Design of a Problem-Based Learning Pain and Palliative Care Elective Course

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Abstract

Objective
To implement and evaluate a problem-based learning (PBL) pain and palliative care elective course to develop students’ pain and symptom management pharmacotherapy knowledge, clinical reasoning process, and self-directed learning skills.

Methods
Each week students received a patient case to independently develop an assessment and plan for each pain and symptom management problem. During class the students discussed their findings within small groups in preparation for a large-group discussion with the instructor. Students’ course grades were based on weekly pre-class case preparation, individual case studies, and self-reflection questions. To assess knowledge gained over the semester a free-response pre- and post-course test was given.

Results
Twenty-five students enrolled in this course. A t-test comparison of the pre- and post-tests yielded a significant difference between the pre- and post-test scores ($p < 0.001$), with the mean score for the tests increasing from 9.6 (out of 20 points) on the pre-test to 14.1 on the post-test. Pearson’s correlation coefficient between the pre- and post-test was 0.45, indicating increased scores were not a result of improvement only among the strong students. The normalized gain ($g$) was 0.43. The average score for each individual case study was slightly more than 80%. Four themes were noted in the students’ self-reflections including patient/family goals of care, individualization of patient care and contrast to curative treatment, improved comfort with “gray therapeutic areas,” and advantages and disadvantages of problem-based learning.

Conclusions
Students demonstrated improved pain and symptom management pharmacotherapy knowledge, clinical reasoning process, and self-directed learning skills after course completion. The skills developed by students will benefit them in future clinical practice. Additional studies are needed to assess the long-term impact of the skills developed in this course.

Keywords
Problem-based learning, Pain, Palliative Care, Pharmacy, Elective

Disciplines
Pharmacy and Pharmaceutical Sciences

Comments
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Conclusions. Students demonstrated improved pain and symptom management pharmacotherapy knowledge, clinical reasoning process, and self-directed learning skills after course completion. Additional studies are needed to assess the long term impact of the skills developed in this course.

Keywords: problem based learning, pain, palliative care, pharmacy, elective

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Introduction/Background
There is increased awareness on the need to improve pain and palliative care content within the current doctor of pharmacy curriculum as evidenced by its inclusion in Appendix B of the Accreditation Council for Pharmaceutical Education (ACPE) Standards 2.0. Pharmacists interact with pain and palliative care patients and caregivers across care settings such as community pharmacies, hospitals, ambulatory care clinics, and long-term care. They frequently have the opportunity to participate in the care of patients requiring pain and symptom management. However, pharmacists report a lack of confidence and inadequate therapeutics knowledge to effectively contribute to community palliative care services and do not want to become a barrier to quality care. A survey of Pharmacy Practice Chairs in 2001 revealed that the didactic curriculum in pharmacy schools averaged 3.89 ± 1.91 lecture hours for end-of-life care (EOLC).

Preclinical years are an ideal time to introduce EOLC concepts to students as they begin to form their professional identities. The knowledge, skills, and attitudes they cultivate at this stage of their training will positively or negatively impact their future EOLC perceptions. Similar foundations in basic sciences, interpersonal skills, empathy, technical competence, and interworkings of the health care system are needed to provide quality care in EOLC as well as others areas of medicine. Trainees are also introduced to EOLC’s hidden curriculum. They are challenged to consider their visions and expectations, medicine’s emphasis on curing disease versus symptom palliation for patients with incurable conditions, and how technical competency is more valued than relational competency.

The Pain and Palliative Care Strategic Planning Summit recommendations advocate for research and innovation in pain and palliative care teaching methods and curricular design including case study development and pedagogical models which encourage interprofessional pain and palliative care learning. Problem based learning fits this criteria. The ACPE Standards 2.0 Guideline 11 discuss the need for students to develop critical thinking and problem solving skills and encourage use of active learning methods such as case studies with the goal to develop self-directed, lifelong learners. This guideline implies that lecture is not optimal to develop critical thinking skills.

Problem based learning (PBL) is an active learning strategy within the medical, pharmacy, nursing, and science education literature that appears to be effective for developing case based
reasoning (CBR) in students who will translate it into future practice. The CBR process includes retrieving most similar case or cases from a clinician’s memory, reusing information and knowledge from similar cases, determining a solution, and retaining the experience and outcome for future problem solving as well as the ability to modify a solution to fit new cases. Experience gained from successfully solved problems is retained for future situations, while the reason for failure is identified and avoided in the future. This process is beneficial to develop expertise by combining textbook knowledge with experiences and can be applied to therapeutics and diagnostics.

Skills developed using PBL in preclinical years translate into clinical training. PBL develops higher level learning skills such as clinical reasoning, self directed learning, and independent and critical thinking skills. Students learn to determine whether additional knowledge or skills are needed to provide better patient care and the process to most effectively and efficiently obtain information from available resources. Development of self-directed learning skills is emphasized to provide the foundation for trainees to modify and expand their knowledge and skills to keep up with practice changes and evidence based medicine. Students are encouraged to challenge each others’ observations, thoughts, and defend their viewpoints during small group sessions.

PBL fits with the multidimensional and longitudinal nature of EOLC. A patient case may evolve to reflect changing goals of care as a patient transitions from curative and disease modifying treatment to palliation and may include physical symptoms, psychosocial issues, as well as spiritual and ethical concerns. Small group discussions can emphasize the clinical, scientific, and personal aspects of hospice and palliative care. PBL is also able to stimulate challenges and different goals of care for acute, chronic, and cancer pain management within patient cases. PBL problems often have multiple potential answers and available resources to derive the solution which fits well with pain and symptom management pharmacotherapy. Descriptive examples utilizing PBL for pain and palliative care education include pharmacy student participation within an interprofessional palliative care elective course. However, there is a lack of available evidence discussing PBL for teaching pain and palliative care pharmacotherapy to pharmacy students. A PBL pain and palliative care elective course offers greater
material depth and breadth than normally possible within the required didactic curriculum and strives to develop students’ clinical reasoning process and self-directed learning skills.

**Rationale and Objectives:**

The pain and palliative care elective course was first offered to second (P2) and third year (P3) pharmacy students during the fall 2010 semester. The 2 credit elective met weekly for 1 hour and 50 minutes. One clinical faculty member who specializes in pain and palliative care coordinated the class and taught drug information and pharmacotherapy topics for 13 of the 15 weeks. The remaining 2 classes on ethics and palliative sedation were team taught with another pharmacy faculty member who teaches law and ethics. Course materials including the syllabus, supplemental readings, in-class case studies, and assignments were posted on the St. John Fisher College (SJFC) web-based course delivery system. The course textbook was the *American Academy of Hospice and Palliative Medicine (AAHPM)* *Primer of Palliative Care 5th Edition* (2010).

The problem based learning (PBL) method utilized for the pain and palliative care elective class was a modified case-based method as defined by Barrow’s problem-based learning methods taxonomy. The modified case-based method differs from traditional PBL in that there is less free inquiry. Fewer opportunities for clinical reasoning process and self-directed learning skill development exist than with traditional PBL when subjective and objective data is provided. Unlike clinical practice, students do not know what additional assessment information is needed or how to obtain it. However, it is a strong teaching method for structuring knowledge for use in clinical contexts and increasing motivation for learning. Given the students lack of PBL exposure elsewhere in the curriculum, the course coordinator thought that the modified case-based method would be a more familiar format to students because it is similar to our required Therapeutics Case Studies course and produce less resistance among the students than the traditional PBL format. The course coordinator wanted to introduce PBL into the curriculum as a means to develop students’ clinical reasoning process, self-directed learning skills, and realization that clinical problems frequently have multiple reasonable solutions.
The course coordinator explained the case based learning process, course goals, and learning objects to the students during the first class. The course goals were for students to gain an understanding of potential pain and symptom management treatments for patients with advanced illness as well as refine their critical thinking skills and ability to individual drug therapy for a specific patient’s needs. Course learning objectives are discussed in Table 1 and were designed using Fink’s taxonomy.²⁰

**Materials and Methods:**

Patient cases for in-class discussion were posted on the course website one week prior to class and included relevant subjective and objective data. An example individual patient case is included in Appendix A. Students would independently work through the patient case outside of class to formulate an assessment and plan for each of the patient’s pain and symptom management problems. Students were assigned small groups to work with in class to review their individual findings and formulate a group assessment and plan for each problem to discuss with the class and instructor. Twenty-six students were divided into 6 groups of 4 to 5 students each. The class demographics are described in Table 2. Groups were assigned by the course coordinator to ensure a balance of second and third professional year students. The rationale was that the third year students would provide support with therapeutics knowledge and the clinical reasoning process to the second year students who were in their first semester of the pathophysiology and therapeutics sequence. No additional criteria were used to create the small groups. Since the students were not previously exposed to PBL within the pharmacy curriculum, a slight modification was made to the modified case-based method. The first 30-60 minutes of class utilized for a student driven content discussion prior to the case discussion. The instructor facilitated the large group content discussion to assure that the key therapeutic content was reviewed. The didactic topics included content recommended by the Strategic Planning Summit for the Advancement of Pain and Palliative Care Pharmacy curricular workgroup.⁶ Course topics included pain and palliative care drug information, overview of hospice and palliative care services, pharmacist’s role in hospice and palliative care, communicating with terminally ill patients and their caregivers, pain assessment and classification, opioids and opioid dose conversions, adjuvant pain medications,
gastrointestinal symptoms, dyspnea, pruritus, delirium, fatigue, myoclonus, terminal secretions, anorexia/cachexia, legal and ethical considerations in palliative care, and palliative sedation. The course coordinator created all the patient cases. They were based on actual patients that she cared for at her clinical practice site and adapted them to incorporate the course topics. A benefit of this elective course is the ability to provide more in-depth pain management content (e.g., 8 hours during the elective versus 4 lecture hours within the school’s required pathophysiology and therapeutics sequence). Additionally pain management principles were re-enforced throughout the course within the weekly patient cases. Numerous symptom management topics such as palliative sedation, anorexia/cachexia, terminal secretions, refractory dyspnea, pruritus, and terminal delirium are only didactically taught within this elective offering. There was a decreased ability to cover all Pain and Palliative Care Pharmacy curricular workgroup’s content recommendations due to the extensive number of suggested topics and decreased ability to review as much therapeutic content with problem-based learning teaching methods versus lecture. Study approval was obtained from the SJFC institutional review board (IRB). Informed consent was obtained prior to voluntarily student enrollment in this study.

The example patient case in appendix A was the last individual case study that the students completed. It was assigned during week 13 of 15 so the only outstanding didactic topics were legal and ethical considerations in palliative care and palliative sedation. The case focused on constipation, dyspnea, and nausea management which required students to draw upon multiple topics they learned over the semester.

Students’ course grades were based on both quantitative and qualitative measures including weekly pre-class case preparation (15% of grade), 3 individual case studies (60% of grade), and responses to 3 self-reflection questions at the end of the course (25% of grade). To assess knowledge gained over the semester a 17 question free response pre and post course test was given during the first and last classes. The course coordinator decided to make the pre and post course test free response to challenge the students to consider that there may be multiple correct answers to most of the questions.

**Assessment of student learning**
The course learning objectives were mapped to specific assessment activities. The first learning objective was to explain the differences between hospice and palliative care and identify patient populations who may benefit from hospice or palliative care services. This was assessed during the second week of the course through the students’ pre-class preparation and completion of 2 cases for in-class discussion comparing palliative care and hospice appropriateness for a pancreatic cancer patient and an older adult patient with an inoperable bowel obstruction. The principle of hospice and palliative care appropriateness was incorporated into the case discussions throughout the semester. One student commented in their self-reflection response that determining when a patient qualifies for hospice or palliative care services was one of the most meaningful skills they learned in the course.

The second learning objective was to discuss pharmacists’ potential roles on pain and palliative care interdisciplinary teams and how they impact patient outcomes. This was a longitudinal learning objective across the course because the concept of the pharmacist being the interprofessional team’s pharmacotherapy expert was incorporated into the drug information and pain and symptom management case discussions throughout the semester. Other topics integrated into the patient cases which highlight a pharmacist’s role include identifying drug related problems such as medications without an indication, drug interactions, dose adjustments for end-organ dysfunction, appropriate medication monitoring parameters, medication counseling, and clinical situations where stopping maintenance and preventative medications is appropriate. The second self reflection question addressing course impact to future practice also links to this learning outcome because it requires future pharmacists to consider their potential role in a pain or palliative care patient’s clinical management.

The third learning objective was to discuss pain assessment and common types of pain. It was the primary focus of the pre-class preparation and in-class patient case discussion during week four. Elements of pain assessment were included within the patient cases for the following topics opioids, non-opioid adjuvant pain medications, pruritus, imminent symptoms, and gastrointestinal (GI) symptoms, as well as in the first individual case study assignment.

Assessment for learning objectives 4 and 5 are closely related. Learning objective 4 addresses the pharmacotherapeutic profile of opioids and non-opioid adjuvant pain medications while objective 5
discusses conversions between different opioid medications and formulations. These points were the focus of the opioid and adjuvant pain medication pre-class preparation and in-class patient case discussion during weeks 5, 6, and 7. Opioids, opioid conversions, and adjuvant pain medications were also secondary patient problems for the pruritus, imminent symptoms, and GI symptoms cases. Individual cases 1 and 3 also included these principals. Numerous students commented in their self-reflections on improved familiarity with the role of opioids in pain management and opioid conversions after taking this course.

The final learning objective was to explain potential etiologies, assessment, monitoring, and pharmacological and non-pharmacological management of common non-pain symptoms in palliative care patients. Nausea/vomiting, constipation, hiccups, dyspnea, fatigue, pruritus, terminal secretions, myoclonus, and delirium were assessed within pre-class preparation and in-class patient case discussion during weeks 6 to 13. Symptoms discussed earlier in the semester were often included within the problem list for patient case discussions later in the course. Individual cases 2 and 3 assessed constipation, nausea, hiccups, and dyspnea.

There are 4 measures of student learning and course usefulness. The first measure is the results from a pre- and post-test related to course material. The second measure is the SOAP notes that students produced for each of the 3 individual cases. The third, and potentially most useful, measure is the collection of student self-reflections that occurred at the end of the course. The fourth measure is the student course evaluations.

Results:

Pre-test and post-test results.

Students completed a pre-test of course material at the beginning of the course, and were tested using the same questions at the end of the course. A t-test comparison of the pre- and post-tests yielded a significant difference between the pre- and post-test scores \( p < 0.001 \), with the mean score for the tests increasing from 9.6 (out of 20 points) on the pre-test to 14.1 on the post-test. Additional statistical
tests yield further insight into this gain. First, Pearson’s correlation coefficient between the pre- and post-
test was 0.45; this correlation indicates a tendency for all students, and not merely the ‘good students’, to
increase their score from pre- to post-test. (If, for example, only high scores on the pre-test increased
from pre- to post-test, the correlation coefficient would likely be much smaller.) Furthermore, the variance
in scores decreased from 7.1 on the pre-test to 3.2 on the post-test; this also indicates that is was not
merely the ‘good students’ who increased their score. (Again, if only high scores on the pre-test increased
on the post test, the variance would have increased.)

A final measure of the student learning in the course is the normalized gain, $<g>$. The
normalized gain is a measure of how much learning takes place in a course, normalized by the amount of
learning that could take place. If $n_{\text{max}}$, $n_{\text{post}}$ and $n_{\text{pre}}$ are the maximum, post-test and pre-test scores,
respectively, on a test, then:

$$<g> = \frac{n_{\text{post}} - n_{\text{pre}}}{n_{\text{max}} - n_{\text{pre}}}$$

It has been commonly found that traditional teaching methods typically produce $<g>$ from 0.1 to
0.3, while more interactive teaching methods typically produce $<g>$ from 0.4 to 0.6. The case method
used in this course, which was very interactive, produced a $<g>$ of 0.43.

Analysis of student case responses.

The SOAP notes for the 3 individual cases were analyzed for common trends, misconceptions,
and the like. The first individual case primarily assessed students’ pain management knowledge. The
second case evaluated constipation, nausea, and hiccups. Constipation, nausea, dyspnea, and opioid
calculations were also assessed in the third individual case which may be referred to in Appendix A. All
individual cases incorporated assessment of dose adjustments for end-organ dysfunction, medications
without an indication, and drug interactions. An analysis did not find any instances of common mistakes
or misconceptions among the students. The average score for each case was slightly more than 80% (as
determined by two pharmacy faculty readers). For each case, rarely was any particular mistake (eg. not
recognizing that use of ondansetron and diltiazem increase constipation risk in the third case) made by
more than 5 students. Given that there were approximately 20 different mistake categories marked for
each case, most student mistakes are rather idiosyncratic, and indicate neither ongoing misconceptions on the part of students nor a systemic problem with the course design.

**Student self-reflections.**

Students were provided 3 self reflections questions at the beginning of the course which included:

- What is the most meaningful thing you learned in this class? How might this impact your future clinical practice and life choices?
- What benefit do you feel this class may have on your future ability to care for pain and palliative care patients and why?
- Do you think the case-based format was an effective teaching method to learn pain and palliative care pharmacotherapy and why?

All responses were submitted at the end of the semester. The self-reflection responses were examined by the 2 authors, but inter-rater reliability was not examined due to the authors’ differing background knowledge. Nevertheless, 4 themes were identified by both reviewers. The common subjects included patient/family goals of care, individualization of patient care and contrast to curative treatment, improved comfort with "grey therapeutic areas”, and student identified advantages and disadvantages of problem-based learning.

Students noted the importance of patient and family centered care for setting goals of care. Most students indicated that they began to see how the experiences and goals of the patient were paramount in palliative care. Goals of care are not static, but require frequent modification as patients' experience a change in their clinical status. Patients and families play a central role in decision making. One student stated that she found it important to understand “what a patient might actually be going through” and another said that the "patient’s priorities and goals” were the most important guide for treatment.

Pharmacists need to consider an individual patient’s values and goals of care when evaluating the risks versus benefits of starting a pain or symptom management medication. For example, two patients may have the same pain rating but one of the patients may value alertness more than pain relief so they can
better interact with their loved ones while another patient might prefer decreased pain but accept
increased sedation from pain medications.

Individualization of patient care decisions including comfort care as a potential treatment option was
also a comment theme. The importance of viewing patients as people, not isolated disease states or
symptoms, and providing holistic patient care was noted. A student noted: “pain should be treated based
on the patient’s experience of their complaint” rather than according to a pre-determined schedule of
drugs. For the first time many students realized that comfort care is a valid therapeutic option when
curative treatment is not possible. The patient cases provided a new frame of reference because they did
not focus on clinical cure which contrasted to other didactic courses. This more patient-centered
approach was different from their usual experience in pharmacy school, and the struggles that this
difference produced, also were noted by several students. Students referred to the “unconventional
decision making” and that the approach was a “different way than the normal curative medicine.” The
patient’s care shifted away from curing or stabilizing acute and chronic diseases by focusing on objective
data like target blood pressure goals or therapeutic drug levels. Instead changes in a patient’s symptom
management and quality of life became the clinical focus. Adjustments in treatment based on patient
prognosis were also new concepts. One student noted that they had not previously considered that it
would be reasonable to stop lipid lowering medications in a patient with a life expectancy of days to
weeks because decreased cardiovascular events are a long-term benefit of statin medications. Other
students stated that the course “opened my eyes” to the difficulties in working with patients in these
situations.

Many students noted improved ease with “grey therapeutic areas”. Patient care has many variables,
so there is not one “right” answer. The opened-ended nature of the patient cases challenged students’
decision making to consider the possibly of numerous reasonable clinical plans that could be justified with
appropriate patient monitoring. While recognizing that palliative care is less rigid in its approach to
medication, some students referred to this being a “grey area”. One student noted a growing ability to “be
able to see the bigger picture” to address the needs of the patients when it is not possible to be as
precise as usual. This grey area requires a more “problem solving” approach to medication and students
noted the ability to “feel confident that [they] can develop and support an evidence-based medication regimen.”

Overall students reported that they enjoyed PBL, but resistance was noted with this new learning style. Some students were frustrated with the shift of teacher driven instruction to self-directed learning. Many commented that they would have preferred a more formal lecture on the topic before working on the cases. They were unsure if the assessment and plan they developed were appropriate because they were challenged to independently learn information and did not have expert knowledge guidance from the instructor on the topic before class. Students reported that ultimately this experience made them a stronger clinician and resulted in greater opportunity to apply concepts and knowledge. They reported the patient cases were a more stimulating way to learn the material than lecture. They enjoyed that the cases were based on actual patients which increased the topic’s clinically relevancy and provided the instructor the ability to discuss the patient’s actual clinical outcome. While students “would have appreciated” more direction in starting their cases, and there was the usual resistance towards new pedagogy such as described by Wenning, in the end the students were overall positive in their comments regarding PBL. Students noted things such as their ability to “pull from our knowledge bank” outside of class and the integration of their knowledge that took place as a result of the course. One student, who acknowledged a lot of resistance at the beginning, stated that “ultimately, I am probably a stronger student for having worked through the thought process…but I did find it challenging.”

Discussion/Conclusions:

The course’s PBL format was successful in providing students an opportunity to deepen their critical thinking abilities, especially as applied to non-curative situations, helped the students to develop confidence in their ability to make clinical decisions, and learn the importance of communication as part of the process of pain and palliative care. Each of these outcomes is a benefit to pharmacists in general, and in particular to those who work in pain and palliative care.

The course’s PBL format required students to develop their critical thinking abilities and be inquisitive to build upon their pre-existing clinical skills. Their ability to gather and assess subjective and objective data was cultivated. Reinforcement of key concepts such as opioid calculations through
repetition over the semester developed confidence in clinical decision making. Students reported in their self reflections that the class discussions were beneficial in developing their assessment and plan rationale through justifying their case based reasoning process to their group members and classmates. Class discussions also increased individual awareness of the multiple potential clinical solutions to each of the patient cases.

Listening to others within their groups elicited valuable input that often changed their initial individual assessment and plan and resembled collaboration that occurs when working within an interprofessional team. Use of SOAP notes for the individual cases required students to justify their reasoning process in writing and provided the opportunity for each student to receive detailed feedback from an instructor with clinical expertise and experience in pain and palliative care pharmacotherapy to determine if their assessment and plan was reasonable as well as fix incorrect assumptions. The goal for developing students' critical thinking and communication skills is to increase their confidence solving complex patient care problems in future clinical practice.

Additionally, PBL assisted with integration of clinical and basic science knowledge from other didactic courses. Student comments after the course showed that students recognized that the clinical reasoning processes they struggled with in the course were important in their future clinical practice. Emphasizing the importance of the clinical reasoning process and self-directed learning skills early in the second and third professional years builds a foundation for experiential training later in the curriculum where they are expected to be more independent and possess the motivation to self-direct their learning. Increased use of active learning in the classroom may help bridge the transition between classroom learning and experiential education especially with its increasing curricular role since introductory pharmacy practice experiences were initiated in the 2007 standards.

The modified case based method was perceived as a more beneficial for second and third year students taking the elective because less experienced learners may respond better to a more structured format that traditional PBL. This method focuses learners on the most significant clinical features of the case and provides a more structured approach to clinical problem solving. Despite the increased structure of this course compared to traditional PBL, students reported feeling "out of their comfort zone"
on the self-reflections. They would have preferred to have content presented in a more structured format prior to working on their patient case assessments and plans.

Despite the benefits of the design of this course, students still reported, in their self-reflections, resistance to inquiry and constructivist teaching methods. These challenges are similar to those reported by Wenning.21 Students may initially oppose these teaching methods if they perceive them as a threat to high grades, especially if they were previously successful with lecture-based teaching. They may become distressed over not “knowing the right answer” because they have to arrive at it on their own. Transitioning from the role of passive to active learners requires students to have communication skills, assume responsibility for their learning, and depend on other group members to successfully solve patient problems.24 Because students were not familiar with PBL elsewhere in the curriculum this may have resulted in decreased enrollment from 26 students to 2 students for the Fall 2011 course. The decline may have resulted from previous pain and palliative care elective students’ feedback to their peers when selecting electives or increased course options. While anecdotal reports from previous elective students noted that the case-based format better prepared them for APPE, it is unclear if more students will recognize the value of self-directed learned or if pressure will develop to modify the course to conform to the more traditional lecture format the students are comfortable with.

Participation in a PBL pain and palliative care elective course improved students’ knowledge of pain and symptom management pharmacotherapy, clinical reasoning process, and self-directed learning skills. Four additional themes were noted by students in their self-reflections including patient/family goals of care, individualization of patient care and contrast to curative treatment, improved comfort with “grey therapeutic areas”, and advantages and disadvantages of problem-based learning. Additional studies are needed to assess the long term impact of the skills developed in this course on students’ future clinical interactions with pain and palliative care patients and caregivers.
References:


