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Development and Evaluation of a 1-Day Interclerkship Program for Medical Students on Medical Errors and Patient Safety

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Medical students need to be well informed about medical errors and patient safety. Pursuant to a needs assessment and pilot program, 229 third-year students participated in a 1-day program on patient safety including a plenary session and workshops. Attitudes and beliefs were measured by a survey at the beginning and end of the program. Completed surveys were returned by 124 (54%) students. Their level of agreement with 14 of 21 rating scale items changed in the expected direction. There were 7 items in which the students' baseline responses were already positive and did not change significantly. A 1-day program on patient safety in the third year of medical school can change students' attitudes and beliefs. There may be a subset of students needing closer attention. The findings provide evidence for the validity of the attitude survey and reinforce the effectiveness of interclerkship programs in medical schools. (Am J Med Qual 2007; 22:13-17)

In its 1999 report titled *To Err Is Human: Building a Safer Health System*, the Institute of Medicine estimated that between 44 000 and 98 000 patients die annually from avoidable medical errors.[1] Correspondingly, the issues of medical errors and patient safety have drawn the attention of the public and the medical profession.

The findings of previous studies highlight the importance of teaching students about these topics and the impact of the medical school environment on students' attitudes and beliefs. For example, there is evidence that the training of young physicians in matters such as safe medication prescribing is suboptimal, contributing to inefficient care and risk of iatrogenic injury. One study determined that only 15% of students believed they were adequately trained in safe prescribing behavior.[2] The significance of this lack of training is underscored by cases illustrating that medical students are an underused resource for the prevention of medical errors.[3]

The literature suggests that young physicians often receive mixed messages about errors as they progress in their training. Most physicians encounter medical errors for the first time as students. These experiences, combined with their consequences, can influence long-term attitudes and behaviors with regard to errors. Preceptors often focus on maintaining the self-esteem of trainees, potentially leading to an inflated sense of mastery and a culture of silence about errors.[4] In addition, by responding ambiguously when learners do exhibit problematic behaviors, attending physicians may

lead trainees to misinterpret or even ignore feedback.[5] The use of formal disciplinary procedures may further discourage learners from confronting errors because these valuable learning opportunities will instead seem punitive.[6] For example, it might not be surprising to find that a student who received a low grade after making a serious mistake in a rotation would be reluctant to report errors in the future.[7] This learning environment may help to explain the finding that physicians' beliefs about the effectiveness of interventions to prevent errors are weakly associated with published evidence.[8] Moreover, these behaviors toward errors reinforce the significance of evidence suggesting that admissions of error and apologies to patients strengthen relationships and diminish punitive responses.[9]

Although attention has been directed at residents' perceptions of and responses to errors,[10-14] the development of a curriculum for medical students has been limited to preclinical courses[15] or family medicine clerkships.[16] Research has shown that interclerkship programs conducted on 1 or a few days between clinical rotations can be effective in covering multidisciplinary topics such as substance abuse and domestic violence that are not always covered rigorously in departmental curricula.[17-19] The purpose of this study was to develop and evaluate a 1-day interclerkship program in the third year designed to change medical students' attitudes and beliefs about medical errors and patient safety.

METHOD

Four months before the pilot program in 2004, a faculty committee designed a 21-item needs assessment for third-year medical students regarding their knowledge and attitudes pertaining to medical errors. The needs assessment included 10 multiple-choice questions to gauge students' baseline knowledge about areas such as the findings in the Institute of Medicine report, the prevalence of medication errors, and liability arising from medical errors. The committee also listed examples of content to find out how receptive students would be to workshops pertaining to errors. Potential workshop topics included "How to Discuss a Medical Error With a Patient," "National Efforts to Limit Medication Errors," "House Staff Fatigue and Its Contribution to Medical Errors," "Electronic Order Entry and Its Relationship to Reducing Medical Errors," "Reporting Medical Errors to Your Attending," and "Professional Liability and Medical Errors."

The average score of 160 students who completed the 10 multiple-choice questions was 36%, with a standard deviation of 15. These results confirmed the students' lack of knowledge of these topics.

The interclerkship program began with a 3-hour morning plenary session with presentations by high-level executives from a nationally recognized cancer institute, a nonprofit organization dedicated to promoting safe medication practices, and a supplier of evidence-based clinical content to health care organizations. They spoke about the impact of medical errors on organizations, medication errors, and the relationship between errors and the growth of technology. At lunch, the dean of the medical school talked about approaches that a medical student might be able to use to discuss a medical error with an attending physician. After lunch, the students attended 1 of 10 faculty workshops in which the participants analyzed case studies of serious medical errors. The major themes of the workshops included the following: barriers and approaches to reporting medical errors in an organization, discussing medical errors with patients, medical errors and systems theory, systems analysis of medication errors, discussing medical errors with one's resident, computerized physician order entry systems as solutions to the problem, protecting oneself from medical malpractice suits, legislation in response to the high cost of medical malpractice insurance in Pennsylvania, near misses in medicine, and new developments in clinical quality improvement. Some faculty members used role-playing during their workshops to enable students to practice the disclosure of errors.

Afterward, the group reconvened for a final, 1-hour plenary session concerning the effects of sleep deprivation on performance and how to avoid medical errors in the face of fatigue.

The needs assessment was readministered to the students immediately after the pilot program. The overall pattern of the results confirmed an opportunity to change the students' attitudes and beliefs about patient safety. As a result, the content of the plenary session and workshops was reevaluated, and 12 specific objectives were defined for students to achieve after participation in the 2005 program. The objectives focused on systems analysis to improve patient safety, legislation and regulation that promote patient safety, and the role of individual accountability in upholding a culture dedicated to patient safety. Subsequently, the planning process for the 2005 program involved tailoring plenary

sessions and workshops toward students' achievement of these objectives. Based on the success of the afternoon workshops in the pilot program, 2 workshop sessions were incorporated into the program's second year.

A draft questionnaire was developed to measure students' attitudes and beliefs about patient safety and medical errors. The first open-ended item asked the student to describe a medical error observed during the first 6 months of the third-year clinical clerkships. The next item probed any action that the student had taken in response to the error. The student was also asked to respond on a 5-point Likert-type scale (with response choices ranging from *strongly disagree* to *strongly agree*) to 25 statements describing issues related to patient safety and medical errors. Examples included "Most medical errors are never reported," "The majority of medical errors occur in ambulatory settings rather than in hospitals," and "It is my duty to speak up if I see an error or problem."

The questionnaire was pretested with staff members in the Center for Research in Medical Education and Health Care, 7 clinical faculty in a variety of specialties, and 4 third-year medical students. After revision, the final Patient Safety Survey included the 2 open-ended items related to a specific medical error observed by the student and 21 Likert-type scale items.

The 2005 program began with a morning plenary session. At registration, each student received a pretest and posttest version of the Patient Safety Survey encoded with a common identification number that could be used to match the 2 versions of the form. The students were instructed to complete and hand in the pretest version before the beginning of the plenary session.

The morning included the following three 45-minute presentations: "Patient Safety—Why Bother?" "Patient Safety and Educational Policy: Get Real," and "Practical Tools to Improve Patient Safety." Plenary speakers included the director of the National Center for Patient Safety of the US Department of Veterans' Affairs, the Director of the Association of American Medical Colleges' Institute for Improving Clinical Care, and the Director of the Quality and Safety Research Group at Johns Hopkins University. Afterward, the dean of the medical college once again spoke to the group during lunch about how students should go about discussing with their attending an error that they have committed or observed. Students were encouraged

not to be afraid of challenging authority when patient safety is involved, even if it seemed inconsistent with their role as a student. The potential of a student to serve as a powerful quality assurance tool in a teaching hospital by being engaged in the learning process was emphasized. Following the dean's presentation, students attended two 1-hour workshops selected from a list of 9 topics. Workshops were comparable to those offered in the pilot program with 2 exceptions: the workshops on barriers and approaches to reporting medical errors and systems theory were replaced with one on regulatory and legislative issues surrounding patient safety. The students were instructed to complete the posttest versions of the Patient Safety Survey when they convened for the plenary session at the end of the day.

The Institutional Review Board of Thomas Jefferson University determined that the use of this anonymous questionnaire data for research was exempt from review. The responses to the pretest and posttest were analyzed using Stata 8.0 (College Station, Tex). Differences in the rate of agreement with each item in the pretest and posttest were evaluated using the z test for proportions.

RESULTS

A total of 229 students attended the 1-day session. Baseline surveys were returned in the morning by 180 students (79%). Only 50 students, representing less than one third of the respondents, provided a brief description of a medical error they had observed. Most frequently described were medication errors (17 errors), followed by surgical errors (8 errors), and errors related to treatment delay or neglect (7 errors). The remaining 18 types of errors included documentation, communication, and incorrect diagnoses.

Table 1 shows the change in the students' agreement with statements related to patient safety and medical errors. Students' opinions changed significantly in the expected direction on 14 statements. The most dramatic shift was observed on the statement that errors are among the leading cause of death, where only about half the students agreed at the beginning of the day. By the end of the day, 85% agreed with this statement. Another large change was seen in the item "I feel that I can speak up if I see an error or problem," in which the rate of agreement increased from 40% to 72%.

There were 7 statements in which the students' responses at baseline were in line with expectations,

Table 1

Percentage of 124 Students Who Agreed With Statements About Medical
Errors and Patient Safety at the Beginning and End of the Interclerkship Program

Item	Pre	Post	*P*
Significant changes in the expected direction			
Protocols and guidelines restrict physicians' clinical judgment	27	12	.01
Medical errors are among the leading causes of adult deaths in the United States	49	85	.01
The majority of errors can be traced to individual physicians' actions	30	11	.01
Formularies compromise safety by constraining physicians' options	35	14	.01
The majority of errors occur in ambulatory settings	13	10	.02
Most medical errors are caused by a few "bad apples"	28	12	.01
Most medical errors are never reported	85	91	.01
Anonymous reporting of medical errors is futile	10	1	.01
The "captain" of any health care team should always be a physician	84	65	.01
Root cause analysis can only be revealing in hospital settings	32	24	.01
Offering an apology to a patient is unwise because it implies negligence	5	3	.04
Good medical care is usually cost-effective care	67	78	.04
As a medical student, I feel I can speak up if I see an error or problem	40	72	.01
As a medical student, it is my duty to speak up if I see an error	85	95	.01
Rate of agreement on pretest in expected direction, no important change			
It is impossible to provide safe, high-quality care while being efficient	12	8	.19
Physicians should use computers to access patient data	90	87	.27
Eight hours of sleep is needed to perform at an optimal level	72	68	.49
Failure to recognize one's own limitations is a major cause of errors	84	81	.83
The best way to improve patient safety is to use evidence-based medicine	91	84	.42
People adapt readily when they get less sleep than needed	13	10	.96
Safety benefits of computerized records outweigh confidentially barriers	86	92	.40

and there was little change in these at the end of the day.

DISCUSSION

These findings document the positive impact of the program on the students' attitudes and beliefs about medical errors and patient safety. They are especially impressive given that the program entailed only 1 day's effort.

Most of the students did not describe a medical error on the baseline form, despite its anonymous submission. This outcome is consistent with findings regarding the consequences of preceptors' emphasis on maintaining trainees' self-esteem[4] and attending physicians' indistinct responses to trainees' problematic behaviors.[5] In addition, students may not be eager to confront these issues. We interviewed several students after the program to try to understand why so few errors were reported. The most common responses involved students' uncertainty about what defines an error. However, several students also noted that third-year students are so inexperienced with the multitude of

stimuli in the clinical setting that they simply do not yet have the ability to fully comprehend what is occurring around them. In other words, they cannot distinguish errors from other activity.

The program evaluated here was delivered on a single day between clerkships in the middle of the third year of medical school. Although some may argue that this issue needs to be integrated throughout the medical school curriculum, evidence indicates that curricular change has little impact on students' perceptions unless there is concentrated time devoted to unique topics such as primary care, quality improvement, communications, and teamwork.[20,21]

A limitation of our study involves the fact that only about half of the students returned baseline and follow-up questionnaires. Consequently, the results do not provide information about the subset of students who did not return questionnaires or those who returned a pretest but did not return a follow-up form. Although not unique to this study, there is a need for replication in other settings and a need for long-term follow-up of the students to determine whether the changes in attitudes and

beliefs endure. Nevertheless, the findings are consistent with other studies that have demonstrated the value of interclerkship programs.

It is important to keep in mind that this is the first administration of the questionnaire. The results provide information that will guide the next revision. Nevertheless, the findings of significant changes on many items in this study provide preliminary evidence for the construct validity of the questionnaire.

The literature indicates that limited attention has been given to the issue of medical errors and patient safety in medical school. This 3-year study led to the development and evaluation of an innovative program for an entire class of more than 200 medical students that addressed these issues in depth. Administration of the pretest and posttest questionnaires confirmed that the program changed some students' attitudes and beliefs and provided preliminary evidence of the questionnaire's construct validity. These findings reinforce the effectiveness of interclerkship programs for teaching interdisciplinary topics such as patient safety and suggest that this model can be considered when issues related to patient safety and medical errors are added to the curriculum.

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