates. Newer personality assessment instruments have been developed and these demand further comprehensive research in relation to this complex topic.

Studies in the past tried to compare specialty choices with personality's pre and post residency but the tools used in these studies (e.g. 16 Personality Factors and Myers-Briggs Type Indicator) have gradually become older and outdated, hence making it difficult to make comparisons in current circumstances (Zeldow et al. 1991; Kassebaum et al. 1995; Vaidya et al. 2004; Oakland 2006).

Several studies, which have analysed the relationship between personality and specialty selection, have produced interesting but sometimes conflicting results: Zeldow and Dougherty (1991) reported that students who preferred surgery as their specialty choice, scored higher on the masculinity trait and lower on depression whereas students electing obstetrics-gynaecology scored the highest on femininity, neuroticism and anxiety. Furthermore, those who selected internal medicine scored low on the neuroticism scale (Zeldow et al.1991).

In an interesting and contrasting study on the personality types of surgeons, general practitioners and anaesthesiologists using the 16-PF, Borges and Osmon found that general surgeons were more tough-minded, resolute, more resistant to stress, had high self-esteem and were less empathic than general practitioners and anaesthesiologists (Oakland 2006; Hojat 2007).

In some other studies, it was ascertained that specialty choices may be mediated by personality traits like empathy (Newton 2000; Hojat et al. 2001; Hojat 2007). In these studies, the highest empathy scores were found among doctors who have

maximum patient interaction such as in psychiatry, internal medicine, pediatrics, emergency medicine, and family medicine and the lowest scores were found among those who have minimum patient interaction such as in anaesthesiology, orthopaedics, neurosurgery, radiology and cardiac surgery and other hospital based specialties (Hojat et al. 2001, Hojat et al. 2002a , 2002b) .

Hojat et al. in their series of studies between 2001 and 2002 among medical students and doctors (Hojat et al. 2001, 2002a, 2002b) clearly showed that women were found to be more compassionate than men which can explain their more frequent choice of primary care or people-oriented specialties.

Vaidya and colleagues, comparing medical students' specialty preferences using the temperament and character inventory (TCI), reported that students selecting emergency medicine and surgery scored higher than students selecting family medicine or internal medicine on the novelty-seeking scale (Vaidya et al. 2004).

Sensation seeking is a personality feature associated with an inclination towards high stress professions such as air-traffic control. Zuckerman (1994, 2007) and Bascom (2006) found that emergency room residents, as opposed to family medicine residents, scored higher on the impulsive sensation seeking scale of the Zuckerman-Kuhlman personality questionnaire (Zuckerman 2002).

Maron and colleagues, while assessing whether physicians gravitate to certain practice specialties due to pre-existing personality traits, reported that the personality profiles present before medical school appear to predict the selection of some residencies and clinical specialties, but not others (Maron et al. 2007).

In a study at the University of Oslo, Tyssen et al. elucidated that a specific combination of personality traits can predict medical school stress and that a combination of high neuroticism and high conscientiousness is considered to be particularly high risk (2007).

In general, many previous research studies give rise to contradictions and conflicts since they did not take into account the changes in personalities and factors at the time of selection of specialties. The students' personalities are still in the process of being influenced by many factors e.g., level of effort, ambitions, role models, family background and culture. Therefore re-examining the relationship between students' personality characteristics and specialty selection will be beneficial in further examining this complex phenomenon. In addition there is a lack of information about students in non-western countries (such as Arab countries). Furthermore the geopolitical situation can also have a profound impact on specialty selection as well as the personalities of students. This will certainly have implications for career counselling and predicting the future workforce in different parts of the globe. This study was designed and conducted to answer the following research questions:

1. What is the influence of gender on the personality profiles of medical students?
2. What are the personality profiles of students categorized according to their preferred specialist choices?
3. What are the preferred career choices of students categorized according to the stage of their medical education?

Methods

Setting and Context

A cross-sectional study was performed at King Khalid University medical school including 590 students from first to fifth year. In Saudi Arabia male and female teaching campuses are separate. The number of seats allocated for males is slightly higher than the number of seats available for women (1.7:1).

Questionnaire

The Zuckerman-Kuhlman personality questionnaire-medium form (ZKPQ-S) was used. Responses were rated on a four-point scale ranging from 1 (disagree strongly) to 4 (agree strongly). Written permission was obtained from the inventor of the questionnaire to use it in the study. This questionnaire is a valid and reliable instrument to assess personalities (Aluja et al. 2006). The questionnaire was developed to measure basic factors of personality or temperament that have a strong biological-evolutionary base (Zuckerman 2002). There are five personality scales in this questionnaire:

1. *Impulsive sensation seeking*: described as a tendency to act quickly on impulse without planning, often in response to the perceived need for thrills and excitement, change and novelty.
2. *Neuroticism-anxiety*: described as a tendency to be nervous, tense, sensitive to criticism, easily upset and obsessively indecisive.
3. *Aggression-hostility*: described as a tendency to express verbal aggression and show rudeness, lack of inconsideration, vindictiveness, a quick temper and an impatient attitude.
4. *Sociability*: described as a tendency to interact well with others, to enjoy being with others, and to have intolerance for social isolation
5. *Activity*: described as a tendency to be active, to prefer challenging work and to be impatient or restless when there is nothing to do.

Four broad types of specialties

Students' interest in specialties was determined by asking them to choose their preferred specialties. In the analysis of the data these specialties were categorized according to a limited number of 'types' of specialty with distinct characteristics.

For this purpose we used a classification of specialties described in previous medical educational research (Lieu et al. 1989; Hojat & Zuckerman 2008). This classification defines four types of specialties:

1. *Hospital-based or procedure oriented*: defined as performing specialized diagnostic procedures or basic applied laboratory research involving minimum contact with patients (e.g. anaesthesiology, radiology, pathology)
2. *Surgical or technology-oriented*: defined as performing highly skilled and specialized therapeutic techniques or procedures, serving as an expert consultant (e.g., surgery and subspecialties, neurosurgery, and ophthalmology).
3. *Non-primary care medical specialties*: defined as providing episodic or long-term care of a certain limited number of medical problems in a mix of ambulatory and hospital-based practice (e.g. cardiology, dermatology, gastroenterology, emergency medicine obstetrics/gynaecology, psychiatry)
4. *Primary care or people oriented*: defined as providing first encounter health/illness appraisal and preventative education and intervention, episodic and long term comprehensive care of a wide variety of medical conditions, primarily office based (e.g., family medicine, general internal medicine and general pediatrics).

Statistical analyses

For the statistical analysis the SPSS (version 11) software was applied. We used two-way multivariate analyses of variance followed by univariate analysis of variance.

Results

Five hundred and forty six students out of 590 took part (this represented a 92.5% response rate). Two hundred and ten students (210) were female and three hundred and thirty six (336) were male. The mean age ($\pm$ standard deviation) of the respondents was 21.5 $\pm$ 2.5 years.

Specialty interest and gender

Table 1 presents the frequency distribution of specialty interest and gender. A great proportion of the students had interest in more than one specialty. However, among students who had made up their mind for one specialty category, a surgical specialty was the most preferred one: 37% of the male students preferred to become a surgical specialist, while among female students this percentage was somewhat lower: 27%. With respect to the second position in the ranking of preferences, both men and women selected a primary care specialty (respectively 12% and 11%). In women there was similar interest in specialties of the category of medical non primary care (11%), while in men the interest for this category was only 4%).

Neither men nor women were very interested in hospital based specialties (men, 4%; women, 3%).

Table 1. Frequency distribution of Specialty interest by Gender

Specialty Interest	Men		Women		Total	
	n	%	n	%	n	%
Hospital Based	14	4%	7	3%	21	4%
Surgical	125	37%	56	27%	181	32%
Medical Non-primary	15	4%	24	11%	39	7%
Primary Care	38	12%	23	11%	61	11%
Multiple specialty	144	43%	100	48%	244	46%
Total	336	100%	210	100%	546	100%

Gender, specialty interest and personality

The summary results of multivariate and univariate statistical analyses are reported in Table 2. In this table, the data of the five personality profiles of the medical students related to their gender and their specialty interest are shown. In general, men had a significantly higher score on the 'impulsive sensation seeking' scale than women ($p< 0.001$), whereas no significant gender differences were found on the other scales.

With respect to the correlation between specialist interest and personality profiles, students preferring a surgery specialty had the highest score on the 'impulsive sensation seeking', 'neuroticism-anxiety', 'aggression-hostility' and 'sociability' scales. This was found in both men and women. For the 'activity' scale the pattern of results was different: among female students the highest mean score was found in those preferring surgery, whereas among men the highest score was found in those who were interested in a hospital based specialty. The univariate analysis reveals the personality differences among specialty categories and shows that these differences between male and female students were statistically significant ($p < 0.05$ or 0.01). However, interactions of specialty preference and gender were not statistically significant.

Table 2. Comparison of the scores on the five scales of the Zuckerman-Kuhman personality questionnaire (ZKPQ) by gender and specialty interest and the summary results of multivariate and univariate analyses

	impSS[1]	**N-Anx[2]**	**Agg-Host[3]**	**Sy[4]**	**Act[5]**
	M (SD)	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**
Gender					
Total men	2.8 (1.8)	2.2 (1.4)	2.0 (1.7)	4.7 (2.4)	4.7 (2.1)
Total women	1.9 (1.8)	2.3 (1.4)	1.8 (1.7)	4.6 (2.2)	4.8 (1.9)
Specialty interest					
A. Hospital based					
Men	2.4 (2.0)	1.7 (1.5)	1.7 (1.2)	4.0 (2.2)	6.2 (1.8)
Women	1.8 (1.3)	2.6 (1.7)	1.8 (1.5)	2.5 (2.5)	5.0 (2.6)
Total	2.1 (1.6)	2.1 (1.6)	1.8 (1.4)	3.3 (2.4)	5.6 (2.2)
B. Surgery					
Men	3.3 (1.3)	4.0 (1.3)	2.4 (1.6)	5.5 (2.8)	4.2 (3.3)
Women	2.6 (1.8)	3.8 (1.6)	2.1 (2.0)	5.8 (1.8)	6.5 (1.9)
Total	2.9 (1.5)	3.9 (1.4)	2.3 (1.8)	5.6 (2.3)	5.4 (2.6)
C. Medical non-primary					
Men	3.2 (2.3)	1.7 (1.5)	1.8 (1.9)	4.4 (1.9)	4.3 (1.6)
Women	1.9 (2.5)	1.8 (1.4)	1.7 (1.7)	4.6 (1.9)	2.0 (1.5)
Total	2.5 (2.4)	1.8 (1.5)	1.8 (1.8)	4.5 (1.9)	4.5 (1.5)
D. Primary care					
Men	2.2 (1.5)	1.5 (1.2)	2.1 (2.2)	5.0 (2.8)	4.0 (1.6)
Women	1.3 (1.7)	1.2 (1.0)	1.5 (1.5)	5.5 (2.6)	2.9 (1.9)
Total	1.7 (1.6)	1.4 (1.1)	1.8 (1.9)	5.3 (2.7)	3.4 (1.7)
Univariate F- ratios					
Main effect of specialty: F(3,546)	4.8**	3.9*	4.8**	4.98**	2.89
Main effect of gender: F(1,546)	29.25**	35.68**	6.89**	5.89**	3.28*
Interaction effects: F(3,546)	0.98	0.45	1.02	0.36	0.58
Group differences					
Gender	M>W	M≤W	M≤W	M≤W	M≤W
Specialty	B>A=C=D	B>A=C=D	B>A=C=D	B>A>C=D	B=A>C=D

*** p < 0.01, * p < 0.05.1. Impulsive sensation, 2. Neuroticism-anxiety, 3.Aggression hostility, 4. Sociability, 5. Activity For gender effect: Wilks' Lambda = 0.95, p ≤ 0.05. For specialty effect: Wilks' Lambda = 0.95, p ≤ 0.05.*

Preferred career choices and the stage of their medical education

Table 3 presents the stage wise distribution of specialty interest. When analyzing the correlation between the stages of the medical students and their specialty interest, we found a positive and high correlation in hospital based, surgical and primary care specialties (*r*-values respectively 0.90, 0.89 and 0.86), which means that there is a increasing trend observed in the selection of these specialties. For the domain of the medical non-primary specialties, there was a negative correlation during the stages of medical education, meaning a decreasing trend of interest (r = -0.58).

Table 3. Stage-wise distribution of specialty interest

	Stage of medical education					
Specialty interest	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**r***
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	
Hospital based	2 (2)	4 (3)	3 (3)	5 (5)	7 (6)	0.90
Surgical	25 (23)	32 (28)	34 (31)	35 (37)	55 (49)	0.89
Medical non-primary	8 (7)	9 (8)	8 (7)	9 (9)	5 (4)	-0.58
Primary care	9 (8)	11 (10)	14 (13)	12 (13)	15 (14)	0.86
Multiple specialties	70 (60)	59 (51)	50 (46)	35 (36)	30 (27)	n.d.
Total	114 (100)	115 (100)	109 (100)	96 (100)	112 (100)	

** Pearson correlation was calculated for students' preferences of specialty interest versus the stages of their medical education*

Discussion

Medical specialty selection forms the basis of the professional career of a doctor. However, as medicine is a diverse field, it is very likely that distinctive specialties are associated with different doctors' characteristics, motivations, and personality attributes (Mowbray & Davies 1971; McGrath et al. 1977; Schwartz et al. 1994).
This study is the first of its kind in the Arab world to look at the influence of gender on the personality profiles of medical students, the personality profiles of students categorized according to their preferred specialist choices and the preferred career choices of students categorized according to the stage of their medical education. The study looks at students at all levels of undergraduate medical education and the questionnaire surveys used had a high response rate. Out of 590 students to whom questionnaires were provided, 546 answered providing an enthusiastic response rate of 92.5%. Male to female student ratio was skewed towards the male students, representing the difference in the number of seats available for male and female students in Saudi Arabia.
The study showed that surgery was the single most popular specialty amongst both male and female students. Our findings are in line with this newly emerging trend of a decreasing dominance of men in surgical specialties and an increasing interest amongst women in surgery at a global level (Blakemore et al. 2003; Fysh et al. 2007). This might have significant implications for workforce planners in future strategic planning.
In general, the results of our study confirm the association between students' personality characteristics and the specialty choices made during undergraduate medical education. This was most significant for students preferring a surgery specialty. These students had the highest score on the 'impulsive sensation seeking', 'neuroticism-anxiety', 'aggression-hostility' and 'sociability' scales. Apparently, the challenging and risk taking nature of a surgical specialty attracts the sensation seekers. This finding is in agreement with previous findings showing that surgeons scored higher on measures of novelty seeking (similar to and highly correlated with sensation seeking), masculinity, and tough-mindedness (Borges et al. 2002; Vaidya et al. 2004).
With respect to gender differences in personality characteristics, males had significantly higher scores on the 'impulsive sensation seeking' scale. This gender difference is consistent with results reported in the cohorts of college students in the USA and Europe (Zuckerman 2002; Aluja et al. 2006; Hojat & Zuckerman 2008).
When a correlation was explored between the personality profiles and the persistence of preferred career choices during the course of medical education, it was observed that there was a significant positive relationship in hospital based, surgical and primary care specialties. In contrast to this, the interest in medical non-primary care decreased during the years of medical studies. Furthermore, in the initial two years a significant number of students selected multiple specialty

categories. However students in the later stages of medical education opted for surgery, primary care and hospital based categories. This transition might reflect the maturity of students' thinking in the later years of their medical course which also shows that specialty selection is an evolutionary process with a multitude of factors affecting the process. These findings are consistent with previous research studies conducted in the USA and Malaysia (Rogayah & Zulfikli 2001; Compton et al. 2008) .

There are a few limitations to the study. Nearly all the students entered medical school as school leavers (and so any conclusions drawn might not apply to graduate entry students).
This was a cross-sectional study and as such offers only a view of one point in time: the results may have been different had another time frame been used. Associations can be drawn between the related variables but as with all cross sectional studies these associations do not necessarily imply a causal inference. In the study medical students were asked what their preferred specialty would be but they were asked at a stage when they were not about to make a definitive choice. As with all surveys of this kind a healthy scepticism must be maintained when interpreting the reports of what respondents said they would like to do at a point a number of years into the future. The Zuckerman-Kuhlman personality questionnaire-medium form (ZKPQ-S) is a valid and reliable tool but it is possible that certain aspects of it may be interpreted differently by people from different cultures. Despite these caveats we feel that this study adds an important piece to the evidence base in relation to gender, personality profile and specialty choice amongst medical students. The separation of male and female students in medical school might also have influenced the results, because interpersonal relations and role modelling work differently in schools where males and females are separated. In conclusion, our study confirms that many of the different personality types tend to have distinct preferences in their choice of careers. Medical respondents often find it helpful to reflect on their personality, values, and interests on their path to making career choices. Personality and specialty choice research can enhance career counseling of medical students and interns, especially for those who are undecided about choosing a specialty that may be best suited to their personality. This can be helpful in selection processes and has implications for predicting the specialty distribution of future health careers.

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Chapter 5

Newly qualified doctors' views on the significance and accessibility of career advice during medical training in Saudi Arabia

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Abstract

Background: Career advice is an important instrument to help students with the proper specialty selection. The study aims (1) to explore the views of newly graduated doctors in Saudi Arabia about their experience with the current status of career support system during medical training and (2) to identify cross-cultural similarities and differences.

Methods: A cross-sectional design study was conducted using a questionnaire to elicit the responses of participants from newly qualified doctors concerning the availability and significance of career advice. SPSS (version 11.0) was used to analyse the data and statistical tests, such as *chi*-square and unpaired *t* tests, were used to analyse the observations.

Results: A response rate of 94.7% was obtained. Among this group 102 were males and 78 were females. Only 53% did receive career advice. The majority of men felt that career advice during medical studies was inadequate, while women were less negative (69% versus 32%; $p = 0.0001$). Furthermore, men were more disappointed about the possibilities for career advice after graduating than women (34% versus 13%, $p = 0.0001$).

Conclusions: The results show that only half of newly graduated doctors had received any career advice during medical training. As the health care system cannot afford the potential waste of time and resources for doctors, career guidance should begin in undergraduate training so that the process of thinking about their future career starts longtime before they make their career choice.

Introduction

The benefits of effective career planning are multiple (Howard & Clegg 2009). Consequently, it is very important to help medical students make the right decision with respect to their professional careers. The health care system cannot afford the potential loss of time, resources and doctors because of mistaken career choices. Therefore, career guidance should begin in undergraduate training so that the process of thinking about their future career starts a long time before students need to make a decision.

The lack of career guidance for medical students and doctors during their training has been identified by a number of research studies (Jackson et al. 2004; Lambert & Goldacre 2009). Career counseling as a specialty area has been recognized since the early 1980s with the establishment of both competencies and credentials. Although some measures have been initiated by some institutions and organizations to improve the career counseling (Wilson & Reece 1995; Porter 1998), but, less attention has so far been paid concerning the career guidance provision as a structured service for medical students and doctors (Carnell & Smith 1996).

A cohort study of the British Medical Association (BMA) confirms that the majority of doctors in training are dissatisfied with the career advice and guidance they received and this dissatisfaction is a country wide phenomenon (British Medical Association 2004). In a recent study (Luck 2000) found that career indecision was, in itself, a considerable cause of stress for up to a quarter of doctors in training. Furthermore formal education and training during early postgraduate years is often reported to be insufficient, of variable quality, and lacking in career guidance. (Jolly et al. 1989; Rolfe et al. 1998; Hannon 2000; Prince et al. 2004; Kendall et al. 2005). A study published in 2004 suggested that early career advice and support during medical school and immediately after graduation might encourage doctors who were considering careers in specialties in which there are shortages (Mahoney et al. 2004). Other studies (Eley & Morissey 2007; Mulroy 2007) have helped define what students want in an internship and indicated that two years before graduating, students are already considering their internship plans.

The purpose of this study was to determine the degree to which such career advice is available in Saudi Arabia. Furthermore, it was aimed to identify cross-cultural similarities and differences. Unfortunately, the number of research studies concerning this subject is very limited in the GCC (Gulf Cooperation Council) region and in Saudi Arabia. In fact, to date, there has not been any systematic research in Saudi Arabia to determine what the career guidance needs of doctors in training are, or whether they are being met. These are the issues that this research set out to explore.

Methods

Participants

This is a cross-sectional study in which participants were newly qualified doctors (interns and first-year residents) in the ABC Central Hospital. At the time of the study 190 graduates fulfilled the criteria of "newly qualified doctors". Granting permission was voluntary and confidential and anonymity was guaranteed. Under Saudi Arabian law, educational studies with questionnaires are exempt from Institutional Board Review.

Situational context

The College of Medicine of King Khalid University has a traditional curriculum in which medical students are trained in five years for a Bachelor of Medicine or Bachelor of Surgery (MBBS). There is one preparatory year and one additional year of internship after graduation. The main objective of this programme is to educate and train future doctors and surgeons who will render effective and exemplary healthcare appropriate to the needs of the urban and rural populations of Saudi Arabia. The ABC Central hospital is the teaching hospital affiliated with the College of Medicine. It is a tertiary care hospital with a capacity of 800 beds and it serves as the main hospital in southern region of KSA.

Questionnaire

The questionnaire dealt with topics which were derived from the literature (Lambert & Goldacre 2007; Jackson et al. 2003) and discussions with newly qualified doctors and educational leaders. After development, it was tested with three classes of the medical school in 2010 and subjected to a validation process which included submitting the questionnaire to interns, residents, and experts to check for item appropriateness and comprehensiveness (face and content validity). All of the questions were closed-ended except for those concerning the significance of career advice and the useful tools in the selection of the specialty. Responses to these questions were rated on a Likert scale ranging from 1 (definitely not agree) to 5 (very much agree). The first part of the questionnaire comprised of a series of demographic queries. The second part of the questionnaire dealt with questions related to different aspects of career advice.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) version 11.0 was used to analyse the data. Descriptive statistics was obtained to allow a comparison among the respondents. Statistical tests such as *Chi*-square and unpaired *t*-tests were used to analyse the observations. A p value of < 0.05 at was considered to be significant.

Results

One hundred and eighty newly graduated doctors out of 190 took part (this represents a 94.7% response rate). One hundred and two respondents were male and 78 were female; their mean age (± standard deviation) was 27.5 ± 3.01 years (male, 28.6 ± 3.5; female 27.0 ± 1.8).

Table 1 shows that 47% of the respondents did not receive any career advice. Among the graduates who did receive a career advice, it was given either by officials of the hospital or the university or during informal communications. Only a minority (7%) got the career advice through the help of family or friends.

Figure 1 shows the opinion of the newly graduated doctors about the career advice they received. In general, men were less satisfied than women. The need for attending a workshop on career or specialty counseling was greater among men than among women (44% versus 32%). Furthermore, the majority of men felt that career advice during medical studies was inadequate, while women were less negative (69% versus 32%). This difference between men and women is statistically significant ($p = 0.0001$). Finally, men were more disappointed about the possibilities of career advice after graduating than women (34% versus 13%, $p = 0.0001$).

Table 1. Provider of career advice

	Who or which organization primarily gave career advice to you?					
Gender	**Not Received**	**Officials of ABC**	**Officials of KKU**	**Senior doctors**	**Family & Friends**	**Total**
Male	45 (44%)	18 (18%)	10 (10%)	20 (20%)	9 (9%)	102
Female	40 (51%)	12 (15%)	12 (15%)	11 (14%)	3 (4%)	78
Total	85 (47%)	30 (17%)	22 (12%)	31 (17%)	12 (7%)	180

Table 2 summarizes the opinions of the graduates about the importance of career advice. Men considered career advice as very important, while women were somewhat less convinced. The difference between their opinions was statistically significant ($p = 0.0001$). The academic office got the highest ranking as a useful resource for choosing the right specialty. In general, men's and women's opinions about the usefulness of several resources for career advice were similar, with only website-based career advice being considered as more useful among men than among women ($p = 0.0003$).

Figure 1: Opinion of the newly graduated doctors about the career advice

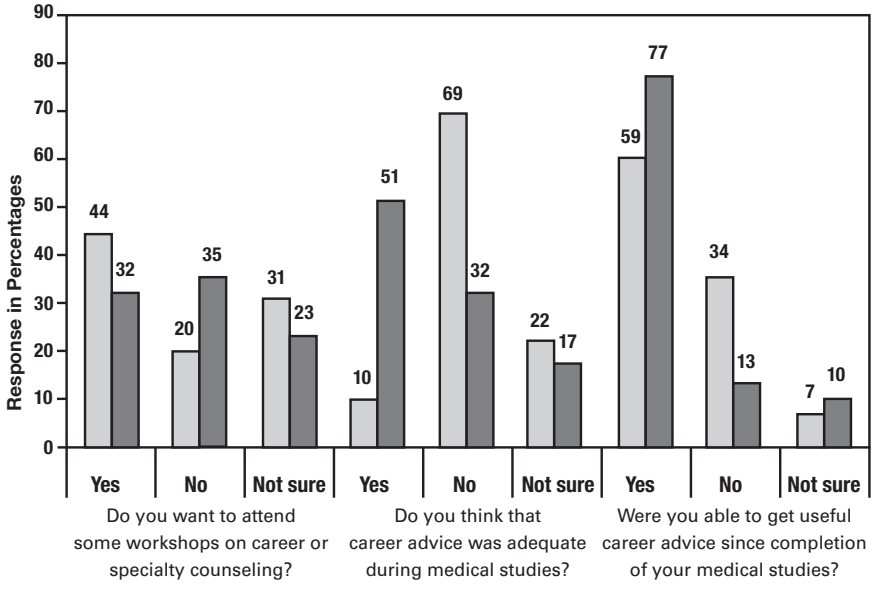

Table 2. Graduates' opinion about the usefulness of career advice, expressed on a Likert scale of 1 (definitely not agree) to 5 (very much agree)

	Male		Female		Statistics	
	mean	SD	mean	SD	T	p
Career advice is important for the specialty choice	4.84	4.2	3.4	3.7	3.69	0.0001
The academic office was a useful medium in choosing the specialty	4.4	3.46	4.2	2.57	2.69	0.359
The website was a useful instrument for counseling/advising careers in medicine	3.4	2.48	2.2	3.24	1.24	0.0003
Publications and web-based resources were useful in the specialty choice	3.4	2.48	3.55	2.41	1.38	0.874
Specialty interest group sponsored panels were useful in the specialty choice	2.88	1.45	2.21	1.26	1.02	0.958
Other than above mentioned resources were useful in the specialty choice	2.49	1.02	2.25	1.05	1.4	0.589

Discussion

The objective of this study was to examine the newly graduated doctors' views concerning the availability of career advice at a teaching hospital affiliated with King Khalid University, Abha, Saudi Arabia. The results indicate that a majority of newly qualified doctors did not receive any career advice at all. This is probably due to the fact that there is no career counseling office in our institution. This is due to the fact that the Medical Education Department at KKU, established only recently, is still in the phase of development. However, the students did not take the initiative to get a career advice from other sources. Only a small proportion of the respondents (7%) had received the career advice from their family and friends and only 17% by senior doctors. This is in contrast to the study conducted by Jackson et al. (2003) in which career advice was given frequently by senior doctors and friends and family (87% and 83% respectively). This difference is difficult to explain. It may be related to difference in the values of family relationship between the eastern and western cultures. In Saudi Arabia's conservative socio-cultural environment, the great respect for elderly people sometimes creates a barrier in discussing freely important issues of one's life with their senior family members. Many newly qualified doctors did not seem well informed about medical career options nor did they feel well supported in finding out about them. In fact, the majority of respondents were dissatisfied with the quality of career advice and guidance they had received. This strongly suggests that existing approaches are insufficient to meet their needs. This is consistent with other published reports including the General Medical Council's survey of 3000 graduate doctors in which only a minority of trainees received any careers advice (GfK NOP Social Research 2006).

A large number of newly qualified doctors viewed inadequate career advice as a major obstacle in finding their way towards a career choice. Males and females differed in their opinion with significantly more men pointing towards inadequate career advice than women. In accordance with this finding, men considered career advice as much more important than women. Our findings are in contrast to those of North American studies, showing that women were less satisfied about career advice than men (Frank et al. 1999; Lepnurm et al. 2006; Furnham 2005).

In general, gender differences in career development appear to be at least in part related to the high proportion of females with greater family commitments. Working environments and the working culture in Saudi Arabia could be another reason contributing to the gender differences. There are, however, some unique factors at play in Saudi Arabian society. Male dominance is the hallmark of the Saudi Arabian culture. This results in men feeling much more responsibility for the financial well-being of the family while women tend to give higher priority to the family than their careers. This might be a reason that men consider career advice to be much more important than women. Consequently, given that a career advice

support system is currently unavailable, men are more dissatisfied about this issue than women.
In our study respondents were asked about the different resources in selecting their specialty. The academic office received the greatest support. A gender difference was only found in the opinion about the website as resource.
In conclusion, the results of this study show that only half of newly graduated students had received any career advice during medical training. Furthermore, men were more dissatisfied about career advice than women and considered career advice much more important than women. It strengthens the opinion that a proactive and educational approach to career advice and guidance should be positioned as part of medical training. This implies a fundamental change of mindset in the whole approach to career advice and guidance for medical students and doctors in training. This means more than just "the availability" of a career advice office. Other interventions may be useful too, such as the use of web-based career advice modules and the training of senior doctors to apply their position as role models more explicitly.

The strength of this study is that it is the first systematic research about the impact of career advice for newly graduates during their medical training in Saudi Arabia. It clearly demonstrates a great need for career advice as a structured part of the programme. A possible limitation of the study is that according to its design by using standard questionnaires, data on the underlying motivation of the respondents for their answers are lacking. In order to get that kind of information, additional qualitative interview studies among newly qualified doctors are needed.

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Chapter 6

Medical students and their lack of enthusiasm for research

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Abstract

Background: There are decreasing numbers of physician-scientists at the global level. A review of the literature reveals a lack of interest in research when examining the perceptions of and attitudes towards research among medical students. The present study aims to explore these perceptions and attitudes to identify factors that could encourage students to choose research careers.
Aims: To understand (1) the perceptions and attitudes among undergraduate (UG) medical students regarding research and (2) the factors contributing to a willingness to take up research as a career.
Method: This is a questionnaire-based cross-sectional study, conducted in the College of Medicine of King Khalid University among 590 undergraduate students in academic year 2010/11. A questionnaire examining student perceptions and attitudes regarding medical research was used. SPSS software version 16 was used to analyse the results. Various statistical tests – Chi-square test, t-test, odds ratio – were used to analyse the data with a significance level of 0.05.
Results: The questionnaire had a response rate of 93% (550 of 590 students returned the questionnaire). Around half of the students felt that research in the field of medicine is important, while only a minority felt that research would be their future career. The greatest barriers to involvement in research in medical school appear to be time, the availability of research mentors and training in research methodology. Furthermore, students consider research as an activity with low status and financial benefits.
Conclusions: Although medical students feel that research should be part of medical education, they are neither inspired nor enthusiastic about choosing research as a career. Aside from there being insufficient time in the programme allocated to science education, the lack of sufficient staff members able to act as role models for students could play an important role.

Introduction

Research as part of medical education has been the subject of several international studies (Ley, 2005; Goyal et al, 2006). Advances in biomedical research during the last decade have highlighted the need to attract greater numbers of physicians to careers that include research (Houlden et al., 2004). In particular, physician participation in research is essential to increase the number of clinical and research studies performed (Zier et al., 2006). Moreover, clinician participation is a basic requirement of translational research. Consequently, it is important to make students aware of the relevance of research during their medical training and encourage them to participate in it (Reinders et al., 2005).

Physician-scientists are defined as individuals with medical degrees who perform medical research as their primary professional activity (Ley et al., 2005). This group is a vital force in transforming clinical observations into testable research hypotheses and translating research findings into medical advances. Physician-scientists are also a critical resource for ensuring excellence in medical education, since they teach students that the basis of medicine is science and that scientific rigour should apply to patient care and research. In general, the new generation of students needs these specialized perspectives to lead in evolving fields such as genetic medicine, pharmacogenetics and bioinformatics. As this research is translated into patient treatment protocols, there is great need for physician scientists with the necessary training and skills to ensure that these protocols are designed and evaluated in ethical and rigorous clinical trials.

Over the last twenty-five years, the number of physician-scientists has not kept pace with the overall growth in the medical research community and there is worldwide concern about a decline in the number of physicians participating in scientific research. Many factors, such as insufficient attention to research and poor training in research skills during medical education, and higher financial returns from clinical careers and reductions in research budgets along with increased competition for research funding, could have contributed to this decline (Houlden et al., 2004; Bansal, 1996). The difficulty of providing a useful research experience in the modern training medical school curriculum is yet another reason (Frishman, 2001; Kemph et al., 1991), as is the accessibility of the discipline to trainees who have no real understanding of what it means to be physician-scientists before their career choices are made (Neilson et al., 1995).

Numerous research articles have been written in the last couple of years about the disappearance of young physician-scientists and, unfortunately, this decline in the number of new physician-investigators remains steady (Houlden et al., 2004). The trend of decline in the physician-scientist pipeline has led some thoughtful

observers to conclude that the physician-scientist is an endangered species or at least a threatened one (Zemlo et al., 2000).
A review of the literature reveals that there is a paucity of information on the awareness, perceptions and attitudes of medical students with respect to research (Wyngaarden, 1979).
This alarm has been sounded globally and evidence is therefore also needed from a Middle Eastern context to confirm or disprove it. Furthermore, data about the factors which determine a medical student's choice to pursue a research career are also lacking for the Gulf region, which has led to the present study to elicit medical students' perceptions and attitudes regarding research and related issues.

Methods

Context
The College of Medicine of King Khalid University is located in Abha on the southwest coast of Saudi Arabia. The University was founded in 1998 and currently numbers around 8,000 students. It has a strong regional position and is among the best in Saudi Arabia. The College of Medicine uses a traditional curriculum and approach, with medical students being trained over six years for a Bachelor's in Medicine and a Bachelor's in Surgery (MBBS), including one preparatory year and one additional clerkship year. The main objective of this training programme is to educate and train future doctors and surgeons to render effective and exemplary healthcare appropriate to the needs of the urban and rural populations of Saudi Arabia. In the first three years all the discipline-related programme components have learning goals and assignments devoted specifically to research skills. Students develop competences in general subjects such as literature searches, methodology and statistics. In the second part of the programme (starting in the fourth year), there are two specific mandatory course units which provide a good basis for inculcating an interest in research and the potential of students in this regard. These two-month course units are embedded in the community medicine programme of the curriculum and deal with questionnaire construction, data collection, basic SPSS skills and report writing in the first course unit, and with auditing and research methodology in the second course unit. An evidence-based medicine (EBM) course unit is also offered as an optional course unit. As the Saudi Arabian Ministry of Higher Education, with the support of the National Commission for Accreditation and Assessment, seeks to promote the inclusion of research in the undergraduate curriculum, the government provides universities with additional money for this purpose.

Participants

This cross-sectional study was conducted in the College of Medicine of King Khalid University and included 590 undergraduate students studying medicine in academic year 2010-2011. Male and female teaching campuses are separate in Saudi Arabia. The number of places allocated to males is slightly higher than the number available for females (1.7:1). Consent was voluntary and participation confidential, with anonymity guaranteed. Under Saudi Arabian law, educational studies using questionnaires are exempt from Institutional Board Review.

Questionnaire

The questionnaire was devised to collect data on the students' attitudes regarding:

1. The importance of research in the field of medicine
2. Their command of various research-related activities, such as writing a research proposal, conducting a study and publishing in a journal (all with adequate supervision from staff members)
3. The choice of research as a career.

The questionnaire consisted of a combination of Yes/No questions and items which asked for a response on a Likert scale ranging from 1 (not very significant) to 5 (very significant). It was subjected to a validation process which included submitting the questionnaire to medical students and educational experts to check for item appropriateness and comprehensiveness (face and content validity). A pilot study of 60 students was conducted to test the questionnaire and the feedback used to rephrase some questions to make them clearer.

Data Analysis

Data was entered in SPSS version 10 and the results were analysed. Descriptive statistics were obtained, including mean, standard deviation (SD), data represented in frequencies, odds ratios with 95% confidence intervals, and different year cohorts were compared using a Chi-square test. A year-wise trend analysis was also carried out through percentages and further investigated through a Chi-square test. The significance level was 0.05.

Results

Of the 590 students, 550 took part (representing a 93% response rate); 348 were male and 202 were female. The distribution among the study years was: first year 25%, second year 22%, third year 24%, fourth year 17% and fifth year 12%. The mean age (±SD) of the respondents was 21.5+2.5 years (male, 21.8+3.6; female 20.7+3.2). The majority of the students were in the 18-20 and 21-23 age groups (39% and 44% respectively). Fifteen percent of the students were in the 24-26 age group and 2% were in the 28-30 age group.

Table 1 depicts the students' opinions about the significance of research to the community and the influence of incentives in choosing a research career. Both male and female students scored between 1.72 and 1.84 on a 5-point Likert scale, reflecting the students' opinion that research has only a modest impact on the community and does not have great appeal as an important part of their career. These opinions were not significantly different between men and women.

Table 1. Significance of research to the community and career (responses given on a Likert scale ranging from 1 (lowest) to 5 (highest)

	Likert scale									
	1	**2**	**3**	**4**	**5**	**No response**	**Mean**	**SD**	**t-statistics**	**p**
Significance of research to the community										
Male	100	106	14	10	5	123	1.72	0.8	1.546	0.123
Female	97	55	10	10	12	18	1.84	0.91		
Influence of financial incentive in opting for research career										
Male	95	110	12	8	7	116	1.74	0.91	0.181	0.857
Female	100	58	8	12	13	11	1.72	0.85		

Table 2 shows the odds ratios for several questions dealing with how research is incorporated into the medical programme. A significant majority of students felt that they did not have adequate time in the programme to pursue research (p=0.002), did not receive adequate training in research methodology (p=0.00001) and that the supervision associated with conducting research was insufficient (p=0.028). The responses to the question of whether the programme had stimulated their interest in research did not yield a clear-cut opinion. Furthermore, financial incentives do not appear to act as a positive stimulus in the students' interest in research as a career.

Table 2. Students' opinions on how research is incorporated into the medical programme (odds ratios analysis)

	Yes	No	No response	Chi-Square	Odds ratio	95% C.I	P-value
Has the medical programme stimulated your interest in research?							
Male	168	136	44	0.225	1.091	0.76-1.56	0.635
Female	103	91	8				
Do you feel that the medical programme gives you the opportunity to gain skills in medical education?							
Male	125	178	45	3.64	1.45	0.992-2.12	0.057
Female	62	28	112				
Do you have adequate time in medical training to pursue research?							
Male	125	179	44	5.81	1.605	1.09-2.36	0.002
Female	57	131	14				
Do you receive adequate training in research methodology in medical school?							
Male	43	260	45	14.14	4.32	1.98-9.98	0.00005
Female	7	183	12				
Are research supervisors readily available to offer guidance in conducting research in medical school?							
Male	46	255	47	4.09	1.8	1.01-3.8	0.028
Female	17	172	13				
Would you take up research as your career option if there were financial incentives?							
Male	122	191	35	1.022	0.829	0.576-1.193	0.179
Female	84	109	9				

Table 3. Yearly analysis of research factors

	Year I students n=144 (26%)	Year II students n=132 (24%)	Year III students n=101 (18%)	Year IV students n=75 (14%)	Year V students n=98 (18%)
Do you think research in the medical field is important?					
Yes	80 (56%)	65 (49%)	70 (69%)	39 (52%)	45 (46%)
No	50 (35%)	45 (34%)	25 (25%)	28 (37%)	25 (26%)
Don't know	14 (10%)	22 (17%)	6(6%)	8 (11%)	28 (29%)
Is it important for medical students to know about research methodology?					
Yes	90 (63%)	90 (68%)	70 (69%)	55(73%)	60 (61%)
No	54 (38%)	42 (32%)	31 (31%)	20(27)	38 (39%)
What do you think of a research career for a doctor?					
Good	35 (24%)	34 (26%)	30 (30%)	22 (29%)	30 (31%)
Financially bad option	34 (23%)	35 (27%)	30 (30%)	16 (21%)	30 (31%)
No status/ respect	30 (21%)	26 (20%)	15 (15%)	21 (28%)	15 (15%)
Not good	32 (22%)	22 (17%)	15 (15%)	10 (13%)	14 (14%)
Don't know	13 (10%)	15 (11%)	11(11%)	6 (8%)	9 (9%)
Have you been a part of a research team in addition to your curriculum?					
Yes	110 (76%)	70 (53%)	58 (57%)	40(53%)	88(90%)
No	34 (24%)	62 (47%)	43 (43%)	35 (47%)	10 (10%)
Are you familiar with the writing of a research protocol?					
Yes	80 (56%)	80 (61%)	60 (59%)	35 (47%)	50 (51%)
No	64 (44%)	52 (39%)	41 (41%)	40 (53%)	48 (49%)
Have you made an attempt to publish?					
Yes	90 (63%)	70 (53%)	45 (45%)	45 (60%)	47 (48%)
No	54 (37%)	62 (47%)	56 (55%)	30 (40%)	51 (52%)

Table 3 shows the yearly trend analysis concerning students' attitudes towards research. In general, around 50-60% of the students feel that research in the medical field is important and that medical students should know about research methodology. With respect to the participants' opinions on research careers for doctors, 24-31% were positive. The other three-quarters considered that it would be a bad option financially and that research had no status or that it was a bad option for doctors.

With respect to their experience with research, the majority of students had participated in a research team (up to 90% of fifth-year students), while around 50% of them had made an attempt to publish the results of research. No significant yearly trend was observed for any of the questionnaire items on the students' opinions about research and their ideas about research as an aspect of their future.

Table 4 depicts the sources of information used for research, with the library being the most vital source for all students, followed by conferences/seminars and internet technology. Again, no yearly trend was revealed.

Table. 4 Sources of information for research

	Year I students n=144 (26%)	Year II students n=132 (24%)	Year III students n=101 (18%)	Year IV students n=75 (14%)	Year V students n=98 (18%)
Library	49 (34%)	66 (50%)	35 (34%)	32 (42%)	43 (44%)
Conferences/Seminars	44 (31%)	32 (24%)	15 (15%)	11 (15%)	22 (22%)
Internet	43 (29%)	31(23%)	45 (45%)	27 (36%)	25 (26%)
Don't know	8 (6%)	3 (2%)	6 (6%)	5 (7%)	8 (8%)

Discussion

There is no doubt that research is an important aspect in the education of medical students. Currently, healthcare decision-making is largely reliant on evidence-based medicine and understanding and using scientific methods has become an important component of the medical profession (Bornstein & Emler, 2001). Training in health research is thus an important part of any modern undergraduate medical education programme (Illing, 2007; Scaria, 2004). It is therefore imperative to instil reasoning and critical thinking skills in medical students to enable them to become real academics (Aslam et al., 2005). However, research education has another goal, namely making students enthusiastic about research and identifying ambitious students with an interest in conducting research, either in combination with a clinical career or as their main activity. Unfortunately, a considerable number of medical graduates around the world lack the desire to pursue a career in medical research (Campbell et al., 2001; Loder, 2000). This has caused a decline in the number of young physician-scientists over the last decades (Nielson, 2003; Brancati et al., 1992) necessitating the early identification of potential future scientists at the undergraduate level (Kupfer et al., 2002).

The current study was initiated to assess perceptions and attitudes among undergraduate medical students towards research in an Arab country in the Gulf region, and to obtain insight into the factors responsible for their unwillingness to take up research as a career. In general, the study results confirm those of studies around the world: students' ambitions for research in Saudi Arabia are also very modest. Although around 50% of the students agreed that research in the medical field is important, it is of great concern that only a minority felt that research would be their future career option. Even more alarming is the finding that many students felt that research had only a modest impact on the community.

How can we explain these findings and how should we proceed to improve

student interest in research? The greatest barriers to involvement in research in medical school appeared to be time, the availability of research mentors and training in research methodology. Furthermore, our students considered research as an activity with low status and financial benefits. However, only a minority of the respondents would have had a more positive attitude towards pursuing a research career were the financial conditions better. Obviously, financial benefits do not act as a positive incentive. This is in contrast with findings in other countries where good financial support systems and exclusive support programmes for research increase the likelihood of students taking up research as their career choice or ensuring that they familiarize themselves with research, irrespective of their future careers (Kassebaum et al., 1995).

In general, there were no significant gender differences observed in relation to the preference for a research career. In contrast, such a difference was found in other studies. The results of a study of Pakistani undergraduates showed that male students had more positive attitudes towards research (Khan et al. 2006). Furthermore, a North American study also found a preponderance of males opting for research careers (Guelich, 2002). An explanation for this sex difference is not clear and could reside in factors such as socioeconomics, culture and demographics, but remains to be elucidated.

What can the explanation for our findings be and what should be done to improve student interest in research as a career? One of the most relevant factors is the teacher/researcher as role model. Staff attitudes in conveying the right perceptions about research are more important than their mere availability (Burgoyne et al., 2010). The great majority of students (nearly 90%!) participating in our study reported difficulty in obtaining research supervisors. It is difficult to explain this finding. Most Saudi Arabian universities only have a few native Saudi staff members, the vast majority of university staff originate from other countries. This could prevent students from identifying themselves with these teachers/researchers as role models. Furthermore, due to faculty staff shortages teachers/researchers have many other commitments, resulting in less time for research education.

There are also other causes definitely hindering student participation in research activities, such as the insufficient exposure to research, the lack of time and the lack of knowledge and skills (research methodology). In our study, time was regarded as a significant obstacle to pursuing research during medical training. This is in agreement with the findings of other studies, reporting that most students feel that inadequate time is allotted to research activities (Gill, 1984; Neilson et al., 1995; Siemens et al., 2010). With respect to the relevance of mastering research methodology, it has been found that training undergraduates in research methodology is known to improve students' awareness and skills and help them develop positive attitudes towards research (Goldstein et al., 1997; Lloyd et al., 2004).

In conclusion, although medical students feel that research should be part of medical education, they are neither inspired to or enthusiastic about choosing research as a career. Of course, this study's findings should be interpreted cautiously for several reasons. Firstly, they reflect the opinion of students from only one institution. Secondly, the survey is cross-sectional rather than a prospective follow-up of the same population. However, even with these restrictions, the main challenge remains how students' ambitions towards research can be stimulated during medical education. Fang et al. (2003) reported that awardees of the Howard Hughes Medical Institute HHMI Cloister Programme were significantly more likely than non-awardees to pursue research careers, as reflected in their higher rates of receipt of NIH postdoctoral awards and faculty appointments with research responsibilities. This reflects the importance of a good support programme to facilitate research careers. In a study in Canada a mandatory critical enquiry elective was introduced during medical training, resulting in a significant increase in the number of students expressing an interest in pursuing a research career. Some other studies have also reported an increase in the likelihood of students to take up research careers after exposure to research activities (Houlden et al., 2004; Hren et al., 2004; Solomon et al., 2003). Extracurricular participation in research during medical school also encourages students to pursue research careers. Students with extracurricular research experience have a greater scientific output after graduation than peers without such experience, and the former publish more articles after graduation than the latter (Reinders et al., 2005). Making research part of the core curriculum and at the same time creating adequate extracurricular opportunities for students to get to know or to get involved in research will improve their attitudes towards research (Remes et al., 2000). The current study results could contribute to the debate on how these suggestions can be implemented in the medical curricula of Saudi Arabia.

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Chapter 7

Conclusions and Discussion

The research presented in this thesis aims to provide a better understanding of the issues surrounding the selection of future doctors and the processes behind their specialty choices. We developed and used various methods to analyse and describe the current screening system used in Saudi Arabian medical schools and the factors related to the specialty preference process, including personality factors. We also analysed the current career counselling system. The research focused on gaining insight into the depth of the discussion about academic selection criteria for undergraduate medical students and how the latter think and select their future specialty choices. This final chapter presents the main conclusions concerning this thesis's three areas of interest: (a) performance predictors in medical school, (b) medical specialty and research career choice, and (c) the effect of personality profiling and career counselling on specialty selection. This chapter will now consider these findings from an international perspective. Finally, we will discuss the strengths and limitations of the studies presented in this thesis and describe some implications for education practice.

Research question 1: What are the predictors of performance in medical school?

One of the starting points for this thesis was the evaluation of the current screening system used by medical schools. The relevance of adequate selection is beyond any doubt. It is important to get selection right because the vast majority of entrants go on to qualify and practise as doctors, placing an ethical responsibility on health sciences programmes to ensure that only reliable and meaningful admission tools are utilized.

In Chapter 2 we explored the relationship between several variables affecting the academic performance of students before enrolment and within medical school. A positive correlation was observed between High School Certificate (HSC) scores and cumulative Grade Point Average (GPA). There was also a positive correlation between HSC and study duration. However, HSC scores could predict GPA only up to 24% and study duration up to 9%.

Medical schools need evidence-based and legally defensible selection procedures (McManus et al., 2005). Because of its immense importance, there has been much scrutiny of the medical school admissions processes over recent years (McGaghie, 1990; Powis, 1998; Gough, 2004). We felt that this type of research was also required in an Arab context, as only a few studies have been published about such processes in this part of the world. Importantly, the existing studies are rather dated and, in contrast to the results of many Western studies (Mitchell, 1990; McManus et al., 2005), they do not report a correlation between secondary school grades and academic performance (El-Hezmi et al., 1987; Huda et al., 2001).

Our findings are consistent with other research reports which have observed positive correlations between HSC scores and medical school grades (Tomlinson et al., 1977; Weiss et al., 1988; Montague & Odds, 1990; Rosenfeld et al., 1992; Baig, 2001; Ferguson et al., 2002; McManus et al., 2003, 2005; Lipton et al., 1988). In a more recent study, McManus et al. (2005) presented three important factors related to determining the predictive power of A-levels on future performance: cognitive ability (which indirectly measures intelligence), substantive content (including a broad array of facts, ideas and theories about basic disciplines) and motivation/personality. The authors reiterated that the predictive value of A-levels is most likely the result of their substantive content or motivation to succeed, or both, while cognitive ability alone cannot be considered the main basis. They confirmed that there was a positive association between A-level grades and career progress. According to this study, A-levels are valid in the selection process, but – despite their predictive ability – they are probably not the only predictors and should not be the sole basis for selection (McManus et al., 2005).
We also found HSC to correlate significantly with study duration. This finding is in agreement with previous research conducted in the Netherlands, where it was observed that higher premedical school entry grades were associated with significantly less time for graduation (Cohen-Schotanus, 2006). We only found a small correlation. However, other factors influencing the correlation between HSC grades and study duration should be considered, including early marriage, early family responsibilities, marital stress, and the unexpected distractions faced by the students from earlier cohorts.

Our main conclusion from this study is that the current selection system in medical schools relies heavily on a medical student's previous academic performance based on HSC scores, and that this is a good predictor of student performance at medical school. However, we argue that it should not be solely relied upon in the admissions process. Whether the utilization of a combination of reliable and valid tools (cognitive and non-cognitive) could enhance the quality of the current medical school admissions process should be investigated further.

Research question 2: What perceptions do undergraduate medical students have about their specialty choice and research career?

Significance of medical students' specialty choices. This question is significant and relevant as it is a determinant of several important activities related to the healthcare sector. The choice of postgraduate medical specialist training by medical students and doctors has an important effect on the future workforce in the healthcare system, especially in times of shortage or oversupply of

physicians. Therefore, studying the process of career choices can provide important information that could assist educational planning and administration, assign priorities and plan for the provision of proper healthcare.

In the study described in Chapter 3, the specialty most preferred by male students was surgery, followed by internal medicine and orthopaedics, while those most preferred by female students were surgery, followed by paediatrics and ophthalmology. These findings are consistent with the results of other studies conducted in non-Western universities, such as that conducted by Khader et al. (2008) in Jordan, where surgery, internal medicine and orthopaedics were the choices most preferred by male students, while obstetrics and gynaecology, paediatrics and surgery were the choices most preferred by female students. The observed popularity of surgery among female students reflects the worldwide decreasing dominance of men in this specialty (Blakemore et al., 2003; Fysh et al., 2007).

Interestingly, in contrast to observations in other studies conducted in Saudi Arabia (Al-Faris et al., 1997), European countries (Turner et al., 2006) and the study by Khader et al. (2008) in Jordan, the present study found that obstetrics/gynaecology was not the most preferred specialty of female students. However, this relative unwillingness of females to study obstetrics/gynaecology could be attributable to concerns about a demanding professional obligation vis-à-vis family commitments, workforce planning and career progression problems, rather than any lack of enthusiasm for the specialty.

Gender was observed to affect the choice of a few specialties, such as orthopaedics and obstetrics/gynaecology. The perceptions which impact on specialty selection by male and female students could reflect different cultural determinants associated with upbringing. Few male students in our study intended to work in obstetrics and gynaecology. In contrast, Figueiredo et al. (1997) reported a preference of 18% and 16% respectively for two cohorts of male students from Brazil for the same subject. In Saudi Arabia, Al-Faris et al. (1997) reported a small preference for obstetrics and gynaecology among men (4%), while Khader et al. (2008) reported that only 1% of men in Jordan expressed such a preference. This very low interest in obstetrics and gynaecology of male students possibly reflects the conservative sociocultural environment in Saudi Arabia.
Interestingly, male students chose a career in less competitive fields than female students. In the affluent society of Saudi Arabia, students are commonly observed to pursue careers or professions which are more rewarding and less demanding. The present finding suggests a sense of rising competition among female students, especially after the introduction of new courses and the opening up of new

institutions across the Kingdom in recent years, complemented by a perceived need to pursue a successful career. In a study conducted among secondary school pupils and young adults in the West, Millan et al. (2005) reported that the women were more ambitious than the men. However, among students who were approaching the final phase of their academic education, men were much more ambitious than women. These gender differences demand further study, although a gender-specific impact of teaching opportunities as a factor for job satisfaction in medical doctors has been reported (Hojat et al., 2010).

Very few students from our study considered family medicine as their first career choice. This observation needs further attention as the current deficiency in trained healthcare physicians in Saudi Arabia is likely to continue until targeted strategies to produce more primary care specialists are developed (Albar, 1999). A similar trend has been described in the United States (Pugno et al., 2001). The preference for family medicine as a career choice declined from 17.3% to 10.5% between 1997 and 2002 in the US (Senf et al., 2003). The low popularity of family medicine implies that this specialty may still have to depend on foreign physicians in the future. Interestingly, a systemic literature review found that the ratio of general practitioners to the population was significantly associated with better health outcomes, fewer unnecessary deaths and lower costs of specialized healthcare (Starfield et al., 2005).

Physician-scientist pipeline. The second part of this research question dealt with the attractiveness of research as a career for physicians. Physician-scientists are defined as individuals with MD degrees who perform medical research as their primary professional activity. Despite their unique and critical role in medical research, a number of studies have revealed that this career pathway is in serious jeopardy (e.g. Bansal, 1996; Houlden et al., 2004). In many parts of the world this disturbing trend has led some thoughtful observers to call for the revitalization of the physician-scientist career path. Although some positive measures have been taken, particularly in research-intensive medical schools where multifaceted programmemes have been developed to encourage medical students to become involved in research both during and after receiving their MD degrees, these efforts have not yet achieved much. The gravity of the situation requires more comprehensive and coordinated efforts on the part of government and medical schools.

The results of the study presented in Chapter 6 generally confirm those of studies around the world. Although around 50% of students agreed that research in the medical field is important, it is of great concern that only a minority felt that research would be their future career. Even more alarming is the finding that many students felt that research only had a modest impact on the community.

The greatest barriers to involvement in research in medical school appeared to be time, the availability of research mentors and training in research methodology. Furthermore, our students considered research as an activity with low status and financial reward. However, only a minority of respondents would have a more positive attitude towards pursuing a research career in case of good financial conditions. Obviously, financial reward does not act as positive stimulus. The results of this study in Saudi Arabia reflect the reported global decline in physician-scientists. In general, there were no significant gender differences observed in relation to the preference for a research career. In contrast, such difference was found in other studies. The results of a study in Pakistani undergraduates showed that male students had a more positive attitude towards research (Khan et al., 2006). Furthermore, a North American study also reported a preponderance of males opting for a research career (Guelich et al., 2002). An explanation for this sex difference is not clear and might be reside in factors such as socioeconomics, culture and demographics, but this remains to be elucidated. The majority of students (nearly 90%) participating in our study reported difficulty in obtaining a research supervisor. This could be due to the fact that most Saudi Arabian universities only have a few native Saudi staff members. The vast majority of university staff originate from other Arab or non-Arab countries. We speculate that this obstructs students from identifying themselves with these teachers/researchers as role models. Furthermore, due to faculty staff shortage teachers/researchers have many other commitments, resulting in less time for teaching research. Effective support systems for research could increase the likelihood of students taking up research as a career (Kassebaum et al., 1995). In a study published in 2003, Fang and Myer reported that recipients of the Howard Hughes Medical Institute HHMI Cloister Programme Award were significantly more likely to pursue research careers than non-awardees, as reflected in their higher rates of receipt of NIH postdoctoral awards and faculty appointments with research responsibilities. This reflects the importance of a good support programme to facilitate research careers.

Research question 3: How is specialty selection affected by personality profiling and career counselling processes?

There are several important issues concerning the personality profiling and career counselling processes which affect the choice of a specialty in a doctor's life.

Personality traits and specialty selection. Selecting a medical specialty is a difficult and critical decision for medical students, which is complicated by a number of factors, including the number of specialties available (Henry et al., 1992). Making the wrong choice can have far-reaching consequences for all parties involved. For

the residents themselves, discovering that the chosen medical specialty is not the right one could lead to dissatisfaction and, as a consequence, reduced wellbeing (Faragher et al., 2005), decreased quality of care (Shanafelt & Habermann, 2002) and reduced patient satisfaction (Grembowski et al., 2005). In addition, it could lead doctors to quit their training programme or transfer to another specialty or subspecialty. Leaving a specialty not only has financial drawbacks for residents, but also affects colleagues, as a team member's departure can disrupt a team's structure, which in turn could affect team functioning and the quality of care. Moreover, resident attrition also affects educational institutions and wider society. Valuable time and money invested by educational institutions, which could have been deployed to patient care for example, are lost, while institutions must bear the enormous costs of replacing residents. Given the impact of making the wrong specialty decision and the considerable number of residents not completing training programmes, it is imperative for medical educationalists to find ways to reduce attrition rates. Improving the fit between residents and their specialty choice is vital to all parties involved, and assessing residents' personality traits could offer opportunities to improve this fit (Borges & Osmon, 2001; Rogers et al., 2010).

In Chapter 4 we explored the relationship between specialty choice and different types of personalities in medical students using the reliable personality instrument ZKPQ with five personality factors: (1) impulsive sensation-seeking, (2) neuroticism-anxiety, (3) aggression-hostility, (4) sociability and (5) activity. Surgery was the single most popular specialty among both male and female students. Males had significantly higher scores on the 'impulsive sensation-seeking' scale and students preferring a surgery specialty had the highest scores on the 'impulsive sensation-seeking', 'neuroticism-anxiety', 'aggression-hostility' and 'sociability' scales. Apparently, the challenging and risk-taking nature of a surgical specialty attracts sensation-seekers. This finding is in agreement with previous studies which found that surgeons scored higher on measures of novelty-seeking (similar to and highly correlated with sensation-seeking), masculinity and tough-mindedness (Borges & Savikas, 2002; Vaidya et al., 2004). In general, the results of our study confirm the association between personality characteristics and the specialty choices made by medical students during undergraduate medical education.

With respect to gender differences in personality characteristics, males had significantly higher scores on the 'impulsive sensation-seeking' scale. This gender difference is consistent with results reported for cohorts of college students in the US and Europe (Zuckerman, 2002; Aluja et al., 2006; Hojat & Zuckerman, 2008).

Medical specialty selection forms the basis of the professional career of a doctor. However, as medicine is a diverse field, it is very likely that distinct specialties are associated with the various characteristics, motives and personality attributes displayed by doctors (Mowbray & Davies, 1971; McGrath & Zimet, 1977; Schwartz et al., 1994). As mentioned above, the finding that surgery was the single most popular specialty among both male and female students accords with a newly emerging trend of a decrease in the dominance of men in surgical specialties and an increasing interest in surgery among women at a global level (Blakemore et al., 2003; Fysh et al., 2007). This could have significant implications for workforce planners in future strategic planning.

Career advice and the specialty selection process. Career advice and specialty selection are closely intertwined, with one significantly affecting the other. A number of studies have identified a lack of career guidance for medical students and doctors during their training. Although some measures have been introduced by some medical schools and organizations to improve career counselling (Wilson & Reece, 1995; Porter, 1998), less attention has been paid to career guidance provision as a structured service for medical students and doctors (Carnell & Smith, 1996). Career indecision resulting from inadequate career advice is a considerable cause of stress for up to 25% of doctors in training (Luck, 2000). Early career advice and support during medical school and immediately after graduation could encourage doctors who are considering careers in specialties in which there are shortages to take them up (Mahoney et al., 2004). Other studies (Eley & Morissey, 2007; Mulroy, 2007) have helped define what students want from an internship and have indicated that students are already considering their internship plans two years before graduating. Therefore, it is very important to assist medical students to make the right decision with respect to their professional careers. The healthcare system cannot afford the potential loss of time, resources and doctors caused by mistaken career choices.

The study described in Chapter 5 found that almost half of students received career advice. The majority of the men felt that career advice during their medical studies was inadequate, while women were less negative. Furthermore, men were more disappointed about career advice opportunities after graduation than women. This negative opinion is probably due to the fact that there is no career counselling office at the institution in our study. However, students did not take the initiative to obtain career advice from other sources. Only a small proportion of the respondents received career advice from their family and friends or from senior doctors. This is in contrast to a study conducted by Jackson et al. (2004), in which career advice was given very frequently by senior doctors and friends and family. This difference is difficult to explain. It could be related to differences in

the value accorded to family relationships between Middle Eastern and Western cultures. In Saudi Arabia's conservative sociocultural environment, the great respect felt for elders sometimes creates a barrier to freely discussing important life issues with senior family members. This strongly suggests that existing approaches are insufficient to meet student and graduate needs. This is consistent with other published reports, including the General Medical Council's survey of 3000 graduate doctors in which only a minority of trainees received any career advice (GfK NOP 2006).

Interestingly, men considered career advice to be much more important than women. Our findings contrast with those of North American studies, which showed that women were less satisfied with career advice than men (Frank et al., 1999; Lepnurm et al., 2006; Furnham, 2005). In general, gender differences in career development in Arab countries appear to be at least in part related to the high proportion of females with greater family commitments. The working environment and working culture in Saudi Arabia could be another factor contributing to the gender differences. There are, however, some unique factors at play in Saudi Arabian society. Male dominance is the hallmark of Saudi Arabian culture. This results in men feeling much more responsible for the financial wellbeing of their families, while women tend to give higher priority to their families than their careers.

As the healthcare system cannot afford the potential waste of time and resources, career guidance for doctors should begin in undergraduate training so that the process of thinking about a future career starts a long time before students make their career choices. This study adds weight to the view that a proactive and educational approach to career advice and guidance should be an essential part of medical training.

Strengths and limitations of the studies presented and suggestions for further research

This thesis has many strengths, but also some weaknesses which provide us with suggestions for further research. A very strong characteristic of the study is that it presents data on medical education in an Arab country, an area in which there is no tradition of research in this field. Consequently, the research questions and the systematic attempt to find answers to them is unique for the area. Furthermore, the studies dealt with several issues which are very relevant to healthcare in the Kingdom of Saudi Arabia. A weakness of the thesis is that the research was carried out at only one institution. Furthermore, the studies were cross-sectional and lacked a follow-up of individual students and a description of the evolution

of their perceptions. The King Khalid University and the ABC Central Hospital, which is affiliated with the KKU's College of Medicine, represent a great number of students. However, to confirm our findings, additional studies on a multicentre and longitudinal basis should be performed.

Implications for educational practice

Our findings on all of the three main research questions have implications for educational practice. The results reported in Chapters 2, 3, 4 and 5 provide the basis for several suggestions for improving the quality of the student admission selection process, career counselling and the process of student specialty choice.

An important finding from Chapter 2 is that the current weight given to secondary school scores is acceptable. However, although it should not be modified drastically, basing admission predominantly on previous academic performance is only partially related to study success. The findings in this chapter could imply that medical admissions personnel have an ethical responsibility to not only use reliable and valid instruments but also to assess and evaluate the admissions process on a constant basis.

Chapter 3 presents two important findings which could have implications for educational reform. The first finding reveals that a strong gender preference prevails in different specialties across the Kingdom. The second important finding is the observation that only a few students opt for family medicine as their professional career. The lack of family doctors could have a great impact on the primary healthcare system.

The findings of Chapter 5 highlight the current poor status of career counselling and emphasize the need for a structured programmeme of career counselling. The results imply a need for a countrywide study that explores the current career support system throughout the Kingdom as well as the importance of incorporating career guidance as an integral part of the medical curriculum. This also implies that targeted strategies are required to provide student support to complement the wealth of information available from a variety of other sources.

The most important practical point deriving from the study described in Chapter 4 is the need to assist students to identify their personality traits, which could in turn help them during the process of specialty selection. The use of personality questionnaires at medical school could be very useful.

The study findings in Chapter 6 confirm a decline in physician research scientists, reflecting the trend in other parts of the world. Measures to reverse this are recommended. This final study in the thesis also reveals the practical implications for educational practice, including the need to emphasize the significance of research in medical practice, to develop a national programme for doctors to undertake training in research that also to offers attractive salaries, and to provide support for the training and mentoring of physician-scientists.

Finally, this thesis emphasizes the need for additional research and the national monitoring of the several indices that have been examined here. Such a database is essential to monitor trends, discern problems and make the required modifications.

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Summary

Samenvatting

Summary

The medical school admission process is one of the most important and complex activities in medical education. It is important to get selection right because the vast majority of entrants go on to qualify and practise as doctors, and so health sciences programmes have an ethical responsibility to ensure that only reliable and meaningful admission tools are utilized. It follows that carelessness at any point in the selection process can adversely affect the health system of a society. In view of this importance, determining the right policy for admission to medical schools is a balancing act – one has to be fair to society and choose people with the potential to be good doctors, and also to the applicants by giving them equal opportunities. After medical school graduation, the second important phase in the medical education process is the medical specialty choice, which forms the basis of the professional career of a doctor.

The research presented in this thesis aims to provide a better understanding of the issues surrounding the selection of future doctors and the processes behind their specialty choices. Several methods were applied to analyse and describe the current screening system used in Saudi Arabian medical schools and the factors related to the specialty preference process, including personality factors. The research focused on gaining insight into the depth of the discussion about academic selection criteria for undergraduate medical students and how the latter think and select their future specialty choices. Furthermore, the current careers counselling system was analysed. The studies presented in this thesis were performed at the King Khalid University Medical School. As far as we know, some of them are the first of their kind in the Arab world.

The first study in this thesis (Chapter 2) investigated selection and the relationship between pre-entry academic grades and study duration, particularly in relation to a subcontinent where very unique factors might be at play. The aim of the research was to evaluate the importance of secondary school results (High School Certificate scores) in the selection process. It was considered that such an analysis may in turn provide valuable insight into the current screening system in Saudi Arabian medical schools. The results revealed that HSC scores correlate with study success. However, as their predictive value was modest, it should not be the only factor to rely on in the selection process.

Chapter 3 sheds light on the current trends and preferences in the specialty choices of undergraduate medical students. The choices medical students and doctors make for their postgraduate medical specialist training has an important influence on the future work force in the healthcare system, and hence studying the process

behind career choice can provide important information to help in educational planning and administration, and in assigning priorities for the provision of proper healthcare. A shortage of information on student perceptions of specialty choice, and the effect of these perceptions on their actual choice, generated a need for research into this subject so the effects could be better understood. The most popular specialty for male students was surgery, followed by internal medicine and orthopedics, while the most popular for female students was surgery, followed by pediatrics and ophthalmology. Male students emphasized factors such as a less competitive field, a shortage of specialists and a diversity of patients, while the prestige of the specialty and teaching opportunities had a greater impact on female students.

Chapter 4 concentrated on the vital issue of personality profile in relation to the specialty choices of medical students. While a number of attempts have been made to develop personality profiles of medical students to predict their final specialty choice and the likely number of specialists in each field, it was considered that these may not fully apply to present-day medical graduates. New personality assessment instruments have been developed and these demand further comprehensive research in relation to this multifaceted topic. In this regard, the Zuckerman-Kuhlman personality questionnaire (ZKPQ-50) is currently a valid instrument used to determine personality contours. Literature about the relationship between personality and specialty selection has produced varied results. Given the substantial need to answer questions pertaining to this topic, and some conflicting results from previous research, this chapter studied the trends and perceptions with respect to specialty preferences among undergraduate medical students. It appears that males have significantly higher scores on the 'impulsive sensation-seeking' scale, and students preferring a surgery specialty had the highest score on the 'impulsive sensation-seeking', 'neuroticism-anxiety', 'aggression-hostility' and 'sociability' scales. Hospital-based, surgical and primary care specialties became more popular as students progressed through their undergraduate years. The study clearly indicated that different personality types have distinct preferences regarding medical students' career choice, and relevant research could improve the careers counselling of medical students and recent graduates.

Chapter 5 dealt with the careers support and guidance system for newly qualified doctors, bearing in mind the importance of careers advice for medical graduates who are about to make a specialty selection decision. Careers counselling is very important for an appropriate specialty choice. Medical education literature highlights the importance of well-informed career decisions and assisting students and junior doctors in this regard. The results presented in this chapter show that

only half of the newly graduated doctors had received any careers advice during medical training, and even those who did receive advice viewed the inadequate careers advice as a major hindrance in finding their way towards a career choice. This pattern is alarming and emphasizes the need to start careers guidance during undergraduate training in order to avoid a potential waste of time and resources. This study also adds weight to the view that a proactive and educational approach to careers advice and guidance should be an essential part of medical training rather than the mere presence of these services in an institution.

The last study in this thesis investigated the perceptions and attitudes of medical students concerning research and a research career (Chapter 6). An observed risk to the scientific community worldwide is the significant decline in research scientists. Several factors, such as insufficient attention to research and poor training in research skills during medical training, higher financial returns from clinical careers, and a reduction in research budgets with increased competition for research funding, may have contributed to this decline. Therefore, it is important to confront students with the relevance of research during their medical training and to encourage them to participate in research projects. The results of this study confirm the reported global decline in physician-scientists with some interesting local trends. Although the importance of research in the medical field is acknowledged by nearly half of the study participants, only a minority felt that research would be their future career choice. The major obstacles to involvement in research in medical school appear to be time, availability of research mentors and training in research methodology, with a significant number of students considering research as an activity with low status and financial benefits.

In chapter 7 the most important research findings of this thesis are summarized and discussed. Furhermore, this last chapter describes practical implications of the study results for educational practice.

Samenvatting

De toelatingsprocedure voor geneeskundeopleidingen is een van de belangrijkste en meest complexe onderdelen van de medische opleiding. Het is belangrijk om op de juiste wijze te selecteren, want de overgrote meerderheid van de deelnemers zal afstuderen en zich vestigen als arts. Daarom hebben geneeskundeopleidingen een grote verantwoordelijkheid om ervoor te zorgen dat betrouwbare en zinvolle selectiemethoden worden gebruikt. Achteloosheid in welke fase van het selectieproces dan ook kan een negatief effect hebben op de gezondheidszorg. Bij de selectieprocedure is het belangrijk aandacht te hebben voor zowel het maatschappelijk belang als het belang van het individu: aan de ene kant moet men eerlijk zijn tegenover de samenleving en mensen kiezen die de potentie hebben om goede artsen te worden, maar men moet ook eerlijk zijn tegenover de studenten die zich inschrijven en hun gelijke kansen bieden. Na het afronden van de geneeskundestudie is de tweede belangrijke fase in de medische opleiding de keuze voor een medisch specialisme, die de basis vormt voor de carrière van een medisch specialist.

Het onderzoek dat in dit proefschrift wordt beschreven heeft tot doel inzicht te geven in de problemen die optreden bij het selecteren van toekomstige artsen en in de processen die ten grondslag liggen aan de keuze voor een specialisme. Er zijn verschillende methoden gebruikt voor het analyseren en beschrijven van het huidige selectieproces dat bij geneeskundestudies in Saudi-Arabië wordt toegepast en van de factoren die gerelateerd zijn aan het kiezen van het specialisme. Het onderzoek is gericht op het verkrijgen van een dieper inzicht in de discussie over academische selectiecriteria voor geneeskundestudenten en in hoe deze studenten denken over hun toekomstige specialisme en een keuze maken. Verder is het huidige systeem voor loopbaancoaching geanalyseerd. De onderzoeken die in dit proefschrift worden beschreven, werden uitgevoerd aan de King Khalid University Medical School in Saudi-Arabië. Voor zover we weten, zijn sommige van deze onderzoeken de eerste in hun soort in de Arabische wereld.

In het eerste onderzoek in dit proefschrift (hoofdstuk 2) wordt gekeken naar de selectiemethode en de relatie tussen middelbare school resultaten en de studieduur. Het doel van het onderzoek was om te evalueren hoe belangrijk middelbare schoolresultaten (scores voor het High School Certificate) zijn bij het selectieproces. De overweging was dat een dergelijke analyse inzicht zou kunnen bieden in de huidige selectiemethode voor geneeskundestudies in Saudi-Arabië. De resultaten lieten zien dat er een verband is tussen HSC-scores en een succesvolle afronding van de studie. Maar omdat de voorspellende waarde beperkt was, zou dit niet de enige factor mogen zijn bij de selectiemethode.

Hoofdstuk 3 werpt licht op de huidige trends en voorkeuren bij de keuze van een medisch specialisme door geneeskundestudenten. De keuzes die geneeskundestudenten en artsen maken met betrekking tot hun medisch specialisme heeft een belangrijke invloed op de toekomstige beroepsbevolking en de gezondheidszorg. Onderzoek naar het proces achter deze beroepskeuze kan relevante informatie opleveren die kan helpen bij de planning en de inrichting van de geneeskundeopleiding en bij het bepalen van de prioriteiten in het bieden van goede gezondheidszorg. Het onderzoek komt voort uit een behoefte aan meer informatie over de percepties van studenten ten aanzien van de keuze van hun specialisme en de effecten van deze percepties op hun daadwerkelijke keuze. Voor mannelijke studenten bleek chirurgie het populairste specialisme te zijn, gevolgd door interne geneeskunde en orthopedie, terwijl voor vrouwelijke studenten chirurgie, pediatrie en oogheelkunde de populairste specialismen waren. Mannelijke studenten vonden een minder concurrerend vakgebied, een tekort aan specialisten en diversiteit onder de patiënten belangrijke factoren, terwijl vrouwen het prestige van het specialisme en mogelijkheden om patiëntenzorg met onderwijs te combineren belangrijker vonden.

Hoofdstuk 4 gaat over onderzoek naar de relatie tussen persoonlijkheidskenmerken en de keuze voor een medisch specialisme door geneeskundestudenten. Hoewel er in het verleden een aantal pogingen is gedaan om persoonlijkheidsprofielen van geneeskundestudenten te ontwikkelen om hun uiteindelijke keuze voor een specialisme te voorspellen (en daarmee het vermoedelijke aantal specialisten in elk vakgebied), werd daarbij ook onderkend dat deze profielen niet volledig van toepassing zijn op de huidige generatie geneeskundestudenten. De literatuur over de relatie tussen persoonlijkheid en specialisme heeft derhalve wisselende resultaten opgeleverd. Inmiddels zijn er echter nieuwe instrumenten ontwikkeld om persoonlijkheid te karakteriseren en is daarmee een nieuwe mogelijkheid ontstaan voor verder onderzoek. Eén van die nieuwe gevalideerde instrumenten is de persoonlijkheidsvragenlijst van Zuckerman-Kuhlman (ZKPQ-50). Om in de Arabische wereld de relatie tussen persoonlijkheid en specialisme voorkeur te bestuderen worden in dit hoofdstuk de trends en percepties met betrekking tot voorkeuren voor specialismen onder geneeskundestudenten beschreven. Het blijkt dat mannelijke studenten aanzienlijk hoger scoren op 'impulsief sensatiezoekend gedrag' en dat studenten die een voorkeur hebben voor chirurgie als specialisme het hoogst scoren op 'impulsief sensatiezoekend gedrag', 'neuroticisme-angst', 'agressie-vijandigheid' en 'vriendelijkheid'. Ondersteunende specialismen, chirurgie en eerstelijnsgezondheidszorg werden populairder naarmate studenten verder kwamen in hun geneeskundestudie. Uit het onderzoek bleek dat verschillende persoonlijkheidstypen duidelijk verschillende voorkeuren hebben voor wat betreft de beroepskeuze van geneeskundestudenten.

Hoofdstuk 5 gaat over het systeem van loopbaancoaching en -begeleiding voor recent afgestudeerde artsen. Goede loopbaancoaching is belangrijk om tot de juiste keuze voor een specialisme te komen. In de literatuur wordt gewezen op het belang van weloverwogen beslissingen als het om de carrière gaat en hulp aan studenten en net afgestudeerde artsen bij het nemen van deze beslissing. De resultaten die in dit hoofdstuk worden beschreven laten zien dat slechts de helft van de afgestudeerde artsen loopbaancoaching had gekregen tijdens de geneeskundeopleiding en dat degenen die wel advies hadden gekregen daar niet tevreden over waren. Dit patroon is alarmerend en benadrukt de behoefte aan loopbaancoaching tijdens de geneeskundeopleiding om te voorkomen dat tijd en middelen worden verspild. Het onderzoek benadrukt ook de opvatting dat een proactieve aanpak van loopbaancoaching en begeleiding een essentieel onderdeel zou moeten zijn van de geneeskundeopleiding.

Het laatste onderzoek in dit proefschrift gaat in op de percepties en houding van geneeskundestudenten met betrekking tot wetenschappelijk onderzoek en een carrière in onderzoek (hoofdstuk 6). Wereldwijd wordt een sterke afname gezien van het aantal medici dat kiest voor een wetenschappelijke loopbaan. Hier kunnen verschillende factoren aan bijdragen, zoals onvoldoende aandacht voor onderzoek en inadequaat onderwijs in onderzoeksvaardigheden tijdens de studie, betere salarissen voor klinisch werkzame artsen en een beperking van onderzoeksbudgetten gecombineerd met een toenemende concurrentie voor financiële middelen voor onderzoek. Het is daarom belangrijk om studenten tijdens hun studie te laten zien hoe belangrijk wetenschappelijk onderzoek is en hen aan te moedigen om deel te nemen aan onderzoeksprojecten. De resultaten van dit onderzoek bevestigen de gemelde wereldwijde afname in het aantal arts-onderzoekers met een aantal interessante lokale trends. Hoewel het belang van onderzoek binnen de geneeskunde door bijna de helft van de deelnemers aan dit onderzoek wordt erkend, geeft slechts een minderheid aan dat ze overwegen om zich in de toekomst met onderzoek te gaan bezighouden. De belangrijkste hindernissen om zich tijdens de geneeskundeopleiding bezig te houden met onderzoek lijken tijd, beschikbaarheid van onderzoeksmentoren en training in onderzoeksmethodologie te zijn, terwijl een aanzienlijk aantal studenten onderzoek ziet als een activiteit met minder status en minder financiële voordelen.

In hoofdstuk 7 worden de belangrijkste resultaten van het onderzoek samengevat en besproken. Daarnaast wordt in dit laatste hoofdstuk ingegaan op de toepasbaarheid van de onderzoeksresultaten.

Curriculum Vitae and Acknowledgements

Curriculum Vitae

Syed Imran Mehmood was born in Karachi, Pakistan on 23 April 1971.[1] He completed a Bachelor's programme in Medicine and Surgery (MBBS) at Karachi University in 1995; he then completed his internship in medicine and surgery at Jinnah Postgraduate medical centre (JPMC), Karachi in 1996. In 1998 and 1999, he was a postgraduate trainee in family medicine (MCPS) at Jinnah Postgraduate Medical Centre (JPMC), Karachi. In the following year he joined the teaching staff (lecturer) of the department of physiology at Baqai Medical University, Karachi, which was followed by a lectureship at Hamdard College of Medicine and Dentistry, Hamdard University. In 2005 and 2006, he was deputy director of postgraduate medical education at Baqai Medical University. In the same year he worked at Isra University, Hyderabad as Assistant Professor and Head of the department of medical education. During this period he joined the postgraduate programme in medical education at Dundee University, UK, where he was awarded a Master's degree in medical education in 2007. In 2007 he moved to King Khalid University (KKU) medical school in Saudi Arabia where he worked as a medical education expert until October 2012. He worked as a curriculum developer, faculty trainer and educational researcher in medical education at the Faculty of Medicine. He has initiated innovation in the undergraduate medical curriculum at KKU. Furthermore, in 2002 and 2004, he was a visiting faculty member at the University of Toronto, Wilson Centre for Research in Education and McMaster University. Recently, he was appointed as medical education consultant at the Umm-ul-Qura University of Saudi Arabia. In this position he is involved in accreditation and quality assurance issues along with faculty training and assessment and research activities.

1 In Urdu, the meaning of Mahmood and Mehmood is the same, i.e. the one who has been praised. Consequently, in practice both spelling variants of the family name are used. Therefore, although the author's family name in his passport is written *Mahmood*, in all other situations, such as publications, he uses the name *Mehmood*.

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