

Genetics in Pre-Clinical Education at University of Minnesota Medical School

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Introduction and Objectives

In their introduction to a 2001 special issue of JAMA that focused on genetics in medicine, Francis Collins and Alan Guttmacher asserted that "genetics is invading the medical mainstream." Collins and Viktor McCusick predicted in a separate JAMA article that the Human Genome Project and related advances in the field of genomics would lead to a revolution in modern medicine. Specialized fields such as pharmacogenomics and toxicogenomics have emerged to expand the possibilities of integrating new genetic knowledge and technologies with medicine and public health. However, surveys of medical students and primary-care physicians in the U.S. do not reflect parallel changes in genetics education. Many medical schools still offer little training in clinical genetics and primary-care physicians widely describe themselves as ill-equipped to handle patients' concerns regarding genetic risks, testing, and treatments. The National Coalition of Health Professional Education in Genetics (NCHPEG) stated: "Ultimately, health care providers, regardless of specialty area, role, or practice setting, will face questions about implications of genetics for their patients. The fast pace of genetic advances and the paucity of professional training in genetics leave many providers without up-to-date answers."

The University of Minnesota provides a three-week course (approximately 15 hours) in Human Genetics during the first semester of medical school. The schedule is divided into lectures on single-gene inheritance, chromosomal abnormalities, complex inheritance, and clinical issues in genetics, including one lecture each on approaches to genetic diagnosis, testing, and counseling. After this course there is no further formal training in genetics beyond an elective rotation in Medical Genetics offered during the clinical years, which about four students elect to take each year. Some genetics topics are covered in other courses, such as Biochemistry, which covers molecular biology, and Physician and Society (PAS), which devotes one two-hour session to "genetics and ethics" during the first-year curriculum.

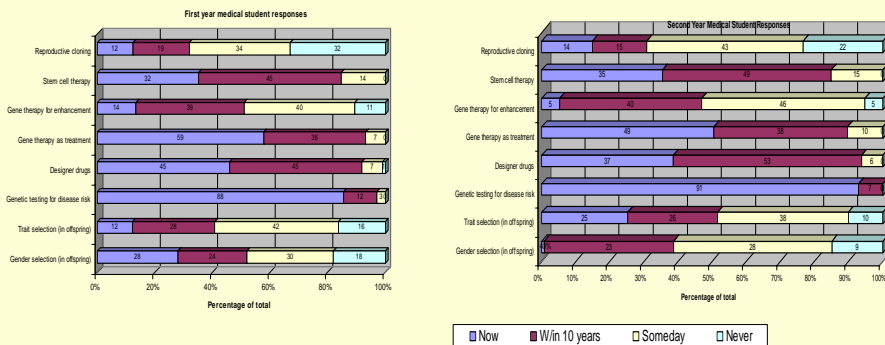
This study aimed to explore the evolving curriculum of the University of Minnesota Medical School Human Genetics course and students' perceptions of its content, including the social and clinical context in which genetics material is presented. The project addressed the following questions:

1. What experiences and attitudes do students have toward genetics upon entering medical school?
2. What value do students place in their medical school genetics education?
3. What role do students believe genetic technology will play in their medical practice and when do they think genetic technologies will be available to them?

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Student estimates of when certain genetic technologies will play a significant role in clinical medicine



Methodology

Human Genetics lectures and genetics-themed lectures within other courses during the first year of medical school were reviewed for scientific and clinical content, including topics and issues of professional ethics related to genetics. The Human Genetics Course Director, Dr. Richard King, was interviewed regarding the faculty's expectations of students and its perceptions of recent or future changes in genetics education. There was also a review of literature relating to genetics education and aptitude in medical school students and practicing physicians.

A group of ten second-year University of Minnesota medical students was solicited to discuss the research questions and better define themes for the survey of first-year students. Because the opinions expressed during this exploratory session were surprising, it was decided that the second-year class should also be surveyed in order to provide some validity to the focus group results. The class of first-year medical students at the University of Minnesota was surveyed in early November 2004, during the first week of the Human Genetics course, in order to gain insight into students' experiences with and attitudes toward the field of genetics. Multiple-choice surveys were handed out after an announcement in class and then also emailed to students. A modified survey was similarly distributed to year-two students in mid-November. Appendix A provides a summary of survey questions and student responses. First-year students who volunteered were invited to a focus group to discuss topics in a more in-depth manner. Both first-year and second-year focus groups were held for one hour over a lunch period. Analysis of survey frequencies and qualitative analysis of focus group transcripts involved a search for trends in the ideas and opinions expressed by students.

Discussion

The results of this study present two main concerns with the current education of medical students at the University of Minnesota. First, most entering students, between 70 and 75 percent, have taken a class in genetics and nearly half completed an undergraduate major in the biological sciences. Students' level of experience indicates that genetics education in medical school can be taught at a more advanced level. Second, students' attitudes toward genetics seem to change slightly from year one to year two in that the significance students place on learning and using genetics decreases. While the quantitative difference in results in this area is not large enough to make a definite conclusion to this effect, focus group results support the trend in data.

There were several major limitations in this study. First, resources allowed for only one focus group per class. Also, focus groups participants and those who responded to the survey were self-selected. Moreover, in responding to survey questions, students may have given the answers that they thought were expected or least out of the norm. This is a common phenomenon in research using surveys. Furthermore, only 50 percent of students returned the survey, a good response rate in this population but a larger proportion of respondents would have lent more credibility to the results. An online survey (especially one that required a response) might have been more effective. Finally, a better analysis of the curriculum in comparison to expected "competencies" of students leaving medical school would have been helpful.

Despite the many limitations present in this study, there is evidence that student attitudes toward the value of a genetics education makes a negative shift during the pre-clinical years of medical school at the University of Minnesota. This most likely occurs because of the lack of integration of genetics material into the general curriculum and the perception of Human Genetics as a "blow off" class. It should be noted that this was not the expected conclusion of this study and while researcher bias may exist in this study in some form, the original preconception was that students would overstate the role that genetics now plays in medicine.

Conclusions

Because of the many limitations of this study, there is ample opportunity for further research. Some of the topics that might be explored are the behaviors and trends among medical students when participating in surveys, the curricula of medical schools around the country, especially those like Johns Hopkins Medical School that have revamped their entire curriculum to integrate genetics into the education,^[1] and the attitudes and beliefs of physicians in different fields to genetics and its importance in their practice. It would also be worthwhile to simply expand the scope of this study and, for example, hold more focus groups, attempt to get a larger survey sample, or question one class of students periodically throughout their medical school career to obtain longitudinal results regarding how students' attitudes toward the subject of genetics change according to their education and experience.

This study does offer some insight into how students view the genetics curriculum and how education at the University of Minnesota Medical School might be improved. The most important point identified in this study is students' consideration of genetics as a topic of less importance than others in the pre-clinical years, based on its presentation. With the changes occurring in clinical medicine and the interest in genetics among the general patient population, this is a discouraging finding. A few suggestions for change:

- Call a meeting with or send a memo to pre-clinical course instructors to discuss more integration of genetics into the curriculum. Explain to these individuals that the absence of genetics-related material leaves students with the impression that it is unimportant and will not affect their patients. Ask lecturers to integrate at least one reference to genetic causes or applications into each of their presentations.
- Devote one class period during the Human Genetics course to a panel discussion with family practice, obstetrics/gynecology, and other generalist and specialist physicians and ask them to talk about genetics in their practice, including how often they deal with issues related to genetics and what kinds of decisions they and their patients are required to make when genetic issues do arise.
- Talk more about the common situations that all students might encounter in their careers, such as different rates of drug metabolism among individuals based on genetic polymorphisms or the significance of the ApoE4 allele to both heart disease and Alzheimer's disease to demonstrate the universal nature of modern clinical genetics and to emphasize that it is not a subject exclusively for obstetricians or pediatricians.
- Course instructors should consider raising their expectations of students entering the Human Genetics course and increasing the level of difficulty and/or the depth and breadth of material
- Enough comment was made on the inadequacy of the PAS course that it warrants notice in general. In the context of this study, the PAS curricula in regards to genetics and ethics should be re-examined.

Several resources might be used to guide this process.

Knowledge of genetics and associated ethical concerns is essential to today's practicing physicians. The possibility that the University of Minnesota Medical School gives students a contradictory impression should provoke concern among the course instructors and the administration. This topic merits further investigation by the Medical School Curriculum Committee.