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REVIEW

Mitigating the risk of opioid abuse through a balanced undergraduate pain medicine curriculum

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Abstract: Chronic pain is highly prevalent in the United States and Canada, occurring in an estimated 30% of the adult population. Despite its high prevalence, US and Canadian medical schools provide very little training in pain management, including training in the safe and effective use of potent analgesics, most notably opioids. In 2005, the International Association for the Study of Pain published recommendations for a core undergraduate pain management curriculum, and several universities have implemented pilot programs based on this curriculum. However, when outcomes have been formally assessed, these initiatives have resulted in only modest improvements in physician knowledge about chronic pain and its treatment. This article discusses strategies to improve undergraduate pain management curricula and proposes areas in which those efforts can be augmented. Emphasis is placed on opioids, which have great potency as analgesics but also substantial risks in terms of adverse events and the risk of abuse and addiction. The authors conclude that the most important element of an undergraduate pain curriculum is clinical experience under mentors who are capable of reinforcing didactic learning by modeling best practices.

Keywords: chronic pain, curricular content, medical education, opioids, pain education, pain knowledge, physician training, teaching

Introduction

Chronic pain is reported in an estimated 30% of adults (aged ≥18 years) in the United States.[1] The need to treat pain is nearly universal across medical specialties and primary care, and expert consensus guidelines have been developed for its management in many patient populations, including surgical patients,[2] cancer patients,[3] the elderly,[4] patients with pain related to osteoarthritis,[5] chronic low back pain,[6] neuropathic pain,[7] and cardiovascular (eg, anginal) pain.[8] Nonetheless, recent surveys of US and Canadian undergraduate medical school curricula call into question the adequacy of current training in pain management.[9,10]

US medical schools provide surprisingly little undergraduate training in pain management, opioid prescribing, and addiction medicine. Only 30% of US medical schools require instruction in opioid prescribing, and 10% require instruction about abuse and addiction.[9] The mean number of hours devoted to undergraduate education in pain management in US medical schools was 11.1 hours per program (range, 1–31 hours).[9] Similarly, only 32% of Canadian medical schools provide formal pain management content in their undergraduate programs.[10] Canadian veterinary schools devote five-fold more hours (mean 87 hours, range 27–200) to pain management education than do Canadian medical schools (mean 16 hours, range 0–38). Efforts

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to improve medical school curricula are therefore essential, not only to improve the control of pain but to ensure that prescribers in every care setting involving pain management are aware of the adverse events (AEs) and potential for abuse and addiction associated with pain medications.

This article reviews current initiatives intended to improve undergraduate medical school curricula for pain management and proposes additional components for incorporation into medical education. The scope of this review is limited to pain management curricula in North American medical schools, although the authors believe that effective training in pain management is an international priority. Emphasis is placed on the importance of training in the use of opioid analgesics, because these agents are potent pain medications with significant potential for AEs, including abuse and addiction.[6,11,12]

Undergraduate pain curricula: recent efforts

International Association for the Study of Pain curriculum

In 2005, the International Association for the Study of Pain (IASP) published the third edition of its *Core Curriculum for Professional Education in Pain*.[13] Topics include the basics of pain physiology, the assessment of pain, and pharmacologic as well as nonpharmacologic treatments, including cognitive behavioral therapy, physical rehabilitation, and surgery. The curriculum covers management strategies for different types of pain, including acute and chronic pain and several noncancer pain conditions for which there are accepted guidelines (eg, osteoarthritis and back pain). It also addresses pain management in specific populations, including older patients, pediatric patients (infants, children, and adolescents), patients with cognitive impairment that limits their ability to communicate, substance abusers, and individuals living in poverty or political turmoil.

Opioids are addressed in a separate module, with an emphasis placed on opioid pharmacology. Topics include the basics of opioid receptor binding, tolerance and dependence, factors contributing to individual variability of response to specific opioids, pharmacokinetics, metabolism, routes of administration, AEs and toxicities, and addiction. Undergraduate pain management curricula based on the IASP recommendations have been implemented at several medical schools, including the University of Toronto, Toronto, ON, Canada;[14] Virginia Commonwealth University, Richmond, VA, USA;[15] and Johns Hopkins University, Baltimore, MD, USA.[16] The programs at these institutions are discussed as examples of the varied ways in which the IASP curriculum has been implemented for undergraduate students. Our search for innovative curricula in pain management and opioid therapy also identified two undergraduate initiatives[17,18] for which implementation trials have not been published and one program designed for graduate students.[19] These are described in Table 1.

It is valuable to compare undergraduate curricula with the graduate pain curriculum put forth by the Accreditation

Table 1 Core elements of pain curricula that address the management of opioids

Curriculum	Core elements
Columbia University College of Physicians and Surgeons[17]	• General CNCP instruction (2 h) • Case-based discussions with discussion questions, handouts, and links to screening instruments and other course materials online
Hurley Medical Center/Michigan State University[19]	Week 1–2 (5 h) • Knowledge pretest • Pharmacological management plan workshop • Pharmacology of short-acting and long-acting opioids, addiction screening, indications for referral • Legal considerations for prescribing • Urine drug test interpretation • Feedback on written management plan based on case scenario Week 3 (2 h) • Role play group activity • Case discussions Outcome measurements • Knowledge post-test • Observation by mentor during live clinical encounter with immediate feedback
University of Washington School of Medicine[18]	Required courses • Year 1 (3 h): physician/psychologist lecture, interaction with invited pain patients • Year 2 (5 h): principles of pain, case-based pharmacology, opioids/NSAIDs, addiction management • Year 3 (5 h): active participation in pain medicine case consultation • Year 4 (2 h): pain case–based learning, opioid Q&A Elective courses • Years 1–2 (32 h): preceptorship in pain clinic • Year 3: pain case–based presentation/ treatment planning • Year 4 (144 h): anesthesia pain medicine (hospital based), acute/interventional pain treatment • Year 4 (1 h): inpatient ordering of opioids (capstone session)

Abbreviations: CNCP, chronic noncancer pain; NSAID, nonsteroidal anti-inflammatory drug; Q&A, question and answer.

Council for Graduate Medical Education (ACGME), which is intended to provide a specialist level of training in pain management. The ACGME pain curriculum has core elements in common with the IASP undergraduate curriculum, such as understanding the anatomic, pathophysiologic, and psychological bases of pain and pain relief; clinical pharmacology; assessment of pain; and management of the risks of analgesic abuse and addiction. However, the ACGME curriculum differs from the IASP curriculum in its emphasis on the need for clinical experience and putting didactic knowledge into practice. The ACGME curriculum addresses this goal through mentored clinical experiences that reinforce didactic learning and provide progressive responsibility, conditional independence, and a supervisory role in patient care based on patient needs and the skills of the specialist in training.[20]

What is taught in the classroom on pain management needs to be put into practice.[21] The ultimate test of a new pain curriculum is improved patient care, a goal that is best achieved when there is some strategy for follow-up to ensure that students comply with the curriculum in the clinical/hospital setting. Evaluating the outcome of a new pain curriculum delivered in the classroom should include assessment of clinical skills. This requires skillful mentoring by attending physicians and residents who agree with the curriculum and use it in the clinic as a basis for instructing students in pain management.

University of Toronto

A didactic program based on the IASP curriculum was implemented at the University of Toronto with a mandatory 5-day, 20-hour course presented to 190 undergraduate medical students and 350 students in allied health disciplines (pharmacy, n=128; physical or occupational therapy, n=121; dentistry, n=70; and nursing, n=31).[14] In addition to lectures, the course included support from faculty members with knowledge of information technology, e-learning, library science, and case study development. Participants were given written materials on pain and its management before program initiation. Large-group sessions were conducted by pain specialists to provide an overview of pain mechanisms, clinical challenges, and World Health Organization classification of health, functioning, and disability. Participants were introduced to actual chronic pain patients, who told their stories. In subsequent small-group sessions, students prepared a management strategy for a "standardized cancer patient" (played by an actor) under the direction of specialists from all the medical disciplines involved. However, the program involved no true clinical experience with students managing real patients under expert mentorship.

Participants completed the Revised Pain Knowledge and Attitudes Questionnaire before and after the course.[14,22,23] Upon completion, mean questionnaire scores improved from 66% before the course to 83% after the course, a statistically significant 17% improvement ($P<0.001$). Scores improved by more than 40% in several areas, including opioid use in the elderly and patients with chronic noncancer pain, management of opioid-related constipation, and physiologic mechanisms of analgesia. The magnitude of improvement in opioid prescribing suggests that the course successfully addressed unmet needs.

Virginia Commonwealth University

The Virginia Commonwealth University Chronic Nonmalignant Pain Management curriculum is an Internet-based educational program divided into six modules: 1) Overview and Assessment of Chronic Nonmalignant Pain, 2) Treatment of Chronic Nonmalignant Pain, 3) Common Pain Syndromes: Fibromyalgia, 4) Common Pain Syndromes: Neuropathic Pain, 5) Identifying and Meeting Challenges, and 6) Legal and Regulatory Aspects of Prescribing Controlled Substances.[15] Site structure is based on learning objectives, with each objective supported by case-based self-assessment questions, tabbed pages with practice resources, and ongoing feedback to reinforce learning. There is also a section that provides "optional advanced content". Participant performance is assessed by a series of questions presented before and after completion of the program. As with the University of Toronto curriculum, there was no clinical experience or mentorship in the Virginia Commonwealth University program.

The curriculum was administered during the 2006–2007 academic year to 161 undergraduate medical students and 278 residents. Participants correctly answered 62.3% of the preprogram questions and 64.0% of the postprogram questions. Eighty-nine percent of participants stated they would use the resources provided again, 74.7% stated they would change their practices and behaviors based on curriculum content, and 95.7% said they would recommend the curriculum to colleagues. However, the slight improvement in test scores after completion of the program does not suggest that it improved knowledge.

Johns Hopkins University

A study in 118 undergraduate medical students at Johns Hopkins University Medical School assessed a 4-day course based on topics identified in IASP guidelines, other medical school curricula, and medical certification examinations. These topics included pain neurobiology; the human and social

costs of pain; the clinical assessment of pain; pharmacologic and nonpharmacologic pain management; interventional approaches to pain management, acute pain, chronic pain, pediatric and geriatric pain, and cancer pain; the impacts of culture and ethnicity on pain; and the medicolegal aspects of pain management.[16] This 4-day course provided 18 hours of a 35-hour overall program of pain management instruction, with the remaining course content delivered as part of other areas in the 4-year medical school curriculum.

Sixty percent or less of the 4-day course consisted of lectures; the rest consisted of workshop activities with faculty members. The lectures introduced basic concepts of pain management, including peripheral pathophysiology of pain, central pain processing and hyperalgesia, and the clinical psychology of pain. Learning laboratories covered pain psychophysics, medication prescribing, and medicolegal aspects of pain management. Day 3 of the Johns Hopkins course focused on chronic pain and opioid use. Topics in this course section included risk assessment for opioid use, pain pathophysiology, opioid pharmacology, and societal duties of the prescriber.[16] Postprogram assessments included multiple choice testing, a brief assessment portfolio, and a paired work assignment test wherein students applied their knowledge of pain to pain problems. Real-world experience with patients was not a part of the 4-day program.

Most of the participants expressed satisfaction with the course and felt they had an enhanced appreciation of "key challenges of providing pain care, eg, assessment, impairment, abuse, and addiction".[16] Following completion of the 4-day course, the mean (SD) score on the multiple choice testing was 75% (eleven), and the mean score on assessment portfolio was 87% (12.2). However, the absence of a test to capture baseline knowledge makes it unclear how much the program fostered new understanding.

Summary

Although these examples suggest that even a short, focused program of study can produce improvement in test scores on the topic of pain management and opioid therapy, a problem common to each program is the lack of clinical exposure and mentoring. The typical model of undergraduate medical education is to conduct didactic teaching in tandem with clinical experience.

In the area of pain management, the quality of mentoring is a key consideration. Given the widespread weakness of pain management education in North American medical schools, undergraduate students may not encounter peers and mentors who follow best practices. A survey of 1,000 randomly selected Canadian primary care physicians revealed that the majority lacked confidence in their skills in prescribing opioids and were concerned about facilitating abuse or addiction.[24] More troublesome, a recent survey of internal medicine residents at a US university health system found that the majority scored poorly on a written examination of therapeutic drug monitoring skills for chronic pain patients taking opioids, yet rated themselves as confident in these skills.[25] Indeed, among male respondents there was an inverse relationship between competence and self-confidence.[26] Even among physicians practicing in a specialty pain clinic, a retrospective analysis of a urine drug screening program found that 55% continued to prescribe opioids in the same manner after risk factors or inappropriate opioid use were identified.[27]

Key elements for an undergraduate pain curriculum

Gaps in the present pain management curricula are not a product of a lack of information but a failure to disseminate currently available knowledge to medical students. The curricula proposed and implemented in the previous examples represent systematic efforts to bridge the gap between theory and practice. Building on the IASP recommendations, the following sections describe areas in which an undergraduate curriculum might be further improved, with the goal of making pain medicine a larger part of the curriculum. However, the curriculum must include experiential opportunities with mentoring by competent clinicians. The necessity of combining didactic and clinical components in undergraduate pain curricula was reflected in a 2013 survey of members of the American Academy of Pain Medicine, which asked participants to rank the priority of learning objectives for a comprehensive pain management curriculum.[28] Although the top ten priority items included the essential knowledge base of pain neurobiology, nonpharmacologic treatments, and the clinical pharmacology of opioids and neuromodulating agents, the highest-ranked components were all clinical skills. Compassionate care and empathy were the top priority, followed by examination skills and communication. The leading message was that the ideal undergraduate medical school pain curriculum should be highly clinical.[28] The medical students need to be exposed to empathic physician mentors from multiple disciplines who have integrated their knowledge base with best practice guidelines and motivational interviewing; in other words, those who model the "art" of medicine.

We believe that an effective curriculum should focus on traditionally underemphasized areas such as clinical

pharmacology, the psychology of addiction, responsible prescribing of opioids, and recognizing and managing aberrant drug-related behavior.

Physiology of pain

A comprehensive pain management curriculum will differentiate between various types of pain, which may be nociceptive, neuropathic, or mixed. Pain may also be central or peripheral, acute or chronic, and cancer-related or non-cancer-related. Accurate diagnosis of the pain syndrome is a prerequisite to the rational use of pharmacotherapies.

Pain classification may not only dictate the appropriate therapy but also influence physician attitudes toward it. Depression is highly prevalent in patients with chronic pain.[29] Depression substantially increases the risk that acute back pain will become chronic.[30] Nonetheless, depression tends to be underdiagnosed, and therefore potentially undertreated, in patients with pain.[31]

Psychosocial aspects of pain

The Association of American Medical Colleges recommends medical school instruction on the role of behavioral and social sciences in medicine.[32] With respect to pain management, these guidelines endorse a healthy mind–body approach to care that incorporates stress reduction, relaxation, treatment of anxiety, treatment of substance abuse, and sobriety maintenance.[32] Emphasis on the psychological and social aspects of pain is of critical importance because chronic pain predisposes individuals to psychiatric comorbidities, particularly depression,[33,34] and because pain and psychiatric comorbidities such as depression, anxiety, and personality disorders increase the risk of substance abuse.[35–41] Moreover, some patients, particularly the elderly, may express depression or anxiety as a somatic complaint. Through a somatic complaint of pain, the patient obtains access to care without acknowledging the psychological distress underlying it. It is therefore essential to address the somatic complaint and the psychiatric factors underlying it to obtain an adequate resolution of symptoms.[42]

There are substantial differences in the psychosocial aspects of pain based on race, economic status, and other factors that are reflected in the patient's experience of pain and attitudes toward treatment, and in the physician's interpretation of the patient's symptoms and attitudes toward treating them. For example, clinicians are more likely to underestimate pain in African American patients and overestimate pain severity in white patients.[43] African Americans are less likely to receive opioid therapy.[44,45] The extent to which this is a product of a lack of physician knowledge about racial differences in pain experience, physician bias, or both falls beyond the scope of this paper. However, a comprehensive medical school curriculum will introduce future clinicians to the concept that both patient and clinician perceptions influence the presentation of pain and its treatment.

Multidisciplinary pain management approach

According to a report prepared for the United States Department of Health and Human Services,[46] a multidisciplinary approach to pain management incorporates four central components: medical therapy for the patient's well-being, which includes medication management; behavioral therapy (eg, cognitive behavioral therapy) to address the psychosocial aspects of patient care; physical reconditioning, focused on physical or occupational therapy, exercise, stretching, and strengthening; and education, with self-management as the focus.

The IASP curriculum concurs that effective pain management is multimodal and multidisciplinary, incorporating nonpharmacologic treatments such as physical therapy and cognitive behavioral therapy, as well as nerve blocks and surgical interventions for more severe pain.[13] An expert panel of clinicians has developed an online continuing medical education program for a multidisciplinary approach to chronic pain management.[47] A balanced approach to pain management that corrects misconceptions about chronic pain and addresses psychiatric comorbidities might lessen the use of opioids in patients at risk of substance abuse. This approach is well suited for initial education in a medical school setting as well as for continuing medical education.

Pharmacology of pain

Nonopioid analgesics

Clinical pharmacology is generally underemphasized in medical school curricula, and this applies not only to opioids but to all pharmacotherapies. A proper understanding of mechanisms of action is essential for selecting appropriate analgesics for specific patient populations and for limiting exposure to medications with the potential for misuse.

Acetaminophen is a weak inhibitor of the cyclooxygenase (COX) enzymes and acts centrally by mechanisms that are not clearly understood but are believed to include inhibition of prostaglandin synthesis.[48] Given its lack of a potent anti-inflammatory effect, the IASP curriculum recommends acetaminophen only for headaches and as an antipyretic.[13]

Tricyclic antidepressants and serotonin–norepinephrine reuptake inhibitors boost levels of neurotransmitters involved in neuropathic pain or pain with a neuropathic component.[49] Nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit the COX-1 and COX-2 enzymes, with COX-2 inhibition providing most of their anti-inflammatory effects.[50]

Given their mechanisms of action, it is logical that NSAIDs and COX-2 inhibitors are recommended for inflammatory conditions such as back pain or osteoarthritis but not neuropathic pain. Similarly, tricyclic antidepressants are considered first-line therapies for neuropathic pain, whereas tricyclics and serotonin–norepinephrine reuptake inhibitors are considered primarily adjunctive therapies in inflammatory conditions. Mechanisms influencing nociceptive pain and the monoamine system explain the broad indications for opioids and also provide a rationale for opioid/antidepressant combinations, such as tapentadol.[51]

Opioid analgesics

Medical students should receive a comprehensive introduction to opioid pharmacology. Opioid receptor affinity predicts aspects of efficacy and tolerability such that patients experiencing inadequate analgesia or poor tolerability with one opioid may benefit from a switch to another opioid with affinity for a different opioid receptor. For example, an opioid with κ-opioid receptor affinity (eg, oxycodone) may be more likely to cause dysphoria than an opioid that works primarily at the μ-opioid receptor (eg, hydromorphone or oxymorphone).[52]

Opioid therapy must be tailored to the needs of special populations, including the elderly, women versus men, pregnant women, patients with psychiatric comorbidities, and adolescents. For example, patients aged ≥65 years typically require a lower opioid dose compared with younger patients,[53,54] are more susceptible to respiratory depression, and are less likely to experience nausea and vomiting.[55] Women are more likely than men to experience nausea and vomiting[55] during opioid therapy and are more susceptible to analgesic effects of opioids with activity at the κ-opioid receptor.[56] Dose adjustments in older patients and women are likely to be necessary.

As discussed previously, patients with psychiatric comorbidities are more likely to abuse opioids, and those taking multiple psychotropic drugs are more likely to experience falls.[57] Because of an increased risk of abuse, added caution should be exercised when prescribing opioids to adolescents. Risk factors include poor academic performance; a history of risk-taking behaviors; a history of depression; and use of alcohol, tobacco, marijuana, or other substances.[58]

Similarly, the health status of individual patients influences opioid selection. Patients with cardiovascular or respiratory disease should not be prescribed methadone, which may cause QT interval prolongation.[59] Opioid metabolites can cause AEs[60–63] when they accumulate in patients with certain comorbidities (eg, renal[64] or hepatic[65] impairment).

Familiarity with opioid formulations is also important because long-acting opioids are generally not indicated for acute pain or for opioid-naive patients.[66–68]

Opioid analgesics: benefits and risks

When balancing the benefits and risks of opioids, it is important to remember that undertreatment of pain may predispose individuals to psychiatric comorbidities, particularly depression.[33,34] Both pain and depression increase the risks of substance abuse.[35]

Opioids may provide effective analgesia in patients with chronic noncancer pain such as low back pain,[6] osteoarthritis,[12] and neuropathic pain[7,11,69] that does not respond to other therapies. In fact, based on effect sizes calculated for Osteoarthritis Research Society International guidelines, opioids are the only oral therapy with an effect size (0.78) that approaches the 0.80 threshold for a strong analgesic treatment effect for osteoarthritis pain. Acetaminophen does not meet the threshold for a clinically meaningful effect (effect size, 0.14), and nonselective NSAIDs (effect size, 0.29) and COX-2 inhibitors (effect size, 0.44) exert small to moderate analgesic effects for osteoarthritis pain.[12] There is a need for further research on the long-term efficacy of opioid therapy for chronic noncancer pain, which remains controversial.[70] A recent systematic review of randomized controlled trials found that although many patients cannot tolerate long-term opioid therapy because of AEs (eg, constipation), those who can tolerate opioids experience clinically meaningful long-term pain relief.[71] However, it must be emphasized that evidence for the long-term use of opioids for relief of chronic pain is weak. All opioids are associated with risks of nausea and vomiting, somnolence, constipation, dizziness, and respiratory depression,[72] although individual opioids differ according to pharmacologic differences described previously. Opioids do not cause gastrointestinal bleeding and may not increase cardiovascular risk to the same extent as NSAIDs. As a result, American Heart Association guidelines recommend considering a trial of an opioid rather than NSAID treatment in patients with heightened cardiovascular risk.[73]

Opioid abuse

Clinicians express greater concern about abuse and addiction than they do about other opioid AEs.[74,75] Strategies for mitigating the risk of opioid abuse have been published in clinical guidelines[76,77] and must be included in pain management curricula at all levels.[13,77]

Factors predicting the likelihood of opioid abuse

Methods for assessing the relative risk of a patient to abuse opioids before initiating therapy include interviews to identify a past, current, or family history of substance abuse.[78] Validated screening tools developed to estimate abuse risk include the revised Screener and Opioid Assessment for Patients with Pain,[79] the Current Opioid Misuse Measure,[80] and the Opioid Risk Tool.[81] Clinicians should also consider entering into more formal patient/prescriber treatment agreements to define expectations with respect to treatment goals, compliance monitoring, and steps to be taken in the event of suspected abuse.[82]

Selecting the appropriate formulation, dose, and duration of therapy

Opioid therapy should be initiated in time-limited trials designed to determine efficacy and safety and gauge patient compliance with the prescribed regimen. There is a growing consensus that administration of a morphine-equivalent dose of >200 mg/day constitutes high-dose therapy and warrants heightened vigilance to guard against abuse. Canadian guidelines go beyond US guidelines with respect to opioid selection, recommending weak opioids such as tramadol or codeine as the initial agent because of a lower potential for abuse, and caution that the familiarity of abusers with certain opioids (eg, hydromorphone, hydrocodone, and oxycodone) increases their propensity for abuse.[77]

The Canadian guidelines also suggest that long-acting opioids may be preferred over short-acting formulations in older patients to improve compliance with prescribed therapy.[77] US guidelines acknowledge that use of long-acting preparations has been proposed as a means of reducing the risk. However, both the US and Canadian guidelines acknowledge that there is no evidence that the around-the-clock analgesia provided by a long-acting opioid formulation actually improves compliance or reduces the risk of abuse.[6,77]

The recent introduction of opioid formulations designed to present obstacles to certain methods of abuse (so-called tamper-resistant formulations [TRFs])[83] should be discussed in a comprehensive undergraduate curriculum. However, because long-term epidemiologic data supporting the ability of these formulations to reduce abuse are lacking, this discussion should concern potential benefits and risks of TRFs, with the most obvious potential risk being overreliance on TRFs in the absence of evidence and in inappropriate patients.

Detection of aberrant drug behavior

Clinicians need to recognize behaviors suggestive of drug seeking for the purposes of misuse, including requests for opioid dose escalations or reports of lost medications. Urine toxicology screening is recommended as a universal precaution in all opioid-treated patients,[84] and in one study reduced substance abuse by 50%.[85] Nonetheless, only a minority of physicians who prescribe opioids conduct urine drug testing,[74] and many who order urine drug screens have difficulty correctly interpreting the results.[86]

Protocol for response to aberrant drug behaviors

All physicians prescribing opioids should develop a protocol for response to aberrant drug behaviors. US[87] and Canadian[77] guidelines for the use of opioids in chronic pain recommend shorter dispensing intervals and more frequent compliance monitoring using both pill counts and urine drug testing, although the accuracy of current monitoring techniques is not fully established.[76] It may be preferable to use long-acting rather than short-acting formulations,[82] although US guidelines state only that a reduced potential for abuse is a theoretical benefit of long-acting preparations, without conclusive data to support it.[87] Patients with concurrent pain and confirmed abuse or an identified addiction disorder may be candidates for a structured trial of methadone or buprenorphine.[77,87] Current addiction to alcohol or nonopioid drugs is considered a contraindication to opioid therapy by some authorities.[82] Continued abuse is always an indication for referral to a drug abuse treatment specialist or facility[82,87] and may be cause for discontinuation of opioid therapy.[87]

Licensing or regulatory requirements

Undergraduate curricula should prepare physicians for the reality of increasing legal and regulatory scrutiny of prescribing practices. For example, the American states of Washington and Florida have implemented guidelines that limit opioid dosing for prescribers lacking adequate training, improve patient screening and monitoring, and encourage appropriate follow-up of aberrant drug-related behavior.[88,89]

Recent actions of regulatory bodies reflect recognition that there is a need for physician education; however, these bodies have turned to drug companies rather than medical

schools to provide the necessary instruction. The US Food and Drug Administration has mandated that pharmaceutical companies that manufacture opioid analgesics develop and implement risk evaluation and mitigation strategies, which include prescriber training on the safe and effective use of opioids.[90] One potential weakness of risk evaluation and mitigation strategies is that they assign responsibility for physician education to parties with a commercial interest in the prescribing of opioids.

The authors consider that there is risk associated with attempting to remedy a lack of education by legislation. If one faces legal or professional penalties for making mistakes in an area where one lacks skills, there exists the temptation simply to not practice in that area rather than acquire the needed skills. From a legislative or regulatory framework, this attitude would have to be countered with penalties for refusing to treat patients with chronic noncancer pain.

Summary

Many practicing physicians in North America lack skills to effectively manage pain and mitigate the risks of opioid abuse. Improving medical school curricula is the most effective long-term solution to this situation. The curricula should provide guidance on how clinicians can minimize the risk of abuse and diversion of strong analgesics by applying a universal precautions approach to monitoring for all opioid-treated patients.[84] Prescribers need to know how to enter into controlled substance agreements with their patients, which can define treatment expectations, appropriate opioid use, and steps to be taken in the event of noncompliance with the prescribed regimen.

The authors of this review believe that the most important element of an undergraduate pain curriculum is clinical experience under the mentorship of residents and attending physicians who are capable of reinforcing didactic learning by modeling best practices. An important component of pain management training also is to educate young physicians about the appropriate time to refer to a pain specialist. Given the complexity of pain management, physicians need to know when a clinical situation goes beyond their level of knowledge. Developing a medical student's ability to assess their preparedness for certain clinical situations may be among the most important aspects of undergraduate training.

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