

Creating a New Paradigm for Premedical Undergraduate Studies: Physicians' Perceptions of Subjects and Skills Critical for Success in Medical School and Practice

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Abstract:

Background/Purpose: The purpose of this study is to determine subjects and skills that are perceived by practicing physicians as essential for success in medical training and practice. Previous studies suggest that better premedical preparation for a future career as a physician may reduce the need for expanded study of non-clinical subjects and skills in the graduate medical curriculum.

Methods: The study was performed with a random sample of licensed physicians in Ohio (n=2,100), who were queried utilizing a survey instrument of 54 questions including demographics and perceptions on eight subjects and sixteen skills essential for success in medical school and practice. Completed surveys (n=356) were found to be representative of the national demographics of practicing physicians, including similar age, education, gender, type of practice, and specialty.

Results: Respondents indicated that the subjects of business, communications, and technology were rated as most important for physician success, while communications, natural sciences and technology were most important for students. Skills identified as most essential to both training and practice included the ability to utilize technology, being honest and truthful, ability to explore, self-educate and research, and ability to communicate orally.

Conclusions: The findings of the study support previous research and indicate that some students entering medical school may not have the breadth of study that practitioners identify as best preparing them for success as a student and practitioner.

Keywords: Medical education, curriculum

In the current medical education environment there is strong evidence, both objective and subjective, to suggest that an interdisciplinary approach to the training of physicians for the future realities of medicine is warranted.¹⁻⁶ In response to this issue, many medical schools have begun to add elective classes in such areas as health finance, ethics, legal aspects of practice, and practice management.⁷ Changes in curricula, teaching methodology, and content have also altered the graduate medical education experience. Interdisciplinary elective courses are often limited in timeframe because of a lack of time free time in the curricula. When compared to introductory courses taken in undergraduate studies (40-50 contact hours) the amount of time given for these courses is insufficient to explore these complex subjects.

The purpose of this study is to assess physicians' perceptions of undergraduate premedical subjects and skills critical for success in medical training and practice. With the increasing role of the physician as manager, educa-

tor, and patient advocate, it is questionable whether the predominantly science-focused premedical major (biology, chemistry and other premedical courses), that is still the norm for the majority of entering medical students, is engendering the most necessary subjects and skills for future success. Results of this study were used to create a ranking of subjects and skills physicians felt were critical to success for medical school and the practice of medicine, in addition to current required premedical coursework.

Background

Medical education has evolved over centuries. In early, pre-20th century America, medical studies were often informal and varied greatly in the breadth and depth of instruction. In 1910, Abraham Flexner released his benchmark study to the Carnegie Foundation for the Advancement of Teaching. This study examined the adequacy of medical instruction across the United States. A primary recommendation of Flexner was the requirement

of an undergraduate degree to study medicine. Since that time, with the exception of a very few combined M.D./B.S. programs, the undergraduate degree has been required for entrance into medical school. Over the course of the last 75 years, medical education has evolved with the addition of such instructional strategies as early clinical contact, case and systems-based study, and care continuums. However, premedical undergraduate education has not seen similar development and has changed little over time.

While the literature concerning the undergraduate premedical education curriculum is somewhat limited, various studies point to some remarkable facts regarding the use of a science-based undergraduate experience for entrance into medical studies. Currently, approximately 65% of students enter medical school with a science-based undergraduate degree,⁸ although research has shown that non-science majors are accepted at approximately equal rates as their non-science peers.⁹ Koenig and Wiley,¹⁰ Jones and Seeman,¹¹ and Shen and Comrey¹² found positive correlations between an undergraduate science-based curriculum and high Medical College Admissions Test scores, as well as performance in the first and second years of medical school. Other studies however, have questioned whether additional science courses in the undergraduate premedical curriculum affect performance in the initial pre-clinical years of education. Studies by Hall and Stocks¹³ and Zeleznick, Hojat and Veloski¹⁴ indicate that additional undergraduate premedical science courses offer no advantage to students in medical board examination scores or successful completion of medical studies.

While these studies are sound research, they do not portray the entire picture for medical school matriculants. In a study of 1,135 medical school graduates Gough¹⁵ found that science-based and non-science based students had no significant difference in performance in the third and fourth years of medical school (clinical years), and no significant difference in successful completion of medical studies. Other researchers have supported these findings, including Smith,¹⁶ Koenig,¹⁷ Schaad,¹⁸ and Herman and Veloski.¹⁹ Each performed studies comparing success in medical studies correlated with undergraduate major, science grade point average, and admission scores. None found that a non-science undergraduate degree or low grade point average in undergraduate science courses was a significant risk factor in a student not completing medical studies. In addition, Huff and Fang²⁰ found that incidence of academic difficulty in medical school occurred no more often in non-science undergraduate majors.

Methods

Following institutional review board approval at Ohio University, the July 2000 list of licensed physicians in Ohio was used to identify potential subjects for this study. Surveys were mailed to each survey participant via United States Postal Service bulk mail. Each survey included a self-addressed postage paid envelope for returns.

The survey instrument was tested for validity by consultation with members of the Ohio University College of Osteopathic Medicine. Basic skill sets were determined using alumni questionnaires developed at three Ohio universities. The survey consisted of four major sections: demographic data, a query regarding medicine as an art or science on a nine-point Likert scale, and 24 questions regarding skills and subjects necessary for success as a medical student and practicing physician on a five-point Likert scale.

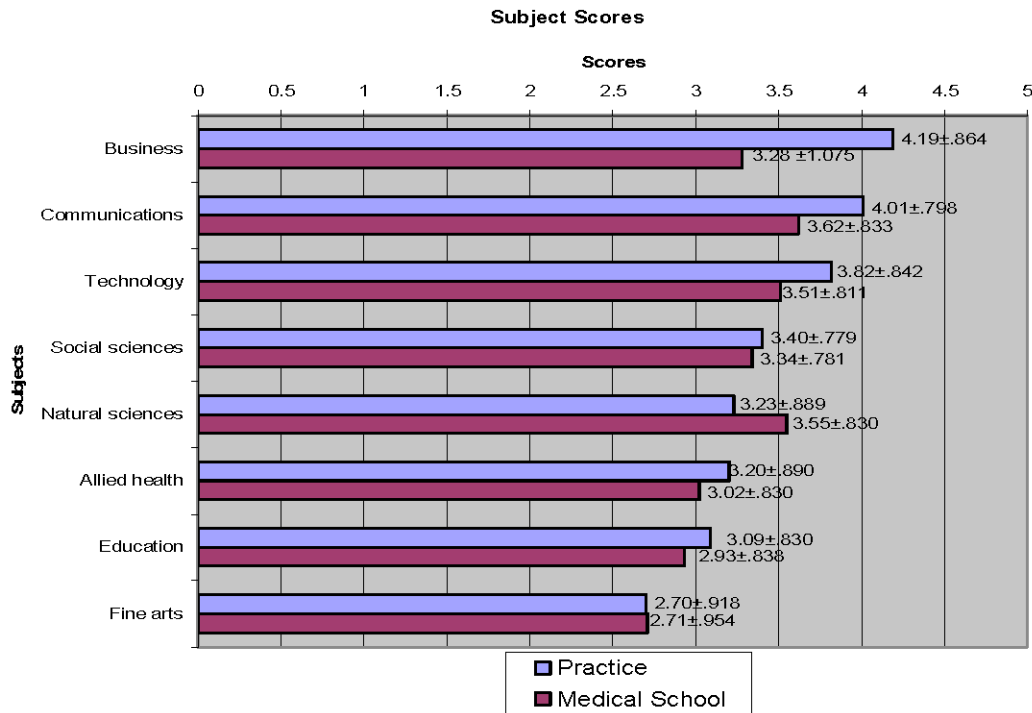
Reliability tests were conducted on the pilot test returns (n=77). Reliability was measured for all items and for constructs for skill items. Alpha levels and split-half reliability tests were run as reliability measures. When all 48 subject and skill areas were included, reliability for the survey instrument was measured at alpha of 0.9219, with a split-half coefficient of 0.8612 for part one and 0.8786 for part two. Data were analyzed using the Statistical Package for the Social Sciences (v 10.01, 2000).

Results

Demographics of the study respondents indicated that the population was relatively similar to the population of physicians as a whole in the state of Ohio and nationally.²⁴ Survey respondents were described as 1) 71.5% male, 23.7% female, 4.8% no-response; 2) 84.3% allopathic physicians, 15.7% osteopathic physicians; 3) 49% primary care, 51% specialty care; 4) average years since high school = 32.85 (average age = 50.85); 5) average years since medical school = 24.2; 6) average years since last residency = 19.27; 7) 76.36% of all time spent in clinical practice; 8) 72.4% hold a science undergraduate degree; 9) 14.4% hold a masters or doctoral degree.

Regarding the question of physicians' perceptions of medicine as an art or science, the mean response on a nine-point Likert-type scale was 4.684 (sd=1.4744, variance=2.1739). Terms on this query were purposefully left undefined to gain insight into basic respondent beliefs. This response may indicate that equal importance should likely be placed on training future physicians in both scientific and technical subjects and skills, as well as

Figure 1



social, personal, and communications subjects and skills.

Study results suggest that natural sciences, a traditional emphasis for premedical studies, may not be solely indicative of success in practice. Physicians identified communications, natural sciences, and technology as the three subject areas most important for success in medical school. However, natural sciences were perceived as less importance for success as a practicing physician. The three subjects deemed essential to the successful practice of medicine are business, communications, and technology. This follows the trends in additional coursework currently being included in the medical curriculum and reinforces the utility of broadening the undergraduate premedical experience. Sciences may also be likely viewed as lower in importance for premedical training due to strong subject area knowledge upon completion of medical training.

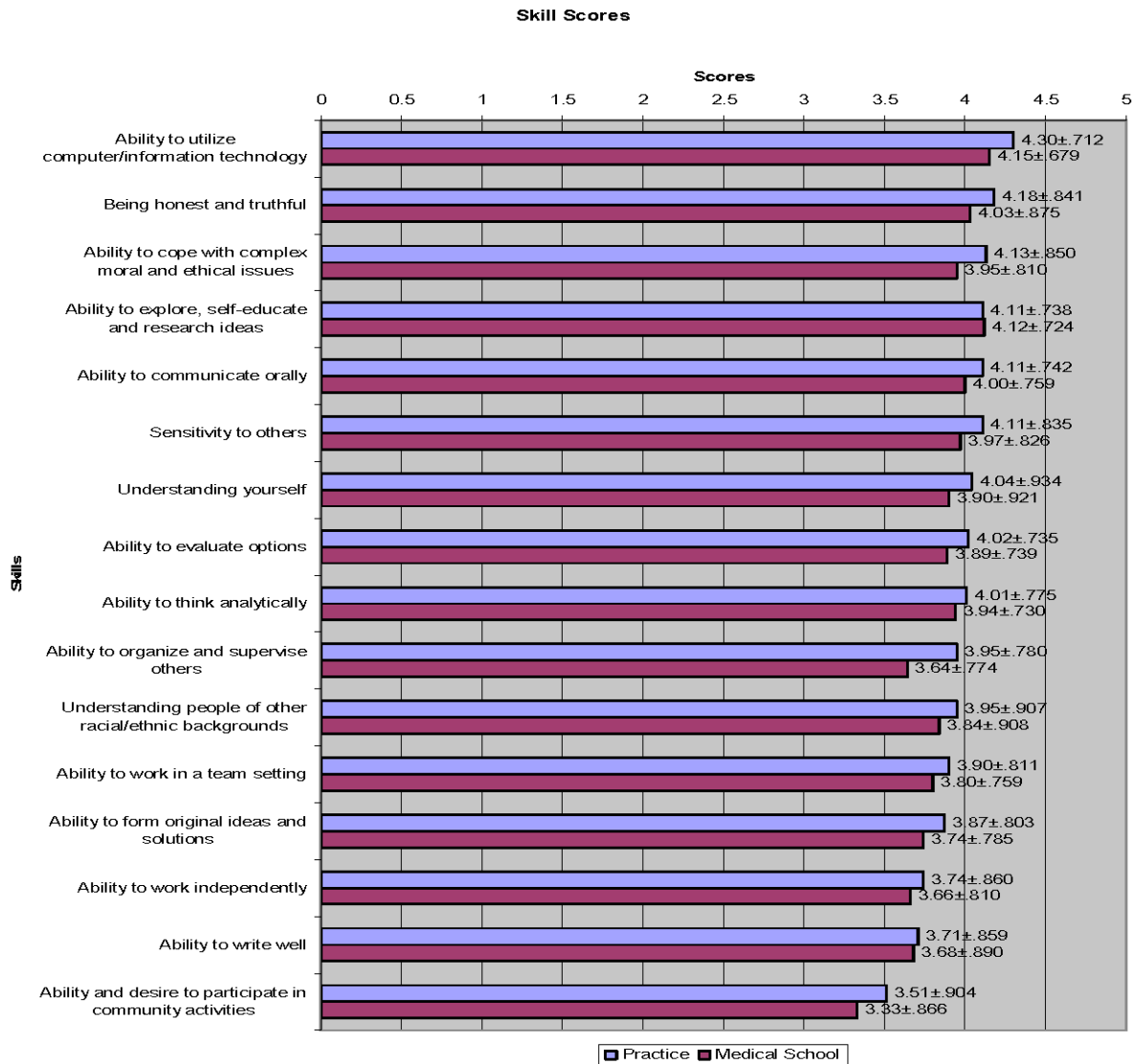
The subject areas of communications and technology were perceived as important for success in both the medical school and the practice environments. The identification of these two subject areas is significant, as many entering medical students may be lacking education in these areas, regardless of premedical major. With the emphasis placed on these subjects by practicing physicians, it may be appropriate for these courses to be required as prerequisites to medical study, in addition to advanced study in

these areas during the medical training experience.

Skills that are deemed important for success in preparation for medical school and success in practice, as well as subject areas regarded as critical, share many commonalities. The skill that ranked first in both training and practice was the ability to utilize computers/information technology. Skills ranked in the top five positions in both medical school and practice were 1) being honest and truthful, 2) the ability to explore, self-educate and research ideas, and 3) the ability to communicate orally. Sensitivity to others was also included in the top five skills for success in medical school, while coping with complex moral and ethical issues was included in the top five for practice. In general, these skills share much in common with the general subject areas judged necessary and include skills inherent in a liberal, interdisciplinary undergraduate experience.

ANOVA and Tukey's Post Hoc tests were also performed to identify any significant differences between groups based on age and years of practice. For subjects and skills identified as important for medical school, natural sciences were perceived to become less important as one had greater age and experience, while the education subject showed the opposite pattern. Business was perceived to be more important by younger respondents. Writing well was perceived as a particularly important

Figure 2



skill amongst the respondents with fewer years of practice experience, while using computer technology, coping with moral/ethical issues, sensitivity to others, and participating in the community were perceived as higher in importance by mid-career practitioners. Higher scores on sensitivity to others were also correlated with increased age.

Differences noted regarding success as a practicing physician indicated that business was perceived to have increasing importance as years of practice increased, while education was perceived as more important for mid-career and mid-age physicians. Allied health was perceived as most important for mid-career practitioners. Regarding skills necessary for success in practice, respondents indicated that thinking analytically and sensitivity to others

were deemed less important by mid-career practitioners than by early or late career practitioners, while participating in the community was deemed more important as the respondents aged.

Discussion

As the medical school curriculum continues to be filled with an ever-increasing wealth of medical knowledge, it is appropriate that the skills necessary for success in medical school and the practice of medicine be included in the undergraduate premedical curriculum. Students and faculty of medical schools have little time for exploring non-medical subjects in the depth and breadth that is necessary for subject mastery. Therefore, defining premedical studies to meet the demands of the medical

environment with sufficient scientific content, as well as providing a non-clinical premedical curriculum that will engender critical traits serves both the student and the profession.

It is clear that the skills necessary for success as a practicing physician and as a medical student differ in some aspects. While the required undergraduate premedical courses in the natural sciences are certainly not contraindicated by this study, the general trend of the science major and its associated strict curricula and limited time for liberal studies is not supported, nor is any major that does not afford the student the opportunity to gain an interdisciplinary undergraduate experience. The identified skills share much in common with the general idea of a well-rounded liberal education. This indicates that acquired knowledge and skills are vastly more important than any particular area of expertise or knowledge.

The importance of business, communications and technology became very clear and were supported by responses in both the subject areas and skills deemed important for success. In addition, coping with ethical and moral issues; the ability to explore, self-educate and research; the ability to evaluate options and think analytically; and the ability to communicate orally were considered of paramount importance for success in practice. These areas and skills are certainly appropriate for inclusion in the undergraduate curriculum and may be consistent with some interdisciplinary degree programs.

Further study identifying specific skills and courses deemed essential for the practice of medicine should be performed and subsequent changes to preferred or recommended undergraduate premedical coursework should be developed. In addition, determining when the subjects and skill should be taught must be analyzed to determine proper placement in the continuum of medical education. All courses and subjects identified may not be necessarily placed in the premedical, but rather in the graduate medical environment. It is inherently important for the success of future students as well as the quality of future physicians that every opportunity is taken to choose medical school matriculants with skills and subject knowledge that will help to assure their success in training and practice. This study has identified broad skills and subjects that will assist in providing premedical advisors and medical school admissions committees with insight into choosing and preparing matriculants for the current medical training and practice environments.

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