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Designing a Patient Safety Undergraduate Medical Curriculum: The Telluride Interdisciplinary Roundtable Experience

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SPECIAL ARTICLES

Designing a Patient Safety Undergraduate Medical Curriculum: The Telluride Interdisciplinary Roundtable Experience

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Purpose: Patient safety has emerged as a global concern in the provision of quality health care, and yet, to date, few medical schools have created and/or implemented patient safety curricula. The purpose of this article is to introduce readers to one model of a patient safety undergraduate medical curriculum, as designed by a group of experts attending an annual interdisciplinary roundtable assembled for this purpose. **Summary:** The Annual Telluride Interdisciplinary Roundtable met in 2005 and 2006 to design what it considered to be a comprehensive patient safety curriculum for medical students. Invited members included stakeholders from a variety of fields, including health care providers, senior health care administration, students, residents, patient advocacy leaders, and curriculum development/assessment experts. The group developed a list of general curricular principles, followed by 11 specific elements felt to be essential to an effective patient safety curriculum for undergraduate medical education students. It also identified a number of challenges to implementing such a curriculum. **Conclusions:** A patient safety curriculum, developed by a group of experts for an undergraduate medical education population, was successfully developed over a two-year period of time. Future meetings of the Telluride Roundtable group have centered on evaluation and refinement of these curricular elements as pilots

occur in a number of medical schools, and new curricular ideas continue to be developed. Continued interprofessional dialogue and collaborative research will enable the development and implementation of a standardized longitudinal patient safety student curriculum.

INTRODUCTION

The goal of a medical education curriculum is to prepare students to address problems that affect the health of the public.¹ Medical errors and patient safety have emerged as global concerns in the provision of quality health care. There has been considerable discussion in both the public and private sectors regarding ways to modify the current medical system to address the concerns raised by the Institute of Medicine's (IOM's) 1999 report, titled "To Err Is Human; Building a Safer Health System."² The IOM's report estimated that as many as 98,000 patients die every year from preventable medical errors in hospitals. In their follow-up report, "Crossing the Quality Chasm: A New Health System for the 21st Century," the IOM called for change in the education and training of physicians in order to address these problems.³ Dr. Jordan Cohen, then President of the Association of American Medical Colleges, stated there needed to be a "collaborative effort to ensure that the next generation of physicians is adequately prepared to recognize the sources of error in medical practice, to acknowledge their own vulnerability to error, and to engage fully in the

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We acknowledge the efforts and tireless dedication of the Telluride Roundtable members in both years 2005 and 2006.

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process of continuous quality improvement.”⁴ However, serious discussions on the design, implementation, assessment, and faculty development needs of patient safety education in undergraduate medical education have been sparse. Although patient safety has been increasingly recognized as a key dimension of quality care, there are few published reports addressing the design, implementation, and assessment of undergraduate patient safety education. These include introductory workshops in patient safety,^{5–8} Crisis Resource Management education based on lessons learned in the aviation industry,⁹ calls for safe medication prescribing^{10–12} continuous quality improvement,¹³ and case-based learning opportunities.¹⁴ Nursing faculty have begun to address patient safety education for new nurses through the Quality and Safety Education for Nurses initiative (<http://www.qsen.org/>). However, considerable effort in areas of patient safety education is still needed to meet the calls for curricular redesign.

STRUCTURE OF THE ROUNDTABLE MEETING

Identifying and implementing a curriculum that instills the necessary knowledge, skills, and attitudes related to patient safety is challenging to undergraduate medical education. Medical educators from the University of Illinois at Chicago organized an annual invitational roundtable titled “Designing a Patient Safety and Quality Outcomes Health Science Curriculum” under the auspices of the Telluride Scientific Research Conference and the Smithsonian Institute (<http://www.telluridescience.org/>). The roundtable is supported by educational grants from the University of Illinois at Chicago College of Medicine and Southern Illinois University School of Medicine. Two roundtables were held in the summers of 2005 and 2006. Members of the roundtables included stakeholders from the fields of nursing, pharmacy, medicine, public health, and law, as well as senior health care administration, students, residents, and patient advocacy leaders. Content experts included those in medical education, curriculum innovation, faculty development, error science, simulator science, quality care, informatics, risk management, law, and accreditation. (See end of article for a complete list of attendees, their job titles, and what year(s) they attended the conference.)

Stakeholders and content experts began to develop a structural framework for a patient safety curriculum through conversations and communications prior to the roundtable. The roundtable participants met for 4 days in August 2005 and again in August 2006 in Telluride, Colorado, to begin a deliberative inquiry process into the design of an interdisciplinary patient safety curriculum. There was considerable overlap in attendees for 2005 and 2006, though the groups were not identical. Roundtable activities included discussions of the current literature, identification of appropriate educational methodologies, and recommendations on the design of a patient safety curriculum as outlined in this article.

OUTCOMES OF THE ROUNDTABLE MEETINGS

The roundtable discussions have to date yielded three main outcomes that need to be addressed in a new undergraduate curriculum on patient safety.

Seeing Health Care (and Health Care Education) Through a Different Lens

To be successful, a patient safety curriculum will require a qualitative culture shift in the way students and educators think about health care education. Health care education, as it currently exists, is focused on an individual’s performance and assessment of that performance. The educational system is also silo based—for example, very little interprofessional or team education occurs. Education, like hospital care, is organized around specific functions; medical students learn to write prescriptions, pharmacy students learn to issue the medication, and nursing students learn to deliver it to patients. Not much attention, however, is paid to the systems needed to link all these functions, and the health care students, into a coherent, integrated, and safe system. In addition, the recognition of the system as a source of error is generally not addressed in the training of students. Instead, students are trained to individually meet their patients’ immediate needs while working around recurrent system problems, ambiguities, and inefficiencies.

An example of an interdisciplinary systems approach to reducing medical error may be illustrative to highlight the difference in seeing health care through this different lens, a necessary shift if a patient safety curriculum is to be successful. The Center for Disease Control estimates that sepsis arising from the insertion of a central venous line affects up to 250,000 patients a year in the United States, killing 15% or more.¹⁵ In an individual silo-based approach to this problem, physicians might receive additional training as to how to insert the line more safely, using simulators and other advanced technology. Beyond that, occasional sepsis arising from central venous line insertion might be considered an unavoidable consequence of an invasive procedure. If the health care team approached the problem from a microsystems perspective, however, other potential solutions might be considered:¹⁶ using transparent dressings to improve the visibility of the wound to caregivers; asking a nurse to supervise every insertion of a central line, watching for lapses in sterile technique, and stopping the procedure if such a lapse is seen; and avoiding femoral lines if possible because of increased infection risk. These and other countermeasures have been instituted in a few hospitals already utilizing systems perspective and root cause analysis approaches, with resulting decreases in infections by as much as 87%.¹⁵ The point, however, is that if health care professionals in these hospitals had been looking at this problem from a silo-based perspective only, these risk reduction countermeasures would never have been conceived, let alone implemented. Medical students need to be aware from the beginning of their training that health care occurs within a system and that they are part of that system, to see medicine through a different lens.

General Curricular Principles in a Patient Safety Curriculum

Interprofessional education. Roundtable participants emphasized that interprofessional education should be a cornerstone of curricula for health science students and that interprofessional education should be introduced early in the educational process. The participants recognized the growing body of work focused on interprofessional education at the student level. Notable efforts include the Institute for Healthcare Improvement Healthcare Professionals Education Collaborative (<http://www.ihl.org/IHI/Topics/HealthProfessionsEducation/>); the Robert Wood Johnson Foundation Partnership for Quality Education initiative (<http://www.pqe.org/>); and the IOM's report titled "Health Professions Education: A Bridge to Quality,"¹⁷ which called for education and assessment of health student competency in interprofessional teamwork. Effective interprofessional teamwork is known to reduce errors caused by miscommunication and poor patient care handover.¹⁸ Grumback and Bodenheimer concluded that research on patient care teams suggests that cohesive teams where physicians and other health care professionals work together are associated with improved patient outcomes.¹⁹ Improved teamwork skills and greater collaboration between professions have been linked with safe and effective health care.²⁰ Students need to be aware of these outcome improvements. In addition, students need to both understand and experience firsthand the fact that "interprofessional learning consists of more than just sharing the same learning environment: it involves acquiring an understanding of the knowledge base, values and ethos of like-minded individuals and developing respect for each others' contribution to the learning process"²¹ (p. 147). We cannot expect that students educated in the current silo model of training will be able to effectively work in interprofessional teams once they have finished their training.

Longitudinal curricular approach. Roundtable members believe that longitudinal approaches must be employed in patient safety education at the undergraduate level. Practicing and reinforcing safety skills at each level are key elements in effective learning. The Dreyfus educational model has been used to describe five longitudinal stages in the development of knowledge and skills of pilots.²² Similar developmental processes have been seen in chess players, adults learning a second language, and adults learning to drive an automobile. Batalden defined medical education and physician development as a continuum starting at the beginning of medical school and continuing throughout a practitioner's professional career and argued that the Dreyfus learning model could be applied to medical education.²³ The first stage of the Dreyfus model ("novice stage") is where basic concepts, skills and values are learned. For clinical skills, Batalden noted, "this is where the beginning student starts learning how to take a medical history through memorization of the chief complaint, history of present illness, review of systems and family and social history." In the second stage, known as the advanced beginner stage, students begin to exper-

iment with limited applications. It is in this second stage that

the third year medical student begins to appreciate common situations such as those facing hospitalized patients (admissions, rounds, discharge) that can only be learned through experience.

The remaining three stages continue through residency and mid-career, where the recognition of patterns and the use of intuition are the major work drivers.

In similar fashion, a basic understanding of the concepts and values of patient safety should be introduced early in the curriculum, preferably in the first 2 years, followed by the supervised experimentation and application of these concepts during clinical clerkships and on into graduate education.

Advanced patient safety educational opportunities for senior students. Roundtable participants agreed that students seeking further knowledge in patient safety should have access to more intensive educational opportunities as electives. Further training in advanced competencies could help interested students develop into leaders, researchers, and scholars in the patient safety field.

Teaching methodologies. There are a number of different strategies and educational modalities that roundtable participants thought should be utilized in addressing patient safety education at the undergraduate level. These include plenaries, small-group learning sessions, experiential learning, simulation, standardized patient role-plays, case-based learning, individual and team-based learning, and supportive audio-visual material. Deliberate practice, a regimen of effortful activities coupled with immediate feedback, designed to optimize improvement, is the key to effective learning and retention of patient safety information, as well as the requisite skills and attitudes.²⁴

Assessment strategies. Roundtable participants stressed that health profession students will need to be assessed in their abilities as team members, not just individually, in a successful patient safety curriculum. Their abilities to see systems-based problems and inefficiencies and to offer systemic solutions through root cause analyses will also need to be assessed. These skills are not easily acquired but are nonetheless critical to enable optimal performance in a health care environment focused on patient safety. Assessment strategies that could be used include the use of multiple choice questions for patient safety knowledge, team-based assessment of groups of interprofessional students as they work through a clinical scenario, standardized patient assessment of full disclosure skills, and the evaluation of student quality improvement projects undertaken in the 3rd year of medical school.

Specific Content for a Patient Safety Curriculum

Roundtable participants agreed on 11 specific elements of curriculum content that they believe are essential for an effective patient safety curriculum at the undergraduate medical education level.

History of the medical error crisis. Students learning about the scope and history of the medical error crisis will create a

need to know and a call to action on the part of these future health care professionals. The knowledge of the IOM's 1999 report² alone with an estimated 98,000 deaths per year due to medical errors will be an eye-opener to students, who otherwise are buried in learning basic science, diagnosis, and treatment and have been unaware of the crisis. A need to know in the area of patient safety will move this topic up on the students' overcrowded attention list. Students should be exposed to this material early in the 1st year of medical school.

Interdisciplinary teamwork skills. As discussed, these skills are critical to the success of any patient safety initiative and are very much absent in today's undergraduate medical education curricula. Issues such as role clarity, conflict resolution, chain of command, and the rehearsal of teams to provide care in specific situations (such as acute trauma or codes) all need to be addressed.²⁵ Students should learn about their and other health care provider roles in the system early in their 1st year of medical school. Subsequently, in the 2nd year, once students are acclimated to medical school and beginning to think about working in clinical settings, topics such as hierarchy, chain-of-command, team-based care, and leadership skills can be introduced.

Time and stress management. The ability to manage one's time and stress, recognize when another health care team member is stressed and thus less effective, or recognize when an entire team is dysfunctional because of stress-related complications is well documented in safety literature as critical to continued optimal performance.²⁶ These skills (managing one's own time and stress) ought to be introduced to students early in their 1st year and should be repeated on at least a yearly basis as a refresher. More sophisticated skills such as recognizing when another health care team member, or indeed the entire team is stressed, should be introduced once students are routinely working with these health care team members in the 3rd year.

Health care microsystems. Education in this arena is important to help students see the health care system through a new lens, no longer a silo-based approach to health care. Understanding that health care professionals all work in multiple microsystems and being effective in doing so as part of a larger whole are key competencies in patient safety.²⁷ This important topic should be introduced to students in their 1st year of medical school, and lends itself to introduction during interprofessional training.

Informatics, electronic medical records, and health care technology. A working knowledge of these new developments in health care will allow students to interact with them and understand their importance in the provision of patient care. Students should be introduced to these concepts in either the 1st or 2nd year, well before they must actually interact with these systems in the 3rd year.

Error science, error management, and human factor science. An overview of how medical errors occur, how humans make mistakes, environmental factors predisposing medical errors,

and principles of how to eliminate the errors from health care systems will begin to equip students to deal with these issues in their professional lives. This material would best be introduced in the 2nd year of medical school as students learn other behavioral science material, and in preparation for their entrance to the clerkships in the 3rd year of medical school, where they will see errors in health care systems in action and must therefore be prepared to begin to understand them.

Communication skills. Although there is communication skills training in undergraduate medical education curricula currently, a particular focus on errors in communication and how these might be avoided is lacking. Patient safety communication content needs to focus on written skills such as order and prescription writing, as well as chart documentation, and oral skills such as communication between members of the health care team during tasks such as hand-offs and consults. These skills are best introduced in the 2nd year of medical school, as they must be in place by the time students begin their 3rd-year clerkships.

Full-disclosure applications. Students need to be trained in the techniques of full disclosure to patients once an error has occurred. Attitudes need to be formed early in students that the admission of mistakes and the ability to say "I don't know" are valued, as these attitudes will allow the culture of medicine to shift to one of patient safety and continuous learning from mistakes.²⁸ Students should be introduced to the concept of full disclosure in the 2nd year of medical school and allowed to practice this skill with standardized patients using simulated clinical scenarios.

Risk management and root cause analysis. Risks and hazards embedded within the structure and process of care have the potential for causing injury and/or harm to patients. Accurate identification of the root causes of events must precede identification and implementation of appropriate interventions. The use of risk assessment techniques including process mapping and failure modes and effects analysis can be used to identify at which point interventions are most appropriate. This information is essential to give health care providers the tools to address problems in patient safety in a systematic, organized, and methodical manner.²⁹ It is probably sufficient to introduce students to the concept that there are such tools available late in their 2nd year as part of their quality improvement training. The actual use of these tools might be implemented into the quality improvement projects assigned to students in their 3rd and/or 4th years.

Outcome measures and continuous quality improvement. Teaching students to monitor outcome measures and to critically examine failures in the system as soon as they occur will lead to improved quality of care.^{30,31} Health care providers trained in this model will more rapidly address failures in systems, rather than continuing workarounds that are demonstrating themselves to be noneffective. Lessons from industry—in particular, Toyota—can be used in health care and health care education to this end.³² Students should learn about issues of

continuous quality improvement late in their 2nd year of medical school, through the use of clinically based examples, which will allow them to actively practice these kinds of skills. Later, in the 3rd and 4th years of medical school, students should be given continuous quality improvement projects, which will allow them to put their knowledge to work in real clinical settings.

Medication errors and reconciliation. Students should be proficient in the recognition and prevention of medication errors and reconciliation, as errors are frequent, often systems based, and amenable to effective countermeasures if examined with a patient safety lens. The clerkship year seems the reasonable time to introduce this subject, as students are in the clinical setting. As such, there will be ample opportunity to practice the recognition of medication errors and to begin to learn techniques for their reconciliation.

Barriers to Implementation

Roundtable participants identified a number of challenges in implementing an undergraduate medical education patient safety curriculum. First, many physicians and educators serving as instructors, mentors, and role models have limited knowledge and experience with the competencies required, because the current medical-legal environment still favors hiding errors and near-misses instead of learning from them. Indeed, most physicians believe they provide safe patient care and do not make mistakes. In a survey given to more than 1,000 doctors, nurses, and residents in urban teaching and nonteaching hospitals, one third of intensive care staff stated that they have never made an error.³³ However, only one third reported that errors are handled appropriately, and more than half reported that they find it difficult to discuss mistakes. It is clear that rather extensive faculty development will be needed for a successful patient safety curriculum to be implemented. Second, educational models are predominantly driven by individual, silo-based performance on examinations that preferentially reward memorization and recall of knowledge over application. Kenneth Shine, past-president of the IOM, concluded that medicine has failed to deliver quality care to patients, because medicine equates quality with how much an individual physician knows instead of looking at quality as how well patients are cared for.³⁴ Changing assessment strategies to look at interprofessional cooperation and problem solving will require new methodologies to be developed and implemented, a significant time- and money-consuming endeavor. Assessment strategies will also need to be modified to reflect the importance of patient safety education and outcomes. A recent article by Kachalia et al. reported on the efforts of an expert panel convened by the American Board of Medical Specialties to look into the types of patient safety questions that should be included in medical board certification examinations, which is encouraging.³⁵ Third, and not inconsequential, will be the struggle to carve out the time and commitment necessary for a successful, longitudinal, patient safety curriculum from an already full curriculum.

SUMMARY AND NEXT STEPS

The goal of a medical education curriculum is to teach students to address problems that affect the health of the public, and patient safety is a concern in the provision of quality health care that needs to be addressed immediately. Students need to understand, appreciate, and demonstrate appropriate patient safety skills early and continuously in their professional educations. Roundtable participants met for four days each in the summers of 2005 and 2006 in Telluride, Colorado, to discuss the curricular design of an interdisciplinary patient safety curriculum. If we are to change the current culture, it is important that students begin to understand, appreciate, and demonstrate appropriate skills relative to the prevention of medical error early in their professional education. Tremendous opportunity exists to profoundly influence the safety of health care delivery by changing the educational environment, teaching methods, and health professional curricula. Although progress has been made, much more is left to be done. Future meetings of roundtable participants in Telluride are slated to occur, in which curricular pilots implemented throughout the year will be discussed; refined; and, if successful, adopted by others. New curricular opportunities will continue to be discussed and designed. Through this continued dialogue and ongoing collaborative research, the development and implementation of a longitudinal patient safety curriculum will occur.

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