

The Effect of Integration of Non-Cognitive Parameters on Medical Students' Characteristics and their Intended Career Choices

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ABSTRACT: **Background:** A new approach for assessing non-cognitive attributes in medical school candidates was developed and implemented at the Hebrew University Medical School. The non-cognitive tests included a biographical questionnaire, a questionnaire raising theoretical dilemmas and multiple mini-interviews.

Objectives: To evaluate the effects of the change in the admission process on students' demographics and future career choices.

Methods: A questionnaire including questions on students' background and future residency preferences was administered to first-year students accepted to medical school by the new admission system. Results were compared with previous information collected from students admitted through the old admission process.

Results: Students accepted by the new process were significantly older (22.49 vs. 21.54, $P < 0.001$), and more had attended other academic studies before medical school, considered other professions besides medicine, and majored in humanities combined with sciences in high school. Significantly more students from small communities were admitted by the new system. Differences were found in preferences for future residencies; compared with the old admission process (N=41), students admitted by the new system (N=85) had a more positive attitude towards a career in obstetrics/gynecology (41% vs. 22%, $P < 0.001$) and hematology/oncology (11.7% vs. 4.8%, $P < 0.001$), while the popularity of surgery and pediatrics had decreased (34.5% vs. 61%, $P < 0.001$ and 68.7% vs. 82.5%, $P < 0.001$ respectively).

Conclusions: Assessment of non-cognitive parameters as part of the admission criteria to medical school was associated with an older and more heterogenic group of students and different preferences for future residency. Whether these preferences in first-year students persist through medical school is a question for further research.

IMAJ/2011; 13: 488-493

KEY WORDS: admission criteria to medical school, non-cognitive parameters, medical students, admission process

The basic values of the science and practice of medicine have remained similar for over 2000 years, but important shifts occurred in recent decades. New technologies, an exponential increase in information, and changes in the public's attitudes and expectations significantly impacted the role of the physician. These changes present an evolving challenge to the medical education system. In their article on medical education, Cooke et al. [1] reviewed the changes in medical education over the past century. According to the authors, medical education has to reconfigure itself in response to changing scientific, social and economic circumstances, and 21st century physicians should be trained with greater emphasis on essential values that together make for an informed, curious, compassionate, proficient and moral physician [1].

In their article on professionalism, Stern and Papadakis [2] emphasize the importance of promoting interpersonal skills and communication abilities for future physicians. In order to predict interpersonal skills, they recommend that brief standard interviews be included in new admission procedures in medical schools. Most medical schools have incorporated those aspects in education and training, but in only a few have admission procedures to detect skills predictable of professional behavior been updated [2,3]. The criteria for admission to medical schools have been under continuous debate in recent decades [3-5]. Traditionally, the main admission criteria were academic achievements, especially in sciences, which were perceived to predict the development of good physicians [6,7]. However, evidence supporting this

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assumption is controversial [5,6]. In a systematic review of the literature published in 2002, Ferguson and co-authors [8] found that previous academic performance is a good, but not perfect, predictor of achievement in medical training [8]. In a more recent article, Peskun et al. [9] suggest that assessment of non-academic characteristics provides additional value to standard academic admission criteria and justify its use as part of the admissions process. In addition to all of the above, there are compelling reasons for changes in the admission process, among them the drive to increase diversity and support long-term health care planning among different specialties and geographies. Goldacre et al. [10] assessed whether UK policy to increase the number of graduate entrants to medical school affected long-term career preferences. They found that graduate entrants are more likely to become general practitioners, a finding that might be useful in planning health care system human resources.

This article will describe the change in the admission system implemented at the Hebrew University-Hadassah Medical School and its effect on characteristics and attitudes of first-year students. We aimed to answer the following questions:

- Was the implementation of a new admission system associated with a change in the demographic profile of the students?
- Were there any changes in future residency preferences of the students accepted by the new system, compared to those of students accepted by the old system? Is it possible to identify changes in attitudes and motivators that could explain different residency preferences?
- Are there correlations between demographic profiles, attitudes and future career preferences?

THE ADMISSION PROCESS TO THE HEBREW UNIVERSITY-HADASSAH MEDICAL SCHOOL

Approximately 300–400 medical students are accepted every year to the four medical schools in Israel. The basis for selection to most academic programs in Israel includes matriculation examination scores and a national psychometric examination that tests language and analytic abilities. Additional selection methods (such as interviews and aptitude tests) vary between the different faculties. Until 2006, the admission process to the Hebrew University-Hadassah Medical School was based mainly on cognitive performance. About 250 candidates with the highest grades (psychometric exam and matriculation scores) were invited for an interview. During the assessment day they were asked to fill in an autobiographic questionnaire after which they were interviewed (a single interview) by three interviewers. The purpose of the interview was primarily to identify and reject candidates who were perceived to have a major personality problem or significant psychopathology (such as clinical depression), or to be untrustworthy. In 2006 the admissions process was changed. The main goal of the

change was to give non-cognitive characteristics more weight in the selection process, such as interpersonal skills, empathy, attentive listening, and an ethical attitude towards the other. In the new admission system, about 400 candidates with the highest grades (psychometric exam and matriculation grades) were invited for evaluation. Candidates filled in two questionnaires: an autobiographic questionnaire about major life events and experiences, and a second questionnaire presenting theoretical dilemmas based on possible professional situations. The candidates then underwent a series of eight short standard interviews based on the Multiple Mini Interviews model [3,11]. Candidates were then graded according to their previous academic performance (25%) and their non-academic skills were evaluated by the faculty evaluation system (two questionnaires and the MMI) (75%). The present study attempts to assess this change in the light of the questions formulated above.

SUBJECTS AND METHODS

First-year medical students at the Hebrew University-Hadassah Medical School in Jerusalem during 2006–2007 were administered an anonymous questionnaire (adapted from Feifel et al. [12]). These students had all been accepted to medical school after the new admission system was implemented. The questionnaire consists of 23 questions on demographic data and background characteristics [Table 1], future residency preferences, motivators for these preferences, and attitudes towards the common medical specialties (measured by a 1–5 score). The Feifel questionnaire has been cited and used extensively in the literature [16–13]. It has been translated to Hebrew and was previously used by Abramowitz and Gofrit [13] in their survey of students in their preclinical years during 2000–2002, before the change in the admission process was implemented. The group of students studied by Abramowitz and Gofrit before the change in the admission process served as a control group for our research, in which we used the same questionnaire (the Feifel questionnaire).

STATISTICAL ANALYSIS

Quantitative variables were analyzed using the one-sample *t*-test. Comparison of qualitative parameters was done by using the one-sample chi-square test. In the original Feifel questionnaire some of the questions required ratings of opinions on a scale of 1–5. In order to simplify the analysis and uncover significant trends, the 1 ('very attractive') and 2 ('attractive') categories were merged into one category, 'attractive'. The 4 ('not attractive') and 5 ('extremely not attractive') categories were similarly merged into one category, 'not attractive'. The 'neutral' category ('3') remained unchanged. This method was used for all relevant questions in both databases. As described

MMI = Multiple Mini Interviews

Table 1. Comparison of demographic and background characteristics of students admitted by the new admission system (N=85) vs. the old admission system (N=127)

	Old system		New system		P value
	No.	%	No.	%	
Mean age (yrs)	21.54		22.49		< 0.001
Gender					
Male	66	53.2	42	55.3	0.719
Female	58	46.8	34	44.7	
Country of birth					
Israel	110	87.3	79	92.9	0.118
Other	16	12.7	6	7.1	
Community size					
< 10,000	17	13.4	23	27.7	0.001
10,000–100,000	46	36.2	25	30.1	
100,000–500,000	24	18.9	17	20.5	
500,000	40	31.5	18	21.7	
Religious background					
Jewish	120	95.2	78	91.8	0.315
Other	6	4.8	6	8.2	
Religiosity					
Secular	76	60.3	45	57	0.298
Traditional	22	17.5	11	13.9	
Religious	28	22.2	23	29.1	
High school major					
Math/Biology/Chem	42	33.1	20	23.8	< 0.001
Math/Physics	67	52.8	18	21.4	
Humanistic studies	2	1.6	1	1.2	
Other (combined)	16	12.6	52	61.9	
Previous academic studies					
No	106	84.1	61	72.6	0.004
Yes	20	15.9	23	27.4	
Considering other studies before medical school					
No	69	55.2	21	33.3	< 0.001
Yes	56	44.8	42	66.7	

P value < 0.05 highlighted in green

above, we compared our current data, which included 85 first-year students admitted to medical school by the new admission process, with data collected previously by Abramowitz and Gofrit [13] of 127 students in their first, second and third preclinical medical school years who were admitted by the old system. When analyzing the demographic information, comparisons were made between the current group and all 127 preclinical students because demographic data had been considered unaffected during the years of medical training. On the contrary, opinions and choices might be influenced through medical training. Therefore, when analyzing data on attitudes and opinions, our new data from first-year students (N=85) were compared with data collected previously [13] from first-year students (N=41), excluding data from students in their second and third year. Not every question was

answered in all questionnaires. Each question was statistically analyzed according to its valid percent. The data were analyzed using the SPSS14.0 program.

RESULTS

The questionnaires were distributed to 106 first-year students during lectures. Eighty-five questionnaires were returned, a response rate of 80.1%.

DEMOGRAPHIC AND BACKGROUND CHARACTERISTICS

Table 1 presents demographic and background characteristics of 85 first-year students accepted by the new admission system, as compared with 127 students accepted by the old admission system and who participated in the previous study [13]. Slightly more than half the students were male. The majority were born in Israel and were secular Jewish. The students admitted by the new method were on average one year older: 22.49 vs. 21.54 years old ($P < 0.001$). Among the students admitted by the new method, 27.4% had attended other academic studies before entering medical school compared to only 15.9% in the former group ($P = 0.004$). Two-thirds of the students in the new admission system group chose medicine after having considered other professions, as compared to less than half in the old admission group, 66.7% vs. 44.8%, respectively ($P < 0.001$). A significant difference was found in high-school major subjects: 61.9% of the students accepted by the new system combined humanistic and scientific studies compared to 12.6% in the old admission system ($P < 0.001$). More students from small communities were admitted by the new system: 27.7% versus 13.4% in the old system group ($P = 0.001$).

FUTURE CAREER PREFERENCES AND MOTIVATORS FOR CHOICES

Figure 1 presents the distribution of future residency preferences of students admitted by the new admission system. Anesthesiology and psychiatry were the least likely career choices, whereas pediatrics was the most likely. Figure 2 presents a comparison of the preferred future career choices (ranked 'likely' and 'very likely') between the two groups. Obstetrics/gynecology was considered a probable future choice by 41% of the students in the new admission group, compared to 22% of the students admitted by the old method ($P < 0.001$). Analysis of the factors underlying this trend shows that obstetrics/gynecology is perceived as an attractive profession due to the following factors: lifestyle, financial reward, interesting subject matter, intellectually challenging, prestige in the medical community and the public, enjoyable work and association with colleagues. In all these parameters there was a statistically significant increase ($P < 0.05$) in attractiveness of obstetrics/gynecology. An increase was found also in the perceived appreciation for the profession by other doctors,

classmates and family members ($P < 0.05$). A future career in surgery dropped from being considered by 61% in the past to 34.5% of the students accepted by the new method ($P < 0.001$). Surgery was perceived in the past by 39.5% as unattractive in terms of lifestyle. This percentage rose to 68.4% in the new group ($P < 0.001$). Although still relatively high, the perception of the scientific basis and future of surgery

Figure 1. Future residency preferences of students admitted by the new admission system (N=85)

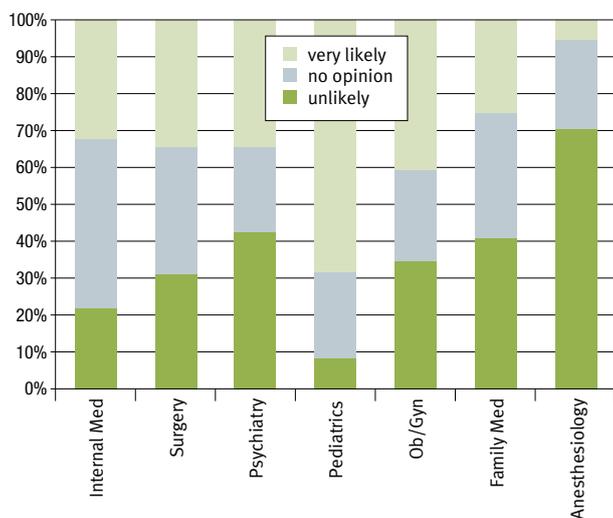
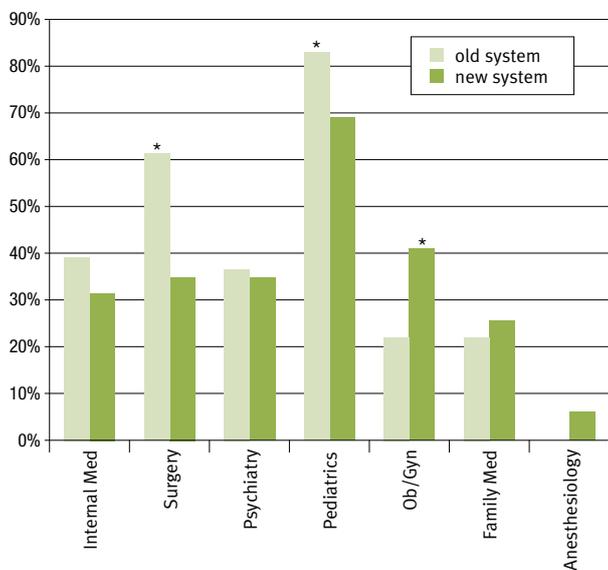


Figure 2. Comparison of preferred future career choices (ranked 'likely' and 'very likely') of students admitted by the new admission system (N=85) vs. the old admission system (N=41)**



**Data from 41 first year students from the previous research, admitted by the old system, excluding the second and third-year students
*Statistically significant, $P < 0.05$

significantly declined in the new system group ($P < 0.001$). Financial reward in surgery was considered more attractive by the new group ($P = 0.021$). A similar declining trend was observed regarding pediatrics residency, 82.5% in the old system vs. 68.7% in the new. Financial reward and lifestyle were perceived similarly by the two groups. The perception of job satisfaction, interesting subject matter and prestige dropped significantly ($P < 0.01$). An open-ended question allowing the addition of other career choices besides those mentioned was included in both questionnaires. Hematology/oncology as a future career choice was noted by 11.7% of students in the new admission group in comparison to 4.8% in the old ($P < 0.001$). Anesthesiology was not among the choices in the original questionnaire. Due to the increasing concern about a shortage of anesthesiologists in Israel we decided to add this residency as an option. Only 6% of the students opted for it as a probable career choice.

The students were asked to attribute importance to different aspects in the choice of residency [Table 2]. Ability to help people was regarded as very important in both groups:

Table 2. Comparison of motivators ranking between students admitted by the new admission system (N=85) vs. the old admission system (N=41)*

	Old system		New system		P value
	No.	%	No.	%	
Lifestyle					
Very important	21	55.3	60	71.4	0.012
Important	13	34.2	19	22.6	
Not important	4	10.5	5	6	
Prestige					
Very important	7	18.4	13	15.7	0.627
Important	11	28.9	22	26.5	
Not important	20	52.6	48	57.8	
Skills					
Very important	32	84.2	68	81.9	0.933
Important	6	15.8	14	16.9	
Not important	0	0	1	1.2	
Financial reward					
Very important	16	42.1	31	37.3	0.428
Important	13	34.2	34	41	
Not important	9	23.7	18	21.7	
Challenging work					
Very important	36	94.7	82	97.6	0.246
Important	2	5.3	1	1.2	
Not important	0	0	1	1.2	
Ability to help people					
Very important	38	100	79	95.2	< 0.001
Important	0	0	4	4.8	
Not important	0	0	0	0	

*Data from 41 first-year students from the previous research, admitted by the old system, excluding the second and third-year students
 $P < 0.05$ highlighted in green

100% of the old group and 95.2% of the new group ranked this factor as very important, with an additional 4.8% of the new group mentioning it as important ($P = 0.004$). Lifestyle was considered very important by 71.4% of the students in the new group vs. 55.3% in the old ($P = 0.012$). Challenging work and skills were ranked as important aspects by both groups without a significant change in the assessment.

CORRELATION BETWEEN DEMOGRAPHICS AND CAREER PREFERENCES

We tried to identify demographic characteristics that could predict residency preferences. A correlation was found between male gender and preference for a career in surgery ($P = 0.012$), and female gender and preference for family medicine ($P = 0.001$). Analyzing the previous data for these correlations we found that the men's preference for surgery was already statistically significant in that group. The preference for family medicine among women is a new finding. Another significant finding was the correlation between religiosity and a hematology/oncology future career choice ($P = 0.039$). Ten students chose hematology/oncology as a future career in the open-ended question. Among them, 6 defined themselves as religious (60%), compared to a prevalence of 29.1% students defining themselves as religious in the entire group.

DISCUSSION

Against the background of continuing debates on the optimal methods of choosing future physicians, changes in the admission process to medical schools are constantly being implemented worldwide. Our study is the first attempt in Israel to assess the effect of a recent change in the admission process to medical school. The data confirm a change in the population of students being accepted to medical school after implementation of the new admission process. Our first question was whether the change in the admission criteria was associated with the admission of students having different demographic and background characteristics. Indeed, we encountered a different student population. The students admitted by the new process were on average one year older, a finding that might indicate a more mature attitude. Given the mandatory military service in our country, there is a 'built in' gap of at least 2–3 years between candidates before and after their military service. Therefore, we suggest taking into consideration these gaps in the design of the admission process and interviews. For instance, the Multiple Mini Interviews should be geared to be age-appropriate to avoid bias in the assessment of individuals before the Israeli Academic Reserve (The Israel Defense Forces offer a college-based officer commissioning program, often covering full tuition for medical school in exchange for extended periods of active military service as an army physician, similar to the ROTC program

in the U.S. military), or those who are exempt from military service (Arab Israelis, ultra-Orthodox). More students from rural areas were accepted, a fact that may have an important impact on future health care delivery, as they might be interested to return and serve their communities as doctors. The fact that more students considered or attended other academic studies and combined humanistic and scientific studies in high school may indicate a more heterogenic, open-minded attitude, with a wider perspective. This is a new finding compared with previous published data that described an increased trend toward a background in exact sciences [17]. The students accepted by the new admission system also had different future career preferences and motivators, a finding that answers the second question of our study. The increased attractiveness of obstetrics/gynecology as a career choice correlated with a statistically significant increase in the perception of various aspects of the profession such as lifestyle, intellectual challenge and prestige. Hematology/oncology was not addressed initially as a stand-alone option in the questionnaire. The students added it as a preferred option in the category 'other'. This fact strengthens the significance of our finding. It was not possible to assess the attractiveness of hematology/oncology by different parameters that were measured for the pre-established options. We analyzed the correlation with the demographic data and found among those who mentioned this option that a high prevalence of students defined themselves as religious. Finally, the third question of our study addressed a possible integration of the different demographic characteristics, perceptions and choices into a profile that could be used to support the planning of the health care system in the future. For instance, Israel suffers from an increasing shortage of anesthesiologists. If a unique profile for future anesthesiologists could be recognized, we could recommend priorities in the admission process to remedy the shortage. As described, our success in this respect was only partial.

The strength of the survey lies in its high response rate, which is comparable to similar studies: 80.1% response rate in this survey vs. 52% [12], 70% [13] and 69% [14] in the literature. It has the benefit of being able to compare the relevant data before and after implementation of the new method of admission to medical school.

Our study has several limitations. The sample size was limited due to the fact that the survey was performed a year after the admission system was changed. The survey assessed the opinions of first-year students, which are likely to be affected during the long course of medical studies. Manuel et al. [18] explored this issue and found a correlation of 50–70% between first-year students' career preferences and eventual choice [18]. The student profile change coincided in time with the selection procedure change. There may be other wider social trends, such as increasing educational achievements in

rural areas, changing public attitudes to leisure time, etc., that explain the trends without the new selection procedure making an independent contribution. Dorsey and colleagues [19] tried to determine whether controllable lifestyle and other specialty-related characteristics are associated with changes in preferences of senior medical students in the United States. They found that perception of controllable lifestyle accounts for most of the variability in recent changing patterns of specialty choices among graduating U.S. medical students. This finding is similar to our results showing a trend of attributing an increasing importance to lifestyle as a motivator when choosing a residency.

We conclude that the new admission system was associated with changes in the students' profile. It is difficult to tell whether this trend will translate into a substantial improvement in the personal and interpersonal skills of these future physicians. Our findings support a global trend of medical students and young doctors losing interest in traditional residencies (i.e., surgery and pediatrics) and opting for more lucrative residencies and an appealing lifestyle [19,20]. Has the time come to consider incentives for young medical graduates to specialize in critical residencies such as anesthesiology? Further evaluation of the trends identified is needed, as are possible correlations between the trends identified and the students' performance and professional success [21]. From an even wider perspective, additional studies are needed to define profiles that will match the expectations from the doctors of the future according to evolving paradigms and needs.

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