BMC Medical Education

RESEARCH

Open Access

Advancing pain education: a cross-sectional study in the Portuguese medical schools

Joana Cristina Ferreira Mendes de Castro Bento[1], Isaura Tavares[1,2] and Daniel Humberto Pozza[1,2,3*]

Abstract

Introduction Chronic pain negatively impacts on quality of life and is often underreported and undertreated. Therefore, it is essential for medical schools to provide education in pain management for students. This study evaluated the current state of pain education in the Portuguese medical schools, focusing on integrating pain-related topics into the curriculum.

Methods A cross-sectional study was employed, involving all the eight public medicals schools in Portugal. The study, approved by the Ethics Committee of the Faculty of Medicine of the University of Porto, utilized a previous validated questionnaire sent via electronic mail. The data collection spanned from January 2023 to October 2023, and responses were analysed using the SPSS software for descriptive statistics.

Results All eight public medical schools responded to the questionnaire, providing insights into their pain education practices. Over the six years of medical education, 50% of the schools offered dedicated course content on chronic pain within the curriculum. This instruction is primarily provided in the second year, with variations in the hours for both theoretical and practical teaching. Additionally, 62.5% integrate pain-related topics into other discipline-based courses, predominantly in the fourth year. Post-graduate pain education activities were reported in only three of the eight schools (37.5%).

Conclusions These findings represent the first analysis of pain education in public Portuguese Medical Schools. The findings indicate that enhancements in pain education through the introduction of mandatory pain topics, curriculum integration, and investment in post-graduation courses are needed. These improvements aim to provide medical students the essential knowledge and skills to proficiently manage the intricate challenges of chronic pain, thereby enhancing patients' quality of life and reducing social burdens.

Keywords Pain, Medical education, Medical schools curriculum, Pain management, Graduate education, Undergraduate education, Program evaluation, Professional competence, Teaching

*Correspondence:
Daniel Humberto Pozza
dhpozza@gmail.com
[1]Departamento de Biomedicina da Faculdade de Medicina, Universidade do Porto, Porto, Portugal
[2]Departamento de Biomedicina da Faculdade de Medicina and i3S- Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Porto, Portugal
[3] Universidade do Porto, Departamento de Biomedicina da Faculdade de Medicina da Universidade do Porto and i3S- Instituto de Investigação e Inovação em Saúde, Porto, Portugal

Introduction

It is difficult to estimate the individual, social and economic negative impacts of untreated pain, which is defined as a multidimensional experience associated with actual or potential tissue damage. Chronic pain encompasses a multitude of emotional disturbances and significantly impairs the overall quality of life [1, 2]. Evaluating pain in individual patients is challenging due to the subjective nature of pain perception, which can lead to patient underreporting or misunderstanding by healthcare providers - factors that often contribute to the undertreatment of pain [3–5].

Arthritis, arthrosis, lower back pain, and headaches are major causes of chronic non-cancer pain, driving people to seek medical care [6–10]. Along with back and neck pain, musculoskeletal disorders contribute significantly to years lost due to disability [11]. Chronic pain affects 37% of the population in Portugal, with an average duration of 10 years, causing a high personal and social burden and affecting mainly the most vulnerable individuals [6, 12]. Furthermore, chronic pain has reached epidemic proportions worldwide, and its economic costs for patients and health care systems have been shown to be extremely high [6, 12, 13]. Recognizing chronic pain as a medical disease rather than a mere symptom can change expectations toward managing it, aiming for functional and emotional restoration [14–17].

Limited understanding of pain's biopsychosocial complexity can lead to inappropriate management [18, 19] and healthcare system demands that professionals integrate up-to-date knowledge for daily pain management [20, 21]. Medical schools provide the appropriate environment for comprehensive pain management education, facilitating the systematic introduction of pain concepts. This structured approach enables future healthcare professionals to build a solid foundation of knowledge, fostering a deeper understanding and proficiency in delivering optimal clinical care. Educational programs in the pain area should include not only the anatomic-physiological aspects, but also the integration of the basic knowledge about pain modulation as well as the translation of this information to the clinical practice. Well-trained physicians will better manage pain in context of the overall biopsychosocial complexity of the patient, rather than focusing solely on the biomedical model [1, 19, 22, 23]. Additionally, post-graduate courses should cover and regularly update pain management, emphasizing both treatment and, crucially, prevention strategies for pain development and progression [24]. The global demand for improved pain medicine education in medical schools is increasing. Current pain education varies significantly across major developed countries, with many facing challenges such as inadequate curriculum integration and insufficient practical training. Highlighting these disparities and the ongoing efforts to standardize pain education underscores the necessity of implementing comprehensive pain education programs globally [10, 25–29]. Many professional pain organizations have recognized the need for the early introduction of pain medicine concepts into medical training [30, 31]. The International Association for the Study of Pain (IASP) core curriculum is the most widely used to teach medical students about pain management [32, 33]. However, the frequency and effects of improperly managed pain on public health remain unknown. Initiatives to create comprehensive pain medicine curricula have been made at a variety of medical schools, but they have not been generally adopted [24].

It was found that the majority of medical students tend to have negative reactions when dealing with chronic pain patients [34, 35]. This could be related to the objective medical training geared towards solving diseases treating specific and tissue thought to be the cause of pain. This approach can contrast with the complex, often subjective nature of chronic pain, which, while manageable for some, may lack a clear cure and require ongoing symptom management. Furthermore, in the initial stages of their medical education, students appear to be discouraged from exposure to chronic pain patients, especially in a primary care setting [34–37]. Providing effective continuing medical education, adressing behavioral responses, is crucial for improving medical students' skills and confidence in managing chronic pain patients, thereby enhancing the ability to positively impact the associated challenges [34, 36].

In Portugal, there are eight public medical schools, and only one private institution that has not yet graduated its first class of medical students at the time of writing. The information about pain education in Portuguese medical schools is scarce or absent and this may represent a problem for medical doctors. In fact, a previous survey completed by 251 medical students and interns from the eight Portuguese medical schools, demonstrated that respondents lacked knowledge in many aspects of pain, which was primarily evident in respondents' self-reports [38]. In 2010, a preliminary survey about the way medical schools taught pain received only five incomplete responses [39]. Therefore, updated information about pain education in Portuguese medical schools, that have about four thousand medical students, is necessary to provide a foundational basis development of curriculum guidelines and implementation strategies.

This study aimed to assess the state of pain education within Portuguese medical schools, specifically focusing on strategies for enhancing curriculum integration and deepening medical students' and interns' comprehension of chronic pain, and its management.

Methods

The current cross-sectional study was approved by the ethics committee of the Faculty of Medicine of the University of Porto (80/CEFMUP/2022) and was conducted at the Biomedicine Department of the same institution. The present medical education system in Portugal spans six years, categorized into basic and clinical years. The curriculum is standardized by a national governing body, ensuring uniformity across medical schools to maintain consistent educational quality. The Ministry of Science, Technology and Higher Education, along with the Portuguese Medical Association, plays a key role in setting and overseeing curricular content. This framework ensures that all medical programs include core competencies and essential clinical training while allowing some flexibility for individual institutions to incorporate specialized topics or emerging fields within medicine. However, there are no specific recommendations, guidelines, or core competencies to stipulate the inclusion of chronic pain and its management in the curriculum. During this period, students receive theoretical and practical training covering various areas of Medicine, including anatomy, physiology, pharmacology, pathology, among others. Generally, Portuguese medical schools dedicate the first three years of medical courses to basic sciences, while the fourth and fifth years focus on clinical education. The sixth year predominantly involves hospital internships and the completion and presentation of the master's thesis. During the first three years, the Portuguese medical students receive theoretical and practical training covering various foundational areas of Medicine, including anatomy, histology, physiology, cell biology, pharmacology, pathology, among others.

The first phase of the investigation was performed in January 2023 through a questionnaire in an editable Word file and a letter explaining the objectives of the study and how to fill out the questions that were sent by electronic mail (email) to the Dean of each medical school. The study sample includes the eight public Portuguese medical schools: Faculty of Medicine of the University of Porto (FMUP), Abel Salazar Biomedical Sciences Institute of the University of Porto (ICBAS), Faculty of Medicine of the University of Lisboa (FMUL), Nova Medical School (NMS), School of Medicine of University of Minho (EMUM), Faculty of Medicine of the University of Coimbra (FMUC), Faculty of Health Sciences of the University of Beira Interior (UBI-FCS) and Faculty of Medicine and Biomedical Sciences of the University of Algarve (MED-UALG). To maximize response rates, the documents described were also sent to the Student Associations of the respective medical schools.

The self-developed questionnaire consisted of a set of questions about pre- and post-graduate pain education in Portuguese medical schools, focusing on how it is integrated into the curriculum, either as a unique subject or associated with others. The primary objectives of the questionnaire were to obtain comprehensive information about pain management education and questions are described in Table 1. A pilot study was performed to validate the questionnaire, ensuring its reliability and validity [39]. The need for written informed consent was waived

Table 1 Descriptive analysis of the received questionnaires ($n = 8$)

Question	
1.a – Is there any specific discipline for the pain study in the pre-graduated course? n (%)	
No	4 (50.0)
Yes	4 (50.0)
If yes, which is the year/years of the discipline? n (%)	
1°	1 (20.0)
2 °	2 (40.0)
4 °	1 (20.0)
5 °	1 (20.0)
6°	0 (0)
How many theoretical hours? mean ± SD (min/max)	15.2 ± 20.1 (2/50)
How many practical hours? mean ± SD (min/max)	4.8 ± 3.0 (0/8)
How many ECTS? mean ± SD (min/max)	13.4 ± 13.4 (3/28)
Regimen? n (%)	
-Mandatory	3 (60.0)
- Optional	2 (40.0)
1.b – Are the related questions to the study, evaluation and pain treatment integrated or approached in any other discipline? n (%)	
No	3 (37.5)
Yes	5 (62.5)
If yes, which is the year/years of the discipline? n (%)	
1°	0 (0)
2°	2 (12.5)
3°	2 (12.5)
4°	5 (31.3)
5°	4 (25.0)
6°	3 (18.8)
How many theoretical hours? mean ± SD (min/max)	15.7 ± 6.2 (6/28)
How many practical hours? mean ± SD (min/max)	41.3 ± 39.6 (0/140)
How many ECTS? mean ± SD (min/max)	4.9 ± 3.1 (2/12)
Regimen? n (%)	
- Obligatory	12 (75.0)
- Optional	4 (25.0)
2 – Is there any post-graduation related to the study of pain? n (%)	
No	5 (62.5)
Yes	3 (37.5)

Legend: n – number, SD – standard deviation, min – minimum, max – maximum, ECTS - European Credit Transfer and Accumulation System

by the ethics committee of the Faculty of Medicine of the University of Porto due to the retrospective nature of the study.

Data were inserted into a database and analysed using the SPSS software for descriptive statistics. Qualitative variables were described using absolute and relative frequencies, while quantitative variables were described using means and standard deviations.

Results

From January of 2023 to October of 2023, all eight public Medical Schools were contacted by e-mail. All of them completed the questionnaire: four were completed by professors, three by the student association presidents, and one by a subdirector. The following results are based on the data that were received from the questionnaires sent by the participant institutions listed in Table 1. To facilitate more comprehensive data analysis, similar disciplines reported in the different programs were grouped together (e.g., pharmacology and pharmacological therapeutics). The summary information included in the syllabus was included in the descriptive statistics of the disciplines for pre- and post-graduation.

The main results demonstrated that in the pre-graduated course, 50% of the medical schools referred the presence of a specific pain-related subject matter, primarily in the second year of the program. On average, these courses included 15.2 theoretical hours, 4.8 practical hours, corresponding to 13.4 European Credit Transfer and Accumulation System (ECTS). Most of these curricular units were mandatory. Additionally, 62.5% of medical schools reported that pain-related topics were integrated into other discipline-based courses across various academic years, primarily in the fourth year of the program, with an average of 15.7 theoretical hours, 41.3 practical hours, corresponding to 4.9 ECTS. Only 37.5% of the medical schools reported the existence of pain-related educational activities in the post-graduation context. These data suggest varying levels of integration of pain topics across different stages of medical education.

The specific responses provided by the medical schools are described as follows:

- *Specific courses that included pain topics in the pre-graduate course*: Basic concepts of Pain Medicine (2 medical schools); General Therapy (1 medical school); Approach and Management of Pain (1 medical school).
- *Courses related to pain*: Pharmacology (3 medical schools); Anaesthesiology (3 medical schools); Motor System – Rheumatology (1 medical schools); Medical Clinical (4 medical schools); Oncology and Palliative Care (3 medical schools).
- *Post-graduation courses*: Post-graduation in Pain Medicine (2 medical school); Chronic Pain: Clinical Approach to the Major Syndromes According to International Classification of Diseases 11th Revision (1 medical school); Master's Degree in Palliative Care (1 medical school); Master's Degree in Neuroscience (1 medical school).

Discussion

The present study's primary findings demonstrated that there were some improvements in the teaching of pain topics in Portuguese medical schools when compared to a preliminary online report, conducted in 2010 [39]. In 2010, just one medical school reported pain-related content in the curriculum, whereas in 2023, five schools reported instruction in pain topics. However, it is important to notice that this previous online report [39] included only 5 medical schools. Additionally, the previous online report has a lack of questionnaire completion, which makes it difficult in assessing the actual enhancement of pain education within medical school curricula. Thereby, these improvements can be due to this reduced number of responses.

While several medical schools worldwide have launched initiatives to provide comprehensive pain medicine courses, these have not been universally adopted. A theoretical framework is necessary to facilitate the implementation of a well-defined pain medicine curriculum in medical schools with specific learning objectives that centre on applying transformative teaching and evaluation methodologies to bridge scientific content and professional practice.

According to the EFIC Core Curriculum in Pain Management [33] and previous studies [38, 40–44], the lack of comprehensive pain management education in medical schools is a significant contributor to the inadequate care of patients with pain. Improving the curriculum of medical schools, including those examined in this study, is crucial for improving the future treatment of chronic pain patients. This enhancement is essential for providing medical students with the core knowledge and skills for the diagnosis and treatment of pain in a comprehensive and coherent way, by the means of bedside instruction, lectures, practical training, and Objective Structured Clinical Examinations. Some topics for reflection to enhance pain education around the world including Portugal are:

- mandatory educational experiences related to basic concepts of pain in the first 3 years of pre-graduation. This should include at least 5 lectures lasting 45 min each and 5 clinical bedside teaching sessions lasting 90 min each (groups maximum

of 6 students and include taking a patient history followed by a case discussion) [33, 40].
- mandatory and/or optional educational experiences related to the proper multidimensional pain treatment in the last clinical years to facilitate the linkage between basic and practical knowledge acquired during the initial years of the course with the diagnosis of pain and its management as an integral part of medical care practice [33, 40].
- the focus of the curriculum should be about significant pain syndromes, such as acute post-traumatic and post-operative pain, cancer pain, neuropathic pain, and chronic non-cancer pain [33, 40].
- engagement of Government-Level Organizations: It is crucial to call on national medical education committees and other government-level organizations to recognize the importance of pain education. By promoting the standardized construction of pain education courses and teaching systems, these bodies can ensure a consistent and comprehensive approach to pain management training across medical institutions. This initiative would help bridge gaps in current educational practices and enhance the overall quality of pain care provided by future healthcare professionals [24, 45].

When compared to the EFIC proposed curriculum [33], our study demonstrated that there is a deficiency in distinct pain-focused modules during the final clinical years. These modules are crucial for promoting the connection between basic and practical knowledge. Additionally, there is a lack of investment in the post-graduation pain area, which represents an opportunity to address this gap in future new programs. Focused practical training during subsequent clinical rotations is also limited and should be enhanced in Portuguese Medical Schools.

Pain management education should continue to emphasize the interplay of biological, psychological, and social factors that influence pain experiences [19, 46]. Richardson [47] reported that students positively evaluated a pain program during a surgery clerkship, which integrated experiential knowledge gained through interactions with patients with theoretical knowledge acquired through readings. The strengths highlighted included its strong relevance to patient care, addressing educational gaps, acquiring new practical knowledge and skills, and emphasizing humanist aspects [47]. Nevertheless, many of the existing pain management curricula lack a crucial component: guidance on developing effective understandable language to communicate with patients and relationship skills [23].

Some authors argue for a shift in focus from assessing pain to broader competencies that address the safe and effective care of patients with chronic pain. In parallel, substance abuse disorders, particularly opioid-related deaths, contribute significantly to the global burden of disease [48, 49]. While pain and addiction are not interchangeable terms, their frequent interaction and co-occurrence highlight the critical need for improvements in teaching about both pain and addiction. The goal is to bring about essential changes in how students are trained and assessed on pain and addiction, aligning education with the evolving landscape of opioid prescribing [50]. Therefore, highly skilled and adequately trained physicians play a fundamental role in pain management and prevention [51–53] and the solution may begin within a more comprehensive and structured medical education [6, 11–13, 15, 54].

Insufficient pain instruction in medical school and the content of these programs whether biopsychosocial or heavily biomedical, a narrower model of management may be partially attributed to the lack of basic competences [23]. The limited pain education that is currently provided may be fragmented and ineffective. Most of it is partially taught within subjects like anatomy and physiology, that do not directly relate to the complicated everyday issues faced by patients, families, and physicians [19, 41, 55, 56]. This superficial and fragmented approach can foster misunderstandings, erroneous beliefs, and consequently, an incorrect approach to patients experiencing pain. Non-invasive, invasive, and pharmacological options and combinations must be well studied before determining the most suitable treatment for managing pain effectively. Hence, a thoughtfully designed curriculum that seamlessly integrates fundamental and practical aspects of pain management is necessary for its enhancement.

This predominant focus on pain and its management during the early years of graduation tends to emphasize physiological and pharmacological aspects. Additionally, this emphasis allows future healthcare professionals to comprehend the pathophysiology, as well as some of the fundamental therapeutic approaches to pain management. However, there is a notable gap in addressing other dimensions of pain, with limited emphasis on the broader, integrative approaches necessary to address its full biopsychosocial complexity. As a result, in most health professions, undergraduate education has little to no impact on students' understanding of pain [19, 56]. Furthermore, pain-related topics were integrated into other non-specific disciplines, mostly throughout the last three years of the course. In fact, instead of being taught in separate pain modules, or connected, most schools teach pain medicine in fragmented ways, inside other medical subjects, such as anesthesia. In this context, a specific discipline in the last years of the graduation is still lacking, for most medical schools, to allow the

connection between basic and applied knowledge learnt in the basic and related disciplines. It is reassuring to see that some European nations are moving toward including pain medicine education in their medical school curricula on a national level [24, 40]. Implementing similar recommendations could greatly benefit Portuguese medical education.

On a positive note, disciplines that incorporate pain management knowledge into their programs are typically mandatory in most institutions, ensuring that all healthcare students receive some foundational training in this critical area. However, on the downside, each institution tends to approach pain management education differently, and there are no standardized guidelines to ensure a consistent level of competency across future healthcare professionals. This lack of uniformity can result in varying levels of preparedness among graduates to effectively manage pain in clinical practice.

When considering the global perspective, comprehensive pain medicine content is not universally required in medical curricula, with significant gaps and inconsistencies observed. Studies show that many medical schools dedicate minimal hours to pain education, leaving new doctors often unprepared to manage pain effectively [24]. In fact, some institutions worldwide struggle to identify any compulsory pain medicine elements within their programs [40, 43, 56, 57]. Nevertheless, there persists a requirement for dedicated pain teaching that addresses the subject thoroughly in a structured, progressive, and competency-focused approach.

On the other hand, concerning post-graduation pain-related activities, three medical schools reported their existence, indicating a decline compared to the 2010 report, which was reported by five faculties. This represents a lack of investment in the post-graduation pain area because most faculties did not provide courses in this area. This observation could be attributed to the insufficient emphasis placed on pain teaching, which fails to inspire new physicians to delve deeper into understanding this crucial area when choosing continuous education. Given the current insufficient teaching/learning about pain during the pre-graduation, the post-graduate level could serve as an opportunity to address the lack of pain-related content at multiple levels within the educational process for physicians. It is well known that chronic pain patients benefit most from a multidisciplinary and multi-professional approach involving medical, nursing, social work, psychology, physical, and occupational therapy skills. Incorporating inter-professional education into health sciences programs is an innovative approach that improves chronic pain management [44, 58]. Post-graduate courses present the perfect timing for this integration. Therefore, a comprehensive pain approach is necessary in post-graduation courses to motivate and update physicians on correct clinical practices, especially within hospital pain services, aiming to enhance pain treatment [42].

Preventing pain is an essential step that cannot be neglected, as pain conditions have a substantial negative impact on quality of life, leading to significant disability and, consequently, high healthcare costs [59]. Monitoring persistent pain in individuals is crucial, as early intervention is the most effective means to prevent long-term chronic pain. This approach involves individualized, patient-centred care with a focus on multimodal approaches [54]. Despite the rising concern about the prevention and management of pain, there are not many publications approaching this important theme. Some publications found in the field of pain education are generalist, while some medical schools have integrated comprehensive teaching programs. However, others offer minimal instruction, highlighting the necessity for curriculum renewal [60–62]. Furthermore, when analysed in many European medical schools, these topics are seen as non-essential and fail to reach what might be expected given the prevalence and public health burden of pain [40].

The limitations of the present study included the time that the institutions spent in filling out the questionnaires, which took longer than anticipated. Due to technical difficulties a more comprehensive analysis of what is really taught about pain in all medical subjects was not feasible. However, from now on, it will be possible to perform the follow-up and the evolution of the pain management teaching in medical education in Portugal.

Conclusions

In conclusion, this study highlighted the limited instruction in chronic pain and its management within eight medical schools in Portugal, emphasizing the need for improved curriculum integration as a potential approach to enhancing pain education. Moreover, implementing mandatory educational experiences related to pain, including bedside instruction, lectures, practical training, and integrating these disciplines in the later years of the graduation program, can facilitate a more cohesive and less fragmented approach to pain education within undergraduate medical curricula. By addressing these suggestions, future medical schools with improved curricula will contribute to ongoing efforts to refine pain education, ensuring alignment with international benchmarks and evidence-based practices, and fostering more proficient healthcare practitioners capable of managing pain effectively. We hope that better education in pain for medical students can lead to better quality of life, reduction in suffering for the patients with less social burden.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-024-06582-w.

Supplementary Material 1

Acknowledgements
We would like to thank all Portuguese medical schools for their kind participation. This study was performed within the aims of Cátedra de Medicina da Dor of the Faculty of Medicine of Porto, Portugal.

Author contributions
JCFMCB, DHP and IT conceived the study. JCFMCB and DHP coordinated the study and drafted the initial manuscript. JCFMCB analysed the data and created the tables. DHP also analysed the data and assisted in creating the tables. JCFMCB, DHP and IT drafted the final manuscript. All authors read and approved the final manuscript.

Funding
No subsidies or grants contributed to this work.

Data availability
Anonymised raw data used in the statistical analysis can be found as supplementary material, using the following link: https://drive.google.com/drive/folders/117Wg469jQGyN5skf6AYEpGNgUMH4wbEl?usp=drive_link.

Declarations

Ethics approval and consent to participate
This study was approved by the Ethics Committee of the Faculty of Medicine of the University of Porto (80/CEFMUP/2022). Study participation was voluntary. All Portuguese Medical Schools were adequately informed about the study's purpose and were granted anonymity and confidentiality regarding their data.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 23 February 2024 / Accepted: 19 December 2024
Published online: 16 January 2025

References

1. Gordon DB, Dahl JL, Miaskowski C, McCarberg B, Todd KH, Paice JA, Lipman AG, Bookbinder M, Sanders SH, Turk DC, et al. American pain society recommendations for improving the quality of acute and cancer pain management: American Pain Society Quality of Care Task Force. Arch Intern Med. 2005;165(14):1574–80.
2. Raja SN, Carr DB, Cohen M, Finnerup NB, Flor H, Gibson S, Keefe FJ, Mogil JS, Ringkamp M, Sluka KA, et al. The revised International Association for the study of Pain definition of pain: concepts, challenges, and compromises. Pain. 2020;161(9):1976–82.
3. Gordon DB, Dahl JL, Miaskowski C, McCarberg B, Todd KH, Paice JA, Lipman AG, Bookbinder M, Sanders SH, Turk DC, et al. American Pain Society Recommendations for Improving the quality of Acute and Cancer Pain Management. Arch Intern Med. 2005;165(14):1574.
4. Lohman D, Schleifer R, Amon JJ. Access to pain treatment as a human right. BMC Med. 2010;8(1):8.
5. Pozza DH, Azevedo LF, Castro Lopes JM. Pain as the fifth vital sign-A comparison between public and private healthcare systems. PLoS ONE. 2021;16(11):e0259535.
6. Azevedo LF, Costa-Pereira A, Mendonca L, Dias CC, Castro-Lopes JM. Epidemiology of chronic pain: a population-based nationwide study on its prevalence, characteristics and associated disability in Portugal. J Pain. 2012;13(8):773–83.
7. Deyo RA, Mirza SK, Martin BI. Back pain prevalence and visit rates: estimates from U.S. national surveys, 2002. Spine (Phila Pa 1976). 2006;31(23):2724–7.
8. Gouveia B, Fonseca S, Pozza DH, Xará D, Sá Rodrigues A. Relationship between Postoperative Pain and Sociocultural Level in Major Orthopedic Surgery. Advances in Orthopedics 2022, 2022:7867719.
9. Gupta S, Atcheson R. Opioid and chronic non-cancer pain. J Anaesthesiol Clin Pharmacol. 2013;29(1):6–12.
10. Shamim T. A simple working classification proposed for Orofacial Pain (OFP) commonly encountered in Dental Practice. Korean J Pain. 2013;26(4):407–8.
11. Cohen SP, Vase L, Hooten WM. Chronic pain: an update on burden, best practices, and new advances. Lancet. 2021;397(10289):2082–97.
12. Azevedo LF, Costa-Pereira A, Mendonca L, Dias CC, Castro-Lopes JM. Chronic pain and health services utilization: is there overuse of diagnostic tests and inequalities in nonpharmacologic treatment methods utilization? Med Care. 2013;51(10):859–69.
13. Azevedo LF, Costa-Pereira A, Mendonca L, Dias CC, Castro-Lopes JM. The economic impact of chronic pain: a nationwide population-based cost-of-illness study in Portugal. Eur J Health Econ. 2016;17(1):87–98.
14. Cauda F, Palermo S, Costa T, Torta R, Duca S, Vercelli U, Geminiani G, Torta DM. Gray Matter alterations in chronic pain: a network-oriented meta-analytic approach. Neuroimage Clin. 2014;4:676–86.
15. Clauw DJ, Essex MN, Pitman V, Jones KD. Reframing chronic pain as a disease, not a symptom: rationale and implications for pain management. Postgrad Med. 2019;131(3):185–98.
16. Raffaeli W, Arnaudo E. Pain as a disease: an overview. J Pain Res. 2017;10:2003–8.
17. Martin SJ, Rost H. What they don't teach you in medical school: helping the patient with chest pain of unknown cause. Br J Hosp Med (Lond). 2022;83(1):1–7.
18. Fillingim RB. Individual differences in pain: understanding the mosaic that makes pain personal. Pain. 2017;158(1):S11–8.
19. Mankelow J, Ryan C, Taylor P, Atkinson G, Martin D. A systematic review and Meta-analysis of the effects of Biopsychosocial Pain Education upon Health Care Professional Pain attitudes, Knowledge, Behavior and Patient outcomes. J Pain. 2022;23(1):1–24.
20. Nuseir K, Kassab M, Almomani B. Healthcare Providers' knowledge and current practice of Pain Assessment and Management: how much Progress have we made? Pain Res Manage. 2016;2016:1–7.
21. Mosadeghrad AM. Factors affecting Medical Service Quality. Iran J Public Health. 2014;43(2):210–20.
22. Cleeland CS, Gonin R, Hatfield AK, Edmonson JH, Blum RH, Stewart JA, Pandya KJ. Pain and its treatment in outpatients with metastatic cancer. N Engl J Med. 1994;330(9):592–6.
23. Mankelow J, Ryan CG, Green PW, Taylor PC, Martin D. An exploration of primary care healthcare professionals' understanding of pain and pain management following a brief pain science education. BMC Med Educ. 2022;22(1):211.
24. Shipton EE, Bate F, Garrick R, Steketee C, Shipton EA, Visser EJ. Systematic review of Pain Medicine Content, Teaching, and Assessment in Medical School Curricula internationally. Pain Therapy. 2018;7(2):139–61.
25. Bond M. Pain education issues in developing countries and responses to them by the International Association for the study of Pain. Pain Res Manag. 2011;16(6):404–6.
26. Schofield P. Pain education and current curricula for older adults. Pain Med. 2012;13(Suppl 2):S51–56.
27. Shipton EE, Bate F, Garrick R, Steketee C, Shipton EA, Visser EJ. Systematic review of Pain Medicine Content, Teaching, and Assessment in Medical School Curricula internationally. Pain Ther. 2018;7(2):139–61.
28. Thompson K, Johnson MI, Milligan J, Briggs M. Rethinking pain education from the perspectives of people experiencing pain: a meta-ethnography to inform physiotherapy training. BMJ Open. 2022;12(1):e046363.
29. Adams MCB, Denizard-Thompson NM, DiGiacobbe G, Williams BL, Brooks AK. Designing Actionable solutions and Curriculum for Pain disparities Education. Pain Med. 2022;23(2):288–94.
30. International Pain Summit Of The International Association For The Study Of P. Declaration of Montreal: declaration that access to pain management is a fundamental human right. J Pain Palliat Care Pharmacother. 2011;25(1):29–31.
31. Lippe PM, Brock C, David J, Crossno R, Gitlow S. The First National Pain Medicine Summit–final summary report. Pain Med. 2010;11(10):1447–68.
32. Leano S, Kalauokalani D. Core Curriculum for Professional Education in Pain, Third Edition. Pain Med. 2007;8(4):392–3.

33. European Federation of IASP Chapters. The Pain Management Core Curriculum for European Medical Schools [https://europeanpainfederation.org/wp-content/uploads/2018/10/CoreCurriculumPainManagement-EFIC-June-2013_FINAL1.pdf]
34. Norris TE. Chronic pain, medical students, and primary care commentary on what can we learn from first-year medical students' perception of pain in the primary care setting. Pain Med. 2011;12(8):1137–8.
35. Rice K, Ryu JE, Whitehead C, Katz J, Webster F. Medical trainees' experiences of Treating People with Chronic Pain: a lost opportunity for Medical Education. Acad Med. 2018;93(5):775–80.
36. Corrigan C, Desnick L, Marshall S, Bentov N, Rosenblatt RA. What can we learn from first-year medical students' perceptions of pain in the primary care setting? Pain Med. 2011;12(8):1216–22.
37. Romualdo JM, Borges E, Tavares I, Pozza DH. The interplay of fear of pain, emotional states, and pain perception in medical and nursing students: a cross-sectional study. PLoS ONE. 2024;19(11):e0314094.
38. Cristóvão I, Reis-Pina P. O Ensino Da Dor Crónica em Portugal: as Perspectivas Dos Estudantes De Medicina E dos internos do Ano Comum. Acta Med Port. 2019;32(5):338–47.
39. Estado da arte do ensino da dor em Portugal. [https://www.dgs.pt/documentos-e-publicacoes/estado-da-arte-do-ensino-da-dor-em-portugal-relatorio-final.aspx]
40. Briggs EV, Battelli D, Gordon D, Kopf A, Ribeiro S, Puig MM, Kress HG. Current pain education within undergraduate medical studies across Europe: advancing the provision of Pain Education and Learning (APPEAL) study. BMJ Open. 2015;5(8):e006984.
41. Fishman SM, Young HM, Lucas Arwood E, Chou R, Herr K, Murinson BB, Watt-Watson J, Carr DB, Gordon DB, Stevens BJ, et al. Core competencies for pain management: results of an interprofessional consensus summit. Pain Med. 2013;14(7):971–81.
42. Loeser JD, Schatman ME. Chronic pain management in medical education: a disastrous omission. Postgrad Med. 2017;129(3):332–5.
43. Mezei L, Murinson BB. Johns Hopkins Pain Curriculum Development T: Pain education in north American medical schools. J Pain. 2011;12(12):1199–208.
44. Turner GH, Weiner DK. Essential components of a medical student curriculum on chronic pain management in older adults: results of a modified delphi process. Pain Med. 2002;3(3):240–52.
45. Shipton E, Steketee C, Visser E. The Pain Medicine Curriculum Framework-structured integration of pain medicine education into the medical curriculum. Front Pain Res (Lausanne). 2022;3:1057114.
46. Bair MJ. Learning from our learners: implications for pain management education in medical schools. Pain Med. 2011;12(8):1139–41.
47. Richardson MG. The patient pain experience: an innovative student curriculum. Med Educ. 2008;42(11):1128.
48. Disease GBD, Injury I, Prevalence C. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the global burden of Disease Study 2015. Lancet. 2016;388(10053):1545–602.
49. Macauley R. The role of the principle of double effect in ethics education at US medical schools and its potential impact on pain management at the end of life. J Med Ethics. 2012;38(3):174–8.
50. Barreveld AM, Griswold T. A National Imperative: Multimodal Pain Education Reform in US Medical Schools. Pain Med. 2018;19(3):415–6.
51. Kadam UT, Thomas E, Croft PR. Is chronic widespread pain a predictor of all-cause morbidity? A 3 year prospective population based study in family practice. J Rheumatol. 2005;32(7):1341–8.
52. Meints SM, Edwards RR. Evaluating psychosocial contributions to chronic pain outcomes. Prog Neuropsychopharmacol Biol Psychiatry. 2018;87(Pt B):168–82.
53. Pierce SM, Heiman AJ, Ricci JA. Evaluating the current state of Ergonomics Education offered to students in US Medical Students. Am Surg. 2023;89(5):1798–806.
54. Fricton J. The need for preventing chronic pain: the big elephant in the room of healthcare. Glob Adv Health Med. 2015;4(1):6–7.
55. Murinson BB, Gordin V, Flynn S, Driver LC, Gallagher RM, Grabois M, Medical Student Education Sub-committee of the American Academy of Pain M. Recommendations for a new curriculum in pain medicine for medical students: toward a career distinguished by competence and compassion. Pain Med. 2013;14(3):345–50.
56. Mankelow J, Ryan CG, Taylor PC, Casey MB, Naisby J, Thompson K, McVeigh JG, Seenan C, Cooper K, Hendrick P, et al. International, multi-disciplinary, cross-section study of pain knowledge and attitudes in nursing, midwifery and allied health professions students. BMC Med Educ. 2022;22(1):547.
57. Marcer D, Deighton S. Intractable pain: a neglected area of medical education in the UK. J R Soc Med. 1988;81(12):698–700.
58. Nicholas MK, Linton SJ, Watson PJ, Main CJ. Decade of the flags working G: early identification and management of psychological risk factors (yellow flags) in patients with low back pain: a reappraisal. Phys Ther. 2011;91(5):737–53.
59. Henschke N, Kamper SJ, Maher CG. The Epidemiology and Economic consequences of Pain. Mayo Clin Proc. 2015;90(1):139–47.
60. Gibbins J, McCoubrie R, Maher J, Forbes K. Incorporating palliative care into undergraduate curricula: lessons for curriculum development. Med Educ. 2009;43(8):776–83.
61. Learning objectives for. Medical student education–guidelines for medical schools: report I of the Medical School Objectives Project. Acad Med. 1999;74(1):13–8.
62. Contemporary issues in. Medicine–medical informatics and population health: report II of the Medical School Objectives Project. Acad Med. 1999;74(2):130–41.

Publisher's note