

**Pain knowledge and attitudes survey amongst final year
medical students at the University of Cape Town:
a cross-sectional survey**

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Abstract

Title: Pain knowledge and attitudes of final year medical students at the University of Cape Town: a cross-sectional survey.

Background: Pain is the most common presenting complaint in patients visiting a healthcare facility. Healthcare professionals need adequate knowledge of pain to be able to manage it effectively.

Aim: To determine the Pain Knowledge and Attitudes of the 2018 final year medical students at the University of Cape Town (UCT).

Setting: The study was conducted by the Department of Anaesthesia and Perioperative Medicine in the Faculty of Health Sciences, University of Cape Town, South Africa with final year medical students

Methods: Unruh's Modified Pain Knowledge and Attitudes (MPKA) questionnaire was utilized to collect data in a cross-sectional survey using an internet-based electronic format.

Results: A total of 104 students out of 232 students in the class (44.8%) participated in the study. The total median score on the MPKA questionnaire was 46 (IQR 44-50.5) out of 57, or 80.7%(IQR 77.2-88.6%).The participants performed worst in the section on the pharmacological management of pain with median scores of 6 (IQR 4-8) (55%) correct out of 11 questions.

Conclusion: Pain knowledge, especially with regards to the pharmacological aspects of pain management, has some important deficiencies in these final year medical students. It appears that the undergraduate curriculum and teaching thereof would benefit from a review of the pain curriculum.

Keywords: pain knowledge, attitudes, medical students

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Section A: Introduction

Background

Pain is the most common reason why patients visit hospital emergency departments (ED) and undertreatment of acute pain in this setting is known to be common.^[1,2] Inadequate pain management remains a significant problem in hospitals. This is often attributed to insufficient pain knowledge amongst medical students and other health professionals.^[3,4] With new graduates likely to encounter patients experiencing acute pain, chronic pain or cancer pain in hospital emergency, surgical, paediatric, obstetric and medical departments as well as in primary health care, it is essential to assess current pain knowledge and attitudes amongst the medical students in order to prevent complications of incompletely assessed and undertreated pain.^[2] To our knowledge, there have been limited published studies exploring knowledge and attitudes towards pain among medical students in the South African context.

Pain has also become an expanding public health problem due to the limited levels of awareness of pain, especially its socioeconomic impact and burden, limited access to timely appropriate care, and inadequate pain education of health professionals - all of which need to be improved.^[5] A South African survey by Kamerman et al published in 2020 comprised of a nationally representative sample of the adult population with 10336 patients, revealed that the prevalence of chronic pain was 18.3%.^[6] Prevalence of chronic pain was greater in females (20.1%) than males (15.8%). The chronic pain definition used in this particular study was pain or discomfort that had been experienced all the time, or on and off for three months or more.^[6] According to the International Association for the study of Pain (IASP), chronic pain is defined as pain that has persisted for a duration of more than 3 months and is associated with significant emotional distress and at times functional disability.^[7] Chronic pain is frequently a result of inadequately treated acute pain. For example, poor post surgical acute pain management during the perioperative period may lead to patient morbidity, unanticipated readmission and persistent postsurgical pain.^[8] Further, several chronic pain conditions have an unclear or poorly understood etiology and pathophysiology, characterized by a complex interaction between biological, psychological and social factors.^[7] In the United States of America (USA) it is estimated that 61.2 billion dollars are lost per year due to the loss of productive time at work due to chronic pain.^[9] The prevalence of

cancer pain is between 20-50%, with approximately 50% of patients with cancer presenting with pain. ^[8] Studies in a wide range of settings have demonstrated poorly managed acute pain, for example, in Nairobi, Kenya, pain was assessed at intervals post-surgery, 55% of patients had pain 30 minutes post-surgery, 35% after 48 hours and 12% had moderate to severe pain after 48 hours. ^[10]

Effective pain management is essential for patients as inadequately treated pain may adversely affect quality of life. ^[11] Unreasonable failure to treat pain is viewed worldwide as poor medicine, unethical practice, and infringement of a fundamental human right, therefore medical students need to have a sound knowledge and a positive attitude towards holistic pain management. ^[11] Other adverse effects of oligoanalgesia include compromised sleep cycles and physical function, increased health care costs, emotional trauma and suffering. ^[12]

Pain Knowledge among medical students

Studies conducted in various parts of the world have shown that medical students and junior healthcare professionals are not equipped with adequate pain knowledge to effectively assess and treat pain. In a 2007 correlational study to evaluate pain knowledge and assessment ability in final year health science students at the University of Cape Town (UCT), the subset of medical students obtained a median score of 75%, however the sample size was small comprising of only 35 medical students out of a possible 183, hence the need to conduct a targeted follow up study on the final year medical students at UCT. ^[13] A more recent cross-sectional study conducted amongst final year undergraduate students from the School of Therapeutic Sciences at the University of the Witwatersrand in 2019 assessing their chronic low back pain knowledge, attitudes and beliefs showed a deficit in knowledge of pain with an overall mean score of 50%. ^[14] In another 2016 survey conducted at the University of Stellenbosch to determine the level of knowledge on chronic pain and its management amongst fifth year Medical students, further indicated the chronic pain knowledge deficits amongst the future doctors with the students scoring 40.48% on the questionnaire. ^[15] The poor scores in the South African cohorts are paralleled in studies of clinical pain conducted internationally.

A prospective, multicenter study assessed the state of emergency department pain management practice in 20 United States (US) and Canadian Hospitals. ^[1] Pain assessments were noted in 83% of cases but very few reassessments were performed and 60% of patients received analgesics that were administered only after lengthy delays with a median of 90 minutes and up to 15 hours passing before analgesia was administered. In addition, 74% of

patients were discharged still in moderate to severe pain. ^[1] This inadequate assessment and administration of analgesia by doctors leads to patients being at high risk of developing chronic pain. In a US 2019 study assessing Resident Knowledge and Perception of Pain Management, more than 50% of the respondents disagreed or strongly disagreed that they were adequately prepared to manage chronic pain, cancer-related pain, and complicated cases of pain. ^[16] They also highlighted that their medical school had not adequately prepared them with knowledge of basic pain physiology, pain assessment and dealing with narcotics-related complaints. ^[16]

Another cross-sectional study evaluated the knowledge, attitudes, and practice of health care professionals regarding chronic pain management in six different educational hospitals affiliated with Shiraz University of Medical Sciences in Iran. In this study significant deficits in knowledge, attitudes, and practice regarding pain and its management were recorded with medical residents only obtaining 51% of answers correct. ^[17] Knowledge, attitudes, and practices of health care providers in Saudi Arabia were assessed by administering a Knowledge and Attitudes Survey Regarding Pain at five different hospitals. ^[28] The authors concluded that there was a deficit in pain assessment knowledge, and pain management in the study group and recommended continuous education on pain assessment to increase the health care providers' knowledge, and enhance their practices regarding pain management. ^[28]

A cross-sectional study looking at Perspectives on Chronic Pain Education of Medical Students and Interns in Portugal revealed that chronic pain education was scattered, unstructured and optional. ^[20] The study further alluded that more pain education is required in medical schools and improvement in the medical undergraduate curricula so that future doctors are competent to adequately manage pain effectively. ^[20]

A 2007 Italian study by Zanolin and colleagues using a 21-item Questionnaire and answered by 4961 professionals in 20 hospitals to Evaluate the Knowledge and Attitudes of Health Care Providers on pain revealed a percentage score of physicians 56.5%, which was low indicating inadequate knowledge of pain. ^[22]

A European study comparing of the knowledge of chronic pain and its management between final year physiotherapy and medical students concluded that there was a lack of understanding of central sensitization, opioid addiction, and fear-avoidance behaviour, all of which are important aspects when assessing pain in order to target correct treatment. ^[18] A Canadian cross-sectional, online survey which was conducted amongst medical students confirms that there were few hours dedicated to pain management training and report discomfort in assessment and treatment of adult and pediatric pain. ^[12]

Cancer can cause much discomfort due to pain and doctors also need to understand how to holistically manage these patients. This was assessed in a Turkish study which evaluated opinions, knowledge and attitudes towards cancer pain management via a questionnaire among doctors working in surgical and medical departments at a university hospital. ^[23] Of the 83% of doctors who completed the questionnaire, approximately 60% had not received any formal education about cancer pain management during their medical school or residency training or some describes the pain education on cancer management as limited in quality and hours allocated for teaching were not satisfied. ^[23] These studies illustrating a lack of knowledge in health care professionals about pain and pain management, and an apparent lack of attention to pain in the undergraduate curriculum highlight the need to explore undergraduate pain education further.

Pain education

Pain education is an important component of health sciences curricula with a need for dedicated modules specifically addressing pain. The impact of pain-specific modules has been shown to be significant. For example, an Australian study aimed at evaluating changes in pain neurophysiology knowledge, beliefs and attitudes following a 12 week clinically-focused pain module in year 3 osteopathy students revealed significant improvements in Neurophysiology of Pain Questionnaire score after the 12 week clinically-focused pain module. ^[19]

Poor education and misconceptions regarding patients in pain are some of the barriers to effective pain management which can be overcome by pain education courses as illustrated by a Greek study where students who attended a dedicated pain course had greater knowledge of chronic pain and the use of opioids than students who did not attend the course. ^[20,21,22]

A review by Webster and colleagues on medical education training for chronic pain highlights significant discrepancies between the prevalence of chronic pain around the world and the low priority of pain education with little time dedicated to educating future physicians about the complexities of pain and especially about the relevance of the social context of those patients. ^[24]

In Brazil, most medical students participating in a survey reported not receiving enough information during the undergraduate program about the proper handling of patients with pain, and patient care in the palliative setting. ^[25] This study further highlights gaps in pain education and palliative care in medical schools and difficulties the students face to convert the theoretical knowledge into practice, mostly with regards to opioid use. ^[25]

An online survey conducted amongst final year medical students from two different universities in Australia and Sweden between December 2016 and February 2017 revealed that the students were knowledgeable about key chronic pain items described in clinical guidelines but reported that chronic pain training was poor, with a need to emphasise the biopsychosocial model, multidisciplinary teamwork and pharmacological training. ^[26]

The University of Washington School of Medicine introduced a 4-year integrated pain curriculum that increased pain education teaching time as well as integrating case-based multidisciplinary clinical training. This course aims to increase knowledge and competency in biopsychosocial measurement, risk assessment, and expand the role of patient-centred interprofessional treatment for medical students, residents, and fellows. ^[27] The impact of this program on patient care by these health care professionals when they graduated will need to be carefully assessed as curricula do not only aim to increase knowledge but should also focus on attitudes.

Attitudes towards pain

A study by Morris et al highlighted that health care providers with negative attitudes to chronic low back pain are most likely not to follow current guidelines for pain management unlike those with a positive attitude. ^[29] They also found that medical training promoted positive attitudes towards patients with back pain and their functional abilities. ^[29] This emphasizes the importance of pain education and its impact on the attitudes amongst medical students so that they can holistically treat patients.

Nimmaanrat et al, in their study in 2015 regarding medical students attitudes towards cancer pain showed that, providing appropriate information by means of lectures can improve the

attitudes of medical students regarding cancer pain management. ^[30] They also found that more information needs to be given to lessen fear of addiction and tolerance since the post-test evaluation showed significantly more negative attitudes concerning the fear of addiction and tolerance. ^[30]

Therefore, it is relevant to evaluate the pain knowledge and attitudes of health sciences students. We conducted a cross-sectional survey to assess the Pain Knowledge and Attitudes of the 2018 final year medical students at UCT using a questionnaire-based approach after ethical approval was granted from the UCT, Faculty of Health Sciences Human Research Ethics Committee (Ref #120/2018, Appendix A) and we adhered to the principles of the Declaration of Helsinki.

Our objectives were:

- ❖ To determine the Pain Knowledge and Attitudes of the 2018 final year medical students at University of Cape Town (UCT).
- ❖ To explore whether pain knowledge and attitudes of medical students in 2018 have improved as compared with final year medical students in 2007.

We have removed the second objective of the study direct comparison to the 2007 study as discussed in response to the previous comment by second peer reviewer, which stated that the 2007 sample was very small and not conducted on an equivalent group to the 2018 study and therefore recommended that the 2018 data could be discussed without comparison to the 2007 data.

We therefore restructured the paper as a descriptive study of the 2018 class with some reference to the earlier study in the discussion.

Outline of Dissertation

This dissertation proceeds as follows: the next section (Section B) contains the detailed protocol for the study as submitted for ethical and hospital approval. Section C presents the accepted manuscript submitted to The African Journal of Primary Health Care and Family Medicine Special Collection: Pain Management and Palliative Care which highlights the study findings and section D has concluding remarks.

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Section B: Protocol

Introduction

Pain knowledge amongst medical students and other health professionals is poor. A study done at University of Cape Town (UCT) in 2007 showed that final year health science students lacked pain knowledge.^[1] The study assessed pain knowledge and attitudes of all final year Health Science students and included medicine, physiotherapy, occupational therapy, dietetics, communication and audiology. Students with previous degrees, students who repeated a year of their current degree or those who had been transferred from other universities were excluded. The response rate from the medical student group was 25% (49/183) with a final sample size after exclusions of (19%) 35/183. 40% of medical students scored less than 75% on the modified version of Unruh's Revised Pain Knowledge and Attitudes Questionnaire (RPKAQ).^[1] Assessment, measurement and pharmacology of pain among medical students was particularly poor with a median of 67% and 58% respectively. Pain assessment and pharmacological management form a cornerstone for medical doctors and is critical for good clinical practice, hence the need for improvement of knowledge.

Pain knowledge and attitudes by medical students and ultimately doctors will influence how pain is managed. Poor pain management may occur because the subject is poorly understood and therefore incorrectly assessed and managed. Since adequate pain treatment is a human right, it is essential that healthcare systems are able to provide such a service.^[2]

Background

The burden of pain

The WHO has estimated that 22% of primary care patients worldwide suffer with chronic debilitating pain.^[3] Chronic pain accounts for nearly one-fifth of physician visits.^[4] In the United Kingdom (UK), chronic pain affects approximately 28 million adults which is between a third to half of the population.^[2] About 19% of adult Europeans suffer from moderate to severe chronic pain affecting the quality of their working and social lives.^[5] In Finland, pain accounted for 40% of all visits to the primary care doctor with patients experiencing mostly back pain, abdominal pain and headache.^[6]

In South Africa, 75% of patients attending an Eastern Cape rural and peri-urban health clinic, visited the clinic because of pain.^[7]

Primary health facilities in South –West Tshwane in South Africa surveyed 1066 patients – the prevalence of chronic pain was 41%- with back pain being the most common symptom.^[8]

The incidence of moderate to severe pain in a South African paediatric trauma unit was found to be 13.3% by use of the numerical rating scale for pain.^[9]

The incidence of older adults living with pain in the UK is approximately 50% in the community and as high as 80% in the nursing homes. Cognitive impairment can make pain management challenging -especially the assessment of the severity of the pain- which may help to guide the administration of appropriate analgesia.^[10]

The prevalence of cancer pain is between 20-50%. Approximately 50% of patients with cancer present with pain, with the highest prevalence among head and neck cancers. Other sites of pain included chest, abdomen and extremities.^[11] Acute post-surgical pain remains poorly managed too. In Nairobi, Kenya, pain was assessed at intervals post surgery. At 30 minutes post surgery pain was prevalent in 55% of patients, 35% after 24 hours and 35% after 48 hours. After 48 hours the prevalence of moderate to severe pain was reduced but was still experienced by 12% of patients.^[12] Human Immunodeficiency Virus (HIV) infected patients constitute a large percentage of the world's population. The prevalence of HIV infection in South Africa in 2017 was 12.57% (7.06 million) people.^[13] The primary focus in treating HIV has been the focus on antiretroviral treatment. Pain and other distressing symptoms are often not considered or managed.^[14]

The consequences of poorly managed pain

It is estimated that 61.2 billion dollars are lost per year due to the loss of productive time at work due to chronic pain in the USA.^[15] Poorly managed post-operative pain affects both physiological and psychological function and is associated with increased morbidity, impaired functional and quality of life, delayed recovery time as well as prolonged use of opioids and higher hospital costs.^[16] Suboptimal treatment of acute pain may increase the risk of the development of chronic pain.^[17]

In acute post-operative pain several negative neurohumoral responses cause increased release of catecholamines which ultimately causes increased myocardial oxygen demand which may potentially lead to more complications.^[18] Uncontrolled acute pain may also cause restricted breathing which leads to pulmonary complications while immobilization may lead to thrombi formation and increased mortality.^[15]

Pain knowledge among healthcare providers

In addition to the study whose data we are following up on, a 2016 survey at the University of Stellenbosch, South Africa, found chronic pain knowledge insufficient among fifth year medical students with the mean overall score for the questionnaire being 41% while 74% of respondents scored less than 50%.^[19] In health care providers in the Middle East in 2016 an overall percentage of pain knowledge was very low at 28.7%. Pain assessment and management among children was particularly poor.^[20]

A national pain audit conducted from 2010 to 2012 in the UK found that only medical specialists in pain medicine (who constitute only a small fraction of medical practitioners) had statutory training requirements and levels of competency that were adequate to accurately assess pain. Not many patients are exposed to competent multidisciplinary pain management hence the need to train medical students adequately.^[21]

A questionnaire completed by German physicians specializing in pain therapy revealed poor knowledge of the WHO recommendations for the treatment of cancer pain including the WHO analgesic ladder with deficiencies in the knowledge of pharmacological aspects.²² Several studies in Brazil have identified that nurses and physicians have a limited understanding of pain and its assessment tools as well as lack of knowledge and misconceptions regarding analgesic and opioid prescriptions leading to inadequate pharmacological treatment of pediatric pain.^[23]

Pain education

Pain education at medical schools is quite limited, variable and fragmented with pain sessions being typically presented as part of general required courses.

In Ethiopia only 4.2% of medical students and paramedics scored above the cut-off point of 70% for good knowledge regarding pain management, although according to feedback from the participants, 73% of them had indicated that they had thought that they had adequately learnt about pain management in their various curriculums.^[24]

In American medical schools many topics included in the International Association for the Study of Pain (IASP) core curriculum received little or no coverage.^[25] In 2012 Vadivelu et al reported that pain education had only been incorporated as part of the curriculum in 3% of schools in the US and that medical school curriculums needed to incorporate pain diagnosis

and management modules.^[15] A 2017 editorial stated that in 2008 the USA identified the under treatment of chronic pain and recommended that undergraduate medical students be exposed to pain medicine, but this has not yet occurred in majority of American medical schools.^[26]

Mezei et al examined curricula of 117 US and Canadian medical schools between August 2009 and February 2010. Approximately 80% of US medical schools required 1 or more pain session while 92% of Canadian medical schools also required pain sessions since many topics outlined in the IASP core curriculum had not been covered in the medical schools' curriculums.^[25]

Pain management education in the UK takes up less than 1% of the university teaching for healthcare professionals.^[15] A survey of 11 major universities across four UK countries showed that the average content of pain teaching of undergraduates was 12 hours.^[27] A core curriculum for professional education in pain in the UK has been compiled by a task force and includes pain anatomy, physiology of pain, assessment of pain and pharmacological and non-pharmacological methods.^[28]

Half of respondents in a survey conducted in developing countries by the IASP respondents had attended formal pain courses and 90% reported that that the level of pain education they had received was inadequate to cover their need as they graduated and entered practice.²⁸ The IASP has put together pain curriculums targeting certain groups of students including medical students, dental, nursing and occupational health students.^[28]

The APPEAL study looked at the current pain education curriculums within undergraduate medical studies during 2012-2013 in 15 European countries. Results showed that in 55% of the medical schools, pain was taught within compulsory non-specific pain modules while in 31% of medical schools pain was taught in dedicated pain modules.^[29]

Aim of the study

1. To assess the Pain, Knowledge and Attitudes of final year medical students of 2018 at UCT using a questionnaire based approach.

2. To determine whether pain knowledge and attitudes of medical students in 2018 have improved as compared with final year medical students in 2007.

Inclusion criteria

All registered final year medical students

Exclusion criteria

None

Data collection

A modified revised Pain Knowledge and Attitudes questionnaire will be used and distributed via email using an Internet-based electronic survey.

Data management and statistics

Descriptive and inferential statistics will be used to summarize the data. Frequency distributions will be used as well as measures of central tendency that is mode, median and mean and measures of dispersion such as the range, standard deviation and variance will be used describe the data collected. Computer statistical programmes for data analysis will be used, such as Epi-Info Version or STATA or SPSS.

Ethical considerations

Ethics approval will be sought from the UCT Research Ethics Committee prior to commencing the study. Participants will be given detailed information about the nature of the study, its purpose, potential risks or benefits and their participation in the study will be on a voluntary basis. No participant names will be required on the questionnaire to ensure anonymity. All the information collected will remain confidential. The completion of the questionnaire will imply the participant's consent to participate in the study.

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Section C: Paper published in The African Journal of Primary Health Care and Family Medicine- Special Collection: Pain Management and Palliative Care

Pain knowledge and attitudes of final year medical students at the University of Cape Town: a cross-sectional survey.

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Abstract

Background: Pain is the most common presenting complaint in patients visiting a healthcare facility. Healthcare professionals need adequate knowledge of pain to be able to manage it effectively.

Aim: The aim of this study was to determine the pain knowledge and attitudes of the 2018 final-year medical students at the University of Cape Town (UCT).

Setting: This study was conducted by the Department of Anaesthesia and Perioperative Medicine in the Faculty of Health Sciences, UCT, South Africa, with final-year medical students.

Methods: Unruh's Modified Pain Knowledge and Attitudes (MPKA) questionnaire was utilised to collect data in a cross-sectional survey using an Internet-based electronic format.

Results: A total of 104 students out of 232 students in the class (44.8%) participated in the study. The total median score on the MPKA questionnaire was 46 (interquartile range [IQR] 44–50.5) out of 57, or 80.7% (IQR 77.2–88.6%). The participants performed worst in the section on the pharmacological management of pain with median scores of 6 (IQR 4–8) (55%) correct out of 11 questions.

Conclusion: Pain knowledge, especially with regard to the pharmacological aspects of pain management, has some important deficiencies in these final-year medical students. It appears that the undergraduate curriculum and teaching thereof would benefit from a review of the pain curriculum.

Keywords: pain knowledge; attitudes; medical students; University of Cape pharmacological aspects of pain management.

Introduction

Pain is one of the most common symptoms experienced by patients in both the inpatient and outpatient setting. However, pain knowledge amongst medical students and other health professionals is poor. ^[1] The World Health Organization (WHO) has estimated that worldwide 22% of primary care patients suffer from chronic debilitating pain, with chronic pain accounting for one-fifth of physician's visits. ^[2,3,4] In South Africa (SA), 75% of patients attending an Eastern Cape rural and peri-urban health clinic visited the clinic because of pain, ^[5] and in a survey of 1066 patients attending primary healthcare facilities in South-West Tshwane (SA), the prevalence of chronic pain was 41%. ^[6]

Acute post-surgical pain remains poorly managed. ^[7] Suboptimal treatment of acute pain may increase the risk of developing chronic pain. ^[8] Poorly managed postoperative pain affects both physiological and psychological function and is associated with increased morbidity, impaired function, and quality of life, delayed recovery time, prolonged use of opioids and higher hospital costs. ^[9] Uncontrolled acute pain may also cause restricted breathing, leading to pulmonary complications, while immobilisation may lead to thrombi formation and increased mortality. ^[10] Two national surveys in the United States reported that 80% of patients experienced severe acute pain post-surgery in 2003, and the number subsequently increased to 86% in 2013. ^[11,12] Healthcare professionals need adequate knowledge of pain to be able to manage it effectively. However, pain education at medical schools is limited, variable and fragmented with pain topics being typically presented as part of general required courses. ^[13] In US medical schools, many topics included in the International Association for the Study of Pain (IASP) core curriculum receive little or no coverage. ^[13] In 2012, Vadivelu et al. reported that pain education had only been incorporated as part of the curriculum in 3% of schools in the United States and that medical school curricula needed to incorporate pain diagnosis and management modules. ¹⁰ A 2017 editorial stated that in 2008, the United States identified the under-treatment of chronic pain and recommended that undergraduate medical students be exposed to pain medicine. This has not yet occurred in the majority of American medical schools. ^[14]

This poor knowledge of pain is not restricted to healthcare professionals training in the United States. A questionnaire completed by German physicians specialising in pain therapy revealed poor knowledge of the WHO recommendations for the treatment of cancer pain, which included the WHO analgesic ladder, with deficiencies particularly in the knowledge of pharmacological aspects. ^[15] Pain management education in the United Kingdom takes up less than 1% of university teaching time for healthcare professionals. ^[10] A UK survey of 11 major universities showed that the average content of pain teaching for undergraduates was 12 h. ^[16] The APPEAL study on pain education curricula within undergraduate medical studies during 2012–2013 (surveying 15 European countries) showed that 55% of the medical schools taught pain within compulsory non-specific pain modules and 31% of medical schools taught pain in dedicated pain modules. ^[17] Several studies in Brazil have identified that physicians have a limited understanding of pain and its assessment tools. ^[18] This lack of knowledge and misconceptions regarding analgesic and opioid prescriptions leads to inadequate treatment. ^[18] In Ethiopia, only 4% of medical students and paramedics scored above the cut-off point of 70% for good knowledge regarding pain management. ^[19]

The situation in SA appears to be similar to other countries. While no articles could be found reporting on the amount of time committed to pain education in the South African undergraduate curricula, a 2007 study at the University of Cape Town (UCT) reported on the pain knowledge and attitudes of the final-year health science students. ^[20] This study showed that final-year health science students had poor knowledge of pain, with 40% of the final-year medical students scoring less than 75% on Unruh's Modified Pain Knowledge and Attitudes Questionnaire (MPKAQ). ^[20] A 2016 survey of University of Stellenbosch fifth-year medical students found that chronic pain knowledge was insufficient with respondents scoring 41%, with 74% of the respondents scoring less than 50%. ^[21]

Given the prevalence and negative impact of pain, having sufficient knowledge of and appropriate attitudes towards pain management are critical competencies for South African doctors. We conducted a cross-sectional survey to assess the pain knowledge and attitudes of the 2018 final-year medical students at UCT using a questionnaire-based approach.

Methods

A cross-sectional survey of final-year medical students was conducted. To ensure a representative sample, a sample size calculation was performed using the Yamane formula: $(n = \frac{N}{1+N(e)^2})$ [Eqn 1] where N is the study population, e is the constant equal to 0.05 (95% confidence) or 0.1 (90% confidence), and n is the sample size. [22] There were 232 registered students in the population. Based on the Yamane formula, we aimed to recruit 147 students (95% confidence) with a minimum of 70 students (90% confidence).

All 232 registered final-year medical students were contacted via their official university email addresses and invited to participate in an online survey of pain knowledge using Unruh's MPKAQ. [23] This tool covers a wide base of knowledge appropriate for healthcare professionals. The Pain Knowledge and Attitudes Questionnaire has established content validity and acceptable internal consistency (Cronbach's alpha 0.65). [24] The questionnaire was previously adapted to make it more appropriate for a South African cultural context, and it was thus called the 'Modified Pain Knowledge and Attitude Questionnaire' or MPKAQ. [20] Changes made included removing ambiguous or repeated questions and a change in the scoring from a Likert scale, which was converted to a correct/incorrect response for scoring, to a simple true or false answer system. The South African adaptation of the MPKAQ was previously piloted and had comparable results to the original questionnaire. [20]

In the email sent to final-year students to recruit them to the study, detailed information about the nature of the study, its purpose, potential risks or benefits and clarifying that participation was voluntary was given. The completion of the online questionnaire implied consent to participate. The Unruh's MPKAQ is divided into six sub-sections, which includes assessment of (1) physiological basis of pain, (2) psychological factors, (3) developmental changes of pain perception, (4) assessment and measurement of pain, (5) pharmacological management of pain and (6) cognitive or behavioural methods of pain relief.

Data management and statistics

Given the non-parametric characteristics of the data from the MPKAQ, the data are summarised as median and interquartile range (IQR) throughout.

Ethical considerations

This study was granted ethical approval from the UCT, Faculty of Health Sciences Human Research Ethics Committee (Ref #120/2018) and adhered to the principles of the Declaration of Helsinki throughout.

Results

The participants in this study were final-year medical students at UCT, completing their sixth year of study. Of 232 students invited to participate, 104 students (44.8%) completed the survey. The median age of the participants was 24 years (IQR: 23–25) with 69 females (66%) taking part.

Scores on the Unruh's modified pain knowledge and attitudes questionnaire

As shown in Figure 1, the median total score on the questionnaire was 46 out of 57 (80.7%), with an IQR of 44–50.5 (77.2% – 88.6%).

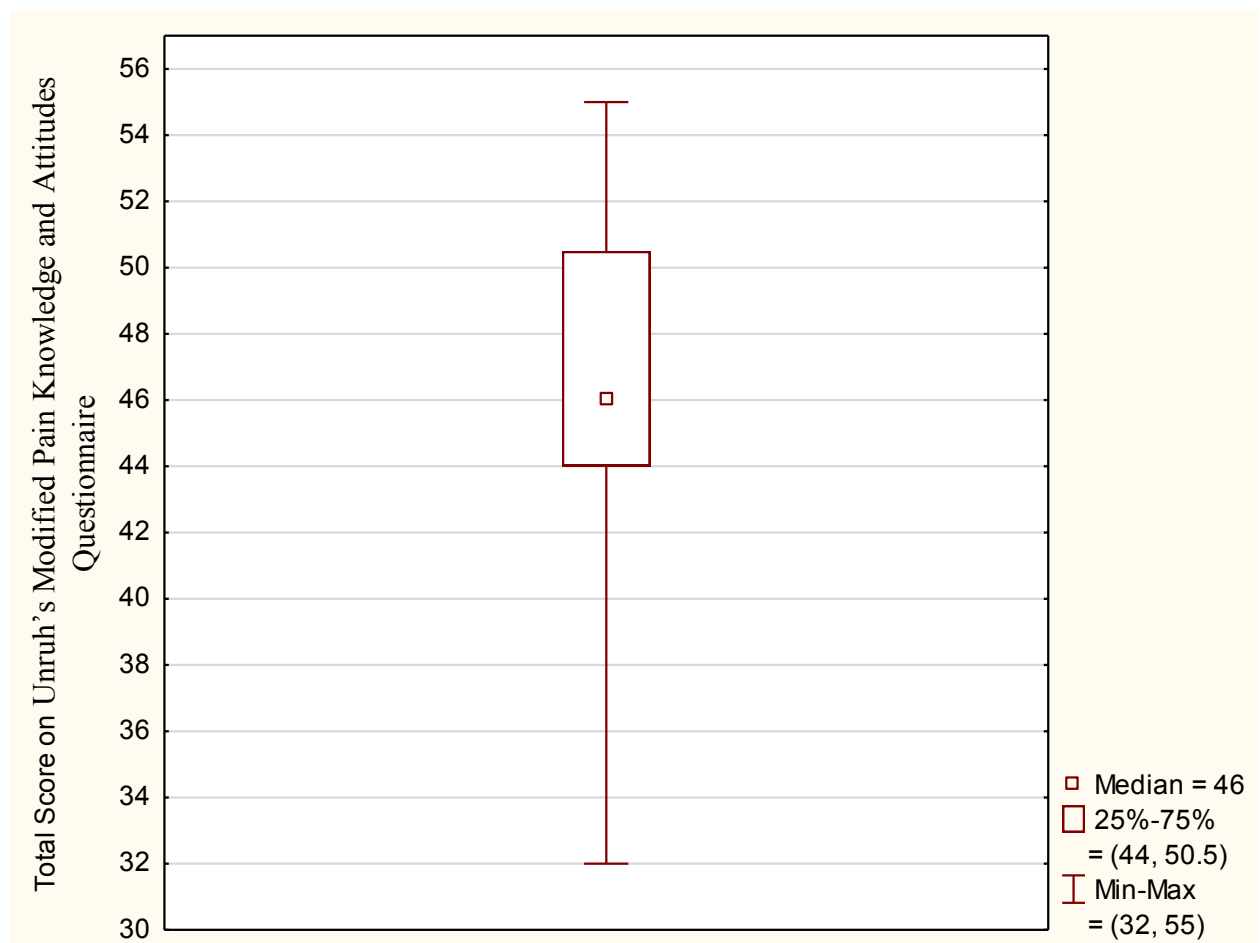


Figure 1: Total median scores (n=104)

TABLE 1: Results of the different sections on the questionnaire reported as medians with interquartile range.

Section on questionnaire	Results		Results
	Median	IQR	Median (%)
1. Physiological basis of pain (x/8)	7	6–8	87.5
2. Psychological factors of pain (x/13)	11	11–12	84.6
3. Developmental changes pain perception (x/9)	8	7–9	88.9
4. Assessment and measurement of pain (x/8)	6	5–7	75
5. Pharmacological management of pain (x/11)	6	4–8	54.6
6. Cognitive or behavioural methods of pain relief (x/8)	8	7–8	100
Total Score (x/57)	46	44–50.5	80.7

IQR, interquartile range.

1. *Physiological basis of pain*: The participants scored a median of 7 (87.5%) correct out of the 8 questions regarding the physiological basis of pain with an IQR of 6–8. Only 57 (55%) of the students correctly identified that there is NOT a predictable relationship between the extent of an injury and the person’s perception of pain (question 1). Furthermore, 37 (36%) of the participants incorrectly believed that the intensity of pain is its most important quality (question 4).

2. *Psychological factors of pain*: The participants scored a median of 11 (84.6%) correct out of the 13 questions with an IQR of 11–12. There were two questions on which participants performed poorly in this section. First, asking whether a person’s statement of pain should always be taken at face value (question 10) was incorrectly selected as untrue by 41 of the students (39%). Second, a true statement that deliberate faking of pain is rare amongst people with pain was incorrectly selected as false by 38 (36%) of the students.

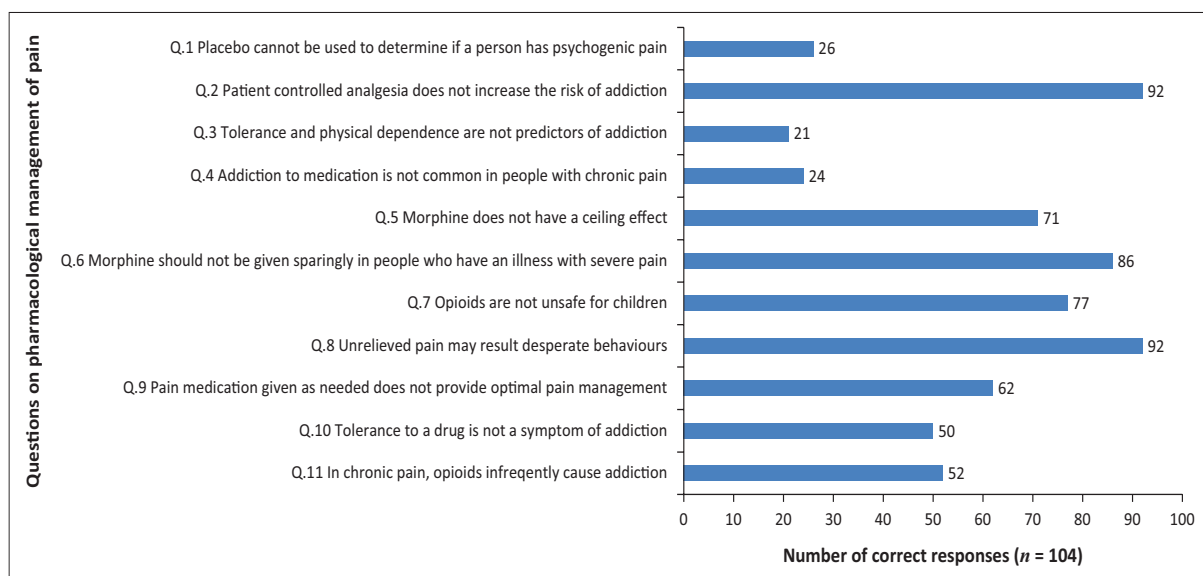
3. *Developmental changes in pain*: The participants scored a median of 8 (88.9%) correct out of the 9 questions (IQR = 7–9). There was only one question in which participants performed poorly. This question asked whether a child who is playing after surgery may have pain. Twenty-four of the participants (23%) incorrectly indicated that this statement was NOT true.

4. *Assessment and measurement of pain*: The participants scored a median of 6 (75%) correct out of the 8 questions (IQR = 5–7). There were two questions on which participants

performed poorly in this section. For question 35, asking participants whether blood pressure, heart rate, respiration and sweating were good measures of postoperative pain was incorrectly identified as true by 90 (87%) of the participants. For question 38, asking whether numerical pain rating scales are the gold standard for measurements in all adults and children was incorrectly indicated as true by 34 (33%) of the participants.

5. *Pharmacological management of pain*: The participants scored a median of 6 (55%) correct out of the 11 questions with an IQR of 4–8. There were several questions, which were problematic in this section on pharmacological management of pain (Figure 2). The worst performance was on question 47, asking if a person who has developed tolerance and physical dependence on pain medication is likely to develop addiction – this was incorrectly answered as true by 83 (80%) of the participants. Question 46 indicating that addiction to medication is common amongst people with chronic pain was incorrectly answered as true by 80 (77%) of the participants. Finally, question 49 stating that placebos can be used to determine if a person has psychogenic pain was incorrectly answered as true by 78 (75%) of the participants.

6. *Cognitive/behavioural methods of pain relief*: The participants scored a median of 8 (100%) correct out of the 8 questions with an IQR of 7–8. The only question on which participants scored poorly was question 53 on which 22 (21%) incorrectly indicated that reinforcement of coping with pain is not an important treatment intervention.



Statements in the above graph have been rephrased as true for consistency (in the PKAQ several statements are phrased negative) **Figure 2**:

Number of participants correctly answering each question in the section on the pharmacological management of pain (n=104)

Discussion

A total of 104 students out of 232 students in the class (44.8%) participated in the study. The total median score on the MPKA questionnaire was 46 (IQR 44-50.5) out of 57, or 80.7%(IQR 77.2-88.6%). The median age of the participants was 24 years (IQR: 23–25) with 69 females (66%) taking part. The participants scored a median of 7 (87.5%) correct out of the 8 questions regarding the physiological basis of pain, a median of 11 (84.6%) correct out of the 13 questions on psychological factors of pain and on developmental changes in pain, a median of 8 (88.9%) correct out of the 9 questions. With regards to assessment and measurement of pain, participants scored a median of 6 (75%) correct out of the 8 questions and score 100% (all 8 questions correct) on Cognitive/behavioural methods of pain relief. The participants performed worst in the section on the pharmacological management of pain with median scores of 6 (IQR 4-8) (55%) correct out of 11 questions.

Despite pain being the most common symptom that patients present with to hospital, healthcare workers inadequately assess and treat pain. 5 This study evaluates the pain knowledge and attitudes of 2018 final-year medical students (104 students, 44.8%). Our sample size allows 90% confidence in the findings. The age and gender distribution of the participants (66% female, 24 years, IQR = 23–25 years) was similar to the age and gender distribution of the whole class (63% female, 24 years, IQR = 24–25 years).

There is no gold standard instrument currently used to assess knowledge, perceptions and attitudes to pain management. Knowledge about pain management amongst nursing and medical students is consistently generally poor, despite the diversity of standardised instruments used to evaluate it. ^[1] The Unruh's MPKAQ was used in 2007 at UCT in a study which looked at the entire final year of health science students. It was modified and piloted at the time and shown to be comparable to the original Unruh's Pain Knowledge and Attitudes and was thus used again in our study. Instruments used in studies around the world to evaluate pain knowledge and attitudes of healthcare professionals tend to ask very similar type questions. ^[1] The particular strength of this tool is its coverage of a broad range of topics, including physiological basis of pain, psychological factors of pain, developmental changes in pain perception, assessment and measurement of pain, pharmacological management of pain, and cognitive or behavioural methods of pain relief.

Because of the high prevalence of pain and its negative impact, previous authors have indicated that an appropriate pass mark on the MPKAQ should be set at 75%, a mark

classified as a 'first class' mark at UCT. 20 The selection of this pass mark has been motivated for based on the frequency with which healthcare professionals will encounter and need to manage pain, suggesting that expertise is required in pain management on graduation. It was encouraging to note that the participants in this survey surpassed this mark with an overall score of 80.7%. This result is similar to those of a previous study conducted in final-year health science students at UCT in 2007 3 where the final-year medical students (n = 35) scored 79% on the same instrument. However, evaluation of the current study participants' performance on the subsections of the questionnaire identifies areas of concern.

The section on the pharmacological management of pain was the most poorly answered with a median score of 55%. This score is worse than the score obtained by final-year medical students who participated in a 2007 study at UCT who scored 64% for this section. [3] The question relating to an individual who has developed tolerance and dependence being likely to develop addiction was incorrectly answered by 80% of the participants. The question that addiction is common amongst people with chronic pain was also incorrectly answered by 77% of participants. Opioid use in non-cancer pain does not commonly result in addiction; a Cochrane review of opioids in non-cancer pain cites an incidence of addictive behaviour to be in the region of 0.27%. [25] These misconceptions about addiction are not unusual. In the United States, medical residents were found to underuse pain scales and opioid-equivalence tables, under-prescribe patient-controlled analgesia and overestimate the risk of addiction. [26] The need for specific education and training with regard to opioid use in the curriculum is important. Evidence-based guidelines on opioid prescribing and education on the topic has changed in the last 10 years. For example, there is limited evidence for using opioids as therapy for chronic, non-cancer pain beyond 16 weeks' duration; however, its use in acute pain management is indicated. [26] Potential under-treatment of acute pain with opioids has severe negative consequences for the patient, including increased morbidity, development of chronic postoperative pain, impaired function, poor recovery from surgery, poor quality of life and increased medical costs for chronic pain management. [9] This poor performance on the pharmacological questions amongst these future prescribers highlights an important gap in the medical school curriculum. It is imperative that medical school curricula remain up-to-date with evidence-based guidelines. At the time of this study, the curriculum at UCT did not have a dedicated pain module for students. As discussed in the introduction, a fragmented approach to pain teaching may be contributing to the poor responses recorded.

On the questions relating to cognitive or behavioural methods of pain relief, the median score was 100%. However, respondents performed poorly on the question regarding the use of reinforcing coping with pain as an important treatment strategy. Understanding the biological processes that are thought to underpin pain has been shown to reduce pain itself. ^[27] Developing an understanding of pain to improve the ability to cope and participate in meaningful life roles has been termed Pain Neuroscience Education. ^[27] Pain Neuroscience Education aims to increase the patient's knowledge of pain-related biology; in particular, the key message is that pain is not an accurate measure of tissue damage. Improving understanding of pain has been shown to decrease pain catastrophising and impart reduction in pain and disability. ^[27]

In 2016, participants in a survey of chronic pain knowledge in fifth-year medical students at the University of Stellenbosch scored poorly on an evaluation of pain knowledge with an overall score of 41%. ^[21] The study used a different data collection tool to that of the present study, comprising 18 questions on basic definitions, classification and management of chronic pain. ^[21] These results support those of the present study, suggesting that undergraduate South African medical students seem to lack adequate pain knowledge to manage patients presenting with chronic pain in particular.

A similar study amongst South African sports physiotherapists, where the same data collection instrument, the MPKAQ, was used, found that 85.5% of the responding physiotherapists had inadequate pain knowledge and attitudes (scored < 75%), with a mean score of 65.5%. ^[28] The lowest scores obtained were for the sections on Assessment and Measurement (47.7%) and Developmental Changes in pain (58.84%). ^[21] The authors noted that students who studied in their first language scored significantly higher in the physiology section than those who were studying in their second language. ^[28] This highlights the importance of teaching students in their first language yielding a better understanding of the subject. At UCT, English is the medium of instruction, with the possibility that the majority of students are studying in their second language.

Limitations

There are several potential limitations to this study. The Unruh's MPKAQ was used. While this tool is not commonly used, it resembles many pain questionnaires with a broad coverage of topics indicated as core in the International Association for the Study of Pain curricular guidelines.^[1] While the sample size was adequate for 90% confidence, there is still a risk of recruitment bias. Students with limited knowledge of pain, or for whom English is not their first language, may have chosen not to participate. In addition, the results cannot be generalised beyond students studying at this institution and receiving the same curriculum.

Recommendations

In line with international recommendations, the undergraduate health science students' curriculum should include a dedicated pain module with the scaffolding of pain into related topics and clear documentation of pain teaching with defined hours allocated.^[17] Scaffolding of pain into the curriculum would include teaching pain management within each specialty that students are exposed to, i.e., pain in obstetrics, urology or orthopaedics. This would result in students learning how to integrate pain management into a patient centred treatment approach.

Conclusion

The assessment and pharmacological management of pain are two important areas in which the participants in this study seemed deficient. Pharmacological management of pain is a crucial tool used by doctors in the holistic management of pain. Similar to worldwide trends, South African undergraduate pain education seems to need prioritising.

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Competing interests

The authors have declared that no competing interest exists.

Authors' contributions

B.M.-T is an anaesthesia registrar. He conducted the study and prepared the final article as part of her Master of Medicine in Anaesthesia. All authors were involved in the review and approval of the final article.

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Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study

Disclaimer

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Section D: Conclusion

It is important that pain be assessed correctly and holistically in order to enable adequate treatment. This study highlighted that there are still some deficiencies in the knowledge and attitudes of pain in final year medical students at the University of Cape Town. These deficiencies could be improved by increasing emphasis on certain aspects in the curriculum, particularly the pharmacological management of pain. In addition, teaching on pain tools and scales could be optimised so that pain is appropriately assessed.

A literature review conducted in 2016 by Ung et al showed that even with the use of diverse standardized instruments, studies have shown that pain management knowledge was generally poor amongst the medical and nursing students and recommended that appropriate evaluations and strategies be implemented. ^[1] A cross-sectional study in Spain on pain curricula across healthcare professions undergraduate degrees also concluded that pain was not such a large component of the undergraduate healthcare curriculum, given the extent of pain and its impact. ^[2] The authors of the Spanish study suggested that the curricula needed to be changed so that the problems all stakeholders have with pain care can be addressed. ^[2]

Enhancement of the pain curriculum was also supported by a qualitative descriptive study of patients, medical students and educators' perceptions of how to improve undergraduate medical education about pain assessment and management. This study identified important themes similar to our own, which included assessment of the following aspects of pain: physical and psychosocial, clinical management of pain with pharmacology and alternative therapies, communication and development of good therapeutic relationships, ethical considerations surrounding pain and the institutional context of medical education about pain. ^[3]

There are several potential limitations to this study. Perhaps the most significant is the risk of recruitment bias. Although the sample size was adequate for 90% confidence, students who

had limited knowledge of pain or for whom English is not their first language may have chosen not to participate in the study. This kind of recruitment bias may have artificially improved the scores. Finally, the questionnaire was updated to align with recent evidence, but this limits comparability with earlier studies.

In conclusion, we recommend that the Undergraduate Health Science students' curriculum should include a dedicated pain module with pain further scaffolded into the curriculum with related topics such as obstetrics or orthopaedics. Clear documentation of the pain curriculum with the allocation of defined hours throughout the program may contribute to graduates who are able to integrate pain management into a patient-centered treatment approach. ^[4]

Further development in the field of pain management in South Africa could be facilitated through an investment in undergraduate and postgraduate medical training through the hosting of pain management seminars or interactive pain assessment and management workshops with different medical disciplines and specialties practically illustrating how pain should be treated holistically. and put in place measures to ensure that the students have understood this important subject. Improving the knowledge of pain might result in a change in attitudes and beliefs or misconceptions on subjects such as opioids and pain will be treated more effectively. ^[5] Given that 1 in 5 South Africans are suffering from chronic pain (Kammerman et al, 2020), it is critical that our health care professionals are adequately trained to address the burden of pain. ^[6]

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Appendices

Appendix A: Ethics Approval



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
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Website: www.health.uct.ac.za/fhs/research/humanethics/forms

26 February 2018

HREC REF: 120/2018

Dr J van Nugteren
Anaesthesia and Perioperative Medicine
D23, NGSH

Dear Dr van Nugteren

PROJECT TITLE: PAIN, KNOWLEDGE AND ATTITUDES SURVEY AMONG FINAL YEAR MEDICAL STUDENTS AT THE UNIVERSITY OF CAPE TOWN: AN 11-YEAR FOLLOW UP STUDY (Masters Candidate – Dr B Mashanda-Tafaune)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study subject to adding the HREC contact details and receiving approval from Dr Khan, Head of Student Affairs.

Approval is granted for one year until the 28 February 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate Institutional approval, where necessary, before the research may occur.

The HREC acknowledge that the student, Dr Blessing Mashanda-Tafaune will also be involved in this study.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 120/2018

Appendix B: Data Collection Documents

INFORMATION LEAFLET

PAIN, KNOWLEDGE AND ATTITUDES SURVEY AMONGST FINAL YEAR UNIVERSITY OF CAPE TOWN, SOUTH AFRICA MEDICAL STUDENTS- A FOLLOW UP STUDY

- **Why is this research being done?**

To find out current pain knowledge and attitudes amongst the 2018 final year medical students at University of Cape Town using a questionnaire based approach and compare if there has been any improvement to the previous study done on medical students class of 2007.

- **Why are you invited to take part?**

To facilitate identification of knowledge gaps and note areas of improvement with regards to the way is pain assessed and treated.

- **How long will you take part in this research?**

It will take approximately 15-20 minutes to complete the electronic questionnaire sent via email.

- **What procedures, drugs or other treatments are involved in this research?**

This survey seeks to identify current knowledge therefore there are no procedures, drugs or treatments involved in this research.

- **What are the risks and discomforts of taking part in this research?**

There are no risks or discomforts anticipated in this research.

- **Are there any benefits to you if you take part in this research?**

There are no monetary benefits to you if you take part, however this research will identify the gaps in pain knowledge and make recommendations with regards to the current pain curriculum.

- **What other choices do you have?**

This study is on a voluntary basis and you have a choice to opt not to participate in this survey.

- **What happens if you do not want to take part in this research?**

There will be no penalties if you opt not to take part in this survey

- **What happens at the end of this research?**

All the information collected will remain confidential, will be analysed and results made available for all participants as well as recommendations and be published in order to improve pain management practices amongst various medical schools.

Appendix C: Unruh’s Modified Revised Pain Knowledge and Attitudes Questionnaire

Demographics

Age

--	--

Gender

Male	
Female	

<u>Physiological Basis of Pain</u>		
1. There is a predictable relationship between the extent of an injury and the person's perception of pain	TRUE	FALSE
2. The perception of pain varies from individual to individual	TRUE	FALSE
3. Nociception always results in pain	TRUE	FALSE
4. The intensity of pain is its most important quality	TRUE	FALSE
5. Two people with exactly the same physical condition or trauma will have similar experiences of pain	TRUE	FALSE
6. Pain is a subjective experience	TRUE	FALSE
7. The duration of pain is similar for individuals with the same pain condition	TRUE	FALSE
8. Unrelieved pain may contribute to the onset of chronic pain	TRUE	FALSE
<u>Psychological Factors of Pain Perception</u>		
1. Chronic pain always has an underlying psychological cause	TRUE	FALSE
2. A person's statement about pain should always be accepted at face value	TRUE	FALSE
3. If there is no organic basis to the pain, then the pain is psychological	TRUE	FALSE
4. Psychologically-caused pain can hurt as much as organically caused pain	TRUE	FALSE
5. A person receiving compensation is less likely to recover from pain	TRUE	FALSE

6. Chronic pain frequently leads to depression	TRUE	FALSE
7. It is common for someone with chronic pain to feel little control over the pain	TRUE	FALSE
8. Pain due to a physiological cause and pain due to a psychological cause can occur simultaneously	TRUE	FALSE
9. People with chronic pain can continue to live productive lives	TRUE	FALSE
10. A person may have severe pain but appear calm and rational at the same time	TRUE	FALSE
11. Learning to tolerate pain builds character	TRUE	FALSE
12. Relief of pain is often more important to the person than treatment of the underlying condition	TRUE	FALSE
13. Deliberate faking of pain is rare among people with pain	TRUE	FALSE
Developmental Changes in Pain Perception		
1. A child, who is playing after surgery, may have pain	TRUE	FALSE
2. Children experience less pain than adults	TRUE	FALSE
3. Due to the immaturity of the nervous system, newborns have little sensitivity to pain	TRUE	FALSE
4. Children have a higher tolerance for pain than adults	TRUE	FALSE
5. If children are given medication for pain, they are more likely to think that drugs will solve their problems in later life	TRUE	FALSE
6. A premature infant is able to feel pain	TRUE	FALSE
7. Children, who have recurrent abdominal pain, are probably seeking attention or trying to escape responsibilities	TRUE	FALSE
8. Elderly people tolerate more pain	TRUE	FALSE
9. Children remember pain	TRUE	FALSE

Assessment and Measurement of Pain		
1. It is impossible to measure pain in an individual who is unable to communicate about pain	TRUE	FALSE
2. Nociceptive pain is characterized by pins and needles and numbness	TRUE	FALSE
3. Self-report is the most meaningful measure of pain	TRUE	FALSE
4. A person, who is sleeping, may have significant pain	TRUE	FALSE
5. Blood pressure, heart rate, respiration, and sweating are good measures of postoperative pain	TRUE	FALSE
6. Chronic pain always has a cause	TRUE	FALSE
7. Pain can be measured on a variety of numerical scales	TRUE	FALSE
8. Numerical pain rating scales are the gold standard for measurements in all adults and children	TRUE	FALSE
Pharmacological Management of Pain		
1. Opioids given for chronic pain frequently lead to addiction (<i>'Opioids' is the accepted medical term for narcotics.</i>)	TRUE	FALSE
2. Tolerance to a drug is a symptom of drug addiction	TRUE	FALSE
3. Pain medication given PRN provides the most optimal relief of pain (<i>Definition: PRN is whenever the person requests medication</i>)	TRUE	FALSE
4. Unrelieved pain may result in desperate behaviour to relieve pain, similar to the actions of someone addicted to drugs	TRUE	FALSE
5. Opioids are unsafe for children because of addiction and respiratory depression	TRUE	FALSE
6. Morphine should be given sparingly to a person who will likely have severe pain in the course of the illness	TRUE	FALSE
7. Morphine does not have a ceiling effect for dosage or therapeutic benefit	TRUE	FALSE
8. Addiction to medication is common among people who have chronic pain	TRUE	FALSE
9. If a person has developed tolerance and physical dependence on pain medication, then addiction is likely to occur	TRUE	FALSE
10. Patient Controlled Analgesia increases the risk of addiction (<i>Def: PCA is self administered medication through an infusion pump.</i>)	TRUE	FALSE
11. Placebos can be used to determine if a person has psychogenic pain	TRUE	FALSE
Cognitive/Behavioural Methods of Pain Relief		
1. Being engaged in meaningful activity may reduce a person's perception of pain	TRUE	FALSE
2. Cognitive/behavioural methods of pain relief can be as effective as pharmacological methods	TRUE	FALSE
3. Relaxation is an effective method of pain relief for mild to moderate levels of pain	TRUE	FALSE
4. Reinforcement of coping with pain is an important treatment	TRUE	FALSE

intervention		
5. A spouse, parents, or other family members may exacerbate non-coping behaviours	TRUE	FALSE
6. Cognitive/behavioural methods have no effect on reducing pain	TRUE	FALSE
7. Changing a person's patterns of thought regarding pain may improve coping skills	TRUE	FALSE
8. Cognitive/behavioural methods may have more impact on improving coping than on reducing the intensity of pain	TRUE	FALSE

Appendix D: Memorandum for complete questionnaire

Correct answers are indicated in red.

Physiological Basis of Pain		
9. There is a predictable relationship between the extent of an injury and the person's perception of pain	TRUE	FALSE
10. The perception of pain varies from individual to individual	TRUE	FALSE
11. Nociception always results in pain	TRUE	FALSE
12. The intensity of pain is its most important quality	TRUE	FALSE
13. Two people with exactly the same physical condition or trauma will have similar experiences of pain	TRUE	FALSE
14. Pain is a subjective experience	TRUE	FALSE
15. The duration of pain is similar for individuals with the same pain condition	TRUE	FALSE
16. Unrelieved pain may contribute to the onset of chronic pain	TRUE	FALSE
Psychological Factors of Pain Perception		
14. Chronic pain always has an underlying psychological cause	TRUE	FALSE
15. A person's statement about pain should always be accepted at face value	TRUE	FALSE
16. If there is no organic basis to the pain, then the pain is psychological	TRUE	FALSE
17. Psychologically caused pain can hurt as much as organically caused pain	TRUE	FALSE
18. A person receiving compensation is less likely to recover from pain	TRUE	FALSE
19. Chronic pain frequently leads to depression	TRUE	FALSE
20. It is common for someone with chronic pain to feel little control over the pain	TRUE	FALSE
21. Pain due to a physiological cause and pain due to a psychological cause can occur simultaneously	TRUE	FALSE
22. People with chronic pain can continue to live productive lives	TRUE	FALSE

23. A person may have severe pain but appear calm and rational at the same time	TRUE	FALSE
24. Learning to tolerate pain builds character	TRUE	FALSE
25. Relief of pain is often more important to the person than treatment of the underlying condition	TRUE	FALSE
26. Deliberate faking of pain is rare among people with pain	TRUE	FALSE
Developmental Changes in Pain Perception		
10. A child, who is playing after surgery, may have pain	TRUE	FALSE
11. Children experience less pain than adults	TRUE	FALSE
12. Due to the immaturity of the nervous system, newborns have little sensitivity to pain	TRUE	FALSE
13. Children have a higher tolerance for pain than adults	TRUE	FALSE
14. If children are given medication for pain, they are more likely to think that drugs will solve their problems in later life	TRUE	FALSE
15. A premature infant is able to feel pain	TRUE	FALSE
16. Children, who have recurrent abdominal pain, are probably seeking attention or trying to escape responsibilities	TRUE	FALSE
17. Elderly people tolerate more pain	TRUE	FALSE
18. Children remember pain	TRUE	FALSE

Assessment and Measurement of Pain		
9. It is impossible to measure pain in an individual who is unable to communicate about pain	TRUE	FALSE
10. Nociceptive pain is characterized by pins and needles and numbness	TRUE	FALSE
11. Self-report is the most meaningful measure of pain	TRUE	FALSE
12. A person, who is sleeping, may have significant pain	TRUE	FALSE
13. Blood pressure, heart rate, respiration, and sweating are good measures of postoperative pain	TRUE	FALSE
14. Chronic pain always has a cause	TRUE	FALSE
15. Pain can be measured on a variety of numerical scales	TRUE	FALSE
16. Numerical pain rating scales are the gold standard for measurements in all adults and children	TRUE	FALSE
Pharmacological Management of Pain		
12. Opioids given for chronic pain frequently lead to addiction (<i>'Opioids' is the accepted medical term for narcotics.</i>)	TRUE	FALSE
13. Tolerance to a drug is a symptom of drug addiction	TRUE	FALSE
14. Pain medication given PRN provides the most optimal relief of pain (<i>Definition: PRN is whenever the person requests medication</i>)	TRUE	FALSE
15. Unrelieved pain may result in desperate behaviour to relieve pain, similar to the actions of someone addicted to drugs	TRUE	FALSE
16. Opioids are unsafe for children because of addiction and respiratory depression	TRUE	FALSE
17. Morphine should be given sparingly to a person who will likely have severe pain in the course of the illness	TRUE	FALSE
18. Morphine does not have a ceiling effect for dosage or therapeutic benefit	TRUE	FALSE
19. Addiction to medication is common among people who have chronic pain	TRUE	FALSE
20. If a person has developed tolerance and physical dependence on pain medication, then addiction is likely to occur	TRUE	FALSE
21. Patient Controlled Analgesia increases the risk of addiction (<i>Def: PCA is self administered medication through an infusion pump.</i>)	TRUE	FALSE
22. Placebos can be used to determine if a person has psychogenic pain	TRUE	FALSE
Cognitive/Behavioural Methods of Pain Relief		
9. Being engaged in meaningful activity may reduce a person's perception of pain	TRUE	FALSE
10. Cognitive/behavioural methods of pain relief can be as effective as pharmacological methods	TRUE	FALSE
11. Relaxation is an effective method of pain relief for mild to moderate levels of pain	TRUE	FALSE
12. Reinforcement of coping with pain is an important treatment	TRUE	FALSE

intervention		
13. A spouse, parents, or other family members may exacerbate non-coping behaviours	TRUE	FALSE
14. Cognitive/behavioural methods have no effect on reducing pain	TRUE	FALSE
15. Changing a person's patterns of thought regarding pain may improve coping skills	TRUE	FALSE
16. Cognitive/behavioural methods may have more impact on improving coping than on reducing the intensity of pain	TRUE	FALSE

Appendix E: Instructions To Authors: Journal The African Journal of Primary Health Care and Family Medicine Special Collection: Pain Management and Palliative Care

Original Research Articles

An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format. Systematic reviews should follow the same basic structure as other original research articles. The aim and objectives should focus on a clinical question that will be addressed in the review. The methods section should describe in detail the search strategy, criteria used to select or reject articles, attempts made to obtain all important and relevant studies and deal with publication bias (including grey and unpublished literature), how the quality of included studies was appraised, the methodology used to extract and/or analyse data. Results should describe the homogeneity of the different findings, clearly present the overall results and any meta-analysis.

Word limit	3500-7000 words (excluding the structured abstract and references)
Structured abstract	250 words to cover a Background, Aim, Setting, Methods, Results and Conclusion
References	60 or less
Tables/Figures	no more than 7 Tables/Figure
Ethical statement	should be included in the manuscript
Compulsory supplementary file	ethical clearance letter/certificate
Language	only manuscripts presented in English or French will be considered

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives,

methods, results and significance of the matter. The structured abstract for an Original Research article should consist of six paragraphs labelled Background, Aim, Setting, Methods, Results and Conclusion.

- Background: Summarise the social value (importance, relevance) and scientific value (knowledge gap) that your study addresses.
 - Aim: State the overall aim of the study.
 - Setting: State the setting for the study.
 - Methods: Clearly express the basic design of the study, and name or briefly describe the methods used without going into excessive detail.
 - Results: State the main findings.
 - Conclusion: State your conclusion and any key implications or recommendations.
- Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

- Social value: The first part of the introduction should make a clear and logical argument for the importance or relevance of the study. Your argument should be supported by use of evidence from the literature.
- Scientific value: The second part of the introduction should make a clear and logical argument for the originality of the study. This should include a summary of what is already known about the research question or specific topic, and should clarify the knowledge gap that this study will address. Your argument should be supported by use of evidence from the literature.
- Conceptual framework: In some research articles it will also be important to describe the underlying theoretical basis for the research and how these theories are linked together in a conceptual framework. The theoretical evidence used to construct the conceptual framework should be referenced from the literature.
- Aim and objectives: The introduction should conclude with a clear summary of the aim and objectives of this study.

Research methods and design: This must address the following:

- Study design: An outline of the type of study design.
- Setting: A description of the setting for the study; for example, the type of community from which the participants came or the nature of the health system and services in which the study is conducted.
- Study population and sampling strategy: Describe the study population and any inclusion or exclusion criteria. Describe the intended sample size and your sample size calculation or justification. Describe the sampling strategy used. Describe in practical terms how this was implemented.
- Intervention (if appropriate): If there were intervention and comparison groups, describe the intervention in detail and what happened to the comparison groups.
- Data collection: Define the data collection tools that were used and their validity. Describe in practical terms how data were collected and any key issues involved, e.g. language barriers.
- Data analysis: Describe how data were captured, checked and cleaned. Describe the analysis process, for example, the statistical tests used or steps followed in qualitative data analysis.
- Ethical considerations: Approval must have been obtained for all studies from the author's institution or other relevant ethics committee and the institution's name and permit numbers should be stated here.

Results: Present the results of your study in a logical sequence that addresses the aim and objectives of your study. Use tables and figures as required to present your findings. Use quotations as required to establish your interpretation of qualitative data. All units should conform to the SI convention and be abbreviated accordingly. Metric units and their international symbols are used throughout, as is the decimal point (not the decimal comma).

Discussion: The discussion section should address the following four elements:

- Key findings: Summarise the key findings without reiterating details of the results.
- Discussion of key findings: Explain how the key findings relate to previous research or to existing knowledge, practice or policy.

- Strengths and limitations: Describe the strengths and limitations of your methods and what the reader should take into account when interpreting your results.
- Implications or recommendations: State the implications of your study or recommendations for future research (questions that remain unanswered), policy or practice. Make sure that the recommendations flow directly from your findings.

Conclusion: Provide a brief conclusion that summarises the results and their meaning or significance in relation to each objective of the study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named. Refer to the acknowledgement structure guide on our Formatting Requirements page.

Also provide the following, each under their own heading:

- Competing interests: This section should list specific competing interests associated with any of the authors. If authors declare that no competing interests exist, the article will include a statement to this effect: The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article. Read our [policy on competing interests](#).
- Author contributions: All authors must meet the criteria for authorship as outlined in the [authorship policy](#) and [author contribution statement](#) policies.
- Funding: Provide information on funding if relevant
- Data availability: All research articles are encouraged to have a data availability statement.
- Disclaimer: A statement that the views expressed in the submitted article are his or her own and not an official position of the institution or funder.

References: Authors should provide direct references to original research sources whenever possible. References should not be used by authors, editors, or peer reviewers to promote self-interests. Refer to the [journal referencing style](#) downloadable on our Formatting Requirements.

Appendix F: Reviewer Comments And Responses

Reviewer 1

1. Reviewer comment:

This study claims to compare the results of a survey the knowledge and attitudes of final year medical student regarding pain with a similar study of medical students in 2007. However, on checking the source of the 2007 study, an unpublished master's dissertation, I discovered that the 2007 survey was carried out on physiotherapy students.

Response

While the Parker et al (2009) study was conducted by final year physiotherapy students in 2007 and published in 2009, the participants were not restricted to physiotherapy students alone but included all Health Sciences students at UCT: Medicine, Physiotherapy, Occupational Therapy, Dietetics, Communication sciences and Audiology. However, taking into consideration the invaluable input from both the reviewers we have refocused the present study's analysis and discussion to report only on the 2018 data with reference to the 2009 paper in the discussion

2. Reviewer comment:

The original questionnaire has been modified. A True/False answer has been substituted for the Likert scale in the original survey.

Response

In Unruh's original Revised Pain Knowledge and Attitudes Questionnaire RPKAQ (1996), participants indicated their answers using a seven-point Likert-scale as correctly mentioned by the reviewer. Scoring of the original questionnaire then required the seven-point Likert scale to be converted to a binomial correct/incorrect response. The response format on the questionnaire was one of the modifications made in the Parker et al (2009) study. The MPKAQ used in the 2009 was adopted for use in this study as we wished to be able to compare the current cohort with the 2007 survey.

The original RPKAQ questionnaire and the modified MPKAQ questionnaire are attached as supplementary material.

3. Reviewer comment

Neither Likert scales nor True/False answers are reliable ways of testing knowledge or attitudes.

Response

We acknowledge that there are weaknesses in the method used to test knowledge and attitudes. In preparation for the study we explored potential methods of evaluation in the paper “Assessing knowledge, perceptions and attitudes to pain management among medical and nursing students: a review of the literature.”, Ung A, Salamonson Y, Hu W, Gallego G. British journal of pain. 2016 Feb;10(1):8-21. The authors concluded that there is no gold standard instrument to assess knowledge, perceptions and attitudes to pain management. We decided to use the same questionnaire as that used in the 2007 study conducted at our institution, which covers various aspects of pain. These include the physiological basis of pain, psychological factors of pain, developmental changes of pain perception, assessment and measurement of pain, pharmacological management of pain and the cognitive or behavioral methods of pain relief. These various aspects of pain have been identified as core curriculum by the International Association for the Study of Pain (Kopf et al).^[1]

4. Reviewer comment

It is claimed that this new questionnaire has been “tested”, however there is no description of it being properly validated.

Response

The original Pain Knowledge and Attitudes Questionnaire (Unruh, 1995) consisted of 65 statements. The Modified Unruh’s PKA questionnaire was adapted and piloted two students from each discipline in the 2007 with results being similar to those of the original. In the methods, information on the validity and reliability of the instrument has been included. “The Pain Knowledge and Attitudes Questionnaire has established content validity and acceptable internal consistency (Chronbach’s alpha 0.65).^[2] The questionnaire was previously adapted by the 2007 researchers to make it more appropriate for a South African cultural context and it was thus called the “Modified Pain Knowledge and Attitude Questionnaire” or MPKAQ . Changes made included removing ambiguous or repeated questions and a change in the scoring from a Likert scale which was converted to a correct/incorrect response for scoring, to a simple true or false answer system. The South African adaptation of the MPKAQ was previously piloted and had comparable results to the original questionnaire.

5. Reviewer comment

The questionnaire is not available to the reader of the article.

Response

Apologies, as noted above both the original and the adapted questionnaires have been included as supplementary material- Appendix 1 & 2.

6. Reviewer comment

References 27 and 28 are incomplete.

Response

References 27 [now 25] and 28 [now 26] completed.

7. Reviewer comment

The research for references 23, 24, 26, 30 do not appear to have been published in peer reviewed journals.

Response

The citations have been corrected.

References 23 [now 20] and 30[now 28] are published in peer reviewed journals and the citations have been updated

References 24 [now 21] and 26 [now 23] are unpublished sources, university theses and their citations have been corrected.

8. Reviewer comment

The page numbers of books sited are not provided.

Response

Reference 13 [now 9] Page numbers inserted 2287-2298

Reference 15 [now 12] Page numbers inserted 534-540

Reference 17 [now 14] Page numbers inserted 332-335

Reference 18 [now 15] Page numbers inserted 267-275

Reference 25 [now 22] Page numbers inserted 258

Reference 29 [now 27] Page numbers inserted 2041-2056

REVIEWER 2

1. Reviewer comment

The introduction is too long, especially the two paragraphs on the prevalence of pain. While some information on the prevalence of pain is required for context, this paper is about knowledge of pain, not the prevalence of pain.

Response

We have reworked the introduction to make it more concise with a focus on the research topic.

2. Reviewer comment

The study relies, to a certain degree, on the comparison between the current data to research conducted in 2007. I have several issues with this comparison. The 2007 work was done in a very small sample, and based on the wording in the manuscript, the study was not conducted in an equivalent group to the 2018 study. The wording used in the manuscript is, "final year health sciences students". Does this include a range of disciplines and how many were final-year medical students were included? If the 2007 group consisted of a mix of degree programmes, what percentage of the group were final year medical students, and if there are sufficient numbers, would it be possible to pull out those data for the comparison? What exacerbates the issues around the 2007 study is that it is not readily available. I tried to access the study but failed. Therefore I could not look at the composition of the group myself. Nor could I check on the properties of the modified questionnaire compared to the original. Because of the issues raised, I do not think the comparison to 2007 is valid and it should be removed from the manuscript. Having said that, I do not think 2007 is required and the 2018 data can stand by itself. Reporting the 2018 data only will make the paper entirely descriptive, but that is fine.

Response

Thank you for the suggestion. We have removed the direct comparison to the 2007 study as discussed in response to the previous comment by second reviewer. We have restructured the paper as a descriptive study of the 2018 class with some reference to the earlier study in the discussion.

3. Reviewer comment

Please include the modified questionnaire in the supplementary materials.

Response

Apologies, the questionnaire will be availed as supplementary material for the reviewer-
Appendix 1

4. Reviewer comment

Please report all data as median (interquartile range) rather than median (range). The IQR lets the reader know where 50% of the data lie, thus giving a better indication of the spread of the data.

Response

Thank you we have reported all data as median with interquartile range (IQR).

5. Reviewer comment

Please report the data in Table 1 as a box-and-whisker plot with superimposed individual data points. Alternatively, keep the percentages but supply 95% confidence intervals. If you choose to report the percentages with 95% CIs, then please include the box-and-whisker plots in the supplementary materials (or visa versa).

Response

Given the lack of normality in the distribution of the data we have chosen to report the results for the subsections in Table 1 as the raw median scores with IQR. We felt that the skewness of data and presentation in box-and-whisker plots made interpretation difficult. As the scores for each of the subsections are calculated from different sub-totals, we have also provided the percentage for ease of interpretation for the reader.

6. Reviewer comment

Please redraw Figure 1 as a box-and-whisker plot of raw scores or percentages with 95% confidence intervals. As with comment 5, if you choose to report the percentages with 95% CIs, then please include the box-and-whisker plots in the supplementary materials (or visa versa).

Response

A box-and-whisker plot of the raw score has been included.

7. Reviewer comment

Please redraw Figure 2 using raw scores and box-and-whisker plots. Alternatively, report the percentages but supply 95% confidence intervals. As with comment 5, If you choose to report the percentages with 95% CIs, then please include the box-and-whisker plots in the supplementary materials (or visa versa). Finally, I suggest that percentage (95% Ci) and box-and-whisker plots are created for all sections of the questionnaire, and these are included in the supplementary materials.

Response

In Figure 2 the number of participants who responded correctly for each individual question for the section is presented. Given that these are responses to individual questions, the number of correct responses are reported. Box-and-whisker or mean percentages with 95%CI are not appropriate here. We have included the information for the sections as above in response to previous comments, but for individual questions we have retained this presentation.

8. Reviewer comment

The discussion is well-written but will need some revision if the 2007 data are dropped.

Response

Thank you we have revised it as commented above.

References

1. Kopf A, Treede R, Graven-Nielsen T, et al. IASP curriculum outline on pain for medicine.
2. Strong J, Meredith P, Darnell R, et al. Does participation in a pain course based on the International Association for the Study of Pain's curricula guidelines change student knowledge about pain? *Pain Research and Management* 2003;8(3):137-42.

Appendix G:

Letter Indicating Paper Accepted for Publication

Ref. No.: 2306

Manuscript title: Pain knowledge and attitudes of final year medical students at the University of Cape Town: A cross-sectional survey

Journal: African Journal of Primary Health Care & Family Medicine

ISSN: 2071-2928, E-ISSN: 2071-2936

Dear Dr Blessing Mashanda-Tafaune

Thank you for your revised manuscript. We have reached a decision regarding your submission. I am pleased to inform you that your manuscript has now been accepted for publication.

The Editorial Office will contact you by 17 June 2020 to finalise your manuscript for the Finalisation and Publication Office. If you need any assistance, kindly contact the Editorial Office at submissions@phcfm.org with any questions or concerns.

We remind our authors that our publisher is a member of CrossChecks plagiarism detection initiative and endorses and applies the standards of the Committee on Publication Ethics which promotes integrity in peer-reviewed research publications. This journal also conforms to the accreditation requirements by both the Department of Higher Education and Training of South Africa and Scielo SA. Be assured that upon publication, your manuscript will be indexed in various international research repositories for further dissemination and reach in readership.

Please help us to improve your experience as an author by taking a few minutes to tell us about the service that you have received. We appreciate your participation and want to make sure we met your expectations, which will give us the opportunity to better serve the community.

Feedback:

https://forms.office.com/Pages/ResponsePage.aspx?id=mXfgHQ3TR0ix-TiEIOAkzi4e5bmrRhDux1_hEph7SZUQVZUWDNTR0tLQTVQODVUNIJT001SzhHSC4u

Thank you for submitting your interesting and important work to the African

Journal of Primary Health Care & Family Medicine. We value your contribution to the journal and for the active involvement in the development of the discipline.

Your manuscript will soon form part of this open access publication and your content will be licensed under the Creative Commons Attribution License. We look forward to your future contributions.

Kind regards,

Dr Antonia L. Wadley

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