The Development of an Internet-Based Course on Dyslipidemias: A New Form of Continuing Education for Pharmacists

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The purpose of this project was to create an Internet-based course and evaluate the impact of the course on pharmacists' knowledge, application of learning to practice and confidence in caring for patients. The ADDIE (Assessment, Design, Development, Implementation, and Evaluation) was used to systematically develop the course. The team assembled to develop the course consisted of content experts, an expert in developing adult CE, an instructional designer, and programmers. PHARMA\textregistered\textendash Cholesterol utilizes an interactive, problem-based approach. It provides information on the management of dyslipidemias, and practical information of which can be applied in clinical practice. The course is completely referenced and, where available, links to sources of primary literature are provided. There are graphic and media elements which help explain concepts regarding atherosclerosis. Based upon preliminary results, the course significantly improved pharmacists' knowledge and confidence towards managing patients with dyslipidemias. Numerous studies suggest that patients at high risk for cardiovascular disease are sub-optimally managed and that alternative methods for improving care is required. PHARMA\textregistered\textendash Cholesterol is a unique method of delivering education to pharmacists and can be used to assist pharmacists to become better involved in the care of patients with dyslipidemias.

INTRODUCTION

Continuing pharmacy education (CE) is intended to keep practicing pharmacists abreast of new therapies, assist with integrating the results from clinical trials into practice, enhance clinical performance, and ultimately improve patient outcomes. Despite the widespread utilization of CE, numerous studies suggest there are gaps between the available clinical evidence and the application of this evidence into practice (1-4). Furthermore, despite the use of CE to inform clinicians of current treatment guidelines, there is often little difference in performance compared to groups not receiving CE (1). These data suggest that the current methods of CE development and

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delivery are neither changing practice nor patient outcomes. More effective strategies are necessary to narrow the gap between learning and the application of learning to practice. Currently, there are numerous methods used to deliver CE. The most commonly utilized forms of traditional CE are live events such as meetings, conferences, workshops, and print-based courses. Numerous reviews of the literature have determined that while the aforementioned methods of education delivery can improve knowledge, there is often little impact on clinical performance or patient outcomes(5-11).

An emerging option for CE delivery is through the use of Internet technology. The Internet offers the following advantages: it is easily and widely accessible, allows the learner to proceed in the learning process at their own pace and at their own convenience, allows the learner to focus on areas which they feel are particularly important, and allows for the use of active learning strategies(12). Despite the potential for the Internet to provide engaging instruction, most Internet pharmacy education courses are merely print-based courses online and thus do not take full advantage of the medium(13). Furthermore, few have been evaluated on their impact on knowledge and application to practice(14).

To address the limitations of traditional CE and the opportunities for developing innovative educational strategies, the following project was undertaken to develop an Internet-based educational course for pharmacists. The course focused on the management of patients with dyslipidemias. Additionally, an evaluation of pharmacists’ needs and the impact of the project on pharmacists’ knowledge, application of learning to practice, and confidence in caring for patients with dyslipidemias was conducted. This paper presents the methods used in developing the educational course, highlights of the final course, and preliminary results of the evaluation component.

PROJECT DEVELOPMENT
The project began in August 1999 and was completed in May 2000. A team-based approach was used in the development of the course. The team members consisted of: (i) an instructional designer, experienced in the design of general educational web-sites, responsible for determining the optimal method of delivering the educational content in order to meet the needs of the user; (ii) Internet programmers responsible for creating the user-interface and course database, configuring the server, and integrating the graphic art and multi-media elements; (iii) two content experts, who were clinical pharmacists experienced in managing dyslipidemias, responsible for developing the content for the course; and (iv) the director of continuing pharmacy education for the province of Alberta.

The ADDIE (Assessment, Design, Development, Implementation, and Evaluation) approach was used to systematically develop the learning course(15). Development occurred in three overlapping phases: Phase 1: Need assessments and instructional design, Phase 2: Development and implementation, and Phase 3: Evaluation.

Phase 1: Need Assessments and Instructional Design
The initial step in the development of the course was to establish the instructional design for the course. The challenge was to avoid a “page-turner” approach that involved numerous lines of text, linear navigation, and little user interaction. On the other hand, it was important to ensure that the final project was not overwhelmingly complex or confusing for users to navigate through. In order to construct the design, a series of assessments involving site visits to community pharmacies, a province-wide survey of practicing pharmacists, and focus groups, were conducted.

Site Visits. Three site visits were conducted by the instructional designer (a non-pharmacist). The visits provided an unbiased practical understanding of the work environment and processes involved in community pharmacy practice. In addition, the site visits furnished insight into pharmacists’ attitudes toward learning and generated several questions to address in the survey and focus group assessment phases.

Survey. The survey was mailed to 1,000 randomly selected practicing pharmacists, from a total of 2,816, in both rural and urban centers within the province. The survey questions addressed pharmacists’ interest in participating in distance education activities, their views on the use of computer technology for educational programming, and asked pharmacists to rank their therapeutic topics of interest. The questioning format varied and involved a combination of Likert-type responses (i.e. 5= very interested, 1= not interested) to ranking choices from highest to lowest.

A total of 560 surveys were returned (response rate of 56 percent). There was wide variation in pharmacists’ interest in distance educational activities (Figure 1). Overall, results demonstrated interest in Internet-based CE. The majority of pharmacists were interested in homestudy correspondence (print-based) courses followed by computer-assisted programs with printed materials, and online computer programs. Approximately, 62 percent of the respondents believed that computers could be useful for CE. Pharmacists believed that computers could improve access to CE, facilitate access to pharmacy experts, and improve the quality of CE programs (Figure 2). The majority of respondents stated they preferred the length of these courses to be less than two hours per session. The three highest ranked therapeutic topics of interest were pain (94 percent), cardiovascular (93 percent), and herbs (92 percent).
Focus Groups. Two focus groups, each consisting of six pharmacists, were held in August 1999 at the University of Alberta and were conducted by members of the project team. Both hospital and community pharmacists were invited to participate. Efforts were made to ensure that attendees represented a range of experience and represented both rural and urban centers. Pharmacists were requested to identify their views on the current CE courses offered, to identify their preferred types of CE programs, and their expectations of online courses.

Pharmacists’ views of the current CE delivery methods were remarkably consistent between focus groups. The majority of pharmacists attended CE programs delivered as lectures or print-based courses. Rural pharmacists stated that print-based CE courses were the major option for participating in CE programs. Pharmacists stated that while most of the current CE offerings were well organized, the courses were non-interactive and did not provide instruction in clinical skill development. The method of obtaining CE units, which was usually through answering a series of multiple choice questions at the end of the session, was felt to be ineffective at assessing skills. All participants stated a preference for case-based, interactive courses to develop practical skills and foster application of learning to patient care.

Pharmacists’ perceptions and expectations of online (“Internet-based”) courses varied. Some perceived online courses to take large amounts of time to complete and expressed “fears” of accessing online courses due to their lack of experience with computers. Most expressed willingness to participate in Internet-based education if the educational programs were interactive, visual without a lot of dense text to read, relevant to clinical practice, easy to use, and able to be completed in a few short sessions.

Instructional Design. The clinical experts produced a document detailing the content to be included in the course. This included material from all relevant clinical trials, as well as, the Canadian treatment guidelines for cholesterol(16). The document also included a list of objectives for the learner, the epidemiology and major risk factors for heart disease, the pathogenesis and pathology of atherosclerosis, the major treatment options (drug and non-drug), and monitoring and follow-up parameters. The instructional designer and clinical expert met weekly to develop learning tasks, clinical cases, questioning formats and sequencing, and opportunities for learning reflection, all of which centered around the course content.

An instructional design report was created, which served as a blueprint for developing the course to ensure that the learning needs expressed by pharmacists and the learning objectives for the content were harmonized in the final course. The report highlighted the instructional strategies, the format for delivering content, and the general architecture, interface issues, instructional tasks for the learners, and student assessment procedures to be incorporated into the course.

Phase 2: Development and Implementation

Project Development. Project development incorporated the results from the need assessments, the content, and the instructional design all of which were interdependent (Figure 3). Changes to any of these components necessitated changes to other areas. The development of the course included converting the revised content to HTML format, producing the web site interface elements (such as navigation), creating the media elements, and the administrative tools used to maintain and update the course. The project team met weekly to discuss development to ensure that the course continued to meet the educational needs expressed by the pharmacists and addressed the learning objectives.

Initially, two kinds of prototypes of the course were created. The first, a “shallow prototype,” provided a general idea of how the structure and interface of the course would appear and how the user would navigate through the course. The second, the “narrow prototype,” developed specific branches of the content from beginning to end. The narrow prototype gave the user an idea of the content and delivery format to be included in the course.

The course, called PHARMA-Learn-Cholesterol, was designed to ensure easy navigation and access for users with varying levels of comfort with technology (novice and experienced). Only minimal computer hardware and software are required to complete the course. The course is designed to take approximately four to six hours of online time, however, this time can be spread out over several weeks. Since most pharmacists reported they were inexperienced with using Internet technology, a companion workbook was developed to function as a guide to getting started with the course. The workbook outlines the features and objectives of the course, how to register for access to the course, how to navigate throughout the web-site, a suggested study plan for completing the course, and a contact number for assistance.

Figure 4 displays the general look of the pages throughout the site. Site navigation occurs linearly or through left-hand navigation bars which learners can proceed deeper into the program for additional information, such as references to primary literature (Figure 4). Both navigation strategies ensure that the learning objectives of the course are met. These navigation strategies allow learners to explore the course content for a variety of purposes and encourages learners to uncover information most useful to their personal learning needs.

From results of the needs assessments, pharmacists stated preferences for interactive and case-based CE events. PHARMA-Learn-Cholesterol addresses these needs. Content is presented through two cases designed to represent “real-life” patients which pharmacists would encounter in practice. The cases are centered around a five-step approach (developed by
our team) to managing patients with dyslipidemias. The five steps are: (i) assessing and identifying patients at risk for heart disease; (ii) identifying the lipid abnormality; (iii) managing cardiac risk factors; (iv) recommending therapy; and (v) implementing monitoring and follow-up (Figure 4). This format is practical and allows the learner to proceed through the course in a self-determined pace and length of study session. This approach to pharmacist-directed care was identical to that used in the recently completed Study of Cardiovascular Risk Intervention by Pharmacists (SCRIP), a 675 patient randomized trial of pharmacists intervention versus usual care on dyslipidemia management. SCRIP was stopped prematurely due to the extreme benefit in the intervention group (17,18).

At the commencement of each step of the five-step process, learning objectives are provided (Figure 4). Additionally, overviews of the information included in the section are included to provide the pharmacist with a glimpse of the content covered in each section. Each line of the overview is hyper-linked so that learners can select areas to focus on (Figure 4). Embedded throughout the course are multiple choice and “choose as many that apply” questions which fall into one of six categories: knowledge, comprehension, analysis, application, evaluation, and synthesis (Figure 5). The primary purposes of this questioning format are to provide a context for the user to explore associated content links and to apply content encountered earlier in the course. A unique feature of this course is that immediate feedback to chosen responses is provided (Figure 5). The feedback is designed to indicate whether the selected response is correct, to provide additional content information, and/or to extend the information beyond the question’s original context.

Various strategies have been employed in the development of the course to address pharmacists’ needs to have CE directly applicable to clinical practice. For instance, the course provides detailed information required to plan and implement cholesterol monitoring clinics within pharmacies. Resources, such as posters, can be downloaded and placed in pharmacies to advertise clinics or to assist in identifying patients at high-risk for cardiovascular disease. Additional resources include clinic checklists and links to suppliers of cholesterol point-of-care devices.

To assist pharmacists with integrating the content learned to clinical practice, various documentation forms were developed which can be utilized in practice. The forms assist pharmacists with assigning patient cardiac risk status scores, identifying patients at the greatest risk for heart disease, requesting patients’ lipid results from physicians, recommending therapy to physicians, and implementing monitoring and follow-up and were based upon the forms used in the SCRIP study (17,18). Additionally, patient information sheets about the various lipid-lowering medications were developed. Pharmacists who register for the course also receive a PHARMALearn-Cholesterol pocket card detailing the five-step approach to managing dyslipidemias, summarizing the major lipid-lowering clinical trials, and outlining the major drug interactions and patient monitoring parameters.

Numerous strategies to encourage application of learning to practice are offered. At the end of each of the five steps, learners are assigned tasks to complete within their own practice. For example, upon completion of step one, learners are encouraged to use the risk factor assessment forms, provided in the course, in their practice to identify the very high-risk patients. To engage pharmacists in active learning strategies, interactive media elements were incorporated to either explain specific content or to allow the user to explore specific content issues. For instance, the pathogenesis of heart disease is demonstrated through interactive media depicting the development of atherosclerosis (Figure 6). The demonstration describes the sources of cholesterol, how the lipoproteins interact in the body, the contribution of each lipoprotein to atherosclerosis, and the process involved
in the development of atherosclerosis. Another media element used in the course is the Framingham risk calculator (Figure 7). After the pharmacist enters the required information, the Framingham risk calculator computes a patient’s 10-year cardiac risk level and depicts the results graphically. Notably, the calculation of a patient’s risk is recommended in the new Canadian guidelines for dyslipidemias. This feature can be easily used in practice to educate patients about their cardiac risk status. To make learning enjoyable for the users, a game show, called the “Cholesterol Challenge” was developed in which learners are faced with a series of questions they have to answer.

To ensure the content reflects evidence in the literature and educates pharmacists regarding the major clinical trials in treating patients with dyslipidemias, PHARMALearn-Cholesterol is extensively referenced. Where available, online links to references are included. These links contain either the online abstract of the selected study or the full text of the article. Since pharmacists expressed time and preference as limiting factors for not reading all of the clinical trials cited throughout the course, summaries of the major clinical trials with which pharmacists should be familiar were developed. This feature allows pharmacists to “dig deeper” into the primary literature if desired. Furthermore, the course can be used as a comprehensive reference for dyslipidemias.

Other unique features of this course are the conferencing/messaging system and the system for maintaining and updating the course. The conferencing feature allows learners to post questions regarding content clarification or ideas for applying the information. In addition, there are opportunities to organize discussion groups with participants, which can be facilitated by content experts. The maintenance system allows for easy update to resource links, references, and content. This feature will ensure the course remains current.

Implementation. Project sign-off and implementation of the project occurred once final changes to the course, based upon feedback from the formative evaluation (see below), had been made. In addition, an application for obtaining accreditation from the national continuing education organization (Canadian Council for Continuing Education in Pharmacy) was submitted and approved for 6 CE units.

Phase 3: Evaluation

Given that the Internet-based design utilized for this course was a new method of delivering CE to pharmacists, it was important that an evaluation of the course be conducted. PHARMALearn-Cholesterol was evaluated to determine the impact of the course on pharmacists’ knowledge and confidence in applying the learning to clinical practice, and on patient outcomes. Both formative and summative evaluations were employed for the project.

Formative Evaluation. The formative evaluation process included usability meetings, pilot testing, expert reviews, and a sponsor presentation. Three usability meetings were held at various stages of project development. On average, five practicing pharmacists were invited to meetings to preview the course and provide feedback on a variety of design issues. Feedback was received on the clarity and complexity of the clinical cases and content presented, the ease of navigation, and the consistency in the graphics (colors and font size) used. Changes to the course were made based upon the feedback gathered during these meetings.

Pilot testing involved 14 pharmacists from the Canadian Armed Forces. To facilitate the process, a feedback system was developed in which the pharmacists could submit their comments online for each page of the course. Feedback was immediately received by the project team. The comments were addressed by the project team and the course changes to the course were completed where appropriate.

The clinical expert reviewers provided feedback on the content included in the site. The feedback from these reviewers was overwhelming positive and only minor changes to the site were recommended.

Finally, to ensure that the course met with the approval of the project sponsors, a meeting was held in which the project was presented. The meeting involved professionals from within the pharmacy community and health care sector including educators, physicians, nurses, and representatives from the business community. Overall, the attendees were pleased with the project and were anxious to proceed with other projects.

Summative Evaluation. The purpose of the summative evaluation is to assess the impact of the course following implementation. This phase of evaluation involves a group of community pharmacists from across Canada. An evaluation of the impact of PHARMALearn-Cholesterol on pharmacist knowledge and
confidence in applying learning to direct patient care will be conducted by having participating pharmacists complete a questionnaire immediately before-and-after and six months after completing the WWW course. The questionnaire consists of 12 multiple choice case-based questions assessing pharmacists’ knowledge of managing patients with dyslipidemias. Five areas will be assessed and include: (i) identifying patients at high risk for heart disease; (ii) identifying the lipid abnormality; (iii) managing modifiable risk factors; (iv) recommending therapy; and (v) monitoring and follow-up. In addition, ten questions, delivered using a Likert-type scale (1=strongly disagree, 5=strongly agree), will assess pharmacists’ awareness of the clinical trial evidence for the treatment of dyslipidemias and of the clinical practice guidelines and assess their confidence in managing patients with dyslipidemias.

In conjunction with the knowledge assessment, a practice-based research study (called SCRIP-plus) will be conducted to evaluate the impact of the Internet-based course on pharmacists’ application of knowledge and skills and the clinical outcomes of patients at very-high-risk for heart disease. After completing the course and attending a workshop focusing on the study procedures, participating pharmacists from a major pharmacy chain across Canada will enroll eligible patients into an intervention program (similar to that described in PHARMA-Learn-Cholesterol) and follow them for six months. The primary outcome of the study will be the change in low-density lipoprotein (LDL-c) over six months.

As this phase of the evaluation process is ongoing, only preliminary results from the knowledge assessment are available. A total of twelve practicing pharmacists participated in the pilot study evaluating knowledge before-and-after completing PHARMA-Learn-Cholesterol. Twelve participants completed the knowledge portion of the questionnaire and 11 completed the awareness and confidence sections. The mean scores of the 12 knowledge questions before and after completing the course were 36.8 percent [95% confidence interval, (CI), 27.7 to 46.0] and 62.6 percent [95% CI, 48.9 to 76.2], respectively. There was a significant increase (41 percent, P<0.00(5,850),(996,996) for the difference) in knowledge after the pharmacists completed PHARMA-Learn-Cholesterol. The knowledge component will be tested again after six months, at which time, a comparison will be made to determine if the increase in knowledge was sustained over time.

Overall, pharmacists’ awareness of the major clinical trials and clinical practice guidelines and their confidence in managing patients with dyslipidemias increased after completing the course. The overall median before completing PHARMA-Learn-Cholesterol was 2.7 [95% CI, 2.3 to 3.2] and was 3.9 [95% CI, 3.7 to 4.1] after completing the course [P<0.001 for the difference].

**DISCUSSION**

Based upon the results of the province-wide needs assessment, 93 percent of pharmacists reported an interest in CE in the area of cardiovascular care, likely reflecting the fact that cardiovascular disease (CVD) is the leading cause of death in North America(19). Elevated cholesterol and the risk for coronary heart disease has been shown to be continuous, graded, and strong(20). Furthermore, numerous large, randomized trials have shown that reducing cholesterol, especially in those patients at the greatest risk for heart disease, can reduce the mortality and morbidity associated with CVD(21-25). The process of cholesterol risk management involves screening, initiating therapy, and treating to target lipid levels, as recommended by clinical practice guidelines. However, numerous studies indicate that patients are under-screened, under-treated, and not treated to target cholesterol goals(26-28). Therefore, there is much room for improvement in the care delivered to these patients. Furthermore, pharmacists can make major contributions to this. In fact, the beneficial role of pharmacists’ involvement in cholesterol risk management has been conclusively proven in a recently completed randomized, controlled trial(17,18).

Pharmacists are in an ideal position to care for patients at risk for heart disease, however most do not currently practice beyond the traditional dispensing role. Pharmaceutical care (PC), defined as the determination of the drug needs for a given individual and the provision not only of the required medication but of the services necessary (before, during, and after treatment) to ensure optimally safe and effective therapy, is the paradigm to which pharmacy practice is shifting(29). Many pharmacists feel they require more education to practice within the PC model(30).

To address pharmacists’ needs for more education in the area of CVD, the gaps in the current cholesterol management practices of patients at risk for CVD, and to explore innovative ways of delivering CE, PHARMA-Learn-Cholesterol was developed. To our knowledge, this is the first interactive, case-based CE course available via the Internet.

PHARMA-Learn-Cholesterol is a new method of delivering CE. The two items incorporated into the course that have been changed from the traditional methods of CE are the instructional strategies and the delivery method (Internet). The instructional strategies are a mixture of authentic cases, embedded questions that address different levels of learning (recall, knowledge, comprehension, application, and evaluation), opportunities for asynchronous discussion, areas for reflective writing, performance support aids, immediate and contextual feedback, and content that is presented at multiple levels of complexity and depth.

The use of the Internet for content delivery enable each of the aforementioned instructional strategies to be incorporated much easier than with other mediums. However, most Internet-based CE courses resemble traditional CE in that they tend to be merely didactic presentations. These courses usually conclude with multiple choice questions which focus on lower-level learning objectives, such as recall and knowledge. These types of online courses do not take full advantage of the medium and perhaps have even less impact than they did in their face-to-face lecture format.

Many pharmacies view Internet technology as an information source for both pharmacists and patients. This course is an example of how strategies for enhancing pharmacists’ involvement in the care of patients with dyslipidemias and the clinical practice of pharmacists can be implemented using Internet technology. The course was intended to be an easily accessible and fully referenced educational and informational tool for pharmacists. The course will be continually updated as information regarding cholesterol management becomes available. To encourage the application of knowledge to practice, documentation forms to assist pharmacists with obtaining relevant patient-related information, making therapeutic decision regarding the initiation of or changes to therapy, making recommendations to physicians, and implementing monitoring and follow-up in their practice have been developed and incorporated into the course. Numerous clinical tools were also developed to aid pharmacists with assessing and educating patients about cardiac risk. The web site provides practical information to pharmacists on how to set-up and implement a
cholesterol clinic in the pharmacy including sample posters, patient schedules, information on how to obtain cholesterol testing devices (and associated contact numbers), and a step-by-step procedural checklist that pharmacists can follow when organizing a clinic.

Internet-based courses do not replace traditional methods of CE, however are intended to offer another method by which pharmacists can access CE. Interestingly, based upon our needs assessments, currently, only 1.5 percent of CE is obtained through online sources. The most plausible explanation of the low participation is because there are few worthwhile online courses available to pharmacists. As more online courses become available, the proportion of pharmacists accessing CE from this source is likely to increase. Furthermore, Internet courses can improve access, especially for those pharmacists practicing in rural or isolated environments.

Evaluation of new educational strategies are essential to determine whether the strategy can not only improve knowledge, but importantly improve practice patterns. Only preliminary information is available on the impact of PHARMALearn-Cholesterol on knowledge, while the impact of the course on practice outcomes is ongoing. The preliminary results of the knowledge assessment, evaluated immediately before-and-after completing the course, found pharmacists’ knowledge significantly increased from 36 to 63 percent. That the baseline scores were only 36 percent suggests that there was little selection bias in participating pharmacists. While we had hoped for a greater increase in after scores, it should be kept in mind that these scores are preliminary (based on only 12 participants) and require further evaluation.

Since this is the first CE course developed through the Internet, there are numerous opportunities for developing future cardiovascular courses and other topics. We are currently developing courses in anticoagulation and hypertension. We also plan to evaluate the impact on pharmacist knowledge and application to clinical practice, and more importantly to evaluate the impact on patient outcomes with each course. As pharmacists become more comfortable using Internet-based technology for learning, we will design future courses that offer an even higher level of interactivity and greater depth of learning.

References


