CONSENSUS-BASED RECOMMENDATIONS FOR AN EMERGENCY MEDICINE PAIN MANAGEMENT CURRICULUM

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Abstract—Background: Increased prescribing of opioid pain medications has paralleled the subsequent rise of prescription medication–related overdoses and deaths. We sought to define key aspects of a pain management curriculum for emergency medicine (EM) residents that achieve the balance between adequate pain control, limiting side effects, and not contributing to the current public health opioid crisis. Methods: We convened a symposium to discuss pain management education in EM and define the needs and objectives of an EM-specific pain management curriculum. Multiple pertinent topics were identified a priori and presented before consensus work. Subgroups then sought to define perceived gaps and needs, to set a future direction for development of a focused curriculum, and to prioritize the research needed to evaluate and measure the impact of a new curriculum. Results: The group determined that an EM pain management curriculum should include education on both opioid and nonopioid analgesics as well as nonpharmacologic pain strategies. A broad survey is needed to better define current knowledge gaps and needs. To optimize the impact of any curriculum, a modular, multimodal, and primarily case-based approach linked to achieving milestones is best. Subsequent research should focus on the impact of curricular reform on learner knowledge and patient outcomes, not just prescribing changes. Conclusions: This consensus group offers a path forward to enhance the evidence, knowledge, and practice transformation needed to improve emergency analgesia.

Keywords—curriculum; emergency medicine residency; pain

INTRODUCTION

Starting with The Joint Commission’s emphasis on the importance of treating pain and recommended implementation of a pain score as the fifth vital sign, prescribers increased their use of opioids for managing patients’ pain (1–5). We now recognize that the national increase in prescription opioid use between 1990 and 2012 came with a price: many patients developed opioid use disorders (e.g., addiction), opioid
side effects, heightened rather than improved pain (i.e., hyperalgesia), and death from overdose. Opioid use, abuse, addiction, overdose, and death are at epidemic levels in the United States, and exposure to prescribed opioids are an important part of the problem (1). Overdose admissions for substance abuse treatment—both illicit and prescribed—increased in parallel with the above changes (1,6). U.S. emergency departments (EDs) have >130 million visits each year, and a majority of these are pain-related visits (7,8). As such, EDs represent important venues in which to address optimal analgesic practice and the safe use of opioids.

The balance between safe and effective opioid use is challenging. Years of research highlighted that emergency clinicians often undertreat pain (“oligoanalgesia”) and treat patients disparately despite similar conditions (5,9–12). In contradistinction to the oligoanalgesia era, we now have high enthusiasm for opioid dampening, such as having regulatory limits on prescribing (including in the ED), developing opioid-free EDs, and creating pathways to alter opioid use. However, we again run the risk of responding before understanding the consequences. Emergency physicians (EPs) provide about 5% of the total opioid prescriptions in the U.S., but often use short-acting opioids in limited quantities (13,14). We know that those filling an ED opioid prescription after discharge are more likely to have another exposure in the next year, but we do not know who suffers harm disproportionate to benefit from this practice (15). Despite limited evidence of ED-triggered opioid prescribing harm, the sheer volume of interaction, the lack of a longitudinal provider–patient relationship, and the around the clock availability of ED care, governmental and professional groups seek to provide guidance for the treatment of pain in ED patients (16,17).

Many call for opioid stewardship to enhance individual and public health. The optimal approach to achieving this goal is not clear, but education is consistently presented as a practical means to incrementally improve analgesic practice and opioid safety. Current and future generations of EPs need expertise in pain control, with an emphasis on therapeutic safety and efficacy, to simultaneously address pain while minimizing the potential for adverse outcomes. We gathered a panel of experts to lead development of a framework to achieve these objectives.

**METHODS**

We convened a full-day session at the Society for Academic Emergency Medicine Annual Meeting, held in Dallas, Texas in May 2014. Speakers were experts in emergency care, pain medicine, medical toxicology, medical education, and public health. They had both speaking and practical experience with pain treatment and education, and many had also written publications on the subject. The first part of the session included seven brief didactic sessions as shown below:

1. Teaching the fundamentals of analgesia
2. Review of existing pain curricula
3. Understanding the adverse effects of analgesics
4. Balancing over- and under-use of opioids in the ED
5. Using milestones to assess curricular success
6. Using simulation to teach pain management principles
7. Using open access methodologies and technologies to reinforce and disseminate a pain management curriculum

The second part of the session included two detailed breakout sessions involving all conference participants. The entire program was open to any interested participants, and we encouraged active participation in the breakout sessions. Session attendees apart from the authors are listed in the Acknowledgements. For the final document, all sessions were video recorded and transcribed by the first author. For the breakout sessions, we took additional notes to supplement the transcription. All authors reviewed the transcription and made edits and additional suggestions. The edited transcription from the seven didactic sessions was then reorganized into a new curriculum-focused framework, which is presented in this article.

**RESULTS**

**Emergency Medicine Pain Management Curriculum Needs Assessment**

Before embarking on the creation of a new curriculum, it is worthwhile to determine the current state of pain education. The 2011 survey of 117 medical schools in North America found that about 80% of schools required ≥1 pain session; the median total number of pain sessions taught was 7, accounting for 11 total hours, and only 4 U.S. schools had a required course in pain management (18). The authors concluded that “There are inarguable links between the undertreatment and the maltreatment of pain and the lackluster state of pain education in medicine. It is likely that unless opinion leaders and the next generation of physicians become aware both of the importance of conscientious pain management and the dangerous deficits in pain education, the crisis in pain care and resultant deaths from opioid abuse will only spiral upwards.”

Obstacles to augmenting pain curricula in medical schools include the disconnect between classroom pharmacologic principles and clinically applicable skills, intrinsic barriers to curriculum reform, and a lack of time (19).
Comprehensive education in residency training is challenging for both medical educators and learners (20,21). Educators may lack formal teaching skill training, and competing clinical demands may result in disinterest or attitudinal barriers about the treatment of pain. Resident learners can be limited by inexperience, difficulty identifying their own knowledge gaps, and a lack of credible and consistent mentorship, such as professional modeling, in addressing challenging pain-related encounters. Barriers specific to emergency medicine (EM) include the variety of types and sources of pain, brief time spent with the patient, competing priorities (e.g., patient satisfaction, duration of stay, and billing requirements), and the need to care for diverse patient populations (e.g., elderly, children, chronic pain patients, and patients with substance use disorders).

The 2013 Model of the Clinical Practice of Emergency Medicine identifies the core content that residents should learn during their training (22). Pain is emphasized in the first section of the document “Signs, Symptoms and Presentations,” and is divided into location of pain (e.g., chest, eye, and abdominal) but does not specify further recommendations. The only other section related to pain management emphasizes local anesthesia, regional nerve blocks, and procedural sedation/analgesia. The European Curriculum for Emergency Medicine is more comprehensive regarding pain and includes the following factors that residents should learn: 1) pain transmission (i.e., anatomy, physiology, and pharmacology); 2) pain assessment; 3) pharmacology of sedative and pain-relieving drugs; and 4) psychological and social aspects of pain in pediatric, adult, and elderly patients (23). The International Association for the Study of Pain has a comprehensive pain curriculum with the following areas of emphasis: 1) the multidimensional nature of pain; 2) pain assessment and measurement; 3) management of pain; and 4) specific clinical conditions (24). None of these three model curricula specifies how the topics should be covered or the modalities for instruction.

Future solutions should acknowledge the deficit in pain education, define and prioritize teaching about the clinical principles of pain management, and provide residents with a clear message that it is their responsibility to successfully incorporate sound pain management techniques into their practice.

**EM Pain Management Curriculum Content**

Analgesia curricula need to address both the beneficial effects and the safety concerns of the various treatment options. Understanding the primary adverse effects of all analgesics is key, with attention on opioid analgesics (i.e., respiratory depression and sedation). Risk factors for respiratory consequences (the most serious opioid side effect), such as sleep apnea and the use of other sedatives, must be taught. The role of tolerance that occurs with long-term use should be clarified, with emphasis on how this interacts with effects and complications. The concerns of opioid addiction, even with short-term use of opioid analgesics provided in the ED, are also a key area for teaching (15). Although current knowledge suggests this only occurs in a small percentage of patients, given the extent to which opioids are prescribed, the absolute number of potential victims of iatrogenic addiction is not trivial even if less than other settings where opioids are used. The limitations of screening for addiction risk factors is another key teaching area (25).

The risks of nonprescription pain relievers are similarly important. Nonsteroidal anti-inflammatory drugs (NSAIDs) may cause gastrointestinal irritation and bleeding, renal disease, and cardiac ischemia, though usually when used in high-dose, long-term patterns in at-risk populations (e.g., the elderly). Acetaminophen is easily taken in supratherapeutic doses and can lead to hepatotoxicity.

Trainees should understand the decision-making that accompanies analgesic selection and the need to include a patient-centered discussion of both the benefits and risks of therapy. More education in nonopioid analgesics, including training in multimodal pain management therapies, should be a key part of every curriculum. An implicit, if not explicit, risk/benefit analysis should be performed to contextualize whether a medication should be used in a particular patient. Discussion of the basic steps toward improving safety, including avoiding use in vulnerable populations for each class of medications, limiting the dose and duration of therapy, considering nonpharmaceutical alternatives, and rationalizing expectations for pain relief (of the provider, the patient, and the patient’s family) should be included.

Recognizing the need for improved pain teaching in medical schools, a group of pain physicians created recommendations for a new curriculum using consensus methodology (26). The group created a list of topics that should be covered in medical school (Table 1). In addition, Motov and Marshall described a curriculum specifically for EM residency programs (27). The program is divided into a 4-week block that is taught during the regular weekly EM didactic sessions held at most residencies. Week 1 includes small group discussion sessions on pain-oriented clinical case vignettes. Week 2 is divided by postgraduate year (PGY), and includes PGY-1: evaluating the usefulness of pain scales, PGY-2: interactive session of NSAIDs in the ED, and PGY-3: evidence-based discussion on parenteral opioids. Week 3 is a journal club session where residents discuss
administering opioids to patients with acute abdominal pain. Week 4 is a session on aberrant drug-related behavior with a patient-oriented simulation model. The curriculum is repeated twice during a three-year residency, and numerous online resources are made freely available (28).

EM Pain Management Curriculum Implementation

The ideal pain curriculum should be modular so that it is not rushed yet can be completed efficiently. Modularity also allows the flexibility to integrate into the various residency curricula that already exist and can be tailored to specific situations, such as instructing some of the content when a grand rounds speaker is visiting and presenting complementary information or when a morbidity and mortality conference discusses a pain-related case. The ideal pain curriculum should also be applicable to different learning settings (i.e., classroom, bedside, and online/asynchronous) and delivered via different learning mediums (i.e., written, case-based, simulation, didactic, and podcast). We highlight the use of simulation as an example medium. In addition, we also make practical recommendations for more rapid dissemination of pain curricula via technology-based solutions, both existing (given that part of the problem lies in the lack of pain management education altogether) and new (as new pain management-related research continues to inform best practice guidelines).

Using simulation to teach pain management principles. Simulation is increasingly used within graduate EM education as a tool to fill experience gaps, challenge learners at the edge of their comfort zone, or recreate critical events. They are able to do so both “on demand” and with the ability to provide time for discussion and reflection that is often lacking during bedside teaching in busy EDs. Simulation-based educational programs allow facilitators to focus on the teaching opportunity without the pressure of providing clinical care or prolonging patient discomfort for those in pain. In addition, simulation allows for consistency across learners, which is particularly important when defined objectives need to be evaluated, such as when using milestones. Many of the milestones listed in the previous section are well-suited for evaluation in a simulation environment.

When designing a simulation-based program as part of a larger pain curriculum, it is best to begin with a needs assessment. Consider including key stakeholders beyond resident physicians for settings with a strong emphasis on team-based care (e.g., a nurse and an advanced practice provider, among others), and be open to incorporating what is of interest to each profession. Consider content resources outside of existing curricula, such as safety intelligence reports or risk data to highlight relevance and specialists in pain medicine or addiction medicine to provide additional expertise. Most commonly, residents during their training engage in a simulation of an opioid overdose; however, additional scenarios can be developed once learning objectives are defined. Scenarios with an emphasis on difficult conversations in pain management (i.e., using standardized patients to discuss the risks and benefits of opioids or address aberrant drug-related behaviors) are not only relevant but benefit from continued practice. Complications of regional anesthesia, such as systemic toxicity from nerve blocks, can also be recreated without technical difficulty (e.g., using task trainers). Screen-based/virtual patients for asynchronous learning could be used with case studies. None of these tools needs to be used in isolation, and in fact hybrid approaches can enhance the overall fidelity of a scenario.

The recent medical education literature includes several innovative approaches to pain management education using simulation. In one study, medical students were paged several times over the course of a day without advanced warning to respond to a simulated patient—initially to set up a patient-controlled analgesia

Table 1. Recommendations for a New Curriculum in Pain Medicine

| 1. Compassionate care and empathy |
| 2. Examination and interview skills |
| 3. Communication skills including team communication |
| 4. Epidemiology, public health implications, and multicultural perspectives of pain |
| 5. Fundamentals of pain neurobiology |
| 6. Pain terminology and pain assessment |
| 7. Behavioral perspectives on pain |
| 8. Counseling pain patients: approach to the patient with pain |
| 9. Clinical reasoning: assessment decisions and treatment decisions |
| 10. Overall risk benefit assessment of pain treatment |
| 11. Fundamentals of nonpharmacologic treatments |
| 12. Prescribing skills |
| 13. Cyclo-oxygenase inhibitors/nonsteroidal anti-inflammatory drugs |
| 14. Neuromodulating agents |
| 15. Opioids |
| 16. Musculoskeletal/spine pain |
| 17. Pain crises (e.g., sickle cell crisis) |
| 18. Acute and surgical pain |
| 19. Headache and other recurrent pain syndromes |
| 20. Neuropathic pain |
| 21. Visceral/abdominal pain |
| 22. Oncologic pain |
| 23. Pain in palliative care patients |
| 24. Pain in older adults |
| 25. Pain in children |
| 26. Pain in patients with substance abuse disorders |
| 27. Pain in cognitively impaired populations |
| 28. Pain and comorbid illness |

* Adapted from Murinson et al. (26).
Using open access methodologies and technologies to reinforce and disseminate a pain management curriculum. Dissemination and implementation of a pain management curriculum for EM residency programs will be challenging. Ultimately, a redesign of the 2013 Model of the Clinical Practice of Emergency Medicine content on pain management is needed in order to address many of the currently lacking critical content areas. Short of this, developing a parallel curriculum using the burgeoning Free Open Access Medical Education (FOAMed) format offers an attractive alternative. This new but well-established movement in medicine is being led by a national and international EM educator community. Using social media resources, such as Twitter and Simplur, web-based educational content is highlighted and interwoven with links to “offline” education, including podcasts and journals. The goal is to more rapidly disseminate new information and decrease the time to adoption of ideas from new studies and practice changing innovations. The new curriculum would fit well into a new practice paradigm seeking rapid adoption.

Specifically, this could be hosted on an EM website with a general outline of a pain curriculum and with links to several slide sets, podcasts, simulation cases, or live lectures on this topic (including some of the specific content lectures from this conference). The site could provide links to these resources and to information on other well-known FOAMed websites, such as Academic Life in Emergency Medicine (www.aliem.com) and Life in the Fast Lane (www.lifethefastlane.com), and use Twitter to inform learners when new content is added. In addition, this methodology could share complex pain management cases and crowdsource discussions about possible solutions by posting them on this site. Most importantly, this will allow for the dynamic evolution of material as subsequent curricula are created and shared using a “living” document. The goal is the development of an open access, peer-reviewed forum for an updated pain management curriculum for EM and any other training program or faculty group that may want to use it.

EM Pain Management Curriculum Assessment

It is important to assess the integration and impact of any educational intervention. Organizations should recognize the need to demonstrate competency and use the educational intervention as an opportunity to express institutional values and subsequently evaluate the impact on patient outcomes (31). Quality improvement approaches may be ideal to test the deliverables of the intervention by identifying specific process measures that can be linked to desired outcomes (18). These measures may take the form of patient-related outcomes (e.g., pain scores, surveys, or adverse events) or metrics at the institution or community level, and should be followed longitudinally (32–34).

For assessment to reflect curricular success or failure, the content tested should be related to the knowledge, skills, and abilities (KSAs) important to the curriculum (35). Traditional assessment of a curriculum’s goals and objectives has taken the form of completion or not, neglecting the progressive nature of knowledge and skills acquisition (36). In 2013, the Accreditation Council for Graduate Medical Education (ACGME) embarked on a new process of assessment, the Next Accreditation System, which consists of markers or milestones that indicate the progressive acquisition of KSAs (37,38). All specialties have developed milestones for use in the assessment of house staff, which typically use a scaled framework of 1 to 5, representing progressive acquisition of KSAs.

A pain management curriculum can be designed within the milestone framework regardless of specialty, and doing so recognizes the gradual acquisition of KSAs necessary to manage patients and their complex pain issues. The milestones were designed at a fairly general level, with subcompetencies designated for each of the recognized six general competencies. For the specialty of EM, the following subcompetencies can be incorporated into an overall pain management curriculum (parentheses represent the specific subcompetency) (39):

- Pharmacotherapy (PC5)
- Disposition (PC7)
- Anesthesia and acute pain management (PC11)
- Professional values (PROF1)
- Patient-centered communication (ICS1)
- Patient safety (SBP1)
- Technology (SBP3)

The overall curricular goals can be developed with separate objectives based on PGY level. A sample EM
pain management curriculum that incorporates milestones is presented in Table 2.

Developing a curriculum within the milestone framework also creates a vehicle for assessment of curricular success. Written tests of knowledge may suffice for the lower levels of proficiency milestones, representing the “what” in the Miller pyramid analogy (36). As proficiency levels increase, the focus of KSA acquisition is on the “how” or “do.” Assessment for higher proficiency levels shifts to performance appraisal or measuring how well an individual performs a skill or task. Performance appraisal can take many forms, ranging from observations of real interactions, chart reviews, and simulated encounters (discussed in detail in the next section), or a hybrid, such as oral examinations.

**CONSENSUS RECOMMENDATIONS**

Based on the seven didactic sessions above and subsequent group discussions, the consensus group recommended an infrastructure for a residency pain management curriculum. The curriculum-focused framework formed from the didactic sessions—namely curriculum needs assessment, content, implementation, and assessment—can be assembled into a dynamic document. In addition, group discussion participants identified a deficit in both research in pain management generally and in pain management education more specifically.

**Needs and Future Direction for Development of a Residency Pain Management Curriculum**

**Needs assessment.** Pain management education is lacking at both the medical school and residency level. In EM, the formal guidelines on pain management content that should be covered are limited. The consensus group advocated for a redesign, including a significant expansion, of the pain management-related content in the 2013 Model of the Clinical Practice of Emergency Medicine. These could be based on a curriculum that has already been proposed for EM residency programs (27). Short of a redesign of the formal curriculum, residency programs could adopt this “informal” curriculum.

**Curriculum content.** What is the optimal breadth and depth of the curriculum, and should it be focused on the safety of opioids given our current epidemic? The consensus group recommended that a curriculum centered on broader aspects of pain management would best serve trainees. Because only a small portion of most residency curricula focuses on pain management, including a broad set of topics would encompass prescribing safety and efficacy. Sample topics include the different types of pain, multimodal pain therapy, nonpharmacologic adjuncts, communication regarding expected course of pain relief, and safe prescribing practices.

**Curriculum implementation.** Programs’ curricula are based both on traditional organ-based systems and
case/problem-based learning (with many programs moving to the latter), and therefore a modular and largely case-based pain curriculum was proposed as being the most adaptable. A lengthy curriculum addendum would be onerous to insert into an existing curriculum, and would also be more difficult for the learner to process and internalize. Programs could insert different pain management modules containing a mixture of short didactics and cases into either a traditional or problem-based curriculum. These modules could be hosted on an EM pain management website and broadcast via existing FOAMed resources.

Curriculum assessment. A pain management curriculum designed within the framework of milestones could subsequently be targeted to each of the relevant milestone sub-competencies, appropriate for each trainee level (for example, Table 2). Assessment format can differ based upon trainee level, for instance written tests for lower levels of proficiency milestones, and observation or simulation for higher levels of proficiency milestones.

The research needed to evaluate a residency pain management curriculum. Parallel to the need for better clinical analgesic deployment data, better information about the educational processes are needed. While there are a handful of studies regarding pain curriculum in medical education generally, there are currently no sufficient studies exploring knowledge gaps in EM residencies in particular (26,40,41). Data regarding existing gaps should be obtained from stakeholders (i.e., residency program directors and residents), either through traditional means, such as surveys or conference calls, or more novel means, such as crowdsourcing from Twitter or other electronic venues. The format should include a combination of open-ended discussion and targeted questions aimed at determining residency programs’ curriculum format, pain management content, current resources used, methods for resident evaluation, and perceived knowledge gaps in trainees, both from their perspective and from their training directors’ perspectives.

Once a modular curriculum exists, assessing the effectiveness across sites and learners is key. Assessments are more difficult to make in a clinical environment, because appropriate patient encounters may be difficult to capture for formal assessment, and it is likely that many of these rare encounters would need to be captured to comprehensively assess all of the learning objectives set for the trainee. The use of simulation can overcome these barriers and should be studied in this context.

The most challenging area to evaluate after implementation of the new curriculum will be how patients’ pain management changes, both in terms of relief and safety. Patient surveys could directly evaluate patient perceived pain relief. Safety is more difficult to measure directly and to link to specific educational actions. Proxy measures, such as the amount of opioid medications prescribed, could be used, but this repeats many of the current limits in that it is not patient-centered. Measuring the change in variation of care related to pain management factors after implementing the new curriculum is another key feature to evaluate educational impact and quality (42). However, this again leaves relative over- and undertreatment effects underappreciated—because analgesic needs and patient desires may vary even for those with similar conditions—and limits the ability to optimally define quality. Here again, more research on emergency pain management would improve the outcomes assessments leading to more quantifiable impact of a pain management curriculum.

The ideal research-related next steps that are needed to avoid a swinging pendulum between under- and overtreatment of pain with opioids are as follows (43):

- Larger studies of patients in the ED who have acute pain, observing the natural histories (e.g., the development of opioid use disorder), and allowing empiric data to help identify those at risk for harm or misuse
- Tools that allow simple and comprehensive opioid prescription and dispensing patterns, informing research and care as it occurs
- Data-driven educational materials that help identify those with or at risk for addiction, misuse, or other opioid harm, and how to intervene, especially in the acute care setting
- Outcome assessments that define the proper role of all opioid use in relieving pain absent harm—not solely looking to “cut down on opioids”

The results of this research will help further refine and guide creation of an educational curriculum.

CONCLUSIONS

We developed a framework and set of guiding principles to drive a new emphasis on analgesic use and education, seeking to optimize care and thwart any public health concerns. Defined learning objectives should drive development, along with a research plan to assess both learner competency and, eventually, patient outcomes. Subsequent research should focus on the impact of curricular reform on learner knowledge and patient outcomes.
REFERENCES


