

# An Ambulatory Care Curriculum for Advancing Patient Safety

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## Abstract

**Objectives:** The objective of this project was to develop and implement a seven module ambulatory care continuing medical education (CME) curriculum and to evaluate the effectiveness of this curriculum in facilitating patient safety.

**Methods:** For knowledge transfer and adoption, each module focused on one safety concept, followed by clinical cases and take-home points. The dissemination strategy relied on the “train the trainer” model and utilized the governance structure of the American College of Physicians (ACP). **Results:** By April 2004, some 7,300 internists had been exposed to the curriculum via regional ACP Chapters. We anticipate 100 percent chapter exposure by 2005. Findings from the pre and post CME analyses showed improvement in attitudes towards patient safety; however, 6-month follow-up showed mixed results. To round out the picture, we attempted to measure the effectiveness of the curriculum via the presenters’ evaluation of the curriculum. **Conclusions:** It was effective to have a trusted colleague conveying the patient safety messages via clinical scenarios accompanied by take-home points. An added bonus was the unanticipated wider dissemination of the curriculum beyond the original target population.

## Introduction

The patient safety ambulatory care curriculum is the product of a 3-year grant funded by the Agency for Healthcare Research and Quality (AHRQ). Programmatically, it falls under AHRQ’s overall patient safety initiative aimed at medical societies and curriculum development. The ambulatory care curriculum encompasses the seven areas identified as essential for improving safety by the Institute of Medicine in its seminal report, *To Err Is Human*.<sup>1</sup> As the title of the training suggests, *Patient Safety: The Other Side of the Quality Equation*, the curriculum firmly identified patient safety as an integral component of quality. This was done to link the new conceptual ideas and behavior patterns (patient safety) to accepted and proven methods (quality initiatives) in the field of medicine. As Rogers<sup>2</sup> argues, individuals have to be predisposed to accept new knowledge. By linking the new knowledge to accepted patterns of professional behavior, predisposition was increased.

The curriculum includes modules on the following topics:

- Systems
- Medication errors

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- Electronics
- Communication
- The patient role
- Office design
- Cognition

Briefly, the systems module exemplifies the powerful influence of systems on patient safety. The medication errors module, in turn, presents proven strategies to prevent the most common medication errors by, for example, substituting computerized physician order entry systems for handwriting. The electronics module focuses on the supportive role electronics can play as point-of-service decision tools, etc. The communication module identifies communication barriers and ambiguities between physicians and other health care providers as well as with patients. The module also contains strategies for overcoming these communication shortcomings. The patient role module points to patients as allies in patient safety and presents what they can do to improve outcomes. The office design module features micro systems process design principles that facilitate safe and reliable care. Finally, the cognition module details people's innate capacity to process information and cope under conditions of information overload and stress.

No one module gives an integrated overview of all seven areas, though each module briefly identifies the other content areas and notes where they can be found in the curriculum. Module structure is identical for all seven content areas. Each module has three distinct components: theory, clinical cases, and take-home points. For example, the systems module opens with an overview of systems theory and its implications for patient safety. The same is the case for the cognition and communication module. The second component of the modules focuses on several clinical cases that present concrete examples of how the theoretical systems' underpinnings play themselves out in reality. Each case illustrates examples of how safety was threatened from a systems perspective. In most instances, cases exemplify several contributing causative features. This highlights the fact that many patient safety problems can be avoided if only one of the contributing causes is removed. The cases are selected so physicians can identify with them and recall similar experiences. When this happens, the theoretical concept is transformed into concrete reality and becomes actionable or enters Bloom's<sup>3</sup> application level. An analysis of what went wrong follows the case, which, according to Bloom, is the analysis level. By recognizing what went wrong, physicians can avoid similar errors in the future. The final component of each module is the take-home point section, which is designed to enable physicians to implement safety changes in their offices almost immediately. The take-home points constitute the Bloomian synthesis level, where solutions to problems are presented. It is important to note here that the solutions are not resource intensive but represent easy to implement steps that are within the physicians' immediate power.

Although each module can stand on its own, three common themes run through all the modules. The themes are systems thinking, communication, and cognition. Clinical cases, therefore, can be analyzed from a variety of theoretical perspectives. The layering of multiple potential causes reinforces the complexity of seemingly simple health care interventions or decisions. Each decision draws on past clinical experience, present assessment, and future expectation of outcome. When appropriate, each case features the contributory roles of the many individuals, such as technicians and nurses aides, who are involved in patient safety issues, sometimes behind the scenes. All of these pieces are embedded in the organizational structure of a clinical environment with rules and regulations that can further complicate the system thinking.

## **Implementation design**

The curriculum was disseminated through the American College of Physicians' (ACP) chapter structure. College membership in the United States is organized into 67 regional chapters. We solicited the governors of each chapter to designate a leader for training in patient safety. Each of these leaders was trained in the content of all seven modules during a day-and-a-half long workshop at College headquarters in Philadelphia. We based our training on the "train the trainer" model used in the education for physicians on the end-of-life care project.<sup>4</sup> These trained individuals went back to their chapters and presented a module of their choice for continuing medical education (CME) in the scientific programs at their chapter meetings. To facilitate chapter buy-in we provided the patient safety presenters, who can be considered early adopters<sup>2</sup> or knowledge brokers,<sup>5</sup> with the lecture materials in PowerPoint® format on a CD, plus speaker notes and the take-home points as a laminated pamphlet to be distributed to attendees. Chapter trainees received questionnaires to be filled out before and after the patient safety presentation.

## **Method**

### **Knowledge dissemination**

American College of Physicians chapter members are the target audience for this intervention. For knowledge transfer and adoption, each module focuses on one safety concept, followed by clinical cases and take-home points, as already stated. Concentrating on safety and its ties to quality avoids the "blame trap"<sup>6</sup> and opens the door to a more constructive dialogue in the discussion of the clinical cases. During presentations, physicians are encouraged to engage in case-based problem solving. This reinforces the theoretical constructs and embeds them firmly in clinical reality. By actively dissecting the various strands that contribute to a safety problem, physicians learn to appreciate the multifactorial causation common to most safety breakdowns. They also learn that if just one of the causative factors had changed from a negative to a positive influence, the problem

could have been avoided (such as when a patient mentions his/her allergy to penicillin). Most importantly, however, by analyzing the cases from the perspective of their own experience, physicians establish the crucial link between patient safety research and their own reality. In effect, they rephrase and restructure patient safety concepts into their own cognitive schemata.<sup>7</sup>

The take-home points encourage physicians to test and apply the new patient safety strategy in their clinical environment. The ability to test new safety behavior via individual take-home points in small increments makes it easier to adopt and accommodate than if an extensive revision of their office practices had been required. Change has been simplified to bite-size adaptation.<sup>8</sup>

## **The College as change agent**

The College was the change agent, functioning at the second level of the outcomes research diagram, as seen by Streyer et al.<sup>9</sup> The demonstration of the effectiveness of the curriculum will be found on the impact on clinical practice, which is level three. Streyer et al. and Rogers<sup>2</sup> recognize the importance of time in diffusion and adoption. While Streyer et al. acknowledge the “incremental and circuitous nature of research,” Rogers poses an S-shaped curve, depicting cumulative adopters over time.

The College leadership fully supported the development and dissemination of the curriculum to its members. The three co-principal investigators were the then-Chair of the Board of Regents, Dr. Rosof; President of the College, Dr. Hall; and Chair of the Governors, Dr. Kirk. Their position of trust and status among members raised the visibility, as well as the desirability, of the program. As research in guideline dissemination and adoption has amply demonstrated,<sup>10</sup> physicians frequently rely on and trust the judgment of their peers in areas they are unfamiliar with. Rogers<sup>2</sup> identifies the crucial role of exemplary demonstrations as potent diffusion agents.

The four training sessions at College headquarters in Philadelphia fall under the exemplary demonstration category. Seventy-eight individual chapter members, selected by their Governors, acted as presenters or detail persons.<sup>11</sup> They spent one and one half days learning the entire seven module curriculum. All training sessions, save the first one, featured the entire seven module curriculum. The first session took place when only three modules had been developed. The individuals who attended the first training session had a second training session to gain command of the remaining four modules. Training took place in the College boardroom, which otherwise is reserved for board-of-regents meetings. Participants sat in an oval so that everyone could see each other. Individual module content was delivered by the expert authors of the modules. One quarter of the time was devoted to coach the presenters in how to deliver the material once they were training their chapters. Open interchange and questions were welcomed. Individuals left with the assurance that we would facilitate the entire presentation, beginning with resource material, access to further background information, and retraining if needed. Over time each training class

developed a sense of cohesion and adopted a new professional identity as patient safety ambassadors.

Presenters chose one module for their chapter's annual meeting. Although the original intent of the grant was to showcase at least three modules at a time in a half-day session, this was not possible because of time constraints. All chapters opted for training in one module at a time, though some had a later presentation of another module.

## **Survey assessment**

Participants in the CME patient safety programs offered at College chapter meetings were self-selected. CME patient safety attendees received three self-administered questionnaires: 1) a baseline questionnaire immediately prior to taking the course; 2) an abbreviated version of the same instrument at the conclusion of the class; and 3) a 6-month follow up questionnaire. Briefly, the instruments focused on attitudes towards patient safety; the likelihood of physicians accepting the possibility of medical errors in their own clinical practice; a sense of control over the occurrence of medical errors; intent to adopt various technologies to reduce the risk of errors; and, finally, the degree to which the study population had been aware of other sources of patient safety information.

## **Results**

### **Knowledge dissemination via the College as change agent**

We held four training programs between January 2002 and March 2004. As previously mentioned, the first training session covered only three modules, while the remaining three sessions featured all seven modules. To date we have trained 78 chapter representatives. Some representatives are counted twice, because presenters who attended the first training session came to a second session to learn the subsequent four modules. Hence, there were more participants (78) than the number of chapters (67). As of July 2004, 45 chapters gave presentations to some 7,500 physicians. Sixteen chapters out of these 45 chapters presented a patient safety program twice. The rest of the chapters had their presenters trained, but have not yet held their annual scientific program meeting. Thus, we anticipate 22 additional presentations through June 2005. At that point, the goal of reaching all ACP chapters in the United States will have been met. Over the next several years, the patient safety curriculum will remain a vital resource for all 110,000 members of the College.

### **Presenters' curriculum evaluation**

Slightly more than halfway through the grant cycle we wanted to learn what presenters thought of the curriculum and why they chose a particular module. While recognizing the survey limitations due to the small sample size, we still felt we could gain some understanding. Therefore, in the fall of 2003 we surveyed the

48 presenters who had participated up to that point in order to get their feedback on the program. The initial response rate was low, so at a later date we contacted nonresponders again while including presenters who had been added since the fall of 2003. Thus, now we have responses from 34 individuals, and our response rate is 44 percent of a total of 78 presenters.

The presenters' survey contains 12 question areas. Most questions are open ended as we did not want to lead presenters' answers. The questions range from which module they chose and why to how they feel about the program in general and how they would like to see it improve. Included also were the obvious questions concerning the strengths and weaknesses of the curriculum.

The survey indicates that the medication error module was the most popular. This module was followed in popularity by systems, idealized office design, communication, and the role of the patient. Recently, several chapters offered to present training on the electronics and cognition modules in the near future. In the assessment of presenters, all modules, save the electronic module, have stood the test of time. The electronic field has moved ahead so fast that the module needs updating.

The College standard CME evaluations—not to be equated with the specifically designed curriculum questionnaires—corroborated the presenters' assessment of the program. Systems and medication errors modules received the highest approval rating from the audience. The remaining modules were scored in the low fours and below on the Likert Scale. Still, it has to be noted that these findings are preliminary, as less than half of all chapter presentations have been tabulated.

The most important factor contributing to presenters' choice of module was their comfort level with the material, followed by how relevant they thought the topic was for their particular audience. The final contributing factor was the decision of the chapter's scientific program committee.

Presenters felt that practicality served as the core strength of the modules, especially when applied to medication errors, systems, and idealized office design. The clinical cases were deemed to be particularly relevant. The medication errors module was singled out for its "ease of presenting, its non-controversial nature, its reliability of material," and the low cost of applying the take-home points. Two individuals described the material as "eye-opening." Twelve presenters stated that the material provided a good overall view. The cognition module was judged to be "too arcane," and "for geeks only." Presenters may have felt intimidated by the link to cognitive science and the need to self-assess their decisionmaking style from the cognitive perspective.

Presenters felt strongly that they wanted to add vignettes from their own experience to get their points across, something that was not possible as long as we were collecting survey data. This urge to add their own stamp to the material may have been one of the motivating factors to branch out into nongrant related patient safety discussions and presentations.

Answers to the question, “How would you improve this module?” were varied. Respondents felt that the modules could be improved by adding updates or more recent requirements, such as those from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). Respondents wanted more examples, especially for the medication module. Some suggested combining related modules into one by picking the best from each. Nine respondents judged the overall curriculum as excellent. One respondent wrote, “Excellent program. I’ve learned a lot and improved the safety of my practice.” Another comment illustrates the applicability of this curriculum to a hospital even though the material was developed with ambulatory care in mind. The respondent commented, “As CEO and president of the hospital, patient safety is one of my top priorities. ...I have newly established a position of a vice president (patient safety) in my hospital....”

## **Dissemination to other venues**

Apart from regular chapter presentations, 24 of the 34 survey responders reported presenting the material at other venues such as grand rounds, residency programs, and medical societies and other community settings. The material also was featured at each ACP annual session from 2002 through 2004. In addition, 19 interested parties learned of the program from colleagues and requested copies of the curriculum. The requests came from several quality assurance programs and the Air Force. Finally, the American College of Cardiology–ACP joint symposium in 2003 featured the medication error module. Recently, the author presented the essence of the curriculum at Loma Linda University and in the planning session program of the American Board of Medical Specialties, the American Board of Family Practice, the American Board of Internal Medicine, and the American Board of Pediatrics.

The wide dissemination and interest in the modules beyond College chapters was not anticipated. The fact that it occurred has to be attributed to a general need and desire to become more knowledgeable about patient safety. The key factor, however, was the commitment of the chapter trained presenters. The training process resulted in a cadre of dedicated speakers. These individuals are not only the early adopters<sup>2</sup>, but also knowledge brokers and boundary spanners, as Lomas emphasized.<sup>5</sup> The patient safety message and behavior have become a part of their professional identity. They reaffirm this identity each time they present the material anew.

Future curriculum dissemination possibilities include incorporation of some of the material in a joint American Board of Medical Specialties and American Board of Internal Medicine recertification program; and a patient safety CME for renewal of State licenses. The American Academy of Neurology has signed a statement that they would like to use this ambulatory care curriculum, with attribution to AHRQ and the College, if funding can be obtained to adapt the material to neurology.

While the dissemination model with the College as change agent worked well, especially as the dissemination was mediated via local experts reporting back to

their colleagues, the survey results present a more ambiguous picture. Due to the 3-year time period of the grant, penetration of non curriculum patient safety material could not be guarded against. The rigorous evaluation of the program itself suffered from these confounding influences.

## Discussion

### Module structure and content

CME has undergone significant changes over the last 20 years or so. The focus has shifted from an emphasis on transmitting content through lectures to facilitating problem-based learning.<sup>12, 13</sup> The structure of the modules reflects this development. The theoretical overview sets the stage and fits the traditional CME paradigm of strict knowledge transfer. This overview serves as the foundation for further learning. The clinical cases, as previously mentioned, illustrate the theory applied to reality. This translation of theory to clinical practice highlights the usefulness of the theoretical paradigm. Finally, the take-home points reinforce the lessons learned during the interactive case analysis with concrete suggestions on how to implement patient safety messages in the physicians' practice environment.

As anticipated, physicians identified with the clinical cases in each module. Each individual case exemplified the context (read: system) in which the problem occurred. Prior experience with similar situations helped physicians to see the material as relevant. The key safety messages of the module had to be applied to successfully process and analyze the discrete steps that led to the patient safety problem. In doing so, the new patient safety schemata became incorporated into the physicians' repertoire of decisionmaking.<sup>14</sup>

The take-home points of all seven modules were compiled into a single pamphlet that has proven quite popular. The guide was not offered as a matter of course to CME attendees. They received take-home points specific to the module they studied. We developed the pamphlet to distribute at our patient safety booth at the 2003 annual session, and the pamphlet is posted on our patient safety Web site ([www.acponline.org/ptsafety/](http://www.acponline.org/ptsafety/)). Despite limited exposure, we have processed over 5,000 requests for the pamphlet, primarily from medical directors of clinics and hospital patient safety officers. All seven modules can be viewed on the Web site in PowerPoint format, and the site offers additional resources for learning more about patient safety. The curriculum content therefore can be obtained without CME.

## Summary

Overall, the evaluation of the CME program, *Patient Safety: The Other Side of the Quality Equation*, might indicate that immediately following instruction, physicians showed positive gains in attitudes and beliefs that patient safety issues are relevant to clinical practice. However, 6 months after CME instruction the

apparent effects of instruction, on physicians' attitudes, beliefs, and reported behaviors were less consistent.

There are several limitations that may have contributed to the ambiguous findings. First, randomization either to instruction or to control conditions was not possible in this evaluation. Therefore, self-selection and previous history biases are major concerns.<sup>15</sup> Second, though efforts were made to control for information contamination, there was no practical way to accomplish this. The increase in information use scores by all participants indicated that the patient safety "message" was spreading via media, professional journals, etc. The physicians participating in the CME may be viewed as early adopters of patient safety ideas; however, there was insufficient information to make that determination.

Despite these apparent limitations, the patient safety CME was successfully implemented in numerous geographic locations in the United States. This fact alone demonstrates the wide acceptance among physicians that patient safety and the reduction of medical errors in clinical settings are important issues that must be addressed in professional practice. However, recent research suggests that many physicians still need to get the patient safety message. One national mail survey of physicians (N = 831) conducted between April and July 2002 asked, "How often are preventable medical errors made?"<sup>16</sup> Eighty percent indicated "not very often" or "not often at all." More recently, a telephone interview of ACP members (N = 239) conducted between June and September 2003 included a question about the threat of medical errors in private practice.<sup>17</sup> When asked, "How would you characterize the threat to patients' safety in private practice settings?" 53 percent indicated either a somewhat low threat or a very low threat. These results point to a continuing need for patient safety training.

## **Conclusion**

The main objective of this research was to establish an ambulatory care curriculum for the average physician in practice and to disseminate this information widely. This goal was accomplished by relying on established models of academic detailing.<sup>11</sup> The recommended behavior changes had to be easy to implement without requiring substantial resources of time or money. The presenters' survey responses attest to the curriculum's success in this area. Presenters' testimony refers to the intuitive nature of the clinical cases. Indeed, this was the one feature they wanted to duplicate the most.

To meet the goal of reaching out to all chapters, the College activated its governing infrastructure and acted as change agent. The College leadership and their chosen presenters acted as trusted peers and influential others to facilitate the spread of the program, as did back-up staff at the College. The patient safety messages embodied in the curriculum found a ready audience that relied on the long-established integrity of the College's educational materials.

While dissemination proceeded smoothly, the very success of dissemination undermined the statistical rigor of the research design for evaluation. Whenever a

choice had to be made between dissemination and protecting the research design from contamination, dissemination won. A number of factors combined to create a minefield of confounding variables. The entire medical community was exposed to media reports and professional articles on patient safety. Thus, there could be no true control group. Further, the voluntary nature of CME program selection produced a biased audience. Moreover, since individual chapters selected different modules, content evaluation was a mixture of responses to different patient safety messages. The original grant application naively assumed that chapters would devote a half-day of training to three modules at a time and that training would be repeated when all the modules were completed. This did not happen. Instead each chapter selected one module for training. This factor alone, not to mention a given presenter's charisma, or lack thereof, undoubtedly confounded the results.

On balance, this program was a success as interest in the program continues beyond the original target audience. The translation of patient safety concepts into clinical cases is the heart of this program and found universal appeal with speakers and audience members alike. This indicates that most physicians, as teachers and as learners, value CME that is directly applicable to their practice. Also, modules on medication errors and systems focus on basic information regarding what constitutes an error, an area many physicians still struggle with. Future studies may want to concentrate more fully on the practical usefulness of patient safety concepts and move away from attitude and behavior questions.

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## References

1. Kohn LT, Corrigan JM, Donaldson MS, editors. *To err is human: building a safer health system*. A report of the Committee on Quality of Health Care in America, Institute of Medicine. Washington, DC: National Academy Press; 2000.
2. Rogers EM. *Diffusion of innovations*. 4th ed. New York: The Free Press; 1995.
3. Bloom B. *Taxonomy of educational objectives: cognitive, psychomotor, and affective domain*. New York: Davis McKay Co.; 1967.
4. Emanuell LL, von Gunten CF, Ferris FD. *The education for physicians on end-of-life-care (EPEC) curriculum*. EPEC Project. The Robert Wood Johnson Foundation; 1999.
5. *Academy Health Reports. Knowledge transfer*. 2003 Dec;14:1,3. Washington, DC: Academy Health. Available at: <http://www.academyhealth.org/publications/academyhealthreports/dec03.pdf>.
6. Reason J. Foreword. In: Bogner MS, editor. *Human error in medicine*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1994: pp. vii–xv.
7. Woods DD, Cook RI. Perspectives on human error: hindsight biases and local rationality. In: Durso FT, editor. *Handbook of applied cognition*. New York: John Wiley & Sons; 1999: pp. 142–71.
8. Berwick DM. Disseminating innovations in health care. *JAMA* 2003 Apr 16;289(15):1969–75.
9. Streyer D, Tunis S, Hubbard H, et al. The outcomes of outcomes and effectiveness research: impact and lessons from the first decade. *Health Serv Res* 2000 Dec; 35(5):977–993.
10. Tunis SR, Hayward RSA, Wilson MC, et al. Internists' attitudes about clinical practice guidelines. *Ann Intern Med* 1994 Jun 1;120(11):956–63.
11. Soumarai SB, Avron J. Principles of academic outreach (“academic detailing”) to improve clinical decision making. *JAMA* 1990 Jan 26;263(4):549–56.
12. Fox RD, Bennet NL. Continuing medical education: learning and change: implications for continuing medical education. *Br Med J* 1998 Feb 7;316:466–68.
13. Smits PBA, Verbeek JH, de Buissonje CD. Problem based learning in continuing medical education: a review of controlled evaluation studies. *Br Med J* 2002 Jan 19;324:153–56.
14. Rohrbau CC, Shanteau J. Context, process, and experience: research on applied judgment and decision making. In: Durso FT, editor. *Handbook of applied cognition*. New York: John Wiley & Sons; 1999: pp. 115–39.
15. Hintze J. *NCSS and PASS number cruncher statistical systems (software)*. Kaysville, Utah; 2001.
16. Blandon RJ, DesRoches CM, Brodie M, et al. Views of practicing physicians and the public on medical errors. *N Engl J Med* 2002 Dec 12;347(24):1933–40.
17. American College of Physicians Research Center. *Medical practice survey: full technical report*. Philadelphia: The College; 2004.

