Original Article

Evaluation of a Web-Based Palliative Care Pain Management Module for Housestaff

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Abstract

The objectives of this study were to determine internal medicine residents’ knowledge of outpatient palliative care pain management, describe the association of level of training with knowledge, and evaluate the impact on knowledge of a web-based, interactive, evidence-based educational module. We developed the module using established educational principles, based on review of other educational materials, guidelines, and the medical literature. The module included pretest and post-test questions, case studies, didactic sections, and web links. Six hundred twelve housestaff in 35 training programs in 19 states completed the module during the 2005–2006 academic year (196 [32.0%] postgraduate year [PGY]-1, 200 [32.7%] PGY-2, and 216 [35.3%] PGY-3). The mean pretest score was 54.4% (range 31.1%–84.6%); scores were lowest for specific pain management knowledge questions, including appropriate titration of breakthrough opioid doses (mean 31.1% correct) and appropriate initial use of opioids (40.7% correct). Pretest scores were not significantly different by level of training (52.2% for PGY-1 and 56.7% for PGY-3). The mean post-test score was 72.8%, a statistically significant increase from the pretest overall (P < 0.001) and for seven of the 10 learning objectives (P < 0.001).

These findings indicate that housestaff lacked knowledge in many areas of palliative care pain management, and knowledge did not increase with time spent in residency. The large increase in test scores after the module suggests that this may be an effective component of a comprehensive palliative care curriculum.

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Individuals interested in accessing the study curriculum can do so free of charge by logging onto http://www.hopkinsilc.org, clicking on “first-time user,” selecting “Internal Medicine Curriculum,” and then selecting “Demonstration Group” as their user group. Content from the module shown here is copyrighted 2002–2007, Johns Hopkins Department of Medicine.

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**Key Words**

Opioids, web-based education, palliative care, pain

**Introduction**

The treatment of pain varies widely in patients with serious illnesses such as cancer, and undertreatment is common, particularly in vulnerable populations such as the elderly. However, quality improvement studies targeting processes of pain management have had mixed results. Systems interventions, such as increasing screening by requiring pain as a fifth vital sign, developing standardized order sets, and establishing pain and palliative care consultation teams, can improve pain management processes. However, physician knowledge and attitudes are a critical foundation for appropriate assessment, treatment, and follow up, and previous studies have found that pain knowledge is suboptimal. Clinical guidelines based on a substantial body of evidence are widely available, but practitioner knowledge deficits and attitudes can limit the translation of evidence to practice.

Active learning opportunities for clinical providers are critical to improving knowledge and attitudes. However, few studies have evaluated how to change clinician knowledge and attitudes about pain. Web-based curricula are a promising new method to improving education in this area, particularly because educational interventions that are interactive and use mixed methods are more effective than standard didactic formats. Web-based curricula can provide high-quality, up-to-date education, and increase the consistency of knowledge across settings. The interactive nature of web-based education, including feedback and links to available resources, makes it particularly attractive for complex topics where practical examples are necessary.

We therefore developed and implemented an online hypertext module for internal medicine housestaff based on evidence for outpatient palliative care pain management. We evaluated the performance of the module across multiple centers to address the following objectives: (1) determine housestaff knowledge of pain treatment recommendations; (2) evaluate whether housestaff knowledge of pain management increased with level of training; and (3) test whether the module improved knowledge about pain management.

**Methods**

**Module Development and Implementation**

Based on experience with previous web-based education modules for internal medicine housestaff, including one on nonpain symptoms in palliative care, we developed a palliative care pain module for housestaff for the outpatient setting. Based on a needs assessment of learners, the overall curriculum was designed around cases and was Internet based to enable flexibility for learners’ time, educational needs, and locations. The curriculum also used hypertext to easily link to sources of evidence that learners were familiar with, particularly PubMed. We organized the module into key domains and elements based on the National Comprehensive Cancer Network cancer pain guidelines, relevant systematic reviews and supplemental literature searches, other pain curricula and resources, a review of barriers to effective pain management, and consultation with experts. We applied clinical judgment and educational experience to create a parsimonious, high-priority list. The domains included: (1) importance of pain management; (2) screening and assessment in both competent and cognitively impaired populations; (3) patient and professional attitudinal barriers to adequate pain management; (4) principles for treating mild, moderate, and severe pain; (5) use of adjuvants and treatment of neuropathic pain; and (6) use of opioids, including breakthrough and continuous dosing, equianalgesic conversion, and management of adverse effects. We developed learning objectives for 10 key elements based on these domains.

We developed the module using a standard approach to curriculum development. The module included both a pretest and post-test,
with questions for each of the 10 learning objectives. The main portion of the module was a series of cases for each domain, each with a set of multiple-choice questions. A didactic section, based on the evidence and guidelines and with web links to references and other resources, followed each case (an example of one domain is shown in Fig. 1 and a screenshot of the module is shown in Fig. 2). We modeled cases and questions on existing resources and used principles of good test question development, including avoidance of “double-barreled” questions and other wording pitfalls. Respondents were also asked to evaluate the module by rating Likert scales on the likelihood the module would alter the way in which they care for patients (from 1 = will not alter to 5 = will significantly alter).

The didactic module was distributed online during the 2005–2006 academic year through the Johns Hopkins ambulatory learning Internet-based Learning Curriculum web site (www.hopkinsilc.org). Residency program directors typically selected modules from the entire curriculum for their residents to complete; this module was mandatory in this year for some groups of residents. The Johns Hopkins University Bloomberg School of Public Health Committee on Human Subjects Research granted exemption to this project as no identifiers were included in the module results.

**Results**

Thirty-five internal medicine residency training programs in 19 states, including academic medical center and community hospital programs, used the module during the 2005–2006 academic year. Six hundred twelve housestaff in 35 training programs in 19 states completed the module during the 2005–2006 academic year: 196 (32.0%) postgraduate year (PGY)-1, 200 (32.7%) PGY-2, and 216 (35.3%) PGY-3. The mean score on the pretest was 54.4% (range among the 10 domains/key elements 31.1%–84.6%); pretest scores were lowest for specific pain management knowledge questions, including the appropriate titration of breakthrough opioid doses (mean 31.1% correct), the use of nonsteroidal anti-inflammatory agents as potential adjuvant agents (36.9% correct), and appropriate initial use of opioids (40.7% correct) (Figs. 3 and 4).

Overall, pretest scores tended to increase slightly with the level of training, although this was not statistically significant: the overall proportion answering correctly was 52.2% for PGY-1, 54.0% for PGY-2, and 56.7% for PGY-3 (P = 0.36). Scores for PGY-3 were statistically significantly greater than for PGY-1 for only one of the objectives: dosing and conversion (Fig. 3). The mean score on the post-test was 72.8% (range among objectives 42.6%–91.2%), and there was a significant increase in the proportion answering correctly from the pretest to the post-test overall (P < 0.001) and for seven of the 10 learning objectives (P < 0.001) (Fig. 4). This increase was similar (P < 0.001) across all PGY groups (post-test scores were 74.6% for PGY-1, 71.7% for PGY-2, and 72% for PGY-3). The mean respondent rating on how much the module would alter the way he or she cared for patients was 3.9 on a scale from 1 (will not alter) to 5 (will significantly alter), with similar ratings across levels of training.

**Discussion**

In this evaluation of a web-based palliative care pain educational intervention for housestaff, we found that pretest knowledge of pain management was low across many domains and key elements, particularly in more complex areas of pain treatment. Mean scores
were only 4.4% higher overall for PGY-3 than PGY-1 housestaff, suggesting that little palliative care pain education occurred during training. The web-based module increased scores by a much greater percentage (18.4%) than the difference between PGY-1 and PGY-3 housestaff, with statistically significant increases for seven of 10 of the learning objectives, supporting its effectiveness for improving knowledge.

3. Barriers to pain management

Mrs. L. is a 92-year-old woman with severe back pain due to a compression fracture from osteoporosis. She refuses to take any pain medications stronger than acetaminophen. Of the options below, the most appropriate way to address her reluctance to take pain medications would be:

a. Give her daughter suggestions on how to get her to take her pain medications.
b. Give her a placebo to see if it helps.
c. Ask if she has any fears of becoming addicted.
d. Give her “Roxanol” and don’t tell her that it’s really morphine.

(Correct answer: c)

Pop-up answers:

a. Incorrect. First, the patient should be evaluated for her reasons for refusing to take pain medications.
b. Incorrect. Placebos are not ethical in the treatment of pain. First, the patient should be evaluated for her reasons for refusing to take pain medications.
c. Correct! This is the most common barrier to taking pain medications.
d. Incorrect. Deceiving patients is not ethical in the treatment of pain. First, the patient should be evaluated for her reasons for refusing to take pain medications.

After adequate assessment for pain, there are still several potential barriers to appropriate pain management. These pitfalls include physician reluctance to prescribe pain medicines (particularly opioids), as well as nursing and caregiver reluctance to give pain medicines. Another common barrier to pain management is patient reluctance to take medicine for pain. The table below outlines some of these common barriers and potential solutions to each. Because several studies have shown that the fear of addiction is the most common concern regarding pain management in cancer and hospice settings (Pargeon and Hailey, 1999, Journal of Pain and Symptom Management, http://www.ncbi.nlm.nih.gov/pubmed/10584660), educating patients and caregivers on this topic is very important. A number of educational tools for patients are available. See, for example, the National Cancer Institute’s “Important Facts About Cancer Pain Treatment”; available at http://www.cancer.gov/cancertopics/paincontrol, and the American Cancer Society’s “Pain Control: A Guide for People with Cancer and Their Families,” at https://www.cancer.org/docroot/MIT/content/MIT_7_2x_Pain_Control_A_Guide_for_People_with_Cancer_and_Their_Families.asp.

Researchers have found significant variability of opinions and attitudes, so an open-ended approach to inquiring about the reasons behind reluctance to take pain medications is essential. Questioning patients (and family members) about potential barriers and good patient education have been demonstrated to improve pain management.

<table>
<thead>
<tr>
<th>Common barriers to pain management related to patient and family beliefs and attitudes</th>
<th>Potential solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of becoming addicted</td>
<td>Explain difference between tolerance and addiction; palliative intent of opioids</td>
</tr>
<tr>
<td>Fear that if they use pain medicine now, it won’t be available later in their disease</td>
<td>Educate that there are not upper limits on opioids and that if they lose their efficacy, doses can be increased</td>
</tr>
<tr>
<td>Fear of adverse effects</td>
<td>Educate about tolerance to adverse effects such as sedation, management of constipation, and availability of alternate opioids</td>
</tr>
<tr>
<td>Fear that taking pain medications means their illness is getting worse</td>
<td>Address fears about progressive illness, as appropriate</td>
</tr>
<tr>
<td>Don’t like taking medications</td>
<td>Discuss how untreated pain can adversely affect their functioning, and discuss pain management in terms of functional goals</td>
</tr>
<tr>
<td>Feel that pain is retribution by God for their sins, and therefore must be suffered social worker</td>
<td>Address spiritual concerns. Consider involving a chaplain, pastoral services, or a social worker.</td>
</tr>
<tr>
<td>Fear of distracting from the care or cure of underlying disease</td>
<td>Discuss how the management of pain is part of the treatment plan and will not interfere with other treatment modalities</td>
</tr>
</tbody>
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Fig. 1. Example domain: case, question and answer, and didactic section.
Objective 7: Palliative Care in the Outpatient Setting: Pain Management 2007-08

Summary Answer

The correct answer is A. Try a different opioid starting at a lower dose, such as oxycodone 2.5 mg po q4h prn.

Adverse effects of opioids are common but can usually be effectively managed. A past history of adverse effects to opioids often contributes to reluctance to take them again.

Key elements in minimizing adverse effects include:

1. Careful history of past opioids and adverse effects. Many patients have had an adverse reaction to one opioid but can tolerate others.

2. Since patients may tolerate one class of opioid but not others, whenever possible, use the same opioid for long-lasting and breakthrough dosing.

3. For elderly patients, those with a history of adverse reactions, and patients afraid of adverse effects, consider starting opioids at a lower dose (2.5-5 mg morphine or equivalent).

4. When continuous dosing is needed, use long-acting opioids; constant blood levels may have fewer adverse consequences than fluctuations due to varying opioid doses.

5. Consider alternative causes. Adverse effects of other medications, disease, and comorbidities may mimic opioid adverse effects and require different management.

6. Educate and support patients and families.

7. Rotating opioids (different drug or route) may help. (24)

8. Significant adverse effects that are not manageable with these steps should lead to consideration of alternative methods of pain control, such as neurolytic blocks and intraspinal pumps.

Management of specific adverse effects is detailed in the table below. A systematic review of management of opioid side effects was written by McNicol et al. in 2003. (25) A review of the literature on cognitive effects of opioids was written by Ersek et al. in 2004. (26)

<table>
<thead>
<tr>
<th>Adverse effect</th>
<th>Tolerance</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constipation</td>
<td>No</td>
<td>Stimulant (senna) plus stool softener (colace) usually used prophylactically</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>Often</td>
<td>- Consider giving a prescription for an antiemetic (eg, prochlorperazine 5mg q6h pm) with new opioid prescriptions in case nausea develops</td>
</tr>
<tr>
<td>Sedation</td>
<td>Develops rapidly</td>
<td>- Patients often have a sleep deficit due to previously uncontrolled pain and poor sleep. If this has occurred, identify this &quot;catch-up&quot; sleep by determining if patient had inadequate sleep prior to starting medication. Patients with sleep deficits should also awaken easily</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- In some patients, particularly with more advanced disease, need to achieve balance between sedation and pain control based on patient's preferences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Stimulants helpful in some cases (e.g., Ritalin 5-10mg in the am and at noon)</td>
</tr>
<tr>
<td>Delirium</td>
<td>No</td>
<td>- Often patients will be able to tolerate a different opioid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- If delirium is not directly related to administration of a new opioid, other or multiple causes related to advanced illness may be the cause</td>
</tr>
<tr>
<td>Respiratory depression</td>
<td>No</td>
<td>- Doesn't occur if opioids are used judiciously. If this is a potential concern, start at a lower dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sedation will occur before respiratory depression</td>
</tr>
<tr>
<td>Urinary retention, itching, rashes</td>
<td>Can often be managed by switching to another opioid</td>
<td></td>
</tr>
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</table>
Although well-established cancer pain guidelines from organizations such as the Agency for Health Care Policy and Research and World Health Organization have been available for more than a decade, interventions to implement them into practice have been limited.23 One other small study also found, as in this study, that housestaff did not follow cancer pain guidelines, and cancer pain management competency was not significantly different between junior and senior residents.24 A qualitative study of how housestaff learn palliative care found that little was learned from formal education, and informal sources, such as precepting, varied in their effectiveness.25 The lack of increase in pain management competency with residency training in this study suggests that little formal or informal pain management content is currently provided to internal medicine housestaff, and that more curriculum content and experiential training are needed.

Two systematic reviews of educational interventions to improve knowledge about pain treatment found that little was learned from formal education, and informal sources, such as precepting, varied in their effectiveness.25 The lack of increase in pain management competency with residency training in this study suggests that little formal or informal pain management content is currently provided to internal medicine housestaff, and that more curriculum content and experiential training are needed.

Fig. 3. Pretest scores, by year of training (*n = 612).

Fig. 4. Pretest vs. post-test score, by learning objective (*n = 612).
control\textsuperscript{12} and palliative care in primary care\textsuperscript{13} identified several studies of effective pain education programs for nurses or physicians. The educational studies in these reviews relating to pain control and primary care used a variety of approaches, including didactics, case discussion, distribution of guidelines, mentorship, and clinical experience; one palliative care course was Internet-based. Although most studies evaluating improvement in palliative care or cancer pain knowledge and attitudes have demonstrated effectiveness, effects on pain assessment and opioid prescribing were mixed in the two studies evaluating these outcomes. Of two studies evaluating patients' pain scores as an outcome, neither showed an improvement with the intervention.

These reviews identified two studies of interventions for housestaff. One small study of housestaff on an oncology rotation, including 30-minute lectures, showed a similar educational impact to this study (increase in knowledge from 58\% to 83\%), although learning may have been due to the clinical experiences in addition to the lectures.\textsuperscript{1} Another study evaluating two one-hour pain seminars as part of a 10-lecture palliative care curriculum resulted in changes in housestaff prescribing practices, although the outcomes tested were limited to how much meperidine was used, whether concomitant bowel regimens were prescribed, and how often nonsteroidal anti-inflammatory agents were used.\textsuperscript{26} Our results are also similar to the impact of other web-based modules on internal medicine topics, suggesting that basic education about pain management can be standardized similar to such topics as hypertension.\textsuperscript{15} However, like all clinical learning, comprehensive housestaff education and skill development and appropriate pain management are also dependent on a number of other tools, such as precepting in patient care, standardized order sets, pain and palliative care consultation, and pharmacy review.

Our study has several limitations, including the retrospective, observational study design. The limited number of questions may increase participation but prevents a comprehensive assessment of each domain. In addition, the lack of question rotation between the pretest and post-test limits the evidence on effectiveness of the educational intervention. Some areas of pain management lack strong evidence and are more subjective, and approaches to management vary widely.\textsuperscript{1} Some areas, such as attitudes and skills, are more difficult to test, and we were unable to cover others in sufficient detail. Integration of this type of module with in-person education with real-life situations is clearly important. Scores did decrease for two objectives, suggesting differences in the difficulty level or needed clarification of the didactic portion or post-test question. Finally, we did not assess whether there were actual changes in the way that the housestaff treated pain.

In conclusion, we found that housestaff lacked knowledge about treatment of pain in many areas, and that knowledge increased only slightly with level of training. Scores increased by a much greater amount with a web-based educational module, providing preliminary support for its effectiveness. Guideline-based, interactive, online pain education might be an effective way to improve translation of evidence into housestaff practice. This intervention is time-efficient, both for teaching and for the housestaff, and is easy to update. The module addresses a variety of content and knowledge and attitudes, and provides standardized education, easy access to supporting evidence, and feedback to the educators. With further development and testing, this type of intervention could be used, together with other educational methods, to widely, efficiently, and systematically educate about pain management.

References


