

EDUCATING FOR SAFETY

Patient Safety Instruction in US Health Professions Education

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Objective. To describe patient safety instruction in health professional curricula, including medicine, nursing, pharmacy, and dentistry.

Methods. A systematic review of the literature from 1966 through 2010 was conducted using 6 databases and based on 3 search criteria: safety management, patient safety, and curriculum.

Results. One hundred fifty-four articles were identified and 23 met inclusion criteria. A variety of educational methods have been used in health profession curricula to promote patient safety including lectures, workshops, objective structured clinical examinations, standardized patients, simulation exercises, root cause analysis, quality assurance projects, and other interactive learning methods. The development of patient safety curricula has been primarily discipline-specific, with little interdisciplinary research found.

Conclusions. Safe, patient-centered care is directly influenced by the quality of education that healthcare professions students receive. From this literature review, research is needed to guide curricular change, specifically focusing on instructional methods and interdisciplinary collaborations.

Keywords: patient safety, health profession, curriculum, medication safety

INTRODUCTION

Approximately 98,000 people die each year in US hospitals from preventable medical errors, and these errors cost \$30 billion in lost income and increased health expenditures.¹ The impact of these errors has led hospitals and regulatory agencies to focus on reducing the number of deaths and adverse events attributed to unintended and preventable medical errors.¹⁻³ In *To Err Is Human: Building a Safer Health System*, the Institute of Medicine (IOM) called for reevaluation of health professions education and the incorporation of patient safety into the curriculums of all health professions.¹

In *Crossing the Quality Chasm*, the Institute of Medicine emphasized the need for healthcare professional educators to create new approaches in developing patient safety and quality improvement skills in their students.⁴ In a follow-up report, *Health Professions Education: A Bridge to Quality*, the IOM clarified their vision, recommending that “all health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches, and informatics.”⁵⁻⁶

In light of this recommendation, educators should consider the development of a revised set of competencies for health professions’ curriculums.^{5,7} Health professionals, using scientific evidence, should be able to describe the components of patient-centered care, identify deviations from patient-centered care in their practices, and determine what actions should be initiated, if necessary, to correct those deviations.⁸ Educators in medicine, nursing, and other health professions are challenged to develop learning experiences that provide the foundation for professional identity and enable graduates to deliver patient-centered care as members of an interdisciplinary team while emphasizing evidence-based practice, quality improvement approaches, and informatics.⁴ Schools of nursing are addressing patient safety education through the Quality and Safety Education for Nurses initiative.⁹ Additionally, the Accreditation Council for Pharmacy Education (ACPE) strongly encourages the addition of quality improvement education to pharmacy curricula.¹⁰

Although patient safety has been acknowledged as necessary in the provision of quality patient-centered care, few studies have been published that describe the design, implementation, and assessment of patient safety education. Describing the state of patient safety education in the health professions would provide educators with additional resources to develop patient safety initiatives. The purpose of this article was to describe research conducted on patient

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safety instruction in the health professions in order to inform health professions educators of ways to incorporate this type of instruction in their curricula.

METHODS

A search of the following databases was conducted for articles published between 1966 and December 2010: PubMed, Cochrane, MEDLINE, ERIC, Academic Search Premier, and ISI Web of Science. The following MeSH terms were used: “safety management” or “patient safety” and “education, dental” or “education, medical” or “education, nursing” or “education, pharmacy” and “curriculum.” Only articles that described patient safety education in US health professions curriculum (medicine, nursing, pharmacy, and/or dentistry) were included.

One hundred fifty-four articles were identified and the abstracts evaluated for inclusion and exclusion criteria. Studies that were not about curriculum (30 articles) or patient safety (31 articles), or were not in English (3 articles) were excluded. Articles that focused on curriculums outside the United States (50 articles), as well as editorials, letters to the editor, and commentaries (12 articles), also were excluded. Also, 2 continuing education articles and 3 articles pertaining to other health-related professions were eliminated.

RESULTS

Twenty-three articles met all criteria for inclusion in the review. For all studies included in this review (Appendix 1), the following data were gathered: title, authors, date, type and total number of subjects, description of the course or initiative, method of instruction, and outcome measurements or assessments (if applicable).

Since 2000, several discipline-specific surveys have been conducted to determine types of instruction and content offered in patient safety at health professions schools.¹¹⁻¹³ However, a systematic review of patient safety initiatives in the health professions has not been conducted. For the majority (69.5%) of studies included in this review, the focus was to educate students on aspects of patient safety using multiple methods. Several programs were in place for medical residents or fellows (39.1%), as well as other licensed health practitioners (13%). There were no articles describing patient safety initiatives in dentistry. Various methods of instruction were used to educate health professions students on patient safety. Thirteen of the studies were completed by medicine, 4 by nursing, and 3 by pharmacy, and 3 were interprofessional efforts.

Instructional Pedagogy

A wide variety of instructional approaches were used among the studies. The most frequently used instructional approaches in the studies were lectures,¹⁴⁻²⁴

case-based exercises,^{16,20,22-23,24-29} active-learning exercises,^{14,16-19,24-25,28,30-31} and discussion.^{14-15,17,21,26-27,31,32}

Simulation exercises were common, including the use of standardized patients^{29,31-33} and role-plays.^{17,18,21} Projects and presentations also were used as a way to engage participants with patient safety topics.^{15,22,24-28,34,35} Of all the initiatives, only 1 described a self-directed curriculum, which was focused on diabetes quality care principles for medical residents.³⁶ The curriculum included readings, weekly self-reflections, and medical record audits. In the appendix, a compilation of the patient safety topics offered by these initiatives is provided.

Assessment

Assessment of the effectiveness of the instruction varied from measuring student attitudes to administering examinations. Self-assessment was commonly used among all the initiatives to quantify changes in knowledge, confidence, attitude, and skills. Eight medical education studies used self-assessment. In the studies, participants reported improvements in attitude,^{17,26} knowledge,^{16,18,24} confidence,^{18,19,24,31} and/or skills^{17,19,24,35} as a result of patient safety instruction. In nursing, Miller and colleagues administered a self-assessment survey instrument to determine students' perceptions of safety and quality knowledge, skills, and attitudes.²⁷ As in medicine, improvement was seen as a result of a safety initiative. Two of the pharmacy education studies used self-assessment survey instruments and reported improvements in knowledge,^{20,21} confidence,^{20,21} attitudes,²⁰ and/or skills.²⁰ Two of 3 of the interprofessional safety initiatives reported improvements in attitudes¹⁴ or skills²³ after completion of safety instruction through the use of a self-assessment instrument.

Seven of the studies used knowledge examinations or objective structured clinical examinations (OSCEs) to assess student knowledge regarding patient safety.^{15,22,28-29,32,33,36} In 2 of the studies, a multiple station objective structured clinical examination (OSCE) was used to assess students' performance on a variety of patient safety issues including detecting a medication error, addressing an adverse event or deficient care, and conducting a root cause analysis.^{28,33} Participants performed well in both studies (100% pass rate) in areas including: root cause analysis, prescription error, negotiation, and evidence-based medicine stations³³ or improved error detection and disclosure skills and identification of deficiencies of care.²⁸

Study Design

The most commonly employed study design was post-assessment, after completion of the patient safety content. However, several initiatives used a more complex design, including a control group,²⁷ mixed methods,²⁷ pre- and

postassessment,^{21-23,25,29} and/or an assessment 1 year after completion of content.¹⁷

DISCUSSION

Conservative estimates rank medical errors as the eighth leading cause of death in the United States. In fact, deaths from medical errors are greater than those from motor vehicle accidents, breast cancer, and acquired immunodeficiency syndrome (AIDS) combined.¹ The Institute of Medicine report *To Err Is Human* addressed the need for safer systems of care and an increased focus on patient safety and systems engineering.¹ A general strategy that has been proposed to create safer systems is to provide specific education on patient safety in the health professions curriculum.⁴ According to Kirch and Boysen, there are 5 critical success factors in the development of a culture of safety: (1) explicit leadership; (2) early engagement of health profession students; (3) the use of residents to educate students about patient safety; (4) the use of health information technology; and (5) promoting teamwork among the health professions.³⁷

From the 23 articles reviewed, we found that some of these factors were considered as part of the safety initiatives described, including the promotion of teamwork and use of health information technology. Although teamwork was reported as a part of these initiatives, few interdisciplinary patient safety initiatives were identified in this review. In some of these programs, teamwork was discussed but no interaction with other disciplines took place. Also, other critical factors were not emphasized, such as the use of medical residents in teaching and early engagement of health professions students. In 9 of the initiatives, the focus was on training medical residents rather than on using them to educate students.

In *Contemporary Issues in Medicine: Quality of Care*, the Association of American Medical Colleges (AAMC) advocated adding patient safety education to undergraduate curricula.³⁸ Despite evidence of curricular innovation at a few institutions, it is unclear to what extent medical schools have initiated patient safety training for their undergraduate students 5 years after the AAMC's call for national implementation of instructional programs.^{17,31,39} The articles identified in this review suggest that efforts are being made to implement patient safety training; however, they do not appear to be widespread. Instead, most efforts to introduce patient safety education appear to have been directed toward residents and physicians already in practice.^{40,41}

An interdisciplinary group of healthcare providers, senior healthcare administration, students, residents, patient advocacy leaders, and curriculum development/assessment experts met to develop a patient safety undergraduate

medical curriculum and identified 11 specific elements essential to an effective patient safety curriculum for medical students⁴²: the history of the medical error crisis, interdisciplinary teamwork skills, time and stress management, healthcare microsystems, informatics, electronic medical records, and healthcare technology, error science, error management, and human factor science, communication skills, techniques of full-disclosure, risk management and root cause analysis, continuous quality improvement including outcome measures, and medication errors and reconciliation.⁴² Many of the programs cited in this review included these elements as part of their patient safety initiatives. However, some of the initiatives were limited in scope and emphasized only a subset of the 11 specific elements, while others were embedded in the curriculum and included all of these elements. Although these elements are recognized by many health professions educators as essential, the inclusion of every element may not be found in all health professions schools.

To educate students on the elements proposed in the patient safety curriculum, a variety of educational methods and strategies could be used including plenaries, small-group learning, experiential learning, simulation, role-plays with standardized patients, case-based learning, individual and team-based learning, and supportive audio-visual materials.⁴³ Structured activities with immediate assessment and feedback are essential to effective learning and retention of information, as well as necessary skills and attitudes.^{43,44} Many of these approaches were found in the studies cited, either used in isolation or as a multifaceted approach.

Prompted by national initiatives, the majority of nursing organizations, agencies, and educational programs have increased the emphasis on patient safety and competence in clinical practice.^{45,46} Evidence of the value of quality and safety competencies is apparent in nursing publications,⁴⁷⁻⁵⁰ standards of practice,⁵¹ and accreditation guidelines.^{52,53} Finkelman and Kenner describe the incorporation of IOM recommendations into the nursing curricula.⁵⁴ The Quality and Safety Education for Nurses initiative developed competencies, including competencies related to safety, that would apply to all registered nurses.^{55,56}

Although there is extensive nursing literature describing safety and its place in curriculum, few nursing studies were identified in this review, making the extent to which patient safety is addressed in the nursing curriculum unclear. Smith and colleagues conducted a survey to describe quality and safety education in nursing programs.¹¹ From the 195 completed surveys instruments, the majority (>95%) of respondents reported the inclusion of content related to each Quality and Safety Education for Nurses competency (evidence-based practice, teamwork and

collaboration, informatics, safety and quality improvement) in their programs. The content was presented in several courses, though a small percentage of schools reported having dedicated courses to teach the competencies. The differentiation between elective and required courses was not assessed. The most common educational methods were: readings (84%), lecture (83%), clinical (75%), case study (57%), paper assignments (56%), course modules (52%), Web-based learning (52%), problem-based learning (49%), interprofessional learning (43%), simulation (43%), return demonstration (36%).¹² Simulation was used less frequently than all other pedagogical strategies except return demonstrations. Based on this data, nurse educators appear to have implemented initiatives in the curriculum to address safety competencies.

In 2001, Johnson and Latif surveyed schools of pharmacy to assess the manner and extent to which medication errors were incorporated into the curriculum.¹³ Of the responding institutions, the majority had embedded medication error instruction in pharmacy administration, therapeutics, or law courses. The majority of instruction was lecture based, with content in human error, medical errors, medication errors, quality or process improvement, root cause analysis, and failure mode and effects analysis. Active learning was incorporated within laboratories at a few responding institutions. Few articles have been published since the 2001 study regarding specific initiatives addressing safety in pharmacy curricula. Patient safety is a component of Standard 9 of accreditation guidelines, indicating ACPE's expectation that it be included in the curriculum.¹⁰

The Educating Pharmacy Students and Pharmacists to Improve Quality (EPIQ) program could assist educators in meeting accreditation guidelines.⁵⁷ EPIQ was developed as a quality improvement education resource to educate students, pharmacists, and other stakeholders in measuring, reporting, and improving quality in pharmacy practice.⁵⁷ The EPIQ program contains 5 modules (17 sessions on quality improvement that address: the status of quality improvement and reporting in the US health-care system, patient safety concepts and definitions, measurement, interventions and incentives, and application to the pharmacy practice setting.⁵⁷ The modules are not sequential and can be used in any order. Each module contains several education sessions, which include a lecture, a learner-centered activity (eg, group activities, case studies), and a discussion, as well as supplemental readings and other relevant topic-specific materials.⁵⁷

Dental schools are unique among US health care education sites. Unlike medical, nursing, and pharmacy schools, dental schools are the only healthcare education sites that consistently provide patient care within their

schools. As expected, the current dental school accreditation process focuses primarily on the educational outcomes of the school, with limited attention to patient safety issues. No studies from dentistry were found in this review. The magnitude and complexity of patient safety issues in dentistry differ from those found in hospitals; thus, patient safety may not be considered a high priority because of the lower morbidity, mortality, and financial impact resulting from human error.¹³

To influence student behavior, research has shown classroom content should be applied to clinical activities and projects.⁵⁸ However, safety and quality have remained primarily in classroom content. Three reasons have been suggested for the lack of widespread engagement of health professions learners with quality and safety issues in the past: (1) quality and safety issues were not identified as educational priorities in the United States until recently, (2) faculty members do not feel confident teaching this content, and (3) quality care and systems improvements have not reached the forefront of clinical practice.⁵⁹

CONCLUSIONS

As healthcare becomes more complex, safe patient-centered care is directly influenced by the quality of the education that health care professionals receive. Based on a review of the literature, further research to support and guide curricular change and more studies focused on instructional methods are needed.

Health profession students could benefit from a problem-based learning curriculum, which encourages discussion, collaboration, quality improvement, and the value of learning from errors in a variety of domains related to clinical practice. Also, simulated experiences would provide students with a more realistic view of practice and allow them to visualize how they will be able to practice within complex situations.⁶⁰ As health profession disciplines continue to investigate methods to train the next generation of students for practice and to ascertain the achievement of patient safety competencies prior to entry into the workforce, evidence is needed to document the effectiveness of these efforts.

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Appendix 1.

Reference	N	Subjects	Instructional Description	Method of Instruction	Selected Outcome Measurements/Results
Sehgal et al (2008) ¹⁴	225	Medical residents, hospitalists, nurses, RPhs	Teamwork training program focused on teamwork behaviors and communication skills	Lecture, facilitated discussion using video, and small-group scenario-based exercises	Open-ended questions on common obstacles to effective teamwork and recommendation of training to peers; 203 evaluations completed; Common obstacles to effective teamwork: time, culture, and workload
Murray et al (2010) ¹⁵	N/A	Senior nursing students	Four 75-minute periods on QI and teamwork	Lecture, discussion, vignettes, root cause analysis matrix, project	Final evaluation; Final exam; Results not reported
Tomolo et al (2005) ¹⁶	105	Internal medicine residents and trainees	Educational intervention with lecture and analysis of clinical cases using the outcomes card tool	Lecture Interactive learning Case studies	98 outcomes cards completed; Self-assessment survey; Improved knowledge in patient safety and case analysis, comfort with use of tool, importance of curriculum
Madigosky et al (2006) ¹⁷	92	2 nd year medical students	10.5 instructional hours to develop knowledge, skills, and attitudes of patient safety and medical fallibility	Lecture, panel discussion, demonstration, root cause analysis, interactive forum, role playing	53 completed questionnaires; Improvements sustained after 1 year: inevitability of medical errors, sharing error information and causes, supporting peer involved in error, analyzing root causes of error, accurately entering a safety report, disclosing errors
Lindquist et al (2008) ¹⁸	170	2 nd year medical students	Simulation	Lecture, role playing, active participation	159 completed surveys; 27% increase (p<0.001) in knowledge; 20% increase p<0.001) in comfort level
Nishisaki et al (2009) ¹⁹	22	1 st year fellows	Multi-centered simulation-based orientation training session (15.5 hours)	Lecture, small group interaction, simulation skills training, hands-on training	16 completed follow-up survey; 93% would recommend training; 86.7% stated training effective in improving patient clinical care

(Continued)

Appendix 1. (Continued)

Reference	N	Subjects	Instructional Description	Method of Instruction	Selected Outcome Measurements/Results
Sukkari et al (2008) ²⁰	129	2 nd year pharmacy students	2-credit course on patient safety debates in healthcare system to improving patient safety	Didactic lectures, case studies, in-class activities, readings, and minute papers	81 surveys completed; High agreement items: medical errors are serious problem, readiness to apply their knowledge/skills in real-world situations, anticipated any significant barriers, commitment to patient safety
Kiersma et al (2009) ²¹	160	1 st year pharmacy students	Lab session to provide experience in recognition, resolution, and prevention of medication errors	Prescription processing, counseling simulations, role-playing, lecture, and discussion	16 question knowledge instrument; 66.9% demonstrated improvement on posttest; 10 question confidence instrument; Confidence improvement on all items
Djurichich et al (2004) ²²	44	Medicine and pediatrics residents	Medical residency continuous QI curriculum	Lecture, case studies, project, presentation	42 completed pre- and post-tests; Higher pretest knowledge associated with higher perceived knowledge and self-efficacy; Higher post-test knowledge associated with higher ratings of self-efficacy
Dobson et al (2009) ²³	223	Nursing, nutrition, pharmacy and PT students	Promote interprofessional competencies by allowing collaborative work on system-based problems using QI methods and tools	Case studies, lecture, facilitated interprofessional group sessions and assignments	134 students completed pre- and post-intervention self-reflections; Significant changes from pre- to post-intervention: Ability to communicate/ cooperate with others; comfort with/ability to identify with team; team conflict; group decision making; role of other professions
Gould et al (2002) ²⁴	77	2 nd year medical students	Curriculum to impact educational outcomes and effect of projects on the quality of care delivered at community practice sites	Training module, chart abstraction seminar, chart review, lectures, active learning, groups projects on diabetes mellitus	53 students completed questionnaires; Significant improvement after training; Knowledge of quality improvement ; Confidence in completing activities in 11 of 15 areas; Ability ratings to create/ monitor implementation plans

(Continued)

Appendix 1. (Continued)

Reference	N	Subjects	Instructional Description	Method of Instruction	Selected Outcome Measurements/Results
Cox et al (2009) ²⁵	N/A	Medical, nursing, health admin, respiratory therapy students	Interprofessional patient safety curriculum updated over a 6 year period	Small group case-based exercises, teamwork exercises, debrief with faculty, problem-based learning for error event case, final presentation	787 students completed pre-/post survey on attitudes regarding quality, safety and teamwork; Disclosure: Pre p<0.01, Post p=not significant; Teamwork/communication: Pre p<0.001, Post p=not significant; Error reporting: Pre p<0.001, Post p=not significant; Interprofessional group curricular: Pre p<0.001, Post p<0.001
Weingart et al (2004) ²⁶	26	2 nd and 3 rd year medical residents	3 week quality improvement elective during ambulatory block rotation	Group discussion, project, readings, chart reviews, case presentations, interviews, root cause analysis, peer review	16 completed surveys; 63% improved understanding of quality in health care; 88% improved understanding of QI; 56% reported behavior change; 66% taught other students/peers/ staff about quality in health care
Miller et al (2009) ²⁷	65	Senior-level nursing students	2 interventions Classroom content only or classroom content and clinical project	Both groups: case study Intervention group: project, readings, adherence, group discussion	Student Perceptions of Safety and Quality Knowledge, Skills, and Attitudes Questionnaire in pre/posttest format; Higher scores displayed for intervention group
Singh et al (2005) ²⁸	45	Family medicine residents	Implement a curriculum to address patient care, knowledge, communication, professionalism, practice-based learning, and systems-based practice	Workshops, series of didactic courses, individual portfolios, simulations, small group exercises, reviews, project, case presentations	Performance in curriculum activities; Poly-pharmacy chart audit (N=184); 24% identified inappropriate use of non-steroidal anti-inflammatory drugs; 6.4% identified inappropriate use of benzodiazepines; Safety journals; 55% included system-based solutions

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Appendix 1. (Continued)

Reference	N	Subjects	Instructional Description	Method of Instruction	Selected Outcome Measurements/Results
Singh et al (2009) ²⁹	59	Family medicine and incoming residents	Implement a curriculum in collaboration to address behavioral skills for patient safety, medication safety, and systems approach to patient safety	6 station OSCE: 2 SP interviews, video and chart-based simulations Written examination: root cause analysis, failure and effect modes analysis	Standardized patient case: Trained residents better error detection and disclosure skills; Chart-based case: Trained residents better identified deficiencies in care; System analysis exercises (pre-/post-test): Significant improvement in number of solutions proposed for root cause analysis and number of steps identified in failure modes and effects analysis
Currie et al (2009) ³⁰	500	Post baccalaureate nursing students	Web-based hazard and near-miss reporting system by monitoring, modeling, and mindfulness	Training by demonstration, personal assistance and e-mail support	3 different academic years; 21,276 reports; 6,005 hazards (59%) and 4,200 near misses (41%) were reported; 1,996 (48%) planned near miss interceptions; 2,240 (52%) unplanned near miss interceptions
Halbach and Sullivan (2005) ³¹	572	3 rd year medical students	4 hour curriculum on awareness of medical errors/ patient safety and provide students with error communication practice	Interactive discussion, readings, a videotape session with a SP, and a small-group debriefing	535 self-report questionnaires evaluated; Increased confidence in discussing errors with patients; Majority agreed that the exercise was a useful learning experience; Statistically significant increase ($p < .01$) in awareness of strengths/weaknesses in communicating medical errors to patients
Ironsides et al (2009) ³²	67	Nursing students	Multiple-patient simulation to evaluate patient safety competencies	Two simulation experiences using 4 patients and debrief	Improvement in patient safety competencies from week 3 to week 10; Mean score on 1 st experience: 11.48; Mean score on 2 nd experience: 13.88

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Appendix 1. (Continued)

Reference	N	Subjects	Instructional Description	Method of Instruction	Selected Outcome Measurements/Results
Varkey et al (2008) ³³	9	Medical fellows	8 station OSCE was piloted for a 3 week QI elective to assess outcomes	OSCE format involving short answer, multiple choice, interaction with standardized patient and RPh, and simulations	Assessed by 3 faculty members using global competency scale and checklist; Stations: Nolan's three-question model, Insurance systems, Root cause analysis, Quality measurement, Prescription error, Negotiation, Evidence-based medicine
Warholak (2009) ³⁴	38	Pharmacy student preceptors	Selection of a project with collaboration between student team members and site preceptor	Quality assurance project	Preceptors perceptions of benefits regarding quality assurance projects include: providing additional resources, decreased medication errors, increased perception of importance/ impact/ urgency of quality assurance in pharmacy practice, perceived a personal positive impact
Holmboe et al (2005) ³⁵	26	2 nd and 3 rd year medical residents	Application of quality of care principles to practice-based learning and improvement	Readings, weekly self-reflection with faculty member, and audits	Self-reported behavioral changes; Personal or self-change; Patient-directed change
Kerfoot et al (2007) ³⁶	693	Medical residents/ students	14-item multiple choice patient safety exam	N/A	640 individuals completed exam; Patient safety knowledge: 58.4% correctly answered items

SP = standardized patients; QI = quality improvement; PT = physical therapy