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AN EXAMINATION OF PAIN EDUCATION OF MEDICAL STUDENTS IN
AUSTRALIA AND NEW ZEALAND

Elsbeth Erica Shipton

BSc Nursing

MSc Medicine

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy



School of Medicine

Fremantle Campus

October 2020

Declaration

I, Elspeth Shipton, hereby declare that the work described in this thesis is my own. I affirm that, to the best of my knowledge, this thesis does not contain written or published materials prepared by others except where acknowledged within the text. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or institution.

Human Ethics The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007, updated 2018). The proposed research study received human research ethics approval from the University of Notre Dame Australia Human Research Ethics Committee (EC00418), Approval Number # 016134F

Signature:

Elspeth Erica Shipton

Date: 21st October 2020

**Kia kaha,
kia māia,
kia manawanui**

Be strong,
be courageous,
be steadfast

Māori proverb

Abstract

Background

Unrelieved pain is a significant public health challenge in Australia and New Zealand. Medical practitioners play an essential role in the management of acute, cancer and chronic non-cancer pain.

Aim

This thesis aimed to examine the delivery of pain education at medical schools in Australia and New Zealand, and to determine how effectively it equips medical students with pain medicine competencies required for internship.

Methods

An explanatory sequential mixed methods approach was used. Quantitative studies focused on gathering information regarding the pain-related content of medical curricula of all medical schools; and on testing pain medicine competencies of final-year medical students and interns across different universities and hospitals. Qualitative methods were used to appraise perceptions of healthcare practitioners and students working alongside interns regarding the extent to which the existing medical student education programme prepared interns to manage patients with pain.

Results

Nineteen out of 23 medical schools completed the curriculum audit and innovative Medical School Pain Curriculum Questionnaire. Medical schools do not have well-documented or comprehensive pain curricula. Pain medicine education is not delivered and assessed using pedagogically sound approaches considering the complexity of the topic, and the prevalence and public health burden of pain. Important barriers and enablers influencing the delivery of successful pain medicine education were identified.

The Medical Students Pain Attitudes and Knowledge Questionnaire, designed to assess pain medicine knowledge and attitudes, was completed by 351 students from

10 universities and 36 interns from two geographical areas. Twenty-one medical students participated in a pain-focused objective structured clinical examination. Gaps in students' and interns' pain medicine competencies were evident in basic concepts of pain processing, multidimensional aspects of pain, pain assessment and management, multiprofessional approach to pain management and pain medicine ethics.

Fifteen healthcare practitioners and students participated in the qualitative interview study. The three major themes emerged: 1) gaps in the current medical curriculum regarding pain medicine education; 2) interns' competencies not matching their pain medicine responsibilities; and 3) gaps in interns' pain medicine competencies affecting the patient and wider community, the intern themselves and the hospital system.

Conclusion

This research has highlighted the necessity for major changes to the current medical curriculum in Australia and New Zealand so that medical students are adequately prepared to address the pain management needs of the communities they will serve in the future. The Pain Medicine Curriculum Framework for improving pain medicine education for medical students is proposed to assist in the ongoing process of ensuring that medical graduates meet the professional and ethical challenges that arise in caring for those in pain.

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List of Publications and Presentations

Publications associated with this thesis (Appendix 1)

This thesis presents edited versions of the following published articles:

1. **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):139–161. (12 citations)
2. **Shipton EE**, Bate F, Garrick R, Steketee C, Visser EJ. Pain medicine content, teaching and assessment in medical school curricula in Australia and New Zealand. *BMC Med Educ.* 2018;18(1):110. (5 citations)
3. **Shipton EE**, Steketee C, Bate F, Visser EJ. Exploring assessment of medical students' competencies in pain medicine-A review. *Pain Rep.* 2018; 4(1):e704.

Presentations associated with this thesis

Peer reviewed conference (oral) presentations

1. **Shipton EE**, Bate F, Garrick R, Steketee C, Visser EJ. Pain medicine education in Australia and New Zealand. 2018 Australian Pain Society 38th and New Zealand Pain Society Conjoint Annual Scientific Meeting, Sydney, Australia. 8–11 April 2018.
2. **Shipton EE**, Steketee C, Bate F, Visser EJ. Pain medicine knowledge of final year medical students in Australia and New Zealand. 2020 Australian Pain Society 40th Annual Scientific Meeting. Hobart, Australia. 5–8 April 2020. (unable to proceed because of Covid-19 restrictions)

Peer reviewed conference (poster) presentations

1. **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. IASP World Congress on Pain, Boston, USA. 12–16 September 2018.
2. **Shipton EE**, Steketee C, Bate F, Visser EJ. Assessment of medical students' competencies in pain medicine—a focused review. 2019 Australian & New Zealand Association for Health Professional Educators (ANZAHPE) Conference. Canberra, Australia. 1–4 July 2019.
3. **Shipton EE**, Steketee C, Bate F, Visser EJ. A focused review of assessment of medical students' pain medicine competencies. 2020 New Zealand Pain Society Conference, Bay of Islands, New Zealand. 19–21 March 2020. (unable to proceed because of Covid-19 restrictions)

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Abbreviations

ACC	Accident Compensation Corporation
AMC	Australian Medical Council
BRM	Borderline regression method
CNCP	Chronic non-cancer pain
DNK	Do not know
ED	Emergency department
EFIC	European Pain Federation
EIPCCG	Expert Interprofessional Pain Competencies Consensus Group
FPM ANZCA	Faculty of Pain Medicine of the Australian and New Zealand College of Anaesthetists
4DF	Four-Dimensional Curriculum Development Framework
IASP	International Association for the Study of Pain
IPE	Interprofessional education
IV	Intravenous
MCQ	Multiple choice question
MPAKQ	Medical Students Pain Attitudes and Knowledge Questionnaire
MPCQ	Medical School Pain Curriculum Questionnaire
MWU	Mann–Whitney U test
NSAID	Non-steroidal anti-inflammatory drug
OIVI	Opioid-induced ventilatory impairment
OSCE	Objective structured clinical examination
PHN	Post-herpetic neuralgia
PMAF	Pain Medicine Assessment Framework
SoM	School of Medicine
SP	Standardised patient

SPMP	Specialist pain medicine physician
SSPM	Standard set pass mark
TENS	Transcutaneous Electrical Nerve Stimulation
UK	United Kingdom
UNDA	University of Notre Dame Australia
USA	United States of America
VAS	Visual Analogue Scale
WHO	World Health Organization

Glossary

Allodynia: Pain resulting from a stimulus (such as a light touch of the skin) that would not normally provoke pain.

Case-based learning: Active learning strategy in which students read and discuss complex, real-life scenarios.

Case-based report: A detailed report of the symptoms, signs, diagnosis, treatment and follow-up of an individual patient, often including a literature search on the topic.

Central sensitisation: Hyperexcitability of neurons within the spinal cord and at supraspinal levels; altered inhibitory neurons in the descending pathways; and activated microglia within the central nervous system.¹ In affected individuals, normally innocuous or minimally painful activity induces severe pain (allodynia and hyperalgesia), increased duration of pain sensations and pain spreading beyond the area of injury.²⁻⁴

Curriculum: The term curriculum usually implies a planned sequence of instruction in a specific field and often provides a statement of the desired pupil outcomes in terms of skills, performances, attitudes and values as well as some description of the pedagogical approaches and assessment methods, and resources aligned to the course.

Elective: This is a period spent by medical students usually in their final year of study in a clinical setting of their choice. It provides an opportunity for medical students to develop their skills by observing and participating in an area of medicine in order to broaden the scope of their exposure to clinical medicine.

e-learning: Virtual learning experience using electronic technologies to access educational curriculum.

Entry-level medical education programme: A tertiary level course of study undertaken at a medical school providing a basic grounding in the core areas of medicine and physiology required for undertaking a practical period of training in order to gain entry to the medical profession.⁵ This could be an undergraduate or postgraduate course.

FACES pain scale: A scale used to measure pain intensity in children or geriatric patients.

Faculty of Pain Medicine of the Australian and New Zealand College of Anaesthetists: The professional body responsible for the education, training and continuing professional development of specialist pain medicine physicians in Australia and New Zealand.

Four-Dimensional Curriculum Development Framework: This is a tool that can be used to assist health educators structure research into curriculum development in health professional education and link educational practice to health policy and professional practice.⁶ It is useful for understanding the entirety of the medical curriculum as well as defining and addressing the complexities of curriculum development.

Integrated curriculum: “A synchronous, trans-disciplinary delivery of information between the foundational sciences and the applied sciences throughout all years of a medical school curriculum”.^{7(p318)}

Integrated Performance Assessment: a classroom-based assessment model that can be used for evaluating students’ communication (interpersonal, interpretive and presentational).

Intern: After graduating from medical school, medical practitioners in Australia and New Zealand are required to undertake a period of clinical practice lasting two years before full registration or unrestricted practice. During this bridging period, medical practitioners are referred to as interns in Australia or junior house officers in New Zealand. To avoid confusion, the term intern was used to refer to both interns and junior house officers in this thesis.

International Association for the Study of Pain: An international organisation that aims to bring clinicians and researchers together to further the knowledge and understanding of pain.

Interprofessional education: This involves opportunities for students from a range of health professional courses to learn with, from and about each other.^{8, 9}

Medical student: Undergraduate and graduate-entry students enrolled in a university degree leading to the qualification of medical practitioner.

Objective structured clinical examination: A tool for evaluation, often used in the health sciences, to test clinical competency and skills such as communication, clinical examination and medical procedures.

Opioid hyperalgesia: The condition is characterised by a paradoxical response whereby a patient exposed to opioids for the treatment of pain develops increased sensitivity to certain painful stimuli.¹⁰

Opioid-induced ventilatory impairment: Respiratory depression caused by opioids, including central depression of respiratory centre, depressed consciousness and upper airway obstruction.¹¹

Pain education resources: These could include pain medicine textbooks, e-modules or courses such as Essential Pain Medicine.¹²

Pain medicine competencies: The knowledge, skills and attitudes medical students should be able to demonstrate when assessing and managing pain.

Pain medicine education: Teaching and learning associated with the acquisition of knowledge, skills, behaviours and professional attitudes related to the management of persons experiencing pain.

Problem-based learning: The use of appropriate problems to increase knowledge and understanding, involving independent study with subsequent group discussion.¹³

Simulation-based learning: Educational activity that uses simulation aides or standardised patients to replicate clinical scenarios.

SOCRATES: An acronym used to assess pain including site, onset, character, radiation, association, time course, exacerbation/relieving factors and severity.

Stakeholders: People who would be affected by or closely involved with pain medicine education at medical school level and health professionals working alongside first-year interns during the delivery of pain management in the hospital environment.

Chapter 1: Introduction

This chapter lays the groundwork for the thesis by introducing the topic of pain education for medical students in Australia and New Zealand. The rationale for choosing the research topic is explained. The aim of the thesis and research design is discussed. The potential contribution of this thesis to existing knowledge of pain medicine education in Australia and New Zealand is considered, and key concepts are described. The chapter concludes with an outline of the thesis.

1.1 Overview of the topic

Pain is ubiquitous and yet remarkably difficult to treat.¹⁴ Pain is a universal human experience—an unpleasant sensation and emotional experience that is unique to each individual.¹⁵ Pain management is a public health challenge in Australia and New Zealand because of the high prevalence of pain, the negative consequences of poor management of pain for individuals and society, disparities in access to treatment, the vulnerability of several populations and the ineffectiveness of population health strategies.¹⁵⁻¹⁷ Evidence points to a major gap between the sophisticated scientific knowledge of pain and the prevailing inadequacy of clinical management.^{18, 19}

Treatment of pain is complex and requires consideration of the type of pain, patient risk factors (e.g. side effects or addiction), patient comorbidities and the psychosocial characteristics of the patient experiencing pain.^{14, 20} Obstacles associated with the implementation of evidence-based pain management strategies are complex, and medical curricula design issues are potentially the greatest barriers to effective treatment of pain.²¹⁻²⁴ Doctors play a key role in caring for patients with pain, whether acute or chronic.^{15, 18} A lack of high-quality pain medicine education at medical schools results in knowledge and skills deficits of medical practitioners, cultural bias towards pain patients, and negative attitudes and beliefs about pain.^{18, 21, 22, 24, 25}

Research shows that high-quality pain medicine education focusing on the assessment, treatment and rehabilitation of persons in pain is lacking in many medical school curricula around the world.^{21, 26-28} There have been calls internationally from pain management experts and educators for improved pain medicine education for medical students.^{15, 29, 30} Advances are being made in terms of the development of

pain-focused curricula for health professionals; the most used of these are the entry-level core curricula developed by the International Association for the Study of Pain (IASP).³¹ These curricula have attempted to connect global scientific knowledge with experience and practice.^{31, 32} Clear objectives are stated with regard to the essential knowledge, clinical skills, and attitudinal and behavioural learning required by newly graduated medical practitioners for clinical practice.^{31, 33}

Medical school curricula priorities tend to focus on connecting learning activities and content with the competencies doctors will require to practise medicine in the communities that they serve.^{6, 34} Educators recognise that the process of curriculum change needs to be deliberately and purposefully managed in order to accommodate changing healthcare requirements in society while maintaining the fundamental standards and values of the educational institution.⁶

The Four-Dimensional Curriculum Development Framework (4DF) developed by Lee, Steketee, Rogers and Moran⁶ offers a mechanism by which the multidimensional and often complex nature of health professional curricula can be examined and developed. This framework comprises four dimensions that alert educators and curriculum developers to the local, societal and political issues that should be considered when developing curricula. These dimensions are (1) future healthcare practice needs; (2) competencies and capabilities required of graduates; (3) teaching, learning and assessment methods; and (4) institutional parameters. Each of these dimensions “conveys a message about issues that matter, for example, what will be known, done, why and how and by whom, how its effects will be measured and its impacts evaluated”.^{6(p69)}

In summary, questions have been raised by educators, clinicians, academics and public health practitioners about whether the current medical curriculum is achieving the stated objectives (training safe, capable and compassionate medical practitioners who are able to meet the future healthcare needs of society).^{6, 35-37} Similar questions have been voiced about whether the current state of medical education meets the needs of the physicians, patients and society in terms of evidence-based pain management, and what learning tools medical schools should apply for promoting and assessing core competencies for pain management.³⁸⁻⁴¹

High-quality research is needed to determine the deficiencies in training of medical students in the field of pain medicine.⁴² There is a need for the structured development of recommendations to enable effective integration of pain medicine education into medical curricula.⁴² To address these challenges, a multidisciplinary approach to pain medicine education based on input from all stakeholders, including medical and allied health clinicians, medical educators and students, is needed.⁴²⁻⁴⁴

1.2 Overview of existing literature on the topic

The topic of pain education for health professionals in Australia and New Zealand was first highlighted in 2002.⁴⁵ A questionnaire-based study was undertaken to examine the pain curricula of medical, dental, physiotherapy, psychology and occupational therapy schools in Australia and New Zealand. It was concluded that topic of pain was not adequately addressed in health professional education in Australia and New Zealand. However, the response rate from the medical schools was 17% and the study did not identify specific information pertaining to the medical school curriculum.⁴⁵ Studies in other countries have illustrated the need for innovative, interprofessional and dedicated pain management education for medical students, and one group of researchers in Finland (1991–2006) examined this topic in detail on a national scale.^{32, 38, 46-50} The learning and teaching methods of pain medicine education in Australia and New Zealand have not been documented.

Three studies have investigated aspects of knowledge, skills and attitudes of medical students regarding pain management in Australia.⁵¹⁻⁵⁴ These studies were limited to either small groups of students or specific areas of knowledge and perceptions. One study, undertaken in 1998, assessed the general pain knowledge of 46 medical students from a single medical school in Melbourne, Victoria.⁵¹ The second study, undertaken at three universities in Western Australia, compared the back pain beliefs of 176 medical students to that of chiropractic, physiotherapy, occupational therapy and pharmacy students.⁵² The third study examined whether contextual variables influenced the perceptions of 107 medical students in the Australian Capital Territory.⁵⁴ No studies have assessed pain medicine competencies of medical students in New Zealand.

There are no published studies examining perceptions of stakeholders towards pain medicine education in Australia or New Zealand. To date, no tools have been developed to assess the adequacy of medical school curricula in terms of preparing future interns to respond effectively to patients in pain.

1.3 Research aims

The overall aim of this research was to examine the delivery of pain education at medical schools in Australia and New Zealand, and to determine how effectively it equips medical students with pain medicine competencies required for internship. To address this aim, the following goals were identified: first, to describe how medical schools in Australia and New Zealand currently teach pain medicine to medical students; second, to identify final-year medical students' knowledge, skills and attitudes regarding pain medicine; and third, to explore stakeholders' attitudes and perceptions regarding the adequacy of the current pain curriculum for medical students in terms of preparing newly graduated interns for the workplace.

1.4 Research questions

To address the aims of the study, the following five research questions were posed:

1. How do medical schools in Australia and New Zealand teach pain medicine to medical students?
2. What do final-year medical students and first-year medical interns in Australia and New Zealand know about pain medicine?
3. What are the attitudes of final-year medical students and first-year interns in Australia and New Zealand towards pain medicine?
4. What level of pain medicine skills do final-year medical students exhibit when performing a pain assessment and communicating with a patient in pain?
5. What are the perceptions of pain medicine stakeholders in Australia and New Zealand regarding the existing pain curricula for medical students in terms of preparing interns to manage patients with pain?

Using the 4DF as a framework for developing the research questions created opportunities to examine the curricula from a unique perspective. As described above, the four dimensions are (1) future healthcare practice needs; (2) competencies and

capabilities required of graduates; (3) teaching, learning and assessment methods; and (4) institutional parameters. Question 1 entailed critical reflection of existing pain management education at medical schools using Dimensions 1, 2, 3 and 4. Questions 2, 3 and 4 assessed students' competencies (in terms of knowledge, attitudes and skills) with an in-depth focus on Dimension 2. Question 5 created an exploratory discussion connecting the changing world of practice (Dimension 1) to the challenge of building new ways of thinking about the inclusion of pain management in the local medical curricula (Dimension 4). The *IASP Curriculum Outline on Pain for Medicine* was used to develop the research questions in terms of what areas of pain medicine education ought to be covered by medical schools if graduates are to be adequately prepared to manage pain.³¹

1.5 Research design

A mixed methods research approach was chosen to provide detail and depth to the exploration of this subject, using triangulation of multiple data sources to increase the credibility of the findings. The study was divided into three phases. The first two phases (the quantitative studies) focused on information gathering of the pain-related content of medical curricula of all universities in Australia and New Zealand, and on testing the knowledge, skills and attitudes related to pain management of a sample of final-year medical students and interns across different universities and hospitals. Phase 3 (the qualitative study) explored medical students' and healthcare professionals' perceptions of the extent to which pre-registration medical education programmes prepare interns to manage patients with pain. The findings from the three phases were then integrated to develop a discussion on the implications of the research.

1.6 Contribution to new knowledge

The purpose of this research was to create an understanding of the necessity for, and challenges associated with, integrating pain medicine education into existing medical curricula in Australia and New Zealand. This is the first study to use a broad framework to assess the provision of pain medicine education nationwide, in an in-depth manner, combining both qualitative and quantitative research methods.

1.7 Key concepts and definitions

1.7.1 Pain

Pain has recently been defined by the IASP as “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage”.^{55(p2)} Pain is always a subjective experience, and a person’s report of pain should be accepted as such and respected.⁵⁵ Pain needs to be understood in the biopsychosocial context. The experience of pain is not necessarily a reflection of activity in sensory pathways.⁵⁵

1.7.2 Acute pain

Acute pain is defined as pain of recent onset and short duration, usually caused by, or related to, injury or disease.⁵⁶ Acute pain is currently seen to be essential for survival, directing the person’s immediate attention to a threatening situation, promoting reflexive withdrawal or active defence, instigating actions (or inaction) to prevent further damage and thereby facilitate healing.⁵⁷

1.7.3 Chronic pain

Chronic pain is recognised as pain that persists longer than three months.⁵⁸ Chronic pain is considered to be maladaptive and results in reduced physical and psychological functioning, and in marked diminution of quality of life.⁵⁷ Chronic pain is often secondary to an obvious underlying condition such as chronic cancer-related pain, chronic posttraumatic or postsurgical pain and chronic secondary musculoskeletal pain.⁵⁹ However, pain can be the sole or leading symptom, such as in non-specific low back pain, fibromyalgia syndrome, irritable bowel syndrome or chronic widespread pain, and this subgroup is called ‘chronic primary pain’.⁵⁸ Chronic pain is now regarded as a disease in its own right with a multifactorial complex constellation of signs and symptoms requiring special treatment and care.^{58, 60, 61}

1.7.4 Pain medicine

Pain medicine is the medical discipline that addresses the prevention of pain, and the assessment, treatment and rehabilitation of persons in pain.⁶² In this thesis, pain medicine refers to the medical treatment of pain using pharmacological and non-pharmacological strategies.

1.7.5 Pain management

Pain management is the process of alleviating or reducing the subjective unpleasant sensory and emotional experience of pain. Professionals from many disciplines may be involved with pain management, including nurses, physiotherapists, psychologists, medical practitioners, pharmacists and occupational therapists. Pain management may involve several methods to prevent, reduce or alleviate pain, including pharmacological, physical and psychological interventions.

1.8 Overview of the thesis

Following this introductory overview of the context of pain medicine education in Australia and New Zealand, Chapter 2 uses the 4DF to review existing literature on pain medicine education, highlighting connections between important curriculum dimensions such as wider regulatory, governmental and health care issues; specific pain medicine knowledge, skills and capabilities; teaching, learning and assessment practices; and the contextual nuances inherent in the educational jurisdictions in Australia and New Zealand. Chapter 3 presents a description and justification of the design and methodology used in this study, along with a discussion regarding research instruments, participants, procedures, data analysis and ethical considerations. Chapters 4 and 5 present the major quantitative findings from Phases 1 and 2. Chapter 6 presents the major thematic findings of the qualitative research in Phase 3. Chapter 7 summarises and discusses the implications of the results of the two quantitative phases and the qualitative phase. Chapter 8 concludes the thesis by summarising the research findings. The strengths and limitations of the mixed methods research method are discussed. Implications of the research findings for medical education practice are presented, and future areas of research are outlined.

Chapter 2: Literature Review

This chapter presents a review of the literature on pain medicine education for medical students in Australia and New Zealand, with international context. The aim of this review was to use selected peer reviewed and grey literature to provide the context of the original research that follows. The concept of pain medicine education within the medical curriculum is introduced. The importance of using a theoretical framework to understand the entirety of the curriculum when considering whether programmes are fit for purpose and meeting societal needs is discussed. The topic of pain medicine education within the medical curriculum is explored in detail using the Four-Dimensional Framework for Curriculum Development (4DF).⁶ The chapter concludes with a summary of literature relevant to the topic.

2.1 Introduction

Medical practitioners undergo training that is intended to produce clinicians for accomplished and responsible practice in service to others.³⁵ The objective of medical education is to instil students with the knowledge, skills, behaviours and professional attitudes that will lead to their becoming safe, capable and compassionate physicians who are able to meet the healthcare needs of society.^{6, 35, 36}

The medical curriculum represents the expression of these educational aims in practice.⁶³ The curriculum implies a planned sequence of learning and often provides a statement of the desired student outcomes in terms of skills, performances, attitudes and values as well as some description of the pedagogical approaches and assessment methods and resources aligned to the course.^{63, 64} The curriculum can be seen as “an expression of intentions, mechanisms and context of the education programme that requires input from all of the stakeholders, including teachers, students, administrators, employers, the government and the wider public”.^{65(p89)} The medical curriculum should fundamentally enhance health service provision and provide a ‘symbiosis’ with the health services and the communities in which the future medical practitioners will work.⁶³

Curriculum design has become a significant field of pedagogic research in the past 20 years.^{7, 66} Medical educators are collaborating with health professional educators to

examine issues surrounding the delivery of appropriate medical education.^{6, 67} The medical curriculum is expected to encompass core competencies based on knowledge, but should also be extended to other critically relevant competencies such as individualised patient-centred and interprofessional care, evidence-based practice, continuous critical inquiry, integration of primary and tertiary care, and use of new informatics.⁶⁷⁻⁶⁹

Many educational bodies have moved to an outcome framework for medical education to guide the design of competency-based pre-registration medical education programmes.^{70, 71} Attention has recently focused on the concept of an ‘authentic curriculum’, whereby medical students acquire the foundational skills, knowledge, understanding and attitudes needed to practise medicine in the communities they serve.⁶⁵ There is now more emphasis on whether the curriculum is responsive to changing health needs, especially in the context of accelerated growth of scientific knowledge and technologies, new infectious and environmental threats to global health, and increasing life expectancy.⁶⁷

Every medical practitioner has a responsibility to provide care for patients with pain, because management of pain transcends speciality and clinical setting.⁷² Medical practitioners play an essential role in preventing pain, conducting comprehensive pain assessments, as well as promoting evidence-based practices. Many evidence-based guidelines and interventions for acute and chronic pain management are available.⁷³⁻⁷⁷

Moderate to severe acute pain is usually managed with a combination of opioids and non-opioid analgesics using a multimodal therapeutic approach within an interdisciplinary framework.⁷⁸ Chronic pain is best managed by a team of health professionals working collaboratively.⁷⁹⁻⁸¹ A step-wise approach is usually taken by medical practitioners to progress through the various treatment options (pharmacological, interventional and non-pharmacological).^{17, 74, 75, 82-84} Treatment needs to be tailored to the unique problems of the patient because one treatment does not work for every patient—even for pain of the same type and aetiology.^{85, 86} Not all persons living with chronic pain can be offered a ‘cure’; for many, the goal becomes improvement of function, symptom reduction and facilitation of adaptive problem-solving and coping skills.⁸⁷ In these cases, medical practitioners need to collaborate

as part of a multidisciplinary team, especially in terms of communication and integration of care.

Medical practitioners play an important role not only in the treatment of pain but also in the prevention of pain. They can educate patients, dispel inaccurate and value-laden beliefs or perceptions about pain, and encourage early mobilisation and return to usual activities.⁸⁸⁻⁹⁰ These strategies are important for preventing disability associated with chronic pain. Medical practitioners also have an important role in terms of educating caregivers, professional colleagues, the media and policy makers.¹⁵

It is essential that entry-level practitioners have the clinical competencies for caring for patients experiencing pain. Research is needed to examine the issues surrounding the delivery of pain medicine education so as to identify whether the current medical curriculum is adequate in preparing graduates to provide safe and effective treatment for patients experiencing pain.^{14, 41}

2.2 The four-dimensional health curriculum framework to guide curriculum review

Theoretical frameworks of curriculum structure and context are useful to assist in articulating and addressing the complexities of curriculum design and development.⁶ As introduced in Chapter 1, the 4DF provides a template to comprehensively examine the complex and dynamic nature of the pain curricula for medical students (see Figure 1 for a schematic design of the 4DF).⁶ It is a useful tool for identifying curriculum priorities and “connecting content and activity with purpose and consequence”.^{6(p68)} It was designed in Australia to generate curriculum and pedagogical discussions crucial to supporting interprofessional education (IPE) as a core component of health professional education curricula.⁹¹ The 4DF has proved to be an effective tool used by individuals and institutions for review and development of interprofessional curricula and curriculum redesign.^{91, 92}

The first dimension asks curriculum developers to consider future healthcare practice needs, taking into account global health, education reforms and local needs. Dimension 2 involves defining and understanding the competencies required for health service delivery. Dimension 3 aligns appropriate methods of teaching, learning and

assessment with competencies, and the fourth dimension examines the local institutional logistics that shape the curriculum design.

This theoretical framework for the development of a health professional curriculum is useful because it recognises the dynamic and complex relationship between the fundamental essential core dimensions of health education. In the following four sections of this chapter, the 4DF frames the review of pain medicine education within the contemporary medical curriculum.

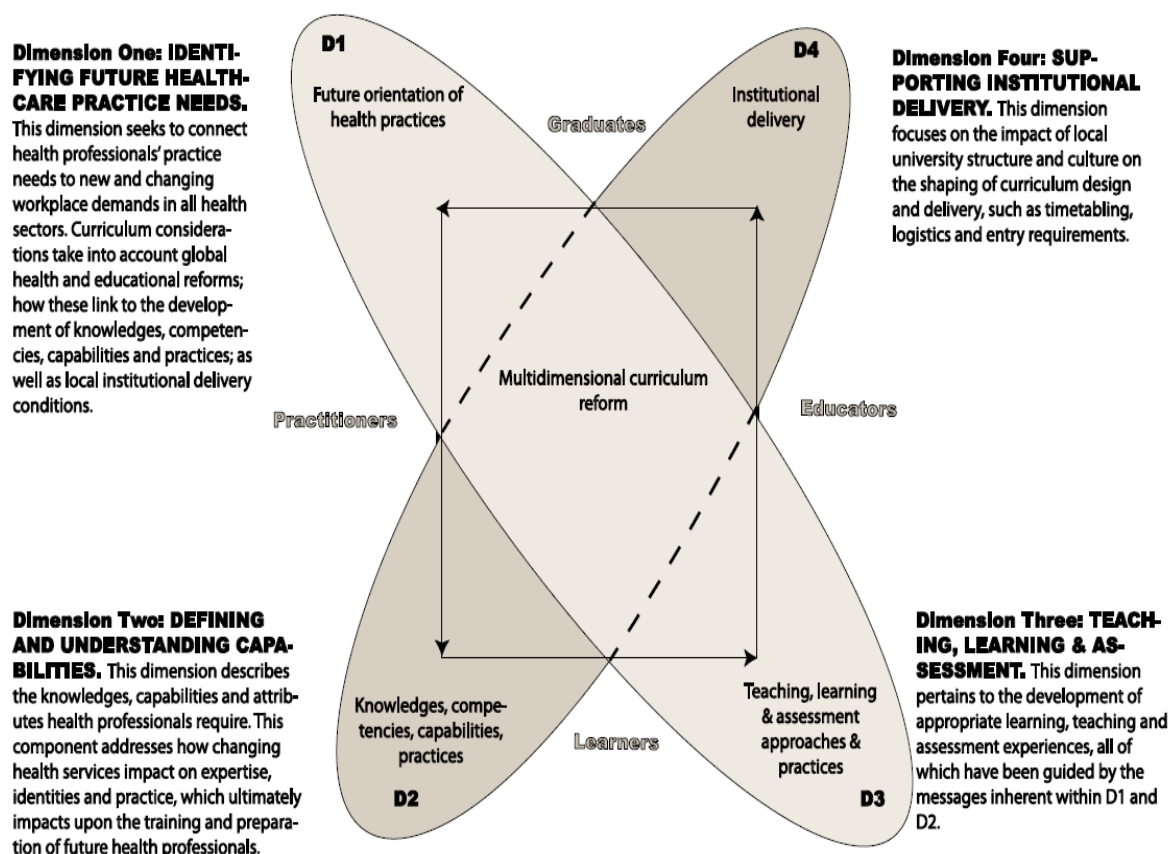


Figure 1. Four-dimensional framework for curriculum development.⁶ Figure used with permission of the Editor, Focus on Health Professional Education journal.

2.3 Dimension 1: Identifying future healthcare practice needs in pain medicine

The first dimension of this framework asks the questions “What is this curriculum for?” and “What is the professional landscape that it aims to prepare students for, now and in the future?”^{91(p6)} Curricula need to meet the requirements of registration and accreditation bodies, but also equip graduates to serve in their particular local health system while maintaining the fundamental standards and values of these institutions.⁶

Curriculum design influences the education of future health professionals in terms of personal, professional, social, cultural, political and economic development, by setting the pre-conditions for the development of specific knowledge, skills and attitudes.⁶

This section begins with a discussion of why pain medicine needs to be included in the medical curriculum. Scientific advances have changed the way pain is understood and managed are addressed, as well as the high prevalence and public health burden of pain. The influence of the professional regulatory system on the inclusion of pain medicine in the medical curriculum is discussed. Next, the legal, ethical, social and governmental issues related to pain medicine that will face medical graduates in the workplace are examined. Finally, challenges medical graduates are likely to face when providing pain treatments in their local health system are explored.

2.3.1 The changing face of pain medicine

Pain medicine is a relatively new healthcare field, but is rapidly evolving.⁹³ Although pain management has been a significant concern of humankind for over 5,000 years, it was only after World War II that scientific research into the complexities of pain really began.^{93, 94} In particular, the understanding of transition from acute to chronic pain, and translation of promising scientific advances into effective diagnostic, preventative and therapeutic strategies for patients have dramatically improved in the past three decades.^{95, 96} Identification of peripheral and central nociceptive processes, discovery of endogenous neurochemicals and recognition of the role of the immune system in the maintenance of pain have furthered the understanding of pain mechanisms, diagnosis and treatment.⁹⁷ The use of pre-emptive and multimodal analgesia has improved acute pain management.^{98, 99} Collaborative research into the benefits of self-management techniques has resulted in the promotion of this strategy for effective chronic pain management.¹⁰⁰⁻¹⁰² Rapid advances in information technology have enabled the capacity to analyse large clinical data sets quickly to improve management at a population level, while consideration of individual mechanisms has improved the ability to provide personalised medicine in the field of acute and chronic pain.⁹⁶

Internationally, there is a continuing gap between what is known about pain medicine and the translation of this into clinical practice.^{41, 96} In general, despite robust evidence for a biopsychosocial model of pain, many medical practitioners continue to focus on

a purely biomedical approach to pain.¹⁰³ Pain is often seen as a symptom of a disease and therefore given a low priority by medical practitioners.²⁴

The Faculty of Pain Medicine of the Australian and New Zealand College of Anaesthetists (FPM ANZCA), the professional body responsible for the education, training and continuing professional development of specialist pain medicine physicians (SPMPs) in Australia and New Zealand, was established in 1998.¹⁰⁴ The discipline of pain medicine was recognised in Australia as a medical specialty in its own right in 2005, and was accredited as a scope of practice in New Zealand in 2012.¹⁰⁴ SPMPs provide comprehensive pain management, including pharmacological interventions, diagnostic and therapeutic procedures, coordination of rehabilitative services, counselling of patients and families, cooperating with other healthcare professionals, and liaising with public and private agencies.¹⁹

Medical practitioners need to be familiar with current evidence-based clinical knowledge and guidelines to provide rapid and effective relief for patients in pain.

2.3.2 Community needs for pain medicine education

2.3.2.1 The increasing prevalence of pain

Pain is a universal experience that can occur at any age from many different causes.²⁰ Acute pain can arise from trauma, burns, infection, emergency and elective surgery, childbirth and severe medical illness.¹⁸ Acute pain is one of the most common reasons for patients to seek treatment at an emergency department; approximately seven out of 10 patients attend because of severe pain.^{15, 25, 105} A prospective observational study of patients in Australia found that 47% of patients continued to experience moderate to severe pain one week after surgery.¹⁰⁶ A further study in Australia showed that severe acute pain was reported by 56% of patients up to three days after orthopaedic surgery.¹⁰⁷ Corresponding figures for acute pain prevalence in New Zealand have not been published.

There is a high prevalence of chronic pain in Australia and New Zealand; evidence from large-scale studies show that approximately one in five of the adult population experiences chronic moderate to severe pain.¹⁰⁸⁻¹¹⁰ In 2018, 3.24 million Australians were living with chronic pain, and it was estimated that in 2016–2017, about 770,000 adults in New Zealand experienced pain almost every day.^{16, 111} Chronic pain is

common in children, and may affect between 25% and 35% of children and adolescents.^{112, 113} A literature review of pain prevalence among residents in aged care facilities internationally found that 40%–60% of residents suffer from pain, and many received suboptimal pain management.^{114, 115} In an Australian study, community-dwelling older adults showed prevalence rates of 38%–62% experiencing pain.¹¹⁶ In New Zealand, Māori have the highest rates of chronic pain compared with other population groups, and chronic pain is more prevalent in areas of high socio-economic deprivation.^{117, 118}

Acute and chronic non-cancer pain (CNCP) rates in Australia and New Zealand are likely to continue to rise, related to the ageing population, lifestyle changes leading to obesity and inactivity, and projected increases in diseases such as diabetes and arthritis.^{15-17, 119-122} Progress in modern medicine is saving the lives of people with catastrophic injuries who in previous times would have died, and enabling people with serious illnesses to survive longer.¹⁵ The price of this survival may be incapacitating pain.¹⁵ Advances in treatment of cancer have led to an increase of painful neuropathic conditions.¹²³

2.3.2.2 The challenge of inadequate pain management

Unrelieved pain is a significant public health challenge globally. Inadequately treated pain is more common in vulnerable populations—including the elderly, children, those with lower socio-economic and education status, cancer patients, and racial and ethnic minorities.¹⁵ This is likely due to issues that include communication difficulties, insufficient organisational support, professional barriers (stereotyping and discordant cultural beliefs), limited access to treatment (difficulties navigating the health system or financial constraints) and mental health issues.¹²⁴

Although acute pain is generally considered to have an important protective function, suboptimal acute pain management can have negative effects on the cardiac, respiratory and gastrointestinal systems, as well as on coagulation, endocrine, immune and psychological function, hypercoagulability and wound healing.^{78, 125-128} Unrelieved acute pain leads to longer hospital stays and higher readmission rates.¹²⁹

There is also a significant risk that uncontrolled acute pain from trauma, surgery and infection (such as herpes zoster) will develop into chronic pain.^{128, 130} Persistent pain

can result in relentless suffering and diminished quality of life.¹³¹ This is related to reduced physical functioning, decreased ability to perform activities of daily living and inability to participate in pleasurable activities. Co-occurring symptoms such as fatigue, anxiety, mood and cognitive problems, sleep disturbances and multisensory hypersensitivity also reduce quality of life.¹³² People with chronic pain appear to have approximately double the risk of suicide compared with control groups.¹³³ The Global Burden of Disease Study 2016 placed low back pain, migraine, other musculoskeletal pain (such as autoimmune, inflammatory, joint, ligament, tendon and muscle disorders) and neck pain in the top six causes of years lived with disability in Australia and New Zealand, alongside depression and anxiety but ahead of ischaemic heart disease, chronic obstructive airways disease, Alzheimer's, lung cancer, stroke and diabetes.^{134, 135} The consequences of not treating chronic pain can be severe; spontaneous recovery is rare and the pain condition can worsen significantly over time.¹³⁶ Adults, adolescents and children waiting for evaluation report severe levels of pain and, in many cases, deterioration of symptoms such as depression and suicidal thinking.^{137, 138} A systematic review of the effect of waiting for treatment for chronic pain concluded that wait times of six months or longer could lead to significant deterioration in health-related quality of life and psychological wellbeing.¹³⁹ The social consequences of persistent pain include breakdown of family and marital relationships, altered social role and social isolation.^{140, 141}

The medical consequences of long-term pharmacological pain management for CNCP include gastric ulcers, hypertension, decreased renal function and myocardial infarction.^{128, 142} There are also risks of harm associated with inappropriate treatment of chronic pain. While the value in using opioids for acute and cancer pain is indisputable, opioids are increasingly being prescribed for CNCP despite an absence of evidence regarding the long-term efficacy or effectiveness.¹⁴³ There are significant harms associated with the long-term use of opioids such as physical dependence, addiction, opioid-induced hyperalgesia and overdose (unintentional or intentional).¹⁴⁴

The economic cost of persistent pain on society is enormous. The total cost of chronic pain in 2018 in Australia was estimated at \$139.3 billion and 7% of total health system expenditure (cardiovascular disease accounted for 10% in a similar period), and up to \$15 billion in New Zealand in 2016.^{16, 145, 146} This cost included loss of productivity at

work, burden of disease costs and healthcare costs, as well as welfare benefits and loss of taxation revenue.^{17, 145} Health system costs included inpatient and outpatient hospital costs as well as pharmaceutical costs, professional fees and residential aged care costs.¹⁷ Health system costs were largely borne by the governmental departments but individuals, family or friends and society carried about 22% of the costs.¹⁴⁵

Economic costs are attributable to the significant adverse effect on people who experience pain, but also on those caring for them, as well as friends and family, co-workers, employers, charities and governments. Pain negatively affects work productivity for both the patient and the carer. Loss of productive time can be explained by reduced performance at work, as well as by absence from work and premature retirement.^{147, 148} Data from the Australian Bureau of Statistics showed that back injuries and arthritis accounted for approximately half of the workers missing from the labour force in the age group 45 to 64 years.¹⁴⁹ The economic burden of pain is also likely to rise in the developed countries with declining fertility rates and increased life expectancy.¹⁷

Medical practitioners need to recognise at-risk populations, and implement effective strategies for acute and CNCP assessment and management so as to reduce the public health burden of pain.¹²⁴

2.3.3 Professional regulatory system requirements

The medical curriculum must meet the demands of the accrediting and professional bodies with respect to defined graduate outcomes. Accreditation is the process whereby organisations set standards to ensure that graduates are competent and safe to practice.¹⁵⁰ Professional accreditation bodies significantly influence curriculum design through the regulations and standards that they set.¹⁵¹ Influencing professional bodies to incorporate pain medicine competencies in entry-to-practice registration and maintenance of certification will possibly have a major impact on pain education and clinical practice.^{40, 151}

It appears that regulatory bodies in Australia and New Zealand have not directed curricular requirements to integrate pain medicine into the curriculum. The Australian Medical Council (AMC) is responsible for developing standards, policies and

procedures for the accreditation of medical programmes for Australia.¹⁵² The New Zealand Medical Council monitors the training of medical students in New Zealand.¹⁵³ The AMC sets standards for medical schools based on the 2012 Graduate Outcomes Statements, requiring monitoring and review of the curriculum content, quality of teaching and supervision, assessment and student progress decisions.¹⁵² However, the AMC sets a framework around which medical education providers structure their individual programmes.¹⁵² It does not specifically define in detail the outcomes that a student must demonstrate for graduation.¹⁵² A broad pain medicine curriculum is therefore currently not a mandatory part of medical degrees in Australia and New Zealand.

Similarly, competencies in pain medicine have not been prioritised by regulatory bodies in Australia and New Zealand. Medical Deans Australia and New Zealand Inc, the eminent body representing entry-level medical education in Australia and New Zealand, endeavours to bring together stakeholders from all levels of medical education and training to prioritise future medical workforce planning.^{154, 155} In 2020, the Medical Deans' Medical Education Collaborative Committee identified a set of core competencies describing the foundational skills and knowledge required for final-year medical students to be ready for internship.¹⁵⁶ No specific pain management core skills were identified apart from 'prescribing analgesic medication (opioid and non-opioid)'. The report specified that students should be able to demonstrate the knowledge of safe prescribing of high-risk medicines such as analgesics in a simulated experience or environment (such as an objective structured clinical examination), and at the time of graduation, be able to perform this competency under indirect supervision.¹⁵⁶

Entry-to-practice competencies that specifically identify pain-related knowledge, skills or attitudes are minimal or mostly absent in regulatory requirements for medical graduates in the United States of America (USA), Canada and the United Kingdom (UK).^{40, 41} It is likely that this is one of the major reasons that comprehensive pain management content is not mandatory in the medical curriculum in these countries.^{21, 26-28, 47, 93, 157} Entry-to-practice competency requirements related to health science undergraduate training in Canada were examined in 2013.¹⁵¹ While dentistry and nursing students were required to complete a number of pain-specific competencies, no regulatory requirements related to pain were found for medical students.¹⁵¹ In 2015,

the UK General Medical Council's required standards for medical graduates specifically mentioned pain in only one category; as a required outcome under the 'prescribing drugs' category, medical graduates are expected to be able to "plan appropriate drug therapy for common indications, including pain and distress".^{158(p6)}

Some progress has been made to address this problem. Core competencies for pain management have been accepted across a number of health professions and speciality professional organisations (such as the International Association for the Study of Pain [IASP], American Academy of Pain Medicine, American Society for Pain Management Nursing, American Council of Academic Physical Therapy, Royal College of Nursing and UK Physiotherapy Pain Association).^{40, 159} Further research is needed to examine whether these recommended core competencies have influenced pain management for patients in these countries.

Systematic change is likely to follow in terms of integration of pain education into the curriculum when accrediting bodies prioritise the need for medical students to display competencies in pain management.⁴⁰

2.3.4 Legal and ethical influences

Pain relief is one of the core principles of ethical medical practice, and unjustifiable failure to treat an individual's pain is considered a denial of a fundamental human right.¹⁸ In the past decade the concept of the right of patients to effective pain management for acute, cancer and palliative pain has been advocated by many professional bodies, including the World Health Assembly, United Nations and American Medical Association.¹⁶⁰⁻¹⁶² The World Health Organization (WHO) has clear guidelines for the pharmacological treatment of cancer pain.¹⁶³ The obligation to provide CNCP management is more complex because treatment approaches for CNCP are more diverse and include both pharmacological and non-pharmacological interventions provided within a multidisciplinary context.¹⁶⁴ However, there are core obligations related to CNCP management that extend from international human rights norms to ensure that health services are available, accessible and acceptable as articulated by the International Covenant on Economic, Social and Cultural Rights.^{164,}

In 2010, the IASP hosted an International Pain Summit to address the international problem of unrelieved pain.¹⁶⁶ At the conclusion of the summit, the delegates adopted the Declaration of Montreal, which indicated three constituent elements to the right to pain management:

- The right of all people to have access to pain management without discrimination.
- The right of people in pain to acknowledgment of their pain and to be informed about how it can be assessed and managed.
- The right of all people with pain to have access to appropriate assessment and treatment of the pain by adequately trained health care professionals.^{166(p2674)}

The FPM ANZCA issued a statement on patients' rights to pain management in 2008, which recognised that patients with pain had the right:

- To have their complaint of pain respected and taken seriously recognising that pain is a personal experience and that individuals vary greatly in their responses to painful predicaments.
- To be cared for in a timely manner by health professionals who have training and experience in assessment and management of pain ... or access to appropriate referral.
- To participate actively ... in education regarding pain and in the development of realistic goals for their pain management plan.
- To expect that their "pain history", current assessment and management plan and responses to therapies will be recorded regularly and in a way that promotes optimal and ongoing pain relief.
- To have access to best practice care, including appropriate assessment and effective pain management strategies, and access to suitably qualified interdisciplinary pain management teams or individuals who should be able to address physical and psychological aspects of management.
- To have appropriate planning for pain management after discharge from immediate care.^{167(pp1,2)}

Practitioners are not compelled by statutory provision in New Zealand to provide pain relief.¹⁶⁸ However, decisions of the Health and Disability Commissioner have supported patients' rights in New Zealand to an appropriate standard of care, which entails the adequate relief of pain.¹⁶⁸

In Australia, the Medical Treatment Act of 2006 of the Australian Capital Territory states a patient under the care of a health professional “has a right to receive relief from pain and suffering to the maximum extent that is reasonable in the circumstances” and, further, “in providing relief from pain and suffering to the person, the health professional must give adequate consideration to the person’s account of the person’s level of pain and suffering”.^{169(p9)}

Pain remains inadequately treated, not only due to lack of knowledge by health professionals, but also because of medical practitioners’ ethnic, racial, gender and age biases.^{18, 25, 170, 171} Medical practitioners have a marked tendency to underestimate the suffering of patients, especially when patients report high levels of pain, depression and reduced quality of life.¹⁷² Health care professional’s judgements about patients with persistent pain are influenced by contextual variables which have been shown to inform assessment, treatment and referral options.^{54, 173-175}

Medical practitioners are at risk of prosecution for inappropriate prescribing of analgesic medications.^{176, 177} Opioids are widely used for the treatment of moderate to severe pain, regardless of aetiology. In many countries, opioid prescriptions are monitored by a central agency and there are many restrictive regulatory policies for opioid use, with penalties for non-compliance.¹⁸ Medical practitioners face legal scrutiny in terms of opioid prescription, including over- or inappropriate prescription.¹⁷⁸ There has been a substantial increase in prescription of opioid medications for CNCP in Australia and New Zealand in the past 20 years, with a parallel increase in opioid abuse, addiction and overdose deaths.^{144, 179, 180} Internationally, substantial practice and knowledge gaps of prescribing physicians have been identified, such as prescription of transdermal fentanyl in opioid-naive patients, or failure to discontinue opioids if ineffective for relieving pain.¹⁸¹ An inquest into the death of a patient in South Australia in 2015 found that the death was preventable and occurred as a result of opioid toxicity.¹⁸² Medical practitioners have recently been reprimanded in Australia over the inappropriate use of ketamine (an anaesthetic agent).^{183, 184}

Medical practitioners may also face prosecution for unprofessional conduct related to inadequate pain management.¹⁸ In the USA, legal challenges have been brought regarding medical practitioners’ failure to take a comprehensive history of pain from the patient, failure to appropriately treat pain and failure to refer a patient to an expert

in pain management.¹⁸ Inadequate pain relief in the geriatric setting has been prosecuted under laws protecting against elder abuse.¹⁸⁵ Physicians may also face litigation arising from interventional procedures for pain relief.¹⁷⁸ Further education of physicians is warranted.²⁴ A rise in litigation associated with inadequate pain-related treatment by medical practitioners is possible in the future.

In summary, medical schools have an ethical duty to teach pain management in a comprehensive manner in order to equip graduates with technical, cognitive, emotional and reflective skills to adequately manage people with pain needs.¹⁸⁶ The preceding literature suggests that students need to be introduced to fundamental ethics of pain management in order to encourage compassion for patients with pain, reflect on prejudices that influence their treatment and maintain respectful attitudes to challenging patients. Pain management needs to be adequately addressed in the medical curriculum to prepare clinicians for the legal environment in which they will be practising.¹⁸

2.3.5 Governmental factors influencing the delivery of pain medicine in practice

Pain has low visibility on political agendas worldwide.^{15, 24, 139, 166} At present, the provision of pain care in Australia has been described as fragmented; in particular, chronic pain care is lacking a coordinated approach.¹⁸⁷ Most state and territory governments fund pain services at the tertiary level in Australia; however, more funding is needed for pain services at primary care and community levels.¹⁸⁸ In Australia, more than a quarter of patients referred to a chronic pain management service remained on the waiting list for more than a year, and the median waiting time from referral receipt to initial clinical assessment for a publicly funded outpatient adult pain management service is five months.¹⁸⁹ Some changes are taking place in Australia, including the 2018 National Strategic Action Plan for Pain Management, supported by the Australian Government, which provides a key step towards a national policy framework to improve access to best practice pain management.¹⁹ The Action Plan seeks to encourage innovation in service design and delivery to ensure that pain is adequately managed across integrated healthcare systems.¹⁹

No comprehensive population health-level strategy currently exists in New Zealand to tackle the magnitude of the problem of pain with coordinated strategies for pain

prevention, treatment, education, reimbursement and research.¹⁶ The Ministry of Health of New Zealand is the government body responsible for the management and development of the health and disability system, and district health boards fund or provide clinical health services in their district. The Accident Compensation Corporation (ACC) is a government organisation providing no-fault personal injury cover for all residents and visitors to New Zealand. ACC covers treatment costs and provides income assistance for those who cannot find work because of their injury. ACC has a wide range of pain management services, including multidisciplinary pain management.¹⁹⁰ However, access to pain management services in New Zealand is limited and fragmented.¹⁶ Waiting times at tertiary clinics are often up to six months because of capacity constraints.¹⁶ In 2018, a tertiary pain clinic in New Zealand declined approximately 65% of appropriate referrals because of capacity constraints.¹⁶

It is critical that government agencies prioritise a coordinated national strategy and provide financial support for pain education to address the unnecessary burden of unrelieved pain.^{191, 192}

2.3.6 Influence of advocacy groups on pain management curricula

The rise of the consumer movement and overall promotion of individualism has resulted in an increased expectation by patients of adequate pain treatment from medical practitioners.¹⁸ Advocacy groups, such as PainAustralia, the Gynaecological Awareness Information Network Pelvic Pain Support Group and the Chronic Pain Australia Forum, have highlighted the under-recognised and under-resourced public health problem of pain, and the need for better access to pain management services.¹⁹³ These groups have stated that denying appropriate care to people with chronic pain is unethical and can result in unnecessary suffering.¹⁹⁴ Lobby groups are campaigning for improved training of healthcare workers, including medical practitioners.¹⁹⁴ Other voluntary health organisations for which pain is a significant problem for their members, such as cancer, diabetic and arthritis societies, are also calling for improved pain management strategies.¹⁵ Many patients are voicing their discontent of healthcare practitioners' lack of relevant knowledge regarding chronic pain, poor communication skills and dismissive attitudes to patients with pain.^{23, 195} Advocacy groups may also apply pressure for pain treatments, such as 'medicinal cannabis', for CNCP that are not supported by scientific research.¹⁹⁶

Educating medical students about safe and effective pain management is an essential part of the drive to address the serious public health problems of inadequate pain relief.⁴⁰

2.3.7 Influence of the pharmaceutical companies on prescribing practices

Bold marketing strategies aimed at medical practitioners can influence prescribing patterns and treatment interventions.¹⁹⁷ Medical practitioners are under increasing pressure from medical accreditation bodies and licensing authorities to obtain continuing medical education credits for retention of licences to practise. While governmental or organisational limits have been placed on sponsorship from third-party payers (i.e. pharmaceutical industry), the advertising that takes place at annual scientific meetings by the pharmaceutical companies may indirectly influence medical practitioners' perceptions of recommended treatment.^{198, 199} In the late 1990s, pharmaceutical companies began aggressively marketing opioids for the treatment of chronic pain, particularly to primary care physicians.²⁰⁰ This led to an exponential increase in the number of opioid prescriptions issued to patients. The devastating impact of the opioid epidemic has led to expensive lawsuits involving a number of pharmaceutical companies.²⁰¹

Direct-to-consumer advertising is allowed in New Zealand. Recent studies have shown that these advertisements are often misleading and are likely to cause harm rather than benefit.²⁰² Medications such as non-steroidal anti-inflammatory drugs, antiepileptics and muscle relaxants have been advertised in New Zealand media for the relief of pain. General practitioners are under increasing pressure from patients to prescribe advertised medicines.²⁰³

Medical graduates need to have a clear understanding of evidence-based pain management guidelines in order to appropriately deal with external forces such as pharmaceutical companies.²⁰⁴

2.3.8 Influence of media on pain management provision and demand for education and services

Print, broadcast and digital media, including static search engines, diagnostic apps, social media and direct-to-consumer advertising, can positively or negatively affect society's opinion of pain as well as increase understanding of acute and chronic

pain.^{205, 206} Back Pain: Don't Take It Lying Down (1997–1999), a mass media campaign of the Victorian WorkCover Authority, aimed to promote several evidence-based concepts, including that people with back pain should remain active and at work, and that disability can be reduced by addressing fear-avoidance beliefs and poor coping strategies.²⁰⁷ The success of the campaign was demonstrated by lasting improvements in public and health professionals' beliefs about back pain, and a reduction in the number of workers' compensation claims during the campaign.²⁰⁷ Medical practitioners need to be made aware of the positive technological resources that can assist in the provision of pain management, such as social media (e.g. Facebook community support groups), educational online platforms (e.g. the Agency for Clinical Innovation Pain Management Network) and treatment apps (e.g. Curable, Headspace).²⁰⁸⁻²¹¹

It has been suggested that over a third of patients use online searches to diagnose their health condition.²⁰⁵ Media are keen to promote discussion regarding topics that are newsworthy but not necessarily beneficial for patients in pain, such as the current debate over medicinal cannabis. In 2019, the FPM ANZCA issued a statement on medicinal cannabis with particular reference to its use in the management of patients with CNCP.²¹² It stated that “at the present time, the scientific evidence for the efficacy of cannabinoids in the management of people with CNCP is insufficient to justify endorsement of their clinical use”.^{212(p1)} Medical practitioners need to be equipped with sound diagnostic skills as well as evidence-based knowledge regarding the most effective treatments for managing pain, rather than the treatments requested by patients.

2.3.9 The healthcare system regarding pain management

Research points to major shortcomings in the ways in which pain is currently addressed by the healthcare system, in Australia and New Zealand as well as internationally.²¹³ Pain management is inadequate because it has historically had a low priority within healthcare systems.^{23, 214} This is likely due to diverse factors, such as institution and system-related barriers (limited number of pain specialists, poorly defined standards, lack of prioritisation of multidisciplinary pain management), healthcare economics (reduced length of hospital stay, few dedicated multidisciplinary pain management clinics, increased cost of newer analgesics), administrative staff and

health practitioner barriers (lack of knowledge and skills, lack of teamwork) and the patient's inability to participate in decision-making (lack of patient-centred care, vulnerability of groups such as the elderly and children).^{99, 215}

Although pain pertains to everyone, it does not have a clear departmental home within the healthcare system.^{15, 93} In many countries clinical services are organised along disease-specific lines, with separate departments for neurology, surgery and cancer. Diseases and treatments have a hierarchy within medicine, with cancer and heart disease at the top.²⁴ There can be no clinical specialty in which the basics of pain management are not relevant because acute and chronic pain are features of each of these disciplines.²² While it is appropriate that acute perioperative care falls under the department of anaesthesia, pain management is considered a secondary activity for the anaesthetist and the operating room activities take primary consideration.⁸⁷

Effective pain management requires collaboration between health professionals.⁸² In Australia, as in many other countries, there is no economic incentive for medical practitioners to engage with other health professionals to assist patients with complex conditions who need individualised care.²¹⁶ Private medical care has also been slow to embrace the concept of multidisciplinary pain management, possibly owing to short-term cost savings or lack of incentives. Private medical insurers favour some procedures such as surgery over behavioural or physical therapies that may be more beneficial to the patient.⁹⁷ Public-funded hospitals vary widely in the provision of pain management services. Some have comprehensive, multidisciplinary inpatient and outpatient services, whereas others divide the service into separate acute, chronic and palliative services.¹⁵ Some make no provision for specialised pain clinics or services, and when available, many pain clinics are understaffed.^{217, 218}

In the community setting, the majority of physiotherapists operate in individual private practices with limited opportunities for working as part of a multidisciplinary team.²³ Physiotherapists are well trained in managing acute pain. However, they often attribute chronic pain conditions to biomedical causes and recommend traditional biomedical treatments that can have an impact on the referral for a multidisciplinary approach to pain management.²¹⁹ Psychological treatment is often considered only after pharmacological therapy has failed.^{23, 220} Lack of funding for specialised pain psychology in both tertiary and primary care settings limits medical students' exposure

to this important aspect of pain treatment.²²¹ In addition, few clinical psychologists are specialised in pain management techniques.²²² Patients themselves are often reluctant to engage with psychologists, fearing the stigma that the pain is 'all in my mind' and therefore not real.²²²

Ideally, a balance is needed between the population health requirements, healthcare system demand for professionals and a supply thereof from the educational system.⁶⁷ There are currently not enough qualified SPMPs to service the entire population.^{16, 111} In 2017 the number of qualified SPMPs in Australia and New Zealand reached 455.²²³ In 2019 an estimated 11 full-time equivalent SPMPs (from 35 pain medicine fellows) were practising in New Zealand.¹⁶ This fell well below the required 47 SPMPs based on the internationally recommended ratio of one full-time equivalent SPMP per 100,000 patients.¹⁶ As more pain specialists are trained, clinical posts need to be made available by the healthcare providers, especially in the public system. However, there may never be enough specialist resources to meet the needs of patients with chronic pain, and it is therefore essential that the emphasis is placed on greater capacity for treatment of chronic pain by non-pain specialists in the primary care setting.²²

In summary, there is a high prevalence and public health burden of pain in Australia and New Zealand. Medical practitioners need to implement effective strategies for acute and CNCP assessment and management. Medical practitioners are likely to face social, legal, ethical and system-related issues when treating patients in pain. The medical curriculum needs to ensure that medical graduates are well-informed and skilled in best practice evidence-based pain management in order to deliver this care.¹⁹

2.4 Dimension 2: Defining and understanding pain medicine capabilities

The second dimension of the 4DF curriculum model involves identifying sets of learning outcomes to specify the pain medicine knowledge, capabilities and attributes needed by health professionals to competently participate in high-quality, relevant and comprehensive health systems. The curriculum needs to connect knowledge with experience and practice to be responsive to the changing needs of the increasingly complex health system yet adaptable to patients with pain in the local context.

This section discusses the historical development of pain medicine curricula and the current recommended pain medicine curriculum for medical students. The development pain medicine core competencies for medical students and work being undertaken to integrate these into the medical school curriculum are described.

2.4.1 Historical context

Historically, members of the IASP were aware of the inadequate teaching of pain management for medical students from its foundation in 1974.²²⁴ A pain curriculum outline for medical undergraduates was developed in 1988 by a team of pain experts, in an attempt to rectify this deficiency.²²⁴ This curriculum outline suggested a list of topics that ought to be covered to adequately prepare medical graduates for the workplace. However, inclusion of pain content into entry-to-practice medical programmes was slow and pain medicine was often taught through an ‘informal curriculum’.^{15, 32, 47, 48, 157} In the 2000s, concerns were expressed by clinicians, academics and public health officials that physicians were not equipped to provide high-quality pain management.^{22, 24, 30, 225-227}

In Australia, the need for high priority to be given to training health practitioners in best practice pain assessment and management was highlighted by the National Pain Strategy in 2010.²¹³ This was the first comprehensive initiative in Australia supported by health professionals, consumers, industry and funders that aimed to improve the quality of life for people with pain, and to minimise the burden of pain on individuals and the community.²¹³ It recommended the designation of pain management as a key competency in medical education and the development of a national pain management curriculum for medical students.²¹³

The lack of pain medicine education for physicians was reiterated by the US Institute of Medicine, National Academies of Sciences, Engineering, and Medicine in the 2011 report *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*.¹⁵ Inconsistencies in teaching pain management across most medical schools, the absence of specific courses dedicated to pain, and the lack of integration of basic science and clinical knowledge of pain medicine during the medical curriculum were highlighted.¹⁵ The “negative generalizations about patients with chronic pain” and the lack of understanding regarding the biopsychosocial concept of pain in teaching across medical schools were noted.^{15(p192)} The problem of

the absence of standards for measuring the effectiveness of treating pain in clinical practice and the paucity of information about treating pain in children was also observed. The report stated that health professionals, including medical practitioners, “need to learn more about the importance of pain prevention, ways to prevent the transition from acute to chronic pain, how to treat pain more effectively and cost-effectively, and how to prevent other physical and psychological conditions associated with pain”.^{15(p56)} The need for interdisciplinary learning to provide compassionate and effective pain management was also highlighted.¹⁵

2.4.2 Current curricula

The original IASP curriculum was updated and entered its fourth edition in 2017.^{31, 228} It was hoped that this *Curriculum Outline on Pain for Medicine* would be used as a guideline for those involved in the medical school curriculum planning, to draw attention to areas that ought to be covered during the medical training.³¹

The *IASP Curriculum Outline on Pain for Medicine* complements the detailed European Pain Federation (EFIC®) Pain Management Core Curriculum for Medical Students, which gives a more detailed breakdown of educational objectives, structure, content, number of teaching sessions and suggestions for delivery.³³

With the advances in the educational research and increased emphasis on competency-based education, pain management experts and educators became aware of the absence of pain management core competencies for entry-level health professional learners.^{229, 230} It was felt that this deficiency was possibly one of the reasons for the lack of pain education in training programmes.²²⁹ Up until then, pain education had generally focused on the acquisition of biomedical knowledge, rather than preparing students to act effectively in increasingly complex and diverse situations.^{229, 230}

In 2012, the Expert Interprofessional Pain Competencies Consensus Group (EIPCCG) comprising leaders from multiple professions with expertise in pain management, education science and development of evidence-based consensus came together to develop core competencies in pain assessment and management for entry-level health professional education.²²⁹ The recommended pain management competencies were categorised into four domains: multidimensional nature of pain, pain assessment

and measurement, management of pain, and context of pain management (see Figure 2).²²⁹ These domains address the fundamental concepts and complexity of pain; how pain is observed and assessed; collaborative approaches to treatment options; and application of competencies across the life span in the context of various settings, populations and care team models.²²⁹ These core competencies were based on the IASP interprofessional core curriculum.²³¹

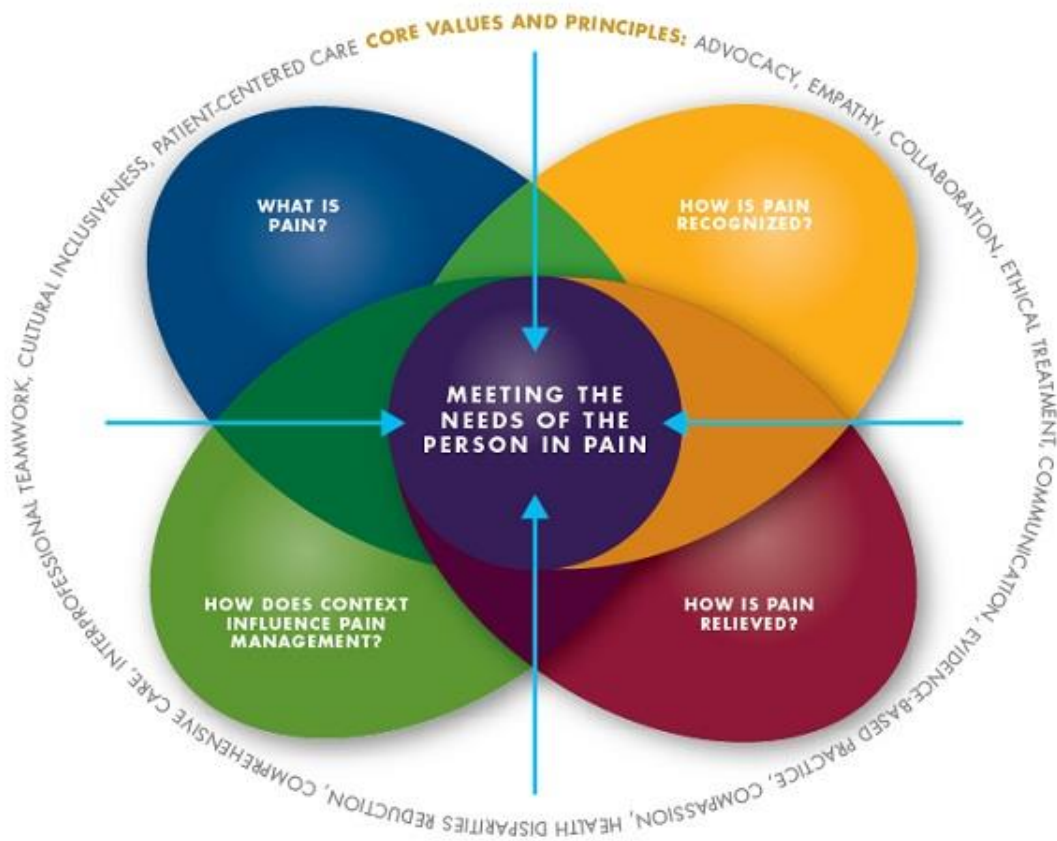


Figure 2. The core competencies for pain management.²²⁹

The core competencies are categorised within four domains. Core values and principles are embedded into all domains and competencies. Figure prepared by Ian Koebner, PhD. Used with permission of Prof Scott Fishman, MD, Principal Investigator of the Expert Interprofessional Pain Competencies Consensus Group.

2.4.3 Integrating pain medicine core competencies into medical curricula

The EFIC and IASP core curriculum have been recommended by expert pain researchers as a suitable structure for pain teaching in the undergraduate curriculum.^{26, 47, 232} The IASP curriculum has been used to inform the tool used for the assessment of pain knowledge, attitudes and skills in Finnish medical schools.⁴⁷

In 2016, the EIPCCG pain management core competencies formed the basis of the document *Strengthening Pain Content in Medical School Curricula*, which was developed by an expert panel as a tool for integrating pain management content specifically into medical school curricula.¹⁴ Potential teaching methods and suggestions for education strategies and content were identified for each learning goal.¹⁴ Table 1 provides an example of how the expert panel envisaged this integration could be implemented. The document also mapped the pain management core competencies with the Association of American Medical Colleges' Physician Competency Reference Set.¹⁴ The EIPCCG pain management core competencies have also been used as a framework for postgraduate continuing professional development for pain educators and clinicians.²³³

Table 1. Integrating pain management core competencies into medical school curricula.¹⁴

<p>Domain 4: Clinical Conditions</p> <p><i>How does context influence pain management?</i></p>
<p>Establishing Learning Goals</p> <p>Domain 4 focuses on the role of the clinician in the application of the competencies developed in Domains 1–3 and in the context of varied patient populations, settings and care teams.</p>
<p>Potential Teaching Methods</p> <p>Case-based learning, problem-based learning, simulation-based learning, team-based learning, clinical experiences, video webinar platforms including tele-mentoring.</p>
<p>Suggested Strategies and Content:</p> <ul style="list-style-type: none"> • Devote at least one clinical conference to pain issues; have students address pain assessment and management even when pain is not primary concern for a specific patient. • Discuss barriers and interventions to ensure seamless transitions in pain care; address role of various professionals in relieving pain. • Attend an interprofessional team rounding, care conference or journal club, and have learners discuss how nursing, pharmacy and physical, occupational, and behavioural health therapists contribute to the pain care team regardless of clinical setting (e.g. office, hospital, nursing home) • Discuss differences in pain management across the life span. • Discuss access to care and social policy as it pertains to people in pain. • Discuss how acute pain not treated can lead to chronic pain, the brain in pain. • Simulate scenarios where the physician can serve as advocate for a patient with pain. • Consider home visits or visits to nursing care facilities. • Accompany patients through the care continuum as a support person or health navigator. • Have students attend support group meeting for people with chronic pain disorders (e.g. fibromyalgia, sickle cell disease, neuropathy).

2.5 Dimension 3: Pain medicine teaching, learning and assessment

The third dimension of the curriculum framework considers the development of appropriate learning, teaching and assessment experiences that are fundamental to the educational needs and intent. Theories of learning, the importance of different modes of teaching and assessment, and the values that are reflected by the selection, sequencing and assessment of learning activities are essential aspects in the acquisition of knowledge, skills and attitudes.³⁴ Medical education involves enabling students to acquire new information, and to develop critical thinking, and reflective and problem-solving skills to be effective future practitioners.²³⁴

This section discusses the teaching, learning and assessment strategies that are necessary to ensure that medical practitioners of the future develop the required knowledge, skills and attitudes to treat the diverse needs of patients' experiencing pain.

2.5.1 The learning and teaching process

Pain management is complex and requires an understanding of the multidimensional aspects of the pain experience and its related management.³¹ Traditional teaching methods such as lectures and seminars are commonly used for teaching the foundational concepts of pain management (basic sciences of pain processing and pharmacological therapy) to provide a well-structured base on which further knowledge is built.^{39, 235} More sophisticated strategies are likely to be required to provide opportunities for students to learn advanced competencies such as delivery of patient-centred care, effective interaction with multiprofessional teams, empowerment of patients to self-manage their pain, and adapting pain assessment and management to the unique needs of special populations.^{39, 229} Individual medical schools in the USA and Canada have developed dedicated pain modules using small-group discussions, expert-led sessions and patient interactions to improve students' clinical skills, attitudes and knowledge with regard to pain assessment and management.²³⁶⁻²³⁸ Case-based teaching has been used to develop the pain management skills necessary to apply knowledge in clinical situations.^{32, 236, 238-242} Problem-based learning was used to introduce students to various paediatric pain assessment tools and different approaches to analgesic treatment modalities.²⁴³

Exposure to clinical activities such as high- and low-fidelity simulations, and interdisciplinary treatment planning are likely to encourage the acquisition of these higher conceptual thinking skills.^{38, 39, 236, 244} ‘Flipping the pain curriculum’ has been suggested, so instead of the standard approach of beginning with and emphasising pathophysiological pain processes, students would be initially exposed to the epidemiology of pain and disability, as well as the social and psychological aspects of pain in society, and then move to the more detailed biomedical aspects of pain management.²⁴⁵

To be effective in pain management, medical practitioners and students need to demonstrate empathy, foster productive communication and nurture positive relationships.²⁴⁶ The ideal pain curriculum also develops students’ reserves of emotional intelligence and resilience in conjunction with clinical knowledge.²⁴⁷ Role playing, motivational interviewing training, communication skills training and improved observational skills training are educational tools that have been recommended to help build empathy.²⁴⁸ Teaching methods such as writing a brief pain narrative, describing pain depicted in a fine-art image, and assessing personal responses to the experience of pain have improved students’ awareness of the affective dimensions of pain while fostering constructive emotional development personally.²⁴⁷ Journaling, discussion groups and structured reflection have also been used by an individual medical school with positive outcomes on pain competencies.²⁴⁷

Students need to be exposed to a variety of clinical experiences that are reflective of clinical practice, such as multidisciplinary outpatient pain clinics, rehabilitation centres, general practice clinics, and workplace and home visits.^{34, 249} This exposure is important so that students see the continuum of pain care and the impact of pain on patients outside the hospital setting.^{34, 249}

2.5.2 Assessment

The main goals of assessment in medical education are the development of reliable measures of student performance to predict future clinical competence, and to promote learning.^{34, 250} Robust assessment and documentation of student expertise is integral for the effective implementation of competency-based medical education.²⁵¹ It is generally accepted that assessments that include formative feedback can enhance learning and that summative assessment often drives learning.^{252, 253} Summative

assessment is also necessary to meet regulatory and public demands for clinical competency of health professionals.²⁵³

Internationally, assessment of medical students' pain management competence is not well documented.^{21, 26-28, 47, 48, 157, 254} A review of methods used to assess medical students' pain medicine competencies internationally showed that medical schools mostly assess pain knowledge, skills and attitudes using written tests or clinical simulation methods.²⁵⁵ Some medical schools have developed alternative assessment methods (such as reflective journals, vignettes and portfolios) and multifaceted assessment processes to measure multiple domains of competence in clinical pain medicine practice.²⁵⁵

The review found that two-thirds of studies did not use assessment tools based on internationally recognised pain medicine curricula/learning objectives (such as the *IASP Curriculum Outline on Pain for Medicine*)³¹ or core competencies for pain management (as recommended by the EIPCCG).²²⁹ The majority of studies focused on assessment of the cognitive level of learning (such as knowledge and understanding of pain medicine) as opposed to the more challenging domains of demonstrating skills and attitudes and developing and implementing pain medicine management plans.²⁵⁵

A lack of attention was paid to exploring assessment of topics such as psychological and physical therapy approaches to pain management as well as types of pain such as headache, visceral pain and chronic primary pain.²⁵⁵ The needs of special populations such as children, the elderly, the developmentally challenged and patients with opioid tolerance were also neglected.²⁵⁵ These are topics listed in the *IASP Curriculum Outline on Pain for Medicine* that should be covered if medical graduates are to be adequately prepared for the management of pain.^{31, 255} Emerging concepts in pain theory, such as central sensitisation, allodynia and the concept of pain as a disease entity were seldom included in the assessment of pain medicine competency.^{232, 255, 256}

The review of assessment methods of pain medicine competencies of medical students highlighted a lack of comprehensive pain medicine assessment models. Pain medicine is a complex and multifaceted discipline that is mostly taught as a topic

integrated throughout the entire medical curriculum.²⁵⁵ The Pain Medicine Assessment Framework (PMAF) was developed to provide a systematic and comprehensive approach to designing pain medicine assessments for medical students.^{31, 257} This framework incorporates the assessment of pain management core competencies recommended for pre-licensure health professionals by the EIPCCG²²⁹ as well as the *IASP Curriculum Outline on Pain for Medicine*.³¹ It allows for planning of frequent assessments across the spectrum of clinical contexts, and the sequencing of assessments in terms of level of learning throughout the medical curriculum.²⁵⁵ The PMAF is a useful record of assessment for the student because it encourages self-reflection, but it is also a valuable resource for supporting critical reflection and evaluation of the pain medicine curriculum by medical educators.²⁵⁵

Focusing attention on Australia and New Zealand, there is no national licensing examination in these countries, so medical schools have their own assessment processes to ensure that graduates are prepared for internship.¹⁵⁴ The Assessment Benchmarking Project was established in 2012 to work collaboratively with the medical schools in Australia and New Zealand to develop clinical assessment resources to provide medical schools with a more rigorous approach to clinical assessment as an alternative to a national licensing exam.²⁵⁸ The assessment benchmarking initiative is currently being implemented in a number of medical schools using the AMC's item bank of scored multiple choice questions.²⁵⁹ The Medical Deans have extended the benchmarking initiative in the disciplines of internal medicine, paediatrics, surgery, psychiatry, obstetrics and gynaecology and general practice.²⁵⁹ It is unknown whether any pain medicine specific items have been included in these tests.

A recent review of the United States Medical Licensing Examination found that 15% of questions reviewed (40% of total examination questions) were fully or partially related to pain.²⁶⁰ These questions were predominantly focused on assessment of pain. This was seen to be problematic because assessment of important competencies such as knowledge of the nature and context of pain or implications for safe and effective treatment were lacking.²⁶⁰

At present, many medical schools assess students against their own curriculum, not the AMC's Graduate Outcome Statements.²⁵⁸ It is not apparent that final-year medical

students are specifically required to display adequate knowledge and skills regarding pain management in order to graduate.

2.5.3 Interprofessional education

Interprofessional collaborative practice has also been seen as a key factor for effective pain management.⁴⁶ IPE has been shown to be effective for improving medical students' pain competencies in a variety of settings, including general pain management, paediatric pain and acute pain.^{46, 236, 261, 262} However, internationally, interprofessional pain education has been neglected.^{21, 157} There is a lack of educational activity to prepare healthcare students for collaborative pain management, despite the recognition that pain is best managed in a multidisciplinary setting.²⁶ In Western Australia, IPE pertaining to pain management was specifically mentioned as an area that could be developed in the future at on-campus clinics at Fiona Stanley Hospital.²⁶³

IPE is not fully integrated into the medical curriculum in Australia and New Zealand, and mostly exists as diverse discreet standalone programmes at individual universities.²⁶³⁻²⁶⁷ However, a number of IPE research and development initiatives have recently been implemented in Australia and New Zealand to encourage high-quality assessment of IPE in diverse settings, to inform educators about the collaborative capabilities of healthcare students and to address the challenges of implementing and maintaining IPE.^{91, 264, 268, 269}

2.6 Dimension 4: Supporting institutional delivery of pain medicine education

The last dimension of the curriculum framework is concerned with the context of the local university structure and culture. This involves the historical, political, social and organisational values of the educational institution, which will have a significant impact on curriculum design.⁶ Cultural norms and practices, established protocols, organisational procedures and the unique politics of the institution (e.g. entry requirements of students, financing of education departments, availability of resources for learning) as well as the discipline (e.g. historical importance placed on bedside manner and the patient's best interests) need to be considered when determining what shapes the curriculum.^{6, 34}

This section discusses the influence of local university context on pain medicine education including the diverse strategic vision of medical schools, access to pain medicine resources and clinical teaching opportunities, length of training and research funding.

2.6.1 Unique strategic position

Universities in Australia and New Zealand have undergone a significant period of expansion and innovation over the past two decades.^{154, 270} Each university has its own organisational systems, processes and structures to determine the medical curriculum, and committees representing medical academics, clinicians and education specialists are usually coordinated in a single office of associate or vice dean for education.⁶⁸

Ideally, medical schools need to constantly adapt and respond to the needs and values of a given society. For example, rural communities in Australia were historically undersupplied in terms of medical workforce.²⁷¹ With Australian Government support, there has been a significant investment in rural clinical schools with increased numbers of medical students and interns based in rural and regional sites.²⁷¹ While this focus has had positive outcomes in developing medical students' understanding of rural and Indigenous health issues, rural medical training programmes may need to make special provision for pain education because most specialist pain clinics operate in metropolitan centres, and allied health professionals and general practitioners with professional training in pain management are lacking in rural districts.^{272, 273}

A pain medicine curriculum would need to be flexible in design for it to be incorporated into the diverse landscape of medical education in Australia and New Zealand.

2.6.2 Resources

The proportion of government funding to universities is declining.¹⁵⁴ Changes to the curriculum require much planning and financial investment, which may be prohibitive because of a lack of resources. Calls by specialist colleges (such as the FPM ANZCA) for changes to the curriculum to include more pain content may be ignored because of a lack of support and resources offered by these bodies.^{38, 187}

2.6.3 Length of training

The traditional model of medical education was a five- or six-year course divided into preclinical and clinical teaching. Recently, there has been a move towards graduate-entry programmes.¹⁵⁴ These are typically four-year programmes for students who have completed a previous academic degree, and provide for greater diversity within the student body.²⁷⁴ The newer graduate medical programmes are shorter in length, and entail a research component that often competes for clinical time.²⁷⁵ The medical curriculum has been described as overcrowded with multiple competing priorities, so it may be difficult to find space for pain medicine content in an already compacted curriculum.^{276, 277}

2.6.4 Value systems of individual education institutions

Each medical school has a set of norms and values that underpin its curriculum.²⁷⁸ Values can be apparent in the formal curricula, such as course content, hours, requirements and evaluation. Important learning also occurs via unscripted and ad hoc teaching, such as during clinical ward rounds (informal curricula). Students learn by example from interactions with their teachers, also termed the hidden curriculum. This hidden curriculum pertains to what is tacitly acquired by example during training as opposed to the formally explicit teaching that the medical school intends to deliver.²⁷⁹ Lack of teaching or clinical exposure on a topic also portrays a value judgement (null curricula).³⁴ The null curriculum of pain medicine would be the absence of teaching regarding the management and assessment of patients experiencing pain from the formal curriculum.³⁴ The imbalance of topics at medical schools has been attributed to a failure to recognise the prevalence of patients' experiencing pain in most primary care practices and indeed in most specialities.²³²

Students continue to learn from senior medical practitioners who have not been adequately trained in evidence-based pain management (but avoid the stigma of lack of knowledge).²⁴ For example, medical professionals consistently tend to underestimate pain, and this tendency is more pronounced with more severe pain.^{172, 280} This has affected medical students' capacity to trust their patients' accounts of their pain.²⁸¹ The hidden curriculum has been mentioned in the context of pain education at medical school, where students indicated that pain was viewed as a nuisance rather than an important symptom and disease in its own right.²⁸² Medical students have also

described a hidden curriculum that suggests that chronic pain patients lack educational value and are too difficult to treat.²⁸¹ Students indicated that since their training primarily emphasised objective measurements, diagnosis and curative treatment, they were unprepared to deal with the 'subjectivity' of pain and inability to cure chronic pain.²⁸¹

Culture is a powerful force in shaping beliefs and behaviours about pain.¹²⁸ It is imperative that medical schools address cross-cultural pain education to ensure issues such as conflicting perceptions regarding pain expression and disparities (in assessment, analgesic requirements and treatment).¹²⁸ Medical students need to be made aware of their own biases and prejudices towards patients with pain.²⁸²

2.6.5 Clinical experiences

The number of medical graduates in Australia increased from 1,348 in 2005 to 3,693 in 2018.²⁷⁰ In 2018, New Zealand medical schools graduated 523 medical practitioners, compared with 358 in 2008.²⁸³ This increase requires renewed focus, not only on the quality of teaching, but also on assessment of priorities, adjustment of internal structures and operational procedures.²⁸⁴ Timetabling and administrative logistics are increasingly more difficult as the numbers of students increase.²⁸⁵ The challenge of providing quality supervised clinical training opportunities outside of traditional hospitals has been identified.²⁷¹ There is a mismatch between the increased clinical training of medical students and the number of clinical staff available for teaching. This is due to a number of factors, including decreased average working hours for medical practitioners, increased number of female medical graduates (reduced availability of clinical service providers because women have lower levels of workforce participation than men) and no corresponding increase in the number of clinical positions in the healthcare system.^{275, 286} The added pressure of an increased number of students is likely to limit universities' enthusiasm for introducing new courses such as pain medicine into the curriculum.

Increased numbers of medical students are competing for access to the limited number of patients in terms of gaining hands-on clinical experience.²⁸⁶ Elective surgery patients are admitted and discharged on the day of their operation, leaving little contact time for students.²⁸⁷ This has an impact on pain medicine education because students do not see the extent of undertreated post-operative or post-trauma

pain in the acute setting after patients have been discharged. Reduced length of stay in public hospitals and a focus on community-based treatment programmes means that reduced numbers of patients are accessible to medical students in Australia.^{287, 288} Small groups of students at bedside teaching (fewer than four) have been recommended.^{289, 290} Elderly patients are less able to provide comprehensive histories owing to confusion or cognitive decline, and ensuring that medical students are competent in terms of pain assessment and treatment in this group of patients will take time.²⁸⁷

It may also be difficult to accommodate large numbers of students in multidisciplinary clinics owing to the vulnerability of these patients.^{290, 291} Many pain clinics are staffed by medical practitioners on a part-time basis, so timetabling increased numbers of students to ensure adequate clinical exposure is difficult.¹⁶

2.6.6 Teaching staff

Historically, clinical teachers at medical schools gained knowledge about how to teach from observing teachers when they themselves were students.^{292, 293} It was assumed that clinical expertise in a particular discipline was adequate preparation for an academic career.²⁹⁴ Over the past 40 years, efforts have been made to improve teaching in medical schools through innovative staff development programmes, and peer and student feedback.²⁹⁵ However, in spite of increased access to these programmes and consultations, many medical school staff members continue to teach based on their experience.²⁹²

In general, educators and clinicians have been found to be lacking in qualifications to competently teach pain content.⁴¹ This results in the perpetuation of pain-related misbeliefs, negative attitudes towards pain management and teaching of outdated knowledge to the next generation of clinicians. Pain education and training needs to be provided by specialists who are uniformly and reliably trained in pain medicine, and these specialists must be supported by academic medical centres and training facilities.²⁹⁶ The lack of pain specialists able to teach in medical schools is also a barrier to implementing an adequate pain curriculum.²⁹⁶ In practice, there is often only limited funding allocated to release the specialist (in this case the pain specialist) from the required clinical duties in the employment setting to focus on medical student education.

2.6.7 Research

Medical schools have differing research priorities, and established medical schools generally outperform emerging medical schools.²⁹⁷ A world-renowned research profile leads to increased reputation and prestige, and attracts increased funding. At present, basic and clinical pain research in Australia remains seriously underfunded.¹⁰⁴ Despite the high prevalence and burden of pain, the Australian National Health and Medical Research Council allocated \$13 million in grants for pain research in 2014, which amounted to just 2% of the total of \$651 million awarded across all disciplines that year.¹⁸⁸ Lack of funding adversely influences endowed research fellowships and endowed chairs focused on basic science and clinical pain medicine at universities, and has negative flow-on effects on curriculum design and teaching about new advances in the field pain medicine.^{97, 298}

2.7 Conclusion

The 4DF is a useful framework to explore the complexities of integrating pain medicine into the medical curriculum with specific regard to the context of Australia and New Zealand. There are significant discrepancies between the prevalence and healthcare burden of pain in society and integration of scientific knowledge regarding effective pain management into clinical practice. It is essential that medical schools develop and present curricula that ensure that medical practitioners are competent in current recommended practices for pain management.¹⁴ The next question is clear: How do medical schools in Australia and New Zealand currently teach pain medicine and is there a need to improve or expand high-quality training about pain and state-of-the-art pain management in the core curricula of medical schools?⁴²

Chapter 3: Research Design

This chapter provides an overview of the research design and methodology of the three phases included in the thesis. The philosophical assumptions and mixed methods design strategy are outlined. Clear justification of the methodological approaches that are relevant to this thesis are also presented. The three phases of the research are explained and details of the research instruments, participants, data collection and analysis methods are described. The chapter concludes with a discussion of the ethical considerations and research rigour.

3.1 Overview of research paradigms

The goal of research is to gain new knowledge in order to increase understanding of a topic or issue.²⁹⁹ Researchers have different belief systems about the nature of truth and reality and how knowledge is created.³⁰⁰ These beliefs influence the choice of research approach, the research design and specific methods of data collection, analysis and interpretation.³⁰⁰ The decisions about choice of research approach are further influenced by the nature of the research topic, and the audience for whom the research is intended.³⁰⁰

Philosophical standpoints are often not explicitly stated in research, but they still influence the practice of research.³⁰⁰ A research paradigm is the set of basic beliefs and values that is used to guide research methods.^{301, 302} It assists the researcher in determining what is worth knowing, including the purpose of the research.³⁰² As described by Guba (1990), each of the different paradigms have their own ontological questions, including what can be known about “how things really are” and “how things really work”; epistemological questions, such as “what is the nature of the relationship between the researcher and the knowledge?” (objectivity, subjectivity; inductive, deductive); and methodological questions guiding how the researcher should go about finding knowledge.^{303(pp18,19)}

3.1.1 Quantitative research

Current quantitative research is based on the post-positivist paradigm, which maintains that reality is concrete and constant, objectivity is essential and phenomena can be predicted from a knowledge of scientific laws.³⁰⁴ This paradigm is the basis of

the 'scientific method'.³⁰⁰ Health research is dominated by the basic premise that reality can be objectively discovered using statistical inferences given the right instruments and conditions.³⁰⁰ The researcher objectively collects evidence through experiments, applies reliable statistical techniques to identify and describe relationships within a sample, and discerns laws and models of behaviour from these social facts that can be generalised to some extent to a larger population.³⁰⁰ Absolute truth can never be fully known, so evidence deduced from research is always imperfect and fallible; hence, researchers indicate a failure to reject a hypothesis rather than proving a hypothesis.³⁰⁰ Post-positivist researchers are concerned with achieving replicability, reliability and validity.³⁰⁵ Examples of research designs used within the post-positivist framework are experimental and survey design strategies such as randomised controlled trials, cross-sectional studies, longitudinal studies, secondary data analysis and systematic reviews.³⁰⁴ Methods used in quantitative research emphasise numerical analysis of data collected from objective measurements, pre-existing data, questionnaires and structured interviews using closed-ended questions.

3.1.2 Qualitative research

In contrast, qualitative research is based on the constructivism paradigm, which posits that the role of other determinants such as culture, ethnicity and behavioural factors play a major part in terms of the interaction of individuals with the healthcare system.³⁰⁰ In constructivist research, individuals actively create meaningful knowledge through immersing themselves in the natural setting of the study participants, thereby uncovering and understanding the contextual world in which they live and work.³⁰⁰ Multiple realities can exist, because the different perceptions and interpretations of each of the study participants are seen as important.

A constructivist ontological perspective maintains that reality cannot be objectively measured and the process is flexible and inductive. Qualitative research designs might include narrative research, grounded theory, phenomenology, ethnographies and case studies. Methods used in qualitative research include in-depth, semi-structured or unstructured interviews, sampling, observation, focus groups and secondary discourse analysis.³⁰⁴ In-depth 'thick description' involving detailed description of study participants' experiences, perceptions and ideas in context is the cornerstone of qualitative research.²⁹⁹ The validity of this research comes from the reliability and

depth of understanding gained from the interaction with the research subjects.²⁹⁹ The knowledge that arises from qualitative research is not necessarily generalisable because it is context based and reliant on the interpretation of the researcher. Qualitative data are analysed using a coding process to generate descriptions, themes or categories. These themes represent the major findings of qualitative research and are then interpreted to give meaning to the knowledge that was obtained.

3.1.3 Mixed methods research

Traditionally, the quantitative and qualitative approaches to research have been viewed as incompatible because of the underlying different ontological and epistemological perspectives. This dichotomy has been challenged by proponents of 'pragmatism', who adopt the position that qualitative and quantitative methods can be used within and across paradigms and reject the 'top down' privileging of ontological standpoints.^{302, 306} Pragmatists are not committed to any one system of philosophy, but embrace multiple paradigmatic perspectives, allowing for a greater freedom to use whatever methodological tools are required to answer the research questions under study.^{306, 307}

Pragmatism is the theoretical orientation most often associated with mixed methods research, in which the focus is on the problem in its 'real-life' social, historical, political and other contexts.³⁰⁶ Mixed methods research has been broadly defined as "research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry".^{308(p4)} The design and findings of each component are central to the other, and this design method draws on the respective strengths of each approach. Integrating or mixing the data is a fundamental feature of this research methodology.³⁰⁹

Mixed methods research uses design strategies that can be sequential (explanatory or exploratory), convergent or embedded.³⁰⁰ Sequential designs allow for connected integration of data. The qualitative or quantitative data are collected and analysed first, and this database is used in the design of the second phase of the research. Sequential mixed methods strategies can be explanatory, when the initial quantitative data results are explained further by the qualitative data, or exploratory, when the qualitative phase informs the development of a research instrument or specifies

variables that are needed in the follow-up quantitative study.³⁰⁰ In convergent methods, qualitative and quantitative data are collected simultaneously, and then subsequently converged or merged to provide a comprehensive analysis of the research problem.³⁰⁰ Consideration of complementary or contradictory findings are used to provide new insights or expand existing knowledge.³⁰⁰ Embedded mixed methods design can involve both convergent and sequential use of data, when one phase of data collection is nested within another. The smaller secondary study (quantitative or qualitative) is embedded within a larger experimental study design and plays a supporting role in the overall design.³⁰⁹

3.2 Theoretical perspectives as applied to this research

3.2.1 Pragmatic paradigm

The pragmatic research design was chosen for this study because the topic of pain medicine within the medical curriculum:

- a) is complex;
- b) needs to be viewed in a regulatory, professional, and institutional context;
and
- c) demands exploration by considering multiple viewpoints and perspectives.^{15, 26, 300}

Pragmatism, with its multi-level perspectives, fits well with the researcher's work in clinical pain management. The background training in the health sector is rooted in the scientific method, yet the clinical experience engaging with people in pain has similarities with the constructivist approach that supports interview-based research. It therefore made sense for this research to be underpinned by pragmatism.

3.2.2 Mixed methods research approach

The purpose of using the mixed method approach was to uncover creative, appropriate and relevant answers to the research questions. The mixed methods research approach was also useful for adding greater breadth to the multidimensional character of the topic than if a single method had been employed. Quantitative data were appropriate for describing current pain medicine curricula at medical schools, as

well as pain medicine knowledge, skills and attitudes of current medical students. Qualitative research methods were necessary to better understand the necessity for, and challenges associated with, integrating pain medicine content into the medical curriculum. Methodological triangulation (combinations and comparisons of multiple data sources, data collection and analysis procedures) was also useful for examining other 'hidden' aspects of the topic, such as values and institutional politics.^{306, 310}

Mixed methods research has been criticised for a lack of explicit documentation of justification for, and transparency of, the mixed methods design, methods and integration.^{311, 312} Accordingly, reporting of this mixed methods study was guided by the *Good Reporting of a Mixed Method Study* guidelines.³¹² The following elements were included in this thesis: justification for using a mixed method approach to address the research questions (Chapter 3); description of the purpose, priority and sequence of the research method (Chapter 3); description of the sampling, data collection and analysis methods (Chapter 3); explanation of where and how the data integration occurred (Chapter 3); identification of the limitations of the study (Chapters 7 and 8); and description of the insights gained from the data integration (Chapter 8).³¹²

3.2.3 Explanatory sequential design

An explanatory sequential design was considered the ideal methodology for this study because a stronger emphasis was placed on the quantitative component of the study.³⁰⁶ Using the explanatory sequential design is also recommended when there is a single researcher because the investigation can be divided into manageable tasks and projected out over a defined period.³⁰⁰ In addition, this design is more suitable for researchers with a strong quantitative background.³⁰⁰

Three phases underpinned this study: Phases 1 and 2 were the quantitative component of the study, and Phase 3 was the qualitative component. Phase 1 focused on gathering information on the current pain content of the medical curriculum at universities in Australia and New Zealand using a curriculum audit tool and a questionnaire. Phase 2 involved gathering information on the current knowledge, skills and attitudes of a sample of medical students and interns in Australia and New Zealand regarding pain, using a questionnaire and an objective structured clinical examination (OSCE).

In Phase 3, interviewing was used to explore the topic of pain medicine education from the perspectives of various stakeholders involved with the delivery, education and practice of pain management.

Separate processes were used to analyse the data: descriptive and inferential statistics were applied to quantitative data analysis where appropriate, while thematic analysis related to the relevant narrative data was used in the analysis of the qualitative data.³⁰⁰ The quantitative results were analysed first, and were then used to inform the questions that were asked of the participants during the qualitative study stage.³⁰⁰ A key principle of the explanatory sequential mixed methods design is that the qualitative data collection builds directly on the quantitative results.³⁰⁰ Participants in the qualitative phase were therefore informed of the quantitative results so that they had the opportunity to explore these results in more depth.

Finally, the results were compared and integrated to examine connections and degree of data convergence (i.e. whether the quantitative and qualitative data supported, contradicted or enriched each other).³⁰⁶ This data integration is a critical component of all mixed methods research.³⁰⁶ The inferences that emerged through data integration were used to answer the research questions.³⁰⁶

Figure 3 provides an overview of the sequential explanatory mixed methods design with the three phases and points of integration. This figure also outlines the study procedures and associated data for each phase.³¹³

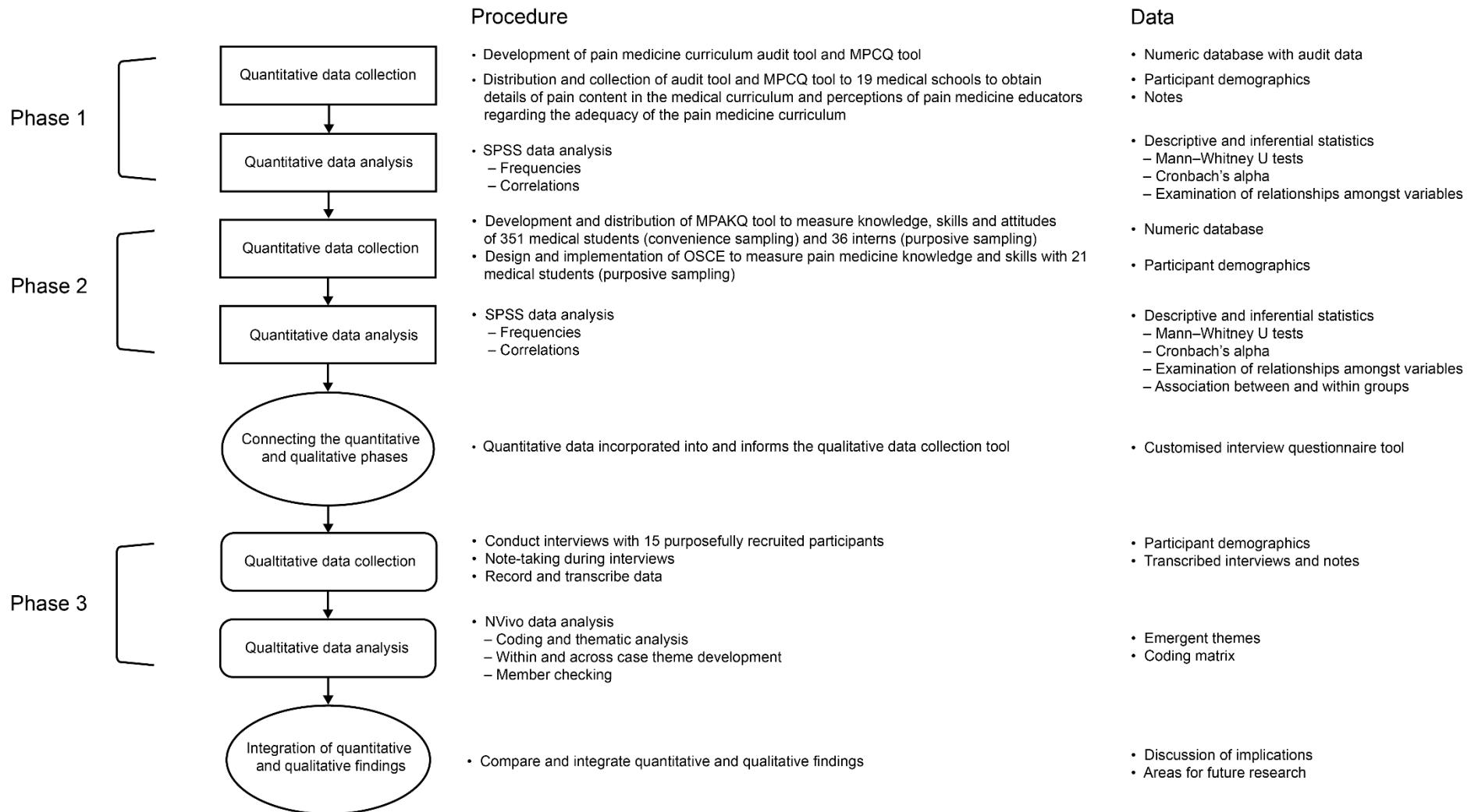


Figure 3. Schema for the mixed methods approach.

3.3 The research phases

The overall aim of this research was to examine the delivery of pain education at medical schools in Australia and New Zealand, and to determine how effectively it equips medical students with pain competencies required for internship. Five research questions were proposed to address this aim:

1. How do medical schools in Australia and New Zealand teach pain medicine to medical students?
2. What do final-year medical students and first-year medical interns in Australia and New Zealand know about pain medicine?
3. What are the attitudes of final-year medical students and first-year interns in Australia and New Zealand towards pain medicine?
4. What level of pain medicine skills do final-year medical students exhibit when performing a pain assessment and communicating with a patient in pain?
5. What are the perceptions of pain medicine stakeholders in Australia and New Zealand regarding the existing pain curricula for medical students in terms of preparing interns to manage patients with pain?

3.3.1 Phase 1

The aim of this phase of the study was to describe the delivery of pain education at all medical schools in Australia and New Zealand in order to address the first research question. Information in Phase 1 was gathered using two innovative instruments: (1) a curriculum audit tool and (2) a Medical School Pain Curriculum Questionnaire (MPCQ). The two parts of this information-gathering exercise were separated for ease of use because the curriculum audit tool survey required considerably more time and effort to complete than the shorter MPCQ.

Specifically, the curriculum audit sought to develop understandings concerning the following aspects of pain medicine curricula:

1. what is taught (topic areas and learning outcomes)
2. how it is packaged (standalone modules or integrated, interprofessional approach, resources, electives and the proportion of time devoted to it in the programme)

3. how it is sequenced (at what stage[s] in the course and how often it is addressed)
4. who teaches it (specialist pain medicine educators or educators from a range of medical disciplines)
5. how it is delivered (e.g. lecture, small-group teaching or problem-based learning)
6. what is assessed and how (multiple choice questions [MCQs], short-answer questions or OSCE)
7. who is responsible for ensuring that pain medicine is included in the curriculum.

The MPCQ was used to gather information regarding the adequacy of the pain medicine curriculum in terms of preparing interns to manage patients with pain in their clinical practice, understanding the biopsychosocial model of pain management, prescribing appropriate analgesic medication for individual patients in pain, working with other health professionals in managing patients with pain and practising pain medicine according to ethical principles. In addition, information was sought about whose responsibility it should be to ensure that pain medicine content was included in the medical curriculum, what recommendations from the medical school's approach to teaching pain medicine might be useful for other medical schools to use, and what barriers had been experienced with regard to the provision of student learning opportunities for pain medicine.

3.3.2 Phase 2

Phase 2 aimed to address Research Questions 2, 3 and 4, as described in Section 3.3. Information in Phase 2 was collected in two stages. The first stage involved gathering information on the current knowledge and attitudes to pain of a sample of final-year medical students using a specially designed Medical Students Pain Attitudes and Knowledge Questionnaire (MPAKQ). Data from the MPAKQ were pooled, and no attempt was made to analyse the data from each university or student individually, or to compare the data from different universities. Knowledge and attitudes of a sample of interns was gathered using the MPAKQ to assess whether any differences existed between this group and students in the same geographical area. The second stage of Phase 2 focused on evaluating the pain medicine clinical skills of a sample of final-year medical students using an OSCE.

3.3.3 Phase 3

This final phase aimed to address Research Question 5. Semi-structured interviews were used to explore the views of pain management stakeholders regarding the extent to which the current medical student education programme prepares medical interns to manage patients with pain.

3.4 Study settings

The three phases of this study were conducted across medical schools in Australia and New Zealand. These medical schools are tertiary educational institutions providing medical education programmes that lead to the qualification of medical practitioner. Medical students enrolled in these programmes may be undergraduate or graduate-entry students. The duration of these courses varies between four and six years. In 2016 there were 19 medical schools in Australia and two medical schools in New Zealand.³¹⁴ The University of Otago in New Zealand has three schools of medicine, and each of these was treated as an individual medical school, bringing the total number of medical schools to 23.

Students included in Phase 2 studies were enrolled at 10 medical schools across Australia and New Zealand. The Phase 2 study also included interns working at hospitals in Australia or New Zealand. Newly graduated medical practitioners in Australia and New Zealand are specifically required to undertake a period of clinical practice to practise the key skills and knowledge learned during their medical education, so as to gain proficiency in the basic clinical skills that will prepare them for the context in which they will be expected to work.

Participants in Phase 3 were situated in nine towns and cities across Australia and New Zealand.

3.5 Research instruments

3.5.1 Phase 1: Curriculum audit

The curriculum audit tool was developed from a review of current pain and medical education literature.^{6, 26-28, 31, 48, 157, 232, 237, 241} In particular, the Four-Dimensional Curriculum Development Framework (4DF) and the International Association for the Study of Pain (IASP) curriculum for medical students were used to formulate the

specific questions included in the audit tool.^{6, 31} With regard to the 4DF, the four dimensions were used as a guide to ensure questions in the audit were comprehensive and addressed both local and broader issues related to the development of a pain medicine curriculum (e.g. Who is responsible for ensuring the inclusion of pain medicine content in the medical curriculum? Which pain medicine framework has been adopted for guiding content? What teaching and assessment methods have been used to deliver the curriculum? and What are the university nuances that have shaped the design and delivery of the pain medicine curriculum?). Seventeen key major topics in pain medicine were identified from the IASP core curriculum (see Appendix 2). Ten experts in the disciplines of medical education or clinical pain medicine reviewed and revised the questions for content and face validity.

3.5.2 Phase 1: Medical School Pain Curriculum Questionnaire

The MPCQ was developed from a review of literature and the *IASP Curriculum Outline on Pain for Medicine*.³¹ The MPCQ was pretested with nine people involved in clinical pain management or university health care education to identify potential problem areas and deficiencies in the research instrument. The pretest was done with subjects different from those recruited for the main study. Changes were made to the MPCQ to reduce negative bias and to improve comprehensibility of the questions. The final questionnaire consisted of 18 questions divided into three sections related to (a) demographic information of respondents, (b) adequacy of current pain education and (c) barriers or recommendations regarding the implementation of pain education in the medical curriculum. Questions were answered in three different formats: using a five-item Likert scale ('strongly agree', 'agree', 'neutral', 'disagree' and 'strongly disagree'), by selecting an answer from the choices offered as a list or in open text format (see Appendix 3 for the MPCQ).

3.5.3 Phase 2: Medical Students Pain Attitudes and Knowledge Questionnaire

There are no published studies of standardised assessment methods to evaluate the pain medicine knowledge and attitudes of medical students in Australia and New Zealand. A structured questionnaire, the MPAKQ, was developed to assess the extent of knowledge of pain science and management, as well as attitudes towards pain management, of final-year medical students in Australia and New Zealand (see Appendix 4). The aim was to develop a questionnaire that was centred on an

internationally recognised pain medicine curriculum with evidence-based content. The questionnaire was developed in conjunction with the researcher's supervisors after a review of current published literature.

Specifically, the IASP objectives and principles for entry-level interns and the 4DF for medical curriculum development were used to formulate the MPAKQ.^{6, 31} An attempt was made to include questions across the broad range of curriculum topics as outlined in the *IASP Curriculum Outline on Pain for Medicine*.³¹ The focus was on pain medicine problems that would commonly be encountered by medical graduates in their first postgraduate year of professional practice in Australia and New Zealand. The 4DF guided the development of the MPAKQ, ensuring that the questionnaire assessed knowledge and attitudes that reflected the values of the professional bodies as well as the necessary competencies for service in the health system.⁶

The questions assessing pain medicine knowledge were designed based on recommendations of the National Board of Medical Examiners, the General Medical Council and current pedagogical evidence.³¹⁵⁻³²⁰ These resources provided guidelines for developing high-quality MCQs and rules for writing one-best-answer questions in the clinical vignette format, and identified common flaws related to question development. MCQs assessing knowledge competencies were designed in the format comprising a stem followed by four answers (options). There was only one correct answer, three distractors and one further option of 'I don't know'.

The questions designed to assess students' attitudes towards pain medicine were based on a review of published literature.^{49, 240, 261, 321-323} These questions focused on ethical issues related to the provision of pain medicine, such as pain being a health and education priority and the influence of culture on pain practice. Questions also addressed the subjective experience of pain, students' emotional response to pain and the concept of chronic pain as a disease. Three questions were similar to those used in a study of Finnish medical students' attitudes to pain, namely, 'I feel anxious when I see a patient in distress due to their pain', 'I rely on the patient's own estimate of their pain' and 'patients suffering from chronic pain seldom receive adequate treatment in primary care', and these were used with permission of the author.⁴⁹ These questions were in a format whereby participants rated their agreement with statements

on a five-point Likert scale ('strongly agree', 'agree', 'neutral', 'disagree' and 'strongly disagree').

The initial questionnaire was designed with approximately 70 questions. The inclusion of questions into the final MPAKQ was determined first by a high rating of content validity from 10 experts (i.e. Would you expect a final-year medical student to be able to answer this question?), and secondly by ensuring that the questions assessed the broad range of pain medicine content topics that should be taught to medical students (as defined by the IASP).³¹ The 10 experts were clinically experienced in the field of pain medicine. Eight of these experts were SPMPs, one was a musculoskeletal physician working at a multidisciplinary pain clinic and one was a registered physiotherapy specialist in pain management. Seven of these experts were also pain medicine educators. The total number of questions was restricted by the time required to complete the questionnaire, which was limited to 10 to 15 minutes for practical purposes.

In total, the final MPAKQ contained 41 questions. Thirty-two questions assessed knowledge, nine questions examined attitudes towards pain medicine and four questions concerned age, sex, information about exposure to training specifically in pain management apart from the current medical degree, and experience with pain (personal or someone close to them suffering chronic pain). There were eight questions pertaining to acute pain, 11 chronic pain questions, one cancer pain question and 12 general questions (see Appendix 5 for the classification of questions according to topic and correlation with the *IASP Curriculum Outline on Pain for Medicine*). The MCQs were constructed to test recall of important pain medicine content as well as the application of medical knowledge to a clinical situation. Nine questions assessed knowledge recall, and the remaining 23 questions assessed higher order thinking processes such as problem-solving and the application of medical knowledge to clinical settings. The correct answer for each knowledge question was based on current published literature (see Appendix 6). One mark was awarded for the correct answer to each question, so a total score of 32 could be obtained for the knowledge part of the questionnaire.

A pretest was undertaken with five medical students to ensure that the questions were clearly articulated, the response options were relevant and the computer-based survey

option functioned properly. The questionnaire was then pilot tested on a class of final-year medical students to establish response rate, time for completion of instrument, number of 'I don't know' responses, baseline scores, response variation and feasibility of analysis. Of the 108 students who were invited to participate, 28 students (26%) completed the questionnaire. Due to the low response rate, the results could not be generalized for the whole population of medical students in that class.

3.5.4 Phase 2: Pain medicine objective structured clinical examination

There are no published studies of standardised assessment methods to evaluate the pain medicine clinical skills of medical students in Australia and New Zealand. Therefore, for the purposes of this thesis, there was a need to develop a specific assessment tool to evaluate the pain medicine clinical skills of current medical students. The OSCE station and marking sheet were designed in collaboration with the supervisors, as well as Professor Jane Courtney (Associate Dean, Clinical, University of Notre Dame Australia [UNDA]), and Associate Professor Elina Tor (Medical Education Assessment & Psychometrics, UNDA). The specific clinical details and scripts of the OSCE were developed by the doctoral candidate. The content of the OSCE was based on previous published research of OSCE assessments of chronic pain and current guidelines regarding the pharmacological management of post-herpetic neuralgia (PHN).^{50, 77, 238, 249, 324}

The station required students to take a history from a standardised patient (SP) presenting with symptoms of PHN. A marking sheet was prepared with four types of scoring scales: a checklist of all 44 items expected to be included in the history-taking assessment (indicated as 'yes' when completed), a six-point performance rating scale ('serious deficiency', 'below expectation', 'borderline', 'at expectation', 'above expectation' and 'outstanding') for the 11 different subtasks in the pain OSCE, a seven-point global score ('dangerous', 'poor', 'below expectation', 'borderline', 'average', 'good' and 'outstanding') reflecting the examiners' judgement of the quality of the integrative whole of the assessment and a three-point scale of the SPs' rating of their inclination to see this doctor again ('no', 'yes', 'would actively seek this doctor out') (see Appendix 7). The SP's rating was not included as part of the total score. The function of the global score scale in this OSCE was to gauge individual examiners' assessment of the quality of the integrative whole of each student's performance in

the station, and this was to be used as the basis to statistically estimate the standard set pass mark for the station.³²⁵ Research has shown that global rating scores are particularly useful for assessing empathy, coherence, and verbal and non-verbal expression.³²⁶

The marking sheet included three sections, namely, history taking, process skills, and diagnosis and treatment. The history-taking section included seven subsections: description of the pain, treatment history, impact on activities, impact on self, past pain experiences, past medical history and social history. The process skills section was divided into two subsections: gathering information (listening, and verbal encouragement to patient to provide information and to express feelings, concerns, expectations and beliefs) and building the relationship (non-verbal behaviour, respectful and non-judgemental acknowledgement of patient's views, empathy). The third section required the student to provide a diagnosis and to answer a question posed by the examiner: "What are three useful classes or types of medication used to manage this condition?"

The marking was weighted as follows: history taking (50%), communication skills (30%), and diagnosis and pharmacotherapy (20%). This was based on an assumed subjective judgement of the knowledge and skills students would be expected to display in order to demonstrate competency.

3.5.5 Phase 3: Pain management stakeholder interviews

An interview guide, which was developed in collaboration with the researcher's supervisors, was used to ensure that certain topics were covered within the specific time frame, while still allowing for participants' experiences or insights to surface. Interview questions were based on previous quantitative research generated in this study, the 4DF for curricula development, the guidelines of the Australian Curriculum Framework for Junior Doctors and the New Zealand Curriculum Framework for Prevocational Medical Training, and the IASP objectives for the pain curriculum for entry-level interns.^{6, 31, 153, 327} Using the 4DF as a framework for developing the research questions created an exploratory discussion connecting current and future healthcare practice (Dimension 1) to the challenge of building new ways of thinking about the inclusion of pain management in the local medical curricula (Dimension 4).⁶

The interview guide consisted of 17 questions (see Appendix 8). Areas included in the interview guide were interns' responsibilities for managing patients with pain and observed demonstrations of interns' competencies in caring for patients in pain (such as assessment, treatment, communication and collaboration with other health professionals). Participants were asked to provide clinical examples to support their answers.

Participants were asked to comment on the data obtained in Phases 1 and 2 of the study (such as the total number of students who gained more than 80% concordant answers in the MPAKQ and the number of universities with fewer than 10 hours of pain-related content in the curriculum). The remaining questions were directed to the topic of pain medicine education for medical students, such as responsibility for delivery, barriers to implementation and suggested improvements.

Extension questions were added to the questionnaire for instances when participants' responses needed further exploration. To reduce researcher bias, an independent review of the draft questions was conducted by the researcher's supervisors, resulting in the removal or rewording of some questions. Two pilot interviews were conducted to establish the general feasibility of the interview tool, such as order of questions, length of time to complete the interview and practical issues related to recording the interview.³⁰⁰ These pilot interview recordings were examined for interviewer bias. The interview tool was then modified with some questions being rephrased and reordered to encourage deeper responses from the participants.

3.6 Sampling and recruitment

3.6.1 Phase 1: Curriculum audit and Medical School Pain Curriculum Questionnaire

All medical schools in Australia and New Zealand were included in Phase 1 of the study. The dean of each medical school (or their delegate) was invited to nominate a representative from the school who had a detailed knowledge about pain education in the curriculum to participate in the study. In the event the dean could not identify a representative to complete the curriculum audit, a person in the medical school who was either coordinating the pain education curriculum or had detailed knowledge of it (e.g. a specialist pain medicine physician [SPMP] or lecturer in pain education) was

approached. A letter was sent to each representative with an invitation to participate in this study. Non-respondents received reminder emails. A non-response to the third email was considered a rejection. Attempts were then made to find another representative from that medical school, by contacting SPMPs and allied health practitioners specialising in pain management working with a clinical hospital associated with the medical school. The process was repeated until all known contacts for the medical school had been approached. It was hoped that the same person completing the curriculum audit would also complete the MPCQ, but it was not a requisite.

3.6.2 Phase 2: Medical Students Pain Attitudes and Knowledge Questionnaire and an Objective Structured Clinical Examination

A convenience sample of final-year medical students were included in the first stage of Phase 2. Professor Max Bulsara (Chair in Biostatistics at UNDA) provided statistical advice regarding the calculations for the minimum sample size of medical students required to be included in the final sample for statistical reliability.

To decide how many individuals were needed in the sample group, it was assumed that the characteristics of the sample would be representative of the overall population of 3,992 students.²⁷⁰ It was assumed that students would have varying degrees of knowledge of pain medicine as measured by the MPAKQ. A pilot test was undertaken to estimate the level of knowledge of the medical students using the MPKAQ. The average total score was 16.86, which equates to 50% correct answers for the questionnaire.

To estimate this proportion (p) in the total number (N) of medical students studying in Australia and New Zealand in 2017, a sample of individuals (s) was taken from the total population, and the sample proportion (\hat{p}) was calculated from the sampled individuals. The estimated \hat{p} was not likely to be exactly equal to the true value p unless the full population of medical students were examined, because \hat{p} depends on the particular individuals that were included in the sample.³²⁸ However, it is possible to use simple sampling statistics to calculate how close the estimated \hat{p} is to the true value of p .³²⁹

The central limit theorem states that as long as you have a reasonably large sample size, the sampling distribution of the mean will be normally distributed.³²⁹ A confidence level (z, or statistical significance) indicates a level of probability that what is observed in the sample accurately represents what is the reality (the proportion of p) in the population being studied.³²⁹ It is expressed as a percentage.³²⁹ In this study a confidence level of 95% was set, so that it could be expected that the estimated \hat{p} would lie in the confidence interval for 95% of the random samples that were repeatedly drawn. The confidence interval (or sampling error) is a range of values around p in which the estimated \hat{p} is likely to be. The confidence interval depends on the sample size (s), the percentage of the sample that is likely to be in a particular category and the total population size. An acceptable error rate for the estimate sp can be set and this is called the margin of error (e). In this study the acceptable margin of error was set at 5%.

To determine the sample size of an unknown population size (S), the following formula was used:³³⁰

$$S = \frac{z^2 \times \hat{p}(1-\hat{p})}{e^2}$$

(z = confidence level/ degree of accuracy, e = margin of error, \hat{p} = sample proportion, S = sample size for unknown total population)

And then the next step was applied because the population total (N) was known:³³⁰

$$s = \frac{S \times N}{S + (N - 1)}$$

(s = sample size for known total)

In this study, the sample size of an unknown population group would be:

$$S = \frac{1.96^2 \times 0.5(1 - 0.5)}{0.05^2} = 384.16$$

And the study sample for the total number of medical students in 2017 would be:

$$s = \frac{384.16 \times 3992}{384.16 + 3991} = 351$$

Using this information, it was calculated that a minimum sample size of 351 students (out of the total of 3,992 medical students studying in Australia and New Zealand in 2017) would be sufficient to estimate the level of knowledge of medical students within 3%–5% of the true population percentage, estimated with 95% confidence.^{270, 328-330} Final-year medical students were selected because it was argued that they would have had the most exposure to pain medicine teaching throughout the curriculum compared with students in other years.

Academic staff members involved with teaching pain medicine (identified in Phase 1), medical education staff or SPMPs at that university were approached to assist with the recruitment of students. The dean of the medical school determined the method of data collection (paper-based, email or e-platform). In the case of students being recruited prior to, or after, a routine timetabled lecture period, all students present at the time were invited to participate in the study. When students were recruited via email, the entire class was sent the invitation to participate in the study. The remaining method of recruitment involved an invitation being placed on the class e-platform, which was accessible to all students in the year group. Recruitment ceased once the allocated number of questionnaires had been completed.

A purposive sample of first-year interns was invited to participate in the first stage of Phase 2 of this study. All first-year interns working at the main teaching hospitals within two geographical areas (one in Australia and one in New Zealand) were approached to participate in the study so that their pain medicine knowledge could be compared with that of the final-year medical students within the same area. The aim was to obtain exploratory data on whether further teaching provided after graduation and clinical exposure might alter their knowledge and attitudes. The interns were approached towards the end of their first year of clinical practice. Recognising the limitations in accessing interns (different departments, work schedules), the aim was to recruit approximately 40 interns in this group because this target number was felt to be attainable. The aim was to compare medical students and interns within the same geographical area to provide a level of conformity, because many students would work in local hospitals after graduation.

For the second stage of Phase 2, an invitation was extended by email to all 112 final-year students at the UNDA Fremantle School of Medicine (SoM) to participate in a formative OSCE. It was suggested that the formative OSCE might assist the students to prepare for the final summative OSCE examinations prior to graduation. An information sheet was given to each participating student prior to the OSCE in order to explain the assessment process and the voluntary nature of participation.

3.6.3 Phase 3: Interviews

Stakeholders in this study were identified as people who would be affected by or closely involved with pain medicine education at medical school level and health professionals working alongside first-year interns during the delivery of pain management in the hospital environment. It was felt that these people would be able to provide insight into whether interns were adequately prepared in terms of pain medicine competencies when commencing their clinical work in the hospital. Five groups of stakeholders were identified: final-year medical students, first-year interns, medical practitioners, SPMPs and nursing/allied health practitioners. Three representatives from each group of stakeholders were interviewed to provide a comprehensive insight into stakeholder perceptions.

A diversity of stakeholders was selected for maximum variation to generate depth of information. Participants were purposefully selected across venues in New Zealand and Australia to represent different locations, diverse types of hospitals (i.e. large teaching metropolitan vs medium to small district hospitals), diverse facilities within the hospital (rehabilitation ward vs emergency department), and different medical specialities (e.g. obstetrics vs rural hospital medicine) to allow for further data triangulation. Only stakeholders with experience and knowledge of the interns' pain medicine responsibilities and competencies in the clinical setting in the hospital were invited to participate. Patients were not included as stakeholders because it was felt they might have difficulty distinguishing interns from other medical practitioners in the hospital setting and that they would likely have a limited perspective, having only been cared for by a small number of interns in one very specific hospital setting.

Final-year medical students were recruited via a request posted on a university web-based portal. The other participants were contacted by telephone or email to invite them to participate in the research. These participants were either known to the

researcher through informal contact, such as Pain Society meetings in Australia and New Zealand, or more formal connections made during Phase 1 of the study (curriculum audit), or were recommended by people working in the local hospital environment. No invited participants declined to be interviewed.

3.7 Research procedures

3.7.1 Phase 1: Curriculum audit and Medical School Pain Curriculum Questionnaire

Phase 1 was undertaken between October 2016 and April 2017. Once a representative agreed to participate in the study, the curriculum audit tool and a link to the online MPCQ (using SurveyMonkey™)³³¹ was sent to them by email. The representative was encouraged to corroborate data with colleagues and students. The completed curriculum audit tool was scanned and returned by email. The data were de-identified so that no medical school could be identified during analysis.

3.7.2 Phase 2: Medical Students Pain Attitudes and Knowledge Questionnaire

The first stage of Phase 2 was undertaken from June 2017 to January 2018. The MPAKQ was distributed in a paper format prior to, or after, a routine timetabled lecture period; or in electronic format (SurveyMonkey™).³³¹ If the medical school agreed, email reminders were sent to encourage participation. The correct answers for the MPAKQ were available to the students as a learning tool after completion of the questionnaire. Ten students were invited to complete the same questionnaire a week later in order to test the reliability of the instrument. They had not been provided with the correct answers for the questions.

A link to the electronic format (SurveyMonkey™)³³¹ of the MPAKQ was distributed by email to all interns at the selected hospitals by the person overseeing the intern education programme at the respective hospitals. Email reminders were sent on one further occasion to encourage participation.

3.7.3 Phase 2: Pain medicine objective structured clinical examination

The OSCEs took place on the premises of the UNDA Fremantle SoM campus in August 2018. The OSCE was coordinated by Dr Milly Johnston, Communication and Clinical Skills Domain, UNDA.

The students were quarantined in a separate room prior to entering the OSCE. Mobile phones and watches were not permitted in the examination room to avoid distraction and prevent access to information. The movement of candidates through the OSCE was triggered by ringing a bell. Personnel were available to ensure students followed the correct procedure regarding the OSCE stages. Two identical OSCE stations operated simultaneously in separate private rooms. The OSCE station lasted for 10 minutes. Students were provided with key case facts and informed that they were required to take a focused history from the patient. The students were then allowed five minutes to prepare for the OSCE station.

There were two examiners—one for each station. The two experienced examiners were briefed prior to the examination regarding standardisation of approach. Three experienced SPs were provided with the script for the OSCE a few days prior to the examination so they were well prepared for the clinical questions. The SPs were aware that certain information was only to be provided if the students actively asked a specific question, and that they were to follow the script as closely as possible. A trial run with each SP was undertaken prior to the examination. The three SPs were rotated through the two stations, allowing for breaks. At the end of the examination, the marking sheet was collected, and the students were thanked for their participation. Feedback regarding their performance was given to the students the day following the assessment.

3.7.4 Phase 3: Interviews

The semi-structured interviews were conducted during May and June 2019. Nine interviews were conducted face to face or via Skype. Six participants indicated a preference for a telephonic interview or did not have access to Skype. The interviews were arranged for a time and venue that was convenient for the participant.

Rapport was established prior to the interview to encourage open conversation, and to emphasise the neutrality of the researcher and respect for the participant's independent views.²⁹⁹ All participants were asked the same set of questions with little variation in question wording. However, the interview process was fluid enough to allow spontaneous interchange between the researcher and the participant, resulting in the re-ordering of some questions.

Interviews were audiotaped and detailed notes were taken during the interview process to record and verify the accuracy of the transcript and to facilitate later analysis (e.g. highlighting important quotations). The narrative data were prepared for analysis by transcribing the raw data into a text format. Transcribing was done soon after each interview to ensure timely analysis. Three participants (20%) provided written documentation to support their answers, which was also used to confirm the accuracy of the transcript.

3.8 Methods of data analysis

3.8.1 Phase 1: Curriculum audit and Medical School Pain Curriculum Questionnaire

Numeric and descriptive data were obtained and statistical analysis was conducted using IBM® SPSS® (Version 23) and Microsoft® Excel® (2018) (see Appendix 2 for curriculum audit tool scoring schedule). Blank items were coded as missing and excluded from analysis. A p value less than 0.05 was considered significant. Descriptive statistics were used to present frequencies and percentages of pain education content in medical schools' curricula. Where appropriate, measures of central tendency and variability were calculated. Non-parametric tests (Mann–Whitney U test) were used to gauge whether significant differences of perception existed between key representatives from medical schools with an SPMP qualification and key representatives with no specialist qualification in pain medicine.

3.8.2 Phase 2: Medical Students Pain Attitudes and Knowledge Questionnaire

Statistical analysis was conducted using IBM® SPSS® (Version 23) and Microsoft® Excel® (2018). Blank items were coded as missing and excluded from analysis. A p value less than 0.05 was considered significant. To draw accurate and reliable conclusions from the data, normality of the data was assessed initially, because different statistical tests need to be applied depending on the distribution of the data. The Shapiro–Wilk test was used to assess whether the scores in the sample were normally distributed because this test is considered more reliable than graphical and numerical methods.³³² In addition, the Shapiro–Wilk is widely used for testing for normality because it is robust across a range of small to medium sample sizes ($n \leq 2000$).³³²

Descriptive statistics were then used to describe the frequency, variance and standard deviation of the following:

1. individual and total item concordant scores of MCQs on the MPAKQ
2. numerical rating for each question scored using the five-point Likert scale.

Non-parametric tests (Mann–Whitney U test) were used to gauge whether significant differences existed between the MPKAQ total scores of the medical student and intern groups. Further tests were administered to explore differences in MPAKQ performance (dependent variable) depending on a variety of independent variables, including:

1. demographic variables including age and gender
2. attitudinal questions (e.g. students who indicated that they found working with pain patients provoked anxiety)
3. extent of previous exposure to pain education.

While comparison between countries was not the aim of the study, statistical exploration of the differences between the countries was necessary to ensure that the results were applicable to both countries. No attempt was made to compare the data from different universities. It was decided that questionnaires with more than two MCQs not answered would be omitted from the analysis because calculation of the individual's overall total score would have been difficult to calculate. Limited descriptive statistical comparisons were made between the students and interns because the number of interns was much smaller.

3.8.3 Phase 2: Pain Medicine objective structured clinical examination

Statistical analysis was conducted using IBM® SPSS® (Version 23) and Microsoft® Excel® (2018) to describe the frequency, variance and standard deviation of the individual item and total scores. Blank items were coded as missing and excluded from analysis.

A standard set pass mark (SSPM) was estimated using the borderline regression method (BRM). In the BRM, an examiner rates a student's performance at each station by completing a checklist and a global rating scale.³³³ To create a linear equation, the checklist marks from all examinees at each station are then regressed on the attributed

global rating scores.³³³ The global score representing borderline performance is substituted into the equation to calculate the pass or fail cut score for the checklist marks.³³³ It was decided that pain medicine assessment and communication skills would be judged adequate if the students achieved above the SSPM. The performance standard scale ('outstanding', 'above expectation', 'at expectation', 'borderline', 'below expectation' and 'serious deficiency') was determined with reference to the SSPM. The marking schedule categories were based on the internal benchmark scale used by the UNDA Fremantle SoM.

3.8.4 Phase 3: Interviews

The data analysis process was aided by the use of a qualitative data analysis computer software programme, NVivo™ (QSR International Pty Ltd), to facilitate the organisation and management of unstructured data. The transcripts were cross-checked with the recordings during coding.

Coding was undertaken to initially summarise segments of data using an iterative process involving reading and re-reading the same transcripts.³³⁴ Codes were used to categorise similar units of data, topics (e.g. acute pain, assessment), processes (e.g. discharging, prescribing) and recurring short phrases (e.g. referring to the acute pain service) or patterns (e.g. hospitals have different approaches to pain management). Some codes were created deductively from the literature review and conceptual framework; other codes emerged progressively or inductively during the data collection and coding process.³³⁴

At this stage, two supervisors reviewed three of the original transcripts independently. A discussion ensued to determine the extent to which their findings confirmed the preliminary patterns that had been identified by the researcher. Based on this discussion, the final themes and their descriptions were refined.

Similar codes were clustered together to create a smaller number of categories and generalisable themes.³³⁴ This involved noting patterns, making contrasts and comparisons, noting the relationships between variables, and finding mediating variables. The raw data were revisited to ensure that the codes and major themes were grounded in them.³³⁵ The results were returned to participants to check for accuracy and resonance with their experiences. Final explanatory conclusions were

drawn after further exploration of influences, consequences and interrelationships between the themes.

Visual displays were created and revised throughout the analysis process to deliver a concise overview of the analysis of the data and to assist with systematic portrayal of the information. First, a matrix was constructed to condense and distil the data from the full range of participants. Second, descriptions of the codes were outlined in the codebook (see Appendix 9). Third, a code frequency table was used to explore variables by providing a descriptive statistical account of the number and types of codes generated from the data analysis (see Appendix 10).³³⁴

3.8.5 Data synthesis

The qualitative and quantitative data sets were reviewed and analysed through integration; either merged (comparing and/or contrasting for convergence and divergence) or connected (descriptions, explanations of outliers and subgroups). When evidence from different sources diverged, reasons for the discrepancy were sought. Finally, when data from both phases had been analysed and the results integrated, inferences were then made. An attempt was made to initiate new ways of thinking about the subject of pain content in the curriculum to enrich the understanding of the topic.

3.9 Research rigour

Rigour in quantitative studies is determined through an evaluation of validity and reliability of the instruments used in the study.³³⁶ The four main criteria to demonstrate research rigour in qualitative studies are confirmability, dependability, credibility and transferability.³³⁷

3.9.1 Phase 1 and Phase 2 validity

Validity is defined as the extent to which an instrument measures what it intends to measure.³³⁶

In Phase 1 and Phase 2, content validity was increased by carefully designing the instruments using the internationally recognised IASP Pain Curriculum for Medicine and the 4DF.^{6, 31} The number of questions in the MPAKQ ($n = 32$) and the wide range

of pain medicine topics covered in the questions also improved content validity. Pretesting of the MPCQ and MPAKQ was undertaken to increase face validity.

Validity of the OSCE instrument was addressed by using experienced SPs. Authenticity was added because the SPs were provided with a script to guide their portrayal, and the script was based on real patients' experiences.³³⁸

Phase 1 included all medical schools in an attempt to address adequate representation and reduce bias. Phase 2 (first stage) included medical students from 10 medical schools to reduce sampling bias. Sample size was calculated using a standard formula to increase the level of probability that what is observed in the sample accurately represents the reality.³²⁹ All final-year medical students at one medical school were invited to participate in the OSCE assessment in Phase 2 (second stage).

Appropriate statistical tests were performed to draw valid conclusions from the data obtained in Phase 1 and Phase 2.

External validity refers to the extent to which inferences from the sample data can be extended to other persons, other settings or future situations.³⁰⁰ The study generated data that were specific for Australia and New Zealand. Generalisations about the pain content in the medical curriculum were not extended to other countries or undergraduate curricula of other health professionals. Specific recommendations were not made to individual universities because the data were presented without identifying features.

3.9.2 Phase 1 and Phase 2 reliability

Reliability refers to the ability of the test to measure accurately and consistently. The MPAKQ was pilot tested to test for feasibility. Reliability of the OSCE instrument was enhanced using standardised scoring rubrics and trained examiners.

Standard setting was estimated using a BRM for the OSCE tool.^{333, 339, 340} BRM is an extremely effective standard setting method when used in high-stakes, practical exams such as OSCEs.³³³ The use of the BRM to determine the set standard was appropriate because this was an examiner-led station.

3.9.3 Phase 3 confirmability

In qualitative methods of research, it is important to ensure that the findings of the study have been shaped by the respondents and not by the researcher's bias, motivation or interests.^{334, 337} A personal bias was acknowledged (see Section 3.9.4). To mitigate this effect, participants were encouraged to answer the questions openly and honestly; and an openness to contrary findings was expressed. It was emphasised that the research would not influence or have any detrimental effect on participants' education or employment. The researcher was not in a position of power or influence over any of the participants. The researcher was not employed by a medical school and did not collect data from her own workplace. Students self-selected to be interviewed, which limited researcher bias. The questionnaire underwent a review process with supervisors and was tested prior to implementation to avoid leading questions and imposed bias. Regular review and feedback was undertaken with the supervisors throughout each stage of the study. Transparency was maintained with provision of a detailed explanation of all stages of the study. The inclusion of verbatim quotations from participants in the final report provided depth of understanding and added to the transparency of the research.

3.9.4 Phase 3 dependability

Dependability reflects the degree to which the researchers document the research process from study conceptualisation through to interpretation.^{309, 337} In this study, the research aims were carefully designed and explicitly stated prior to the commencement of the study. The research protocol was assessed by independent examiners at an early stage. The process and results of the study were examined by the supervisors to ensure that the findings were supported by the data.³⁰⁹ The interview method encouraged coherent and explicit exploration of the topic and allowed the participants (rather than the researcher) to define the focus of the responses.²⁹⁹ Data were collected across a full range of appropriate settings and respondents to fully explore the research question. Field notes were taken to enhance the audio recordings and to detail non-verbal cues not captured in the recordings. Data quality checks were made by two supervisors to assess interviewer bias. The interview data were imported into a qualitative software system (NVivo™) to allow for improved management of the data. The data were displayed in several different formats (such

as matrix, network diagram, codebook) to improve systematic portrayal and analysis of the data across all cases. The findings showed meaningful parallelism across participants and sites.

3.9.5 Phase 3 credibility

Credibility requires the researcher to show that the findings are an authentic portrait of what is being examined.³³⁴ Participants were selected on the basis that they had personal interaction with interns in the clinical environment and would therefore authentically represent current practice. The majority of participants were also currently, or had recently been, involved with the medical school education system. The semi-structured and open-ended questions were specifically designed to explore, in detail and at length, elements most relevant to the topic of the study. The questionnaire was pilot tested before being distributed to participants to ensure that questions resulted in detailed responses. There was flexibility in the time allocated for the interviews so that participants had the opportunity to elaborate at length on the data. Questions ranged from being more generally focused to detailed probing. Participants were encouraged to describe clinical examples to illustrate their experiences. This assisted the researcher with correct interpretation of the participants' views.

Triangulation of data was used to explore the topic from the perspectives of different stakeholders, that is, pain management specialists, other specialist clinicians, other healthcare professionals (such as registered nurses), junior interns and medical students—in an attempt to verify conclusions. Triangulation among data sources produced generally converging conclusions. Inter-rater reliability was confirmed via independent reviews of three of the original transcripts by the researcher's supervisors. Following detailed discussion of these reviews, agreement was reached regarding the emergent themes.

Member checking (participant feedback) of the transcribed data provided evidence of the trustworthiness of the results. Findings from previous phases of the research were presented to participants, who confirmed the emerging themes.

3.9.6 Phase 3 transferability

In qualitative research, it is important to know how far the findings can be transferred to other settings or contexts.³³⁴ In this study, transferability was achieved by involving a diverse group of participants at different sites across Australia and New Zealand, thereby making data results potentially generalisable among differing cohorts of healthcare providers. Clear descriptions of the research protocol, the context and characteristics of the participants were provided to enable the reader to assess whether the findings are transferable to their own setting.

3.9.7 Explicit bias of researcher

The researcher has worked in the field of acute and chronic pain management in the private setting for over 20 years. She has seen many hospital discharge medical summaries indicating that, despite presenting with significant pain, patients did not receive adequate pain management input while in the hospital setting and were not referred timeously for appropriate multidisciplinary pain management on discharge. Her view is that many medical practitioners in the community still focus on a biomedical model of pain care and provide minimal patient education to support optimal self-management, exercise and psychological therapies for patients experiencing pain.

The researcher has a tertiary qualification in education with experience in allied health university curriculum development and assessment. She has networked with healthcare providers involved in clinical pain management and education across New Zealand and Australia, which has resulted in many conversations regarding pain medicine education. During these conversations, health professional educators have voiced their frustration with the lack of mandatory, structured and comprehensive pain medicine curricula. Informal discussions with a handful of medical students have supported this view, thus informing the researcher's perspective that pain medicine is not adequately taught at some medical schools.

While the researcher's background has mostly been from a quantitative paradigm and therefore might favour this methodology, clinical work in pain management involves communication and interviewing, which contributed to her skills in qualitative research methodology. A knowledge of pain medicine was advantageous in terms of understanding terms such as the names of medication, abbreviations and context

while undertaking the research and analysing the data. These biases were acknowledged from the time of initiation of this study, and ways in which this might be portrayed during the different processes of the study were explored. It was recognised that careful attention would need to be paid to transparent and consistent study design throughout the data collection and analysis processes of the qualitative and quantitative stages, as well as the integration process to minimise bias.

3.10 Ethical considerations

3.10.1 Ethics approval

All phases of the research were approved by the University of Notre Dame Australia's Human Research Ethics Committee (reference number 016134F; see Appendix 11) and were assessed to have met all the requirements as outlined in the National Statement on Ethical Conduct in Health Research (2014). This study was classified as Low Risk Research.

3.10.2 Site authorisation

It was mandatory that site authorisation approval was received for each site in the study prior to commencing any research related to that institution. Authorisation was received from the dean or equivalent at each university for the research to be conducted at their institution. Similar permission was obtained from the human research ethics committee office at hospitals where the interns or clinicians were employed.

Te Komiti Whakarite, the Canterbury District Health Board Māori Health Research committee for Māori consultation, also provided support for the research undertaken.

3.10.3 Research participants

Participation information sheets were provided to all potential participants for all phases of the study. All participants were recruited on a voluntary basis. Participants' confidentiality and data privacy were protected. Anonymity of the medical schools, individual medical students, educators and clinicians was maintained throughout the study. No personal or identifiable information from one participant, university or hospital was made visible to another participant.

The final-year medical students interviewed in Phase 3 were offered a practical guide on acute pain management as an incentive to participate in the study, because it was thought that this group might be the most difficult to engage. No incentives were offered to the other participants.

3.10.4 Consent

In Phase 1, curriculum representatives completing the online SurveyMonkey™ questionnaire were required to indicate that the information sheet had been read and that consent had been given.

In Phase 2, medical students and interns completed the questionnaire, which provided their implied consent, because they chose to participate.

Informed consent was obtained from all medical students involved with the OSCE assessment in Phase 2 and interviewees in Phase 3 of the study.

3.11 Summary

In this chapter, the rationale for adopting a pragmatic paradigm in this research was outlined and the mixed methods research design and component phases were described. Data collection and analysis methods were discussed. Finally, considerations regarding research rigour and ethical considerations were outlined.

Chapter 4: Results of the Quantitative Data Analysis—Phase 1

This is the first of two chapters presenting the results of the quantitative research analysis. This chapter addresses Question 1 of the research—How do medical schools in Australia and New Zealand teach pain medicine to medical students? The characteristics of the medical schools included in this study are presented first. Next, the perceptions of educators are explored in terms of the adequacy of the current delivery of pain medicine education and the need for curricula change. Following this, the details of the pain curriculum are described in terms of content, documented learning objectives, resources, packaging (type of modules, interprofessional approach, electives, proportion of time devoted), and teaching and assessment methods. Finally, educators' perceptions regarding the challenges influencing the incorporation of pain medicine into the medical curriculum and recommendations from individual schools' pain medicine education programmes are described.

The results of a curriculum audit on pain medicine content, teaching and assessment in medical school curricula in Australia and New Zealand were published in *BMC Medical Education*, a peer reviewed journal targeting health professional training (undergraduate, postgraduate and continuing education) with a special focus on curriculum development, evaluations of performance, assessment of training needs and evidence-based medicine.³⁴¹ This chapter presents an edited version of the published article as well as additional data from the Medical School Pain Curriculum Questionnaire (MPCQ) tool.

4.1 Characteristics of the participating medical schools

Information was obtained from 19 of the 23 medical schools, reflecting an 83% response rate for the curriculum audit tool. Seven medical schools (37%) offered a four-year course, five (26%) offered a five-year course and seven (37%) offered a six-year course.

4.2 Results of the Medical School Pain Curriculum Questionnaire

4.2.1 Demographic characteristics of participants completing the MPCQ

All 19 participants (100%) indicated that they were involved in medical school curricular activities. The average number of years they had been involved in these curricular activities was 13. Ten participants (55%) were currently or previously a member of their medical school curriculum committee. There were eight female participants (42.1%). Table 2 summarises the demographic characteristics of the 19 participants.

Table 2. Demographic data for the 19 participants who completed the MPCQ.

Demographic item	<i>n</i>	%
Professional status		
Medical practitioner	14	73.7
Non-clinical educator	3	15.8
Allied health practitioner	2	10.5
Currently teaching medical students in		
First year	6	33.3
Second year	10	55.5
Third year	9	50.0
Fourth year	7	38.9
Fifth year	5	27.8
Sixth year	4	22.2

Note. Percentages are based on number of responses and do not total 100%.

4.2.2 Design and delivery of pain medicine curriculum

All 19 participants indicated that the curriculum committee of each university needed to take responsibility for ensuring that pain medicine was included in the medical curriculum. Nine participants (47%) indicated that they felt that the Australian or New Zealand Medical Council should take responsibility for ensuring that pain medicine was adequately addressed in the medical curriculum (see Table 3).

Table 3. Who is responsible for the pain medicine curriculum? Participants' perspectives.

Organisation	<i>n</i>	%
University medical curriculum committee	19	100.0
Medical Council	9	47.4
Individual university departments	7	36.8
Australian Health Practitioner Regulation Agency	5	26.3
Faculty of Pain Medicine	2	10.5
Individual lecturers	2	10.5
Government	1	5.3
Consumer input	1	5.3

Note. Percentages are based on number of responses and do not total 100%.

Sixty-three percent of participants suggested that anaesthesia departments were best placed to offer pain medicine education; 47.4% suggested integrated pain services were best placed to offer pain medicine education (see Table 4). Participants supported pain medicine education to be delivered by palliative care teams (31.6%), and basic science disciplines of physiology (21.1%) and anatomy (21.1%). Six participants (31.6%) mentioned that the pain medicine curriculum should be integrated into the curriculum by all appropriate departments or disciplines, possibly coordinated by the Department of Anaesthesia.

Table 4. Which department/disciplines are best placed to teach pain medicine? Participants' perspectives.

Department/discipline	<i>n</i>	%
Anaesthesia	12	63.2
Integrated pain service	9	47.4
Palliative care	6	31.6
Physiology	4	21.1
Anatomy	4	21.1
General practice	3	15.8
Pharmacology	3	15.8
Behavioural medicine (psychology, psychiatry)	2	10.5
Surgery	2	10.5
Emergency medicine	1	5.3
Rehabilitation medicine	1	5.3

Note. Percentages are based on number of responses and do not total 100%.

4.2.3 Adequacy of pain medicine education

All the participants agreed that it was important for medical schools to have a formal pain curriculum, and the majority ($n = 14$, 74%) favoured that changes should be implemented to the way pain medicine was taught at their medical schools. Nine participants (47.4%) indicated that the medical school curriculum was inadequate in terms of preparing interns to manage patients in pain in the clinical setting.

Participants were divided into three groups according to their level of agreement with the 11 statements regarding the importance and adequacy of the current pain medicine education at medical school. Group 1 consisted of participants who strongly agreed or agreed with the statement, Group 2 consisted of participants who were neutral about the statement and Group 3 consisted of participants who strongly disagreed or disagreed with the statement. Table 5 shows the number of participants in each category as well as the median and mean score (with standard deviation [*SD*]) for each statement. The mean score ranged from 1.95 ($SD = 0.780$) to 3.53 ($SD = 1.073$), and the median score ranged from 1 to 4 (see Table 5).

Participants indicated higher levels of confidence that the medical school curriculum adequately prepared interns to use appropriate tools for measuring pain ($n = 13$, 68% strongly agreed or agreed [SA/A]), understand the biopsychosocial model of pain management (SA/A $n = 12$, 63%), work with other health professionals in managing patients with pain (SA/A $n = 11$, 58%), and employ ethical principles when practising pain medicine (SA/A $n = 11$, 58%).

Participants were less confident about the number of resources in teaching staff with pain management expertise (SA/A $n = 8$, 42%) and the process of assessment of pain medicine competencies (SA/A $n = 4$, 21%).

Table 5. Participants' perceptions about the adequacy of pain medicine education in their school (N = 19).

Statement	Strongly agree/ Agree		Neither agree nor disagree		Disagree/ Strongly disagree		M	SD	Median
	n	%	n	%	n	%			
Medical students should be exposed to a formal pain medicine curriculum in my medical school.	19	100	0	0	0	0	1.16	.375	1
Overall, the current pain medicine curriculum in my medical school's programme is adequate in terms of preparing interns to manage patients with pain in their clinical practice.	7	36.8	3	15.8	9	47.4	3.05	1.177	3
The pain medicine curriculum at my medical school is well resourced in terms of teaching staff with expertise in pain management.	8	42.2	1	5.3	10	52.6	3.21	1.272	4
The pain medicine curriculum at my medical school is well resourced in terms of teaching staff having access to current teaching and learning resources.	9	47.4	1	5.3	9	47.4	3.05	1.353	3
The pain medicine curriculum in my medical school adequately assesses students' competency in pain medicine.	4	21.1	5	26.3	10	52.6	3.53	1.073	4
I have confidence that the current pain medicine curriculum prepares interns to use appropriate tools for measuring pain.	13	68.4	2	10.5	4	21.1	2.42	1.121	2
I have confidence that the current pain medicine curriculum prepares interns to understand the biopsychosocial model of pain management.	12	63.2	3	15.8	4	21.1	2.47	1.123	2
I have confidence that the current pain medicine curriculum prepares interns to prescribe appropriate analgesic medication for individual patients	9	50*	7	38.9*	2	11.1*	2.61	1.092	2.5
I have confidence that the current pain medicine curriculum prepares interns to work with other health professionals in managing patients with pain.	11	57.9	5	26.3	3	15.8	2.58	.961	2
I have confidence that the current pain medicine curriculum prepares interns to practice pain medicine according to ethical principles.	11	57.9	6	31.6	2	10.5	2.42	1.017	2
Changes need to be made to the way pain medicine is taught at my medical school.	14	73.7	5	26.3	0	0	1.95	.780	2

Note. *n = 18. Figures are given as a mean and median of the given Likert scale (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree).

There was no statistical difference in the perceptions of specialist pain medicine physicians (SPMPs) and those of other participants for any of the statements. Table 6 presents the details of these test results.

Table 6. Differences between perceptions of 12 SPMPs and 7 non-SPMP participants.

Adequacy statement	z	p value
Overall adequacy of pain medicine education	-.368	.71
Adequacy of staff resources	-.813	.43
Adequacy of teaching and learning resources	-.476	.64
Adequacy of medical schools' assessment of pain medicine competencies	-1.392	.16
Adequacy of curriculum to prepare interns to use appropriate tools for measuring pain	-.464	.64
Adequacy of curriculum to prepare interns to understand the biopsychosocial model of pain management	-.591	.56
Adequacy of curriculum to prepare interns to prescribe appropriate analgesic medication for individual patients	-.311	.76
Adequacy of curriculum to prepare interns to work with other health professionals in managing patients with pain	-1.907	.06
Adequacy of curriculum to prepare interns to practise pain medicine according to ethical principles	-1.872	.06
Changes need to be made to the way pain medicine is taught at my medical school	-1.217	.22

4.2.4 Barriers and strengths of pain medicine education

Participants highlighted a number of barriers they had experienced regarding the provision of student learning opportunities for pain medicine. These were categorised under three headings: organisational, curriculum design and instructional factors (see Figure 4). Key organisational barriers involved limited time ($n = 9$, 47.4%) and a lack of prioritisation of pain medicine in the curriculum ($n = 6$, 31.6%). Poor coordination of the pain teaching in the curriculum was highlighted by five participants (26.3%) as a curriculum design barrier. Limited clinical exposure (practical clinic-based tutorials, 'apprentice-style' learning and opportunities to interact with a broad range of patients) was identified by four participants (21%) as the main instructional barrier.

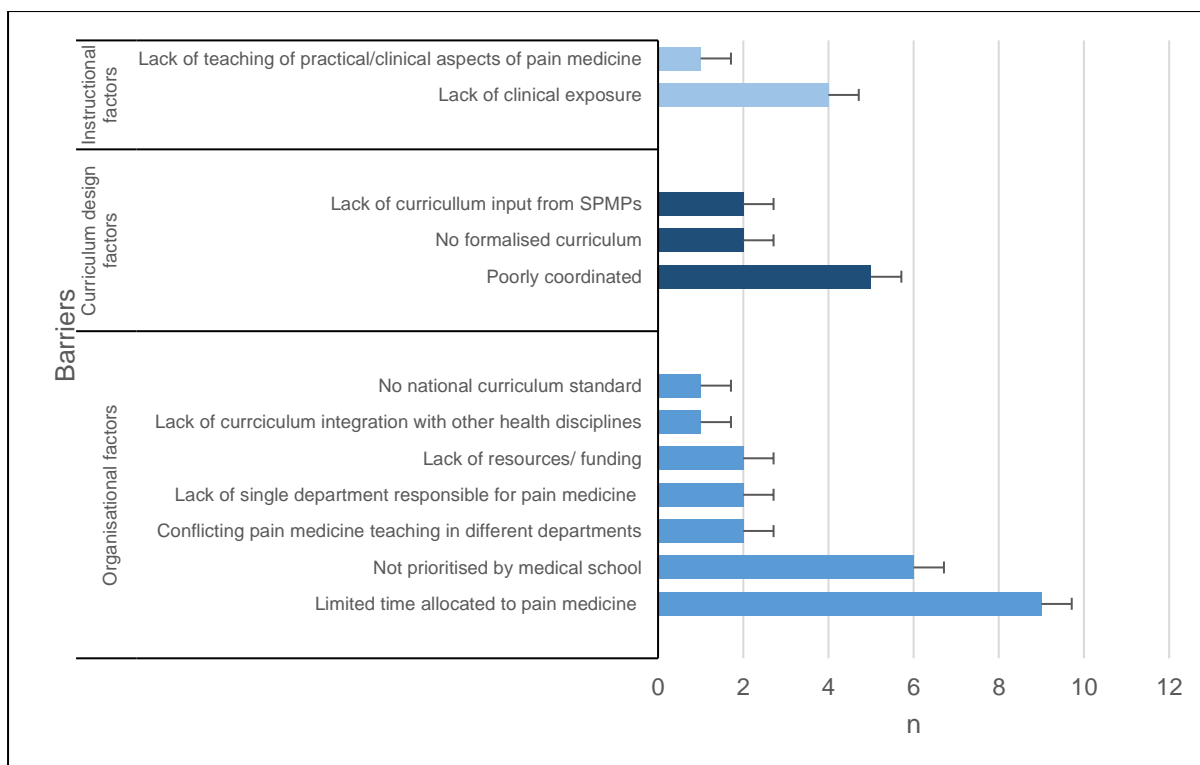


Figure 4. Barriers to effective pain medicine education

Participants recommended organisational, curriculum design and instructional approaches to improve the delivery of pain medicine education (see Figure 5). Eight participants (42.1%) highlighted problem- and case-based learning (including practical suggestions for their first experiences as interns) as key instructional approaches to facilitate effective pain medicine education. Six participants (31.2%) suggested a variety of teaching methods such as lectures, courses, seminars, tutorials, modules, clinical placements and online learning as effective means of delivering pain medicine content. A range of pain medicine topics (medical ethics, cultural influences, acute and chronic pain management) in the pain medicine curriculum were recommended by five participants (26.3%). Five participants (26.3%) stated that a defined or mapped pain medicine curriculum would be beneficial. Two participants (10.5%) recommended the inclusion of SPMPs and clinicians in the pain medicine curriculum development process.

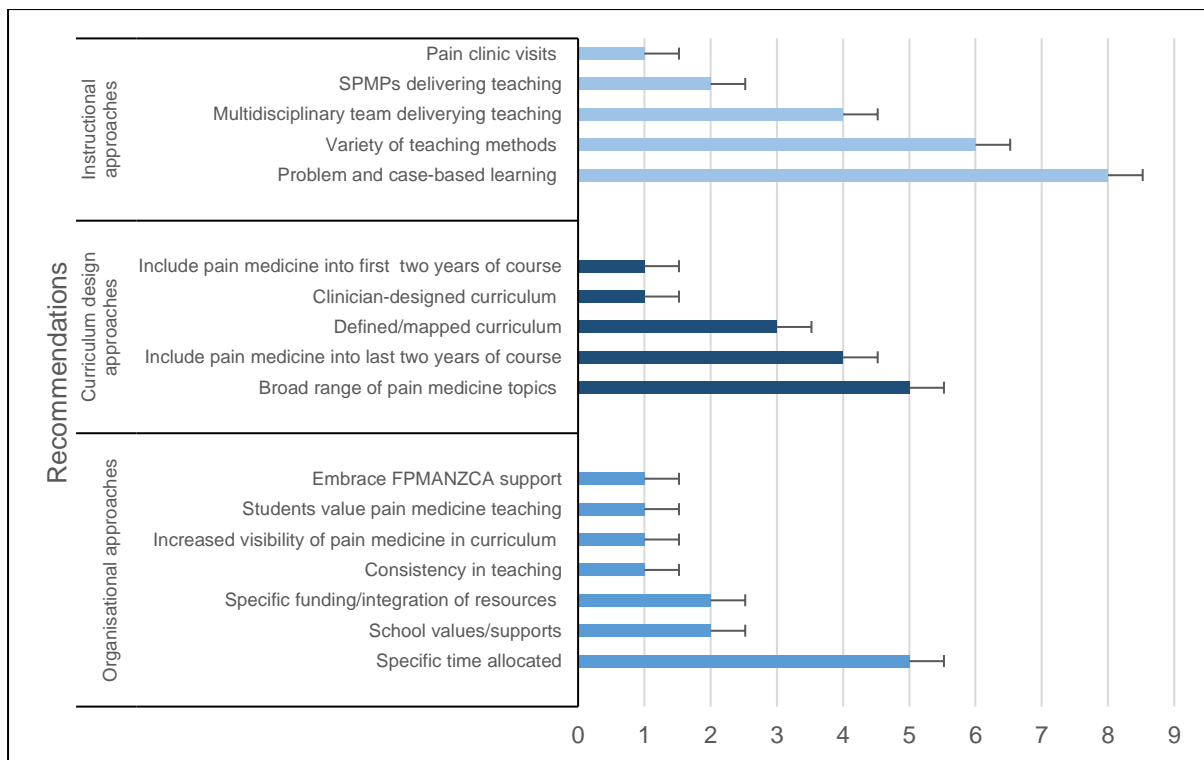


Figure 5. Recommendations for effective pain medicine education.

4.3 Characteristics of pain medicine education obtained from the curriculum audit

4.3.1 Pain-related content or topics in medical curricula

At least 17 medical school curricula (90%) included the topics of the neurophysiology of pain, clinical assessment, primary analgesics and the multidimensional model of pain (see Table 7). Adjuvant analgesics, palliative or cancer pain and the concept of peripheral or central sensitisation were listed in 13 curricula (68%). Fewer than half the schools covered the topic of psychological methods for managing pain, medical interventions and ethics. The multidisciplinary pain clinic, medico-legal aspects of pain medicine, geriatric pain and paediatric pain were topics included in fewer than five medical school curricula (26%).

Table 7. Frequency of pain-related content or topics covered in the medical curriculum.

Pain-related content or topics	<i>n</i>	%
Neurophysiology	19	100.0
Clinical assessment	18	94.7
Primary analgesics	18	94.7
Multidimensional model of pain	17	89.5
Central and peripheral sensitisation	13	68.4
Adjuvant analgesics	13	68.4
Palliative care/cancer pain	13	68.4
Aetiology	12	63.2
Physiotherapy management	11	57.9
Acute pain team	10	52.6
Psychological management	9	47.4
Medical interventions	8	42.1
Ethics	6	31.6
Multidisciplinary pain clinic	5	26.3
Medico-legal aspects	4	21.1
Paediatric pain	4	21.1
Geriatric pain	4	21.1
Other	3	15.8

Note. Percentages are based on number of responses and do not total 100%.
n = Medical schools where elements of the curriculum were available.

The International Association for the Study of Pain (IASP) core curriculum was partially implemented in eight medical schools (42.1%). No school had fully implemented the IASP core curriculum. Five schools (26.3%) indicated that they were unsure whether the IASP curriculum had been implemented or not, and six schools (31.6%) had not implemented the IASP curriculum at all.

4.3.2 Specified learning objectives related to pain medicine

Learning objectives specific to pain medicine were not identified at eight medical schools (42.1%). Specific learning objectives were most frequently identified for clinical assessment of a patient in pain (*n* = 11, 57.9%), neurophysiology of pain (*n* = 10, 52.6%), analgesics (*n* = 9, 47.4%) and the multidimensional model of pain (*n* = 8, 42.1%) (see Table 8).

Table 8. Frequency of specific pain medicine learning objectives.

Specified learning objective	<i>n</i>	%
Clinical assessment	11	57.9
Neurophysiology	10	52.6
Primary analgesics	9	47.4
Multidimensional model of pain	8	42.1
Psychological management	6	31.6
Aetiology	5	26.3
Central/peripheral sensitisation	4	21.1
Medical interventions	4	21.1
Physiotherapy management	4	21.1
Adjuvant analgesics	4	21.1
Palliative care	3	15.8
Ethics	3	15.8
Other	2	10.5
Clinical exposure acute pain team	2	10.5
Medico-legal	1	5.3
Paediatric pain	1	5.3
Geriatric pain	1	5.3
No specified learning objective	8	42.1

Note. Percentages are based on number of responses and do not total 100%.
n = Medical schools where elements of the curriculum were available.

4.3.3 Integrated or discrete pain modules and electives

In 18 schools (94.7%), pain medicine education was integrated into other compulsory subject areas and was spread over the entire curriculum. Pain medicine was offered as a discrete and compulsory, one-week module at one medical school (5.3%). This school also offered pain medicine education within other subject areas throughout the medical course. Ten schools (52.6%) offered a student elective in pain management ranging from two to six weeks.

4.3.4 Time allocated to pain medicine

Time allocated for pain medicine teaching during the entire medical curriculum ranged from five to 43 hours, with a mean of 19.6 hours (*SD* = 10.9), a median of 20 hours and mode of 30 hours.

4.3.5 Departments delivering pain medicine education

The pain medicine curriculum was delivered mainly from the departments of anaesthesia (73.7%), physiology/neurophysiology (57.9%) and pharmacology (47.4%) (see Table 9). Medical schools reported an average of five departments or disciplines delivering pain medicine content in the curriculum (mean = 5, mode =7).

Table 9. Frequency of departments or disciplines delivering pain medicine content in the curriculum.

Departments/disciplines delivering pain medicine content	<i>n</i>	%
Anaesthesiology	14	73.7
Physiology	11	57.9
Pharmacology	9	47.4
Palliative care	7	36.8
Orthopaedics	6	31.6
Psychology	5	26.3
Clinical skills	5	26.3
General practice	4	21.1
Anatomy	4	21.1
Rheumatology	3	15.8
General surgery	3	15.8
Internal medicine	3	15.8
Obstetrics/Gynaecology	3	15.8
Geriatrics	2	10.5
Neurology	2	10.5
Psychiatry	2	10.5
Paediatrics	2	10.5
Intensive care	2	10.5
Microbiology/Biochemistry	1	5.3
Pathology	1	5.3
Rehabilitation	1	5.3
Advanced learning	1	5.3
Emergency	1	5.3
Ethics	1	5.3
Pain medicine	1	5.3
Health economics	1	5.3

Note. Percentages are based on number of responses and do not total 100%.
n = Medical schools where elements of the curriculum were available.

4.3.6 Teachers delivering pain medicine education

Medical clinicians taught pain medicine at all 19 medical schools, alongside non-clinical lecturers in 52.6% of schools and allied health professionals (36.8%). A simulation instructor taught pain medicine at one school (5.3%).

With specific regard to availability of 'specialists or recognised experts' in the field of pain medicine to assist with the pain medicine education, 90% of medical schools indicated that SPMPs were available for teaching of medical students. Specialist pain physiotherapists and psychologists were engaged with teaching pain medicine at 37% of schools, and specialist pain nurses were included at 32% of schools (see Table 10).

Table 10. Frequency of pain specialists/recognised experts as teachers of pain medicine.

Specialist	<i>n</i>	%
Specialist pain medicine physician	17	89.5
Physiotherapist	7	36.8
Psychologist	7	36.8
Registered nurse	6	31.6
Occupational therapist	3	15.8
Anaesthetist	2	10.5
Palliative care	2	10.5
Psychiatrist	1	5.3
Non-clinical scientist	1	5.3
Rheumatologist	1	5.3
No	1	5.3
Unsure	1	5.3

Note. Percentages are based on number of responses and do not total 100%.
n = Medical schools where elements of the curriculum were available.

4.3.7 Pain medicine education resources

Specific pain medicine education resources such as textbooks, e-learning modules or shared education programmes were not used at 37% of schools. Of those schools that used specific pain medicine education resources, 32% used books and 26% used the four-hour basic pain medicine education module Essential Pain Medicine.³⁴² The Australian Government National Prescribing Service pharmacy e-learning module was used by 11% of schools, and a further 16% used undisclosed e-learning tools.³⁴³

4.3.8 Interprofessional education

In 79% of medical schools, medical students were not exposed to interprofessional education (IPE) in the context of pain medicine education. The remaining 21% were unsure whether IPE occurred within their institution.

4.3.9 Teaching and assessment methods

All medical schools used didactic teaching methods. Clinical exposure was frequently included as a teaching method (84%). Tutorial teaching methods were used by 47% of schools, and 42% adopted case-based learning. Problem-based learning was used by 26% of schools and e-learning by 21% of schools. Self-directed learning and simulation-based learning were used infrequently (see Table 11).

Table 11. Frequency of teaching methods.

Teaching method	<i>n</i>	%
Didactic learning	19	100.0
Clinical exposure	16	84.2
Tutorial	9	47.4
Case-based learning	8	42.1
Problem-based learning	5	26.3
E-learning	4	21.1
Self-directed learning	3	15.8
Simulation-based learning	2	10.5

Note. Percentages are based on number of responses and do not total 100%.
n = Medical schools where elements of the curriculum were available.

As shown in Table 12, multiple choice questions (MCQs) were used as an assessment tool for pain medicine education by 63% of schools, and short-answer and case-based reports by 48% of schools. The objective structured clinical examination (OSCE) was used by 32% of schools, and 16% of schools were unsure of whether any assessment of pain medicine education took place.

Table 12. Frequency of assessment methods.

Assessment method	<i>n</i>	%
Multiple choice question	12	63.2
Short answer	9	47.4
Case-based report	9	47.4
Objective structured clinical examination	6	31.6
Assignment	2	10.5
Online	1	5.3
Observed	1	5.3
Integrated Performance Assessment	1	5.3
Not assessed or unsure if assessed	3	15.8

Note. Percentages are based on number of responses and do not total 100%.
n = Medical schools where elements of the curriculum were available.

4.4 Summary

This chapter presented the results of Phase 1 of the study, which examined the extent to which pain medicine education is taught in medical schools in Australia and New Zealand. The results suggest that medical schools lack well-documented comprehensive pain medicine curricula. Neurophysiology, clinical assessment, analgesia use and multidimensional aspects of pain medicine were covered by most medical schools. Specific learning objectives for pain medicine were not identified by 42% of medical schools. Pain medicine teaching was delivered at all schools by a number of different departments throughout the curriculum. The mean time allocated for pain medicine teaching over the entire medical course was just under 20 hours. Teaching and assessment methods did not reflect modern educational practices. IPE in the context of pain medicine education was not well addressed. An OSCE was used by 32% of schools to assess knowledge and skills in pain medicine. Sixteen per cent of schools were unsure of whether any assessment of pain medicine education took place. The majority of participants in the MPCQ favoured changes being made to the way pain medicine was taught at medical schools. Participants indicated that there was a lack of resources in teaching staff with expertise in pain management and inadequate assessment of medical students' pain medicine competencies. Participants believed that responsibility for ensuring that pain medicine is included in the medical curriculum falls primarily on curriculum planners at each medical school

and secondly, on the Medical Council. They also indicated that individual departments such as anaesthesia, pain medicine and palliative care were best suited to teaching pain medicine education. Important barriers and enablers influencing the delivery of successful pain medicine education were identified by participants.

Chapter 5: Results of the Quantitative Data Analysis—Phase 2

This chapter presents the findings from the assessment of medical students' pain medicine competencies to answer the second, third and fourth research questions:

2. What do final-year medical students and first-year medical interns in Australia and New Zealand know about pain medicine?
3. What are the attitudes of final-year medical students and first-year interns in Australia and New Zealand towards pain medicine?
4. What level of pain medicine skills do final-year medical students exhibit when performing a pain assessment and communicating with a patient in pain?

First, the results of the Medical Students Pain Attitudes and Knowledge Questionnaire (MPAKQ) are presented. Second, the results of the objective structured clinical examination (OSCE) assessment of students' pain medicine knowledge and skills are presented.

5.1 Results of the Medical Students Pain Attitudes and Knowledge Questionnaire assessment

5.1.1 Participating students and interns

Three hundred and sixty final-year medical students from 10 universities (162 from New Zealand and 198 from Australia) agreed to participate in the study. Seven universities did not respond to the email correspondence, four universities declined permission to access their students and two universities provided a link to the questionnaire on a class website but none of the students participated. The response rate when the questionnaires were delivered by hand by the researcher was 97% (156/161). The response rate when the questionnaire was emailed to students or posted on a class e-platform was 17% (182/1056). The overall response rate was 25% (360/1442). Nine questionnaires (3%) had significant missing data and were excluded from the analysis resulting in a final total of 351 questionnaires included in the analysis. Four students had either one or two missing multiple choice questions (MCQs), and their data were included in the analysis. Twenty-five interns from Australia and 11 interns from New Zealand completed the MPAKQ online (response rate of 10.5%). There was no missing data in the intern questionnaires.

5.1.2 Demographics of students and interns

The mean age of the participating students was 25.38 years (range 18 to 44 years, standard deviation [SD] 4.28), and the mean age of the interns was 25.47 years (range 23 to 28 years, SD 2.160). Four students did not enter their age. The majority of medical students ($n = 207$, 59%) and interns ($n = 21$, 58%) were female. Two students (1%) identified as neither male nor female. A total of 27 students (8%) indicated that they had been exposed to training specifically in pain medicine outside of their medical degree. These students had qualifications in physiotherapy (five students), nursing (five students), pharmacy (three students) and para-medicine (one student). Five students had attended a pain management workshop, pain-related selective (one student) or acute pain service (one student). Six students did not describe the training. A total of 216 (62%) students indicated that they had experienced chronic pain or someone close to them had experienced chronic pain.

5.1.3 Overall assessment of students' pain medicine knowledge

Of the 32 questions examining pain medicine knowledge, the mean total MPAKQ score was 17.49 correct answers, median 17 (range 4–28, SD 4.04). This equates to a mean score of 55%. The Shapiro–Wilk test showed that the data were not normally distributed ($p = .044$), so non-parametric tests were used for statistical analysis.

To establish that the information gained from analysis of the data was applicable to both countries, it was necessary to examine the data for any differences between the two countries. A comparison of the mean total scores of the MPAKQs of students from Australia and New Zealand showed differences in scores for Australia (median [Md] = 19, $n = 192$) and New Zealand (Md = 16, $n = 159$), (Mann–Whitney U [MWU] $p < 0.001$, $r = 0.35$).

Further analysis of this was undertaken, since it was known from previous research that a particular medical school in Australia had a higher level of pain education in the curriculum than most of the other schools in both Australia and New Zealand. This analysis showed differences in scores for Australia (excluding the medical school with high levels of pain education) (Md = 18, $n = 102$) and New Zealand (Md = 16, $n = 159$), (MWU $p = 0.005$), with $r = 0.17$ showing this to be a small effect.

No student correctly answered all 32 questions; 105 students (29.9%) obtained a correct score of 20 or above (over 60%), and 131 students (37.3%) obtained a correct score of less than 17/32 (50%) (see Figure 6).

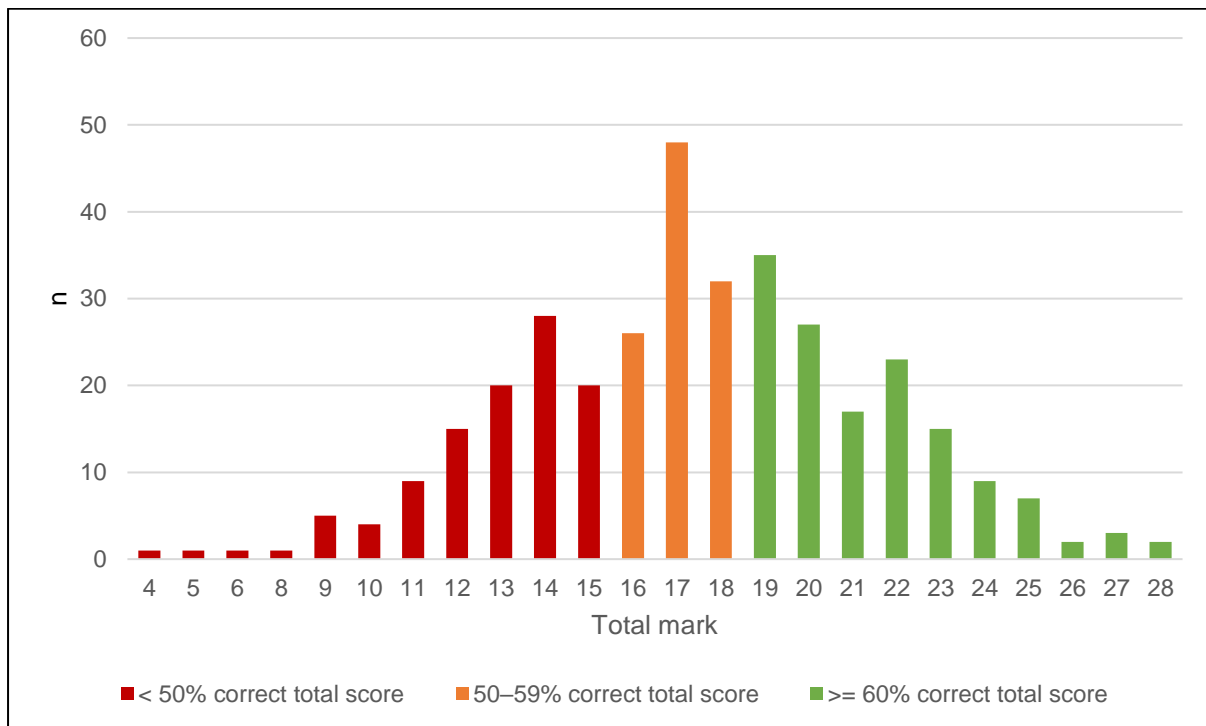


Figure 6. Frequency of total scores obtained by students for multiple choice questions in the MPAKQ.

5.1.4 Percentage of correct responses for each multiple choice question

The total number of correct responses for each question ranged from 10% ($n = 34$) to 93% ($n = 326$). The mean and median correct response rate was 55% ($n = 192$) (see Figure 7). Thirteen questions (41%) had a 60% or above correct response rate, four questions (13%) had a 50%–59% correct response rate and 15 questions (47%) had a less than 50% correct response rate. Appendix 12 displays details of each question and the responses of the students.

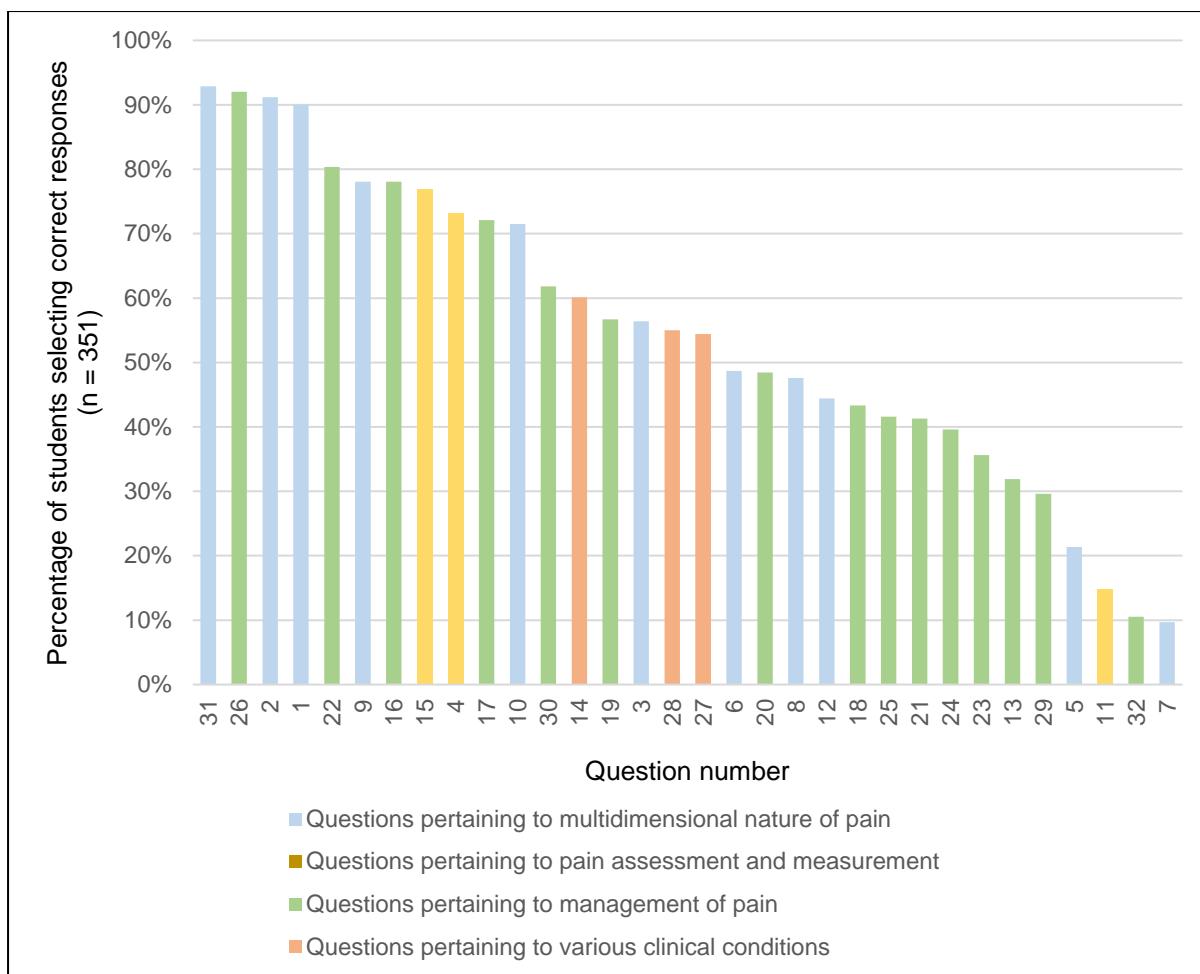


Figure 7. Percentage of students with correct scores for each question.

Table 13 categorises the questions into the International Association for the Study of Pain (IASP) curriculum content topics according to the correct response rate. Questions with less than 50% correct responses were represented within the multidimensional nature of pain, pain assessment and measurement, and the management of pain. Questions with less than 50% correct responses included six of the possible nine questions testing knowledge recall (67%) and nine of the possible 23 questions testing application of medical knowledge to a clinical situation (39%). Five of the possible eight questions related to acute pain (62%) and three of the possible 11 questions (27%) related to chronic pain were correctly answered by less than 50% of students.

No questions pertaining to pain assessment or specific clinical conditions (such as headache, fibromyalgia or paediatric pain) had a response rate of 80% or over.

Table 13. Categories of MCQ topics according to correct response rate.

IASP major curriculum domain	60% or more correct responses (question number)	50%–59% correct responses (question number)	<50% correct responses (question number)
Multidimensional Nature of Pain: Definition of pain Ethical issues Basic sciences (neurophysiology, pharmacology, psychology)	<ul style="list-style-type: none"> • <i>Definition of pain (1)</i> • <i>Characteristics of chronic pain (2)^c</i> • <i>Pharmacological action of lidocaine (9)</i> • Risk of disability with catastrophic thinking (10) • Fear-avoidance behaviour (31)^c 	<ul style="list-style-type: none"> • Example of nociceptive pain (3) 	<ul style="list-style-type: none"> • <i>Percentage of Australian and New Zealand population experiencing pain (5)^c</i> • <i>Nerve fibres that conduct noxious stimuli (6)</i> • <i>Pain inhibitory neurotransmitters (7)</i> • <i>Descriptors of central sensitisation (8)^c</i> • <i>Definition of allodynia (12)</i>
Pain Assessment and Measurement	<ul style="list-style-type: none"> • Clinical presentation of visceral pain (4) • Clinical indication for a spinal MRI scan (15)^c 		<ul style="list-style-type: none"> • Correct method for assessment of post-operative pain intensity (11)^a
Management of Pain: Clinical pharmacology Psychological therapies Physical therapies Medical interventions	<ul style="list-style-type: none"> • Medication for post-herpetic neuralgia (16)^c • Risk of constipation related to analgesic choice (17) • Analgesics for chronic renal impairment (22) • Physical and psychological management of chronic low back pain (26)^c • Non-pharmacological management of acute low back pain (30)^a 	<ul style="list-style-type: none"> • Features of pharmacological dependence (19) 	<ul style="list-style-type: none"> • Appropriate analgesics for acute renal colic (13)^a • <i>Effects of prolonged use of high dose morphine (18)^c</i> • Earliest reliable indicator of impaired breathing due to opioid (20)^a • Most appropriate analgesic for acute back pain (21)^a • Clinical effects of tricyclic analgesics (23)^c • Action of COX-2 selective inhibitors (24) • Post-operative opioid prescription (25)^a • Physical therapies for relieving acute pain (29)^a • Indicators for long-acting nerve blocks (32)
Clinical Conditions (clinical issues associated with different types of pain and patient subgroups)	<ul style="list-style-type: none"> • Aspects of pain history important for headache diagnosis (14)^c 	<ul style="list-style-type: none"> • Effective therapy for fibromyalgia (27)^c • Analgesic post-tonsillectomy for a child (28)^a 	

Notes. Italics indicates questions assessing knowledge recall

^a indicates question regarding acute pain

^c indicates question regarding chronic pain

5.1.5 Use of the multiple choice question optional answer 'Do not know'

Each question had an optional answer of 'Do not know' (DNK). When evaluating responses for each question, the frequency of students selecting the DNK option varied from 0% to 72% (see Appendix 12). Question 32 (regarding nerve ablation procedure) had the most DNKs selected ($n = 254$, 72%), with 6% correct and 18% incorrect responses. Question 1 (regarding definition of pain) had the least DNKs selected ($n = 0$), with 90% correct and 10% incorrect responses. In general, questions that were incorrectly answered had a higher number of the DNK option selected.

However, there were a few exceptions to this. Question 12 (regarding allodynia) had only six DNKs (2%), with 44% correct and 54% incorrect responses. Question 11 (regarding assessment of pain intensity) had 21 DNKs (6%), with 15% correct and 79% incorrect responses. Question 21 (regarding analgesia for acute back pain) had only 20 DNKs (6%), with 41% correct responses and 53% incorrect responses (of which 48% were just one option).

In contrast, there were two questions for which a higher proportion of students selected the DNK option. In Question 6 (regarding nerve fibres that conduct noxious stimuli), 143 students (41%) chose DNK for this question, and 49% were correct and 10% were incorrect. For Question 27 (regarding management of fibromyalgia) 120 students (34%) chose DNK for this question, and there were 54% correct and 12% incorrect responses.

5.1.6 Incorrect answers that could indicate opportunities for pain medicine education

Since the students had the option of selecting DNK, it seems reasonable that they would then have chosen a response based on the belief that this response was the most correct answer. In some instances, the students' choice of option was of concern in terms of clinical significance (see Table 14).

Table 14. Incorrect option choice that reflected poor clinical practice.

Question number and description	Incorrect answer options	<i>n</i>	%
21. The MOST appropriate analgesic for a 35-year-old bricklayer with three days of acute back pain is	• Paracetamol-Codeine	168	47.9
11. Which of the following is the most appropriate way to assess pain intensity in a 50-year-old man on the first day after a total knee replacement?	• Measuring his morphine use via a patient-controlled analgesia pump	141	40.2
	• Observing the patient's behaviour	89	25.4
20. The earliest reliable clinical indicator of impaired breathing due to opioids is	• Respiratory rate of 10 per minute	116	33.0
12. Pain caused by gently touching the skin of a patient with 'shingles' is called	• Hyperalgesia	110	31.3
	• Neuralgia	77	21.9
19. The MOST important feature of pharmacological dependence is	• Reduced drug effectiveness over time	95	27.1
18. Prolonged use of high dose morphine may cause	• Renal impairment	79	22.5
13. A 30-year-old man is admitted to the emergency department with renal colic. The most appropriate analgesic is an intravenous injection of	• Pethidine	76	21.7
3. An example of a nociceptive pain condition is	• Post-herpetic neuralgia	74	21.1
30. A 63-year-old man sees you with a three-day history of low back pain after lifting a box at work. The MOST appropriate management is	• Bed rest	66	18.8
25. A 23-year-old patient is prescribed "7.5–15 mg SC morphine 1-hourly PRN" for pain relief after a laparotomy the day before. His last injection of morphine 15 mg was 90 minutes ago. He is difficult to wake, but finally responds saying that his pain score is 9/10 and that he would like another morphine injection. You would	• Give 7.5 mg morphine by intramuscular injection for a more gradual onset of effect	13	3.7
	• Give 10 mg of oral slow-release morphine for sustained pain relief	52	14.8
	• Give 2 mg morphine by IV injection for a shorter duration of effect	38	10.8

5.1.7 Multiple choice question score related to gender, previous training in pain and personal experience of pain

There were no significant differences in the total scores between males and females (mean total score male students 17.61, female students 17.40, MWU $p = .82$);

students with exposure to pain training prior to their medical degrees and those with no previous pain training (mean total score for students with prior exposure 17.46, students with no prior exposure 17.89, MWU $p = .593$). There was no difference in the total score of students who had experienced chronic pain (self or someone close to them) compared with those with no exposure to chronic pain apart from their medical degree (mean total score for students with experience of chronic pain 17.37, students with no prior exposure to chronic pain 17.69, MWU $p = .277$).

5.1.8 Students' attitudes towards pain medicine

Table 15 shows that the mean scores of attitudes of students as rated on the Likert five-point scale ranged from 1.97 ($SD = 0.784$) to 3.91 ($SD = 1.000$). The Shapiro–Wilk test showed that the data were not normally distributed ($p < .001$) for all nine statements so non-parametric tests were used for statistical analysis.

Table 15. Attitudes of students by statement.

Statement	<i>M</i>	<i>SD</i>
33A I feel anxious when I see a patient in distress due to their pain. ⁴⁹	2.25	.833
33B I rely on the patient's own estimate of their pain. ⁴⁹	2.35	.745
33C Patients suffering from chronic pain seldom receive adequate treatment in primary health care. ⁴⁹	2.59	.933
33D My cultural background could affect my ability to assess and treat pain.	3.13	1.173
33E I feel confident about my ability to work together with other health professionals in the field of pain management.	2.35	.835
33F When I see consistently high scores on pain rating scales in the face of minimal or moderate pathology, I feel that this means that the patient is exaggerating their pain. ³⁴⁴	3.22	.939
33G All persons living in Australia or New Zealand have equal access to pain management.	3.91	1.000
33H Chronic pain is a disease in its own right rather than just a symptom of a disease.	1.97	.784
33I Relieving pain is given a high priority in my medical training.	2.54	1.000

Note. Figures are given as a mean of the given Likert scale (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree).

Students were divided into three groups according to their level of agreement with the nine statements (see Figure 8 and Appendix 12). Group 1 consisted of students who either strongly agreed or agreed with a statement (SA/A), Group 2 were students who

were neutral about the statement (N) and Group 3 consisted of those who either strongly disagreed or disagreed with the statement (SD/D).

The majority of students either strongly agreed or agreed with the following statements: 'Chronic pain is a disease in its own right' (SA/A $n = 292$, 83.2%); 'I feel anxious when seeing a patient in distress due to pain' (SA/A $n = 257$, 73.2%), 'I rely on the patient's own estimate of their pain' (SA/A $n = 235$, 67.0%), and 'I feel confident about my ability to work together with other health professionals in the field of pain management' (SA/A $n = 231$, 65.8%). Most students disagreed or strongly disagreed with statement 'All persons living in Australia or New Zealand have equal access to pain management' (D/SD $n = 276$, 78.6%).

Almost half of the students agreed that 'Relieving pain is given a high priority in my medical training' (SA/A $n = 192$, 54.7%) and that 'Patients suffering from chronic pain seldom receive adequate treatment in primary health care' (SA/A $n = 178$, 50.7%). Almost half of the students disagreed or strongly disagreed with the statement 'When I see consistently high scores on pain rating scales in the face of minimal or moderate pathology I feel that this means that the patient is exaggerating their pain' (D/SD $n = 159$, 45.3%).

Students were neither resolutely in agreement nor in disagreement with the statement 'My cultural background could affect my ability to assess and treat pain' (SA/A $n = 128$, 36.5%).

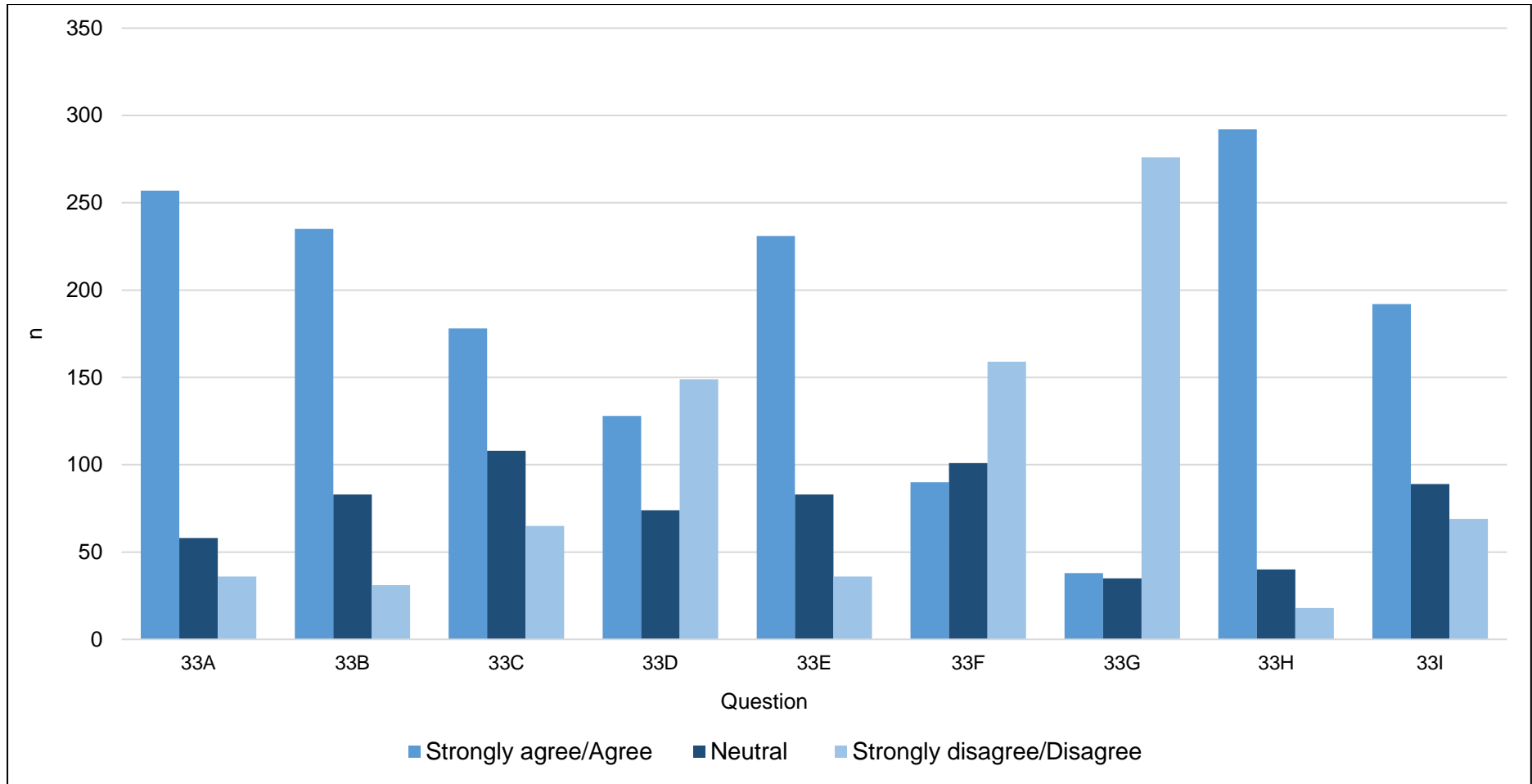


Figure 8. Distribution of responses by students to attitude statements.

5.1.9 Attitude related to gender, prior pain training and personal experience of pain

Male students (mean [M] 2.42, $n = 142$) indicated lower levels of anxiety when exposed to a distressed patient in pain compared with females ($M = 2.14$, $n = 207$; MWU $p = .001$, $r = .18$). There was no statistical difference in the scores regarding the other eight statements for males versus females.

Students with prior exposure to pain management training ($M = 1.89$, $n = 27$) were more confident about working as a multidisciplinary team than those with no previous pain training ($M = 2.38$, $n = 323$; MWU $p = .004$, $r = .15$).

There was no evidence of differences in the attitudes to pain medicine between students who had personally suffered chronic pain or were close to someone who had experienced chronic pain and students who had no such exposure to chronic pain.

5.1.10 Relationship between attitude score and mean total knowledge score

The Kruskal–Wallis test was conducted to explore the relationship between attitudes to aspects of pain medicine and levels of knowledge, as measured by the total score of MCQs (see Table 16). There was a significant difference between the median total scores of pain knowledge for students who agreed or strongly agreed and the students who disagreed or strongly disagreed for Q33A (anxious when faced with a distressed patient) ($p = .01$), Q33E (confidence about ability to work together with other health professionals) ($p = .006$) and Q33I (relieving pain is given a high priority in my medical training) ($p = .02$).

Table 16. Relationship of attitudes to MPAKQ knowledge scores.

Item	Strongly agree/Agree Group 1		Neutral Group 2		Strongly disagree/Disagree Group 3		χ^2 (df, N)	p value	Mann- Whitney Test Group 1 vs Group 3 p value
	Median	n	Median	n	Median	n			
Q33A I feel anxious when I see a patient in distress due to their pain. ⁴⁹	17	257	18	58	18.5	36	7.77 (2,351)	0.021*	0.01*
Q33B. I rely on the patient's own estimate of their pain. ⁴⁹	17	235	18	83	19	31	3.92 (2,349)	0.141	
Q33C. Patients suffering from chronic pain seldom receive adequate treatment in primary health care. ⁴⁹	17	178	17	108	18	65	0.753 (2,351)	0.686	
Q33D. My cultural background could affect my ability to assess and treat pain.	17	128	17	74	17	149	0.905 (2,351)	0.636	
Q33E. I feel confident about my ability to work together with other health professionals in the field of pain management.	17	231	18	83	15.5	36	7.745 (2,350)	0.021*	0.006*
Q33F. When I see consistently high scores on pain rating scales in the face of minimal or moderate pathology, I feel that this means that the patient is exaggerating their pain. ³⁴⁴	17.5	90	17	101	18	159	1.210 (2,350)	0.546	
Q33G. All persons living in Australia or New Zealand have equal access to pain management.	18	38	17	35	17.5	276	1.449 (2,349)	0.485	
Q33H. Chronic pain is a disease in its own right rather than just a symptom of a disease.	18	292	16.5	40	17.5	18	7.072 (2,350)	0.029*	0.97 (NS)
Q33I. Relieving pain is given a high priority in my medical training.	18	192	17	89	16	26	6.335 (2,350)	0.042*	0.02*

Note. *Denotes significance $p < 0.05$.

5.1.11 Attitudes versus individual multiple choice questions

The relationship between answers for the MCQ Q11 ‘the most appropriate way to assess the intensity of a patient’s pain’ and the level of agreement with the statement ‘I rely on the patient’s own estimate of their pain’ was examined. There was a small association between the students who believed that they would rely on the patient’s own estimate of their pain yet chose an answer in the MCQ that indicated they would disregard the patient’s own assessment of their pain (MWU $p = .046$, $r = .11$).

5.1.12 Comparison of students’ and interns’ pain medicine knowledge

Mean knowledge scores of medical students and interns in one geographic area of Australia (students $n = 25$; interns $n = 25$) and one geographical area of New Zealand (students $n = 22$; interns $n = 11$) were compared (see Figure 9). Normality was assessed using a Shapiro–Wilk test, which reported a normal distribution of scores ($p = .240$).

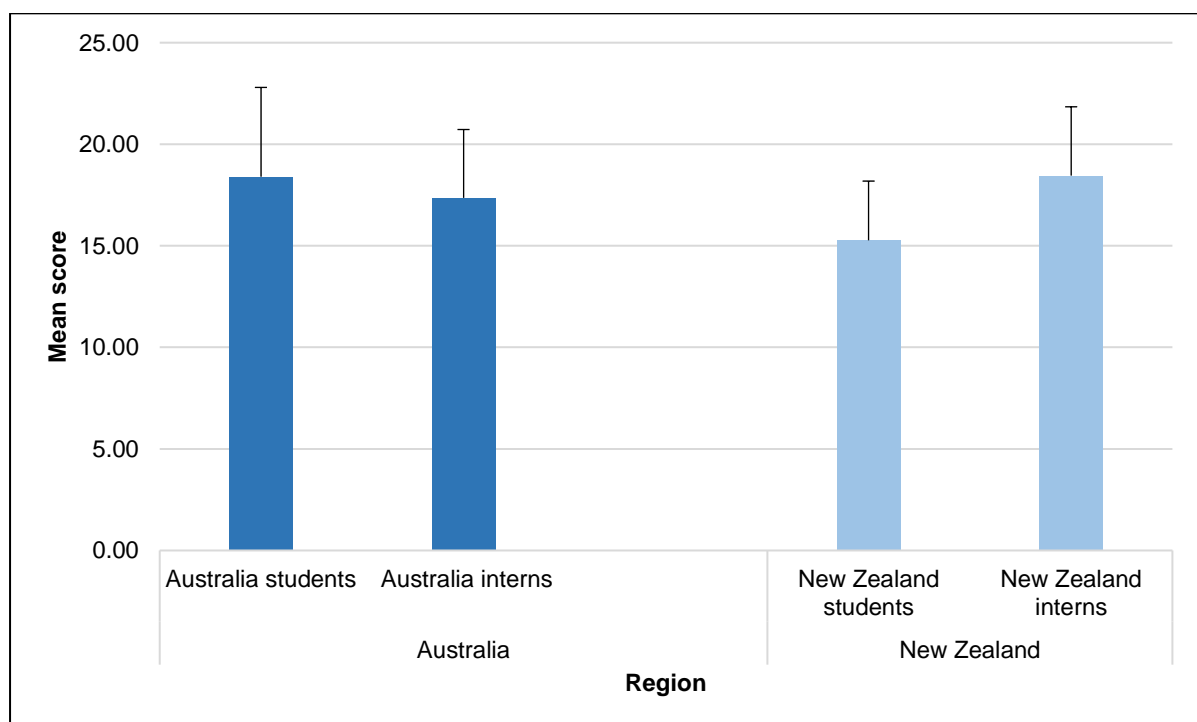


Figure 9. Mean knowledge scores of a sample of students and interns in Australia and New Zealand.

Knowledge scores of interns and medical students

An independent-samples *t*-test was conducted to compare the total mark scores of medical students with those of interns within each geographical area. There was no significant difference in total mark scores for medical students ($M = 18.4$, $SD = 4.397$) and interns ($M = 17.36$, $SD = 3.365$; $t(48) = .939$, $p = 0.352$) in Australia. There was a significant difference in the mean total mark scores for the medical students ($M = 15.273$, $SD = 2.914$) and interns ($M = 18.45$, $SD = 3.387$; $t(31) = 2.802$, $p = 0.009$) in New Zealand.

Attitudes of interns and medical students

An appraisal of the mean total score in relation to the attitude of participants to the various pain medicine statements was undertaken. The Shapiro–Wilk test showed that the mean scores were not normally distributed ($p = 0.001$) for the four groups.

There was no statistical difference in attitudes between the interns and students in Australia, nor between the interns and students in New Zealand (see Figure 10 and Appendix 13).

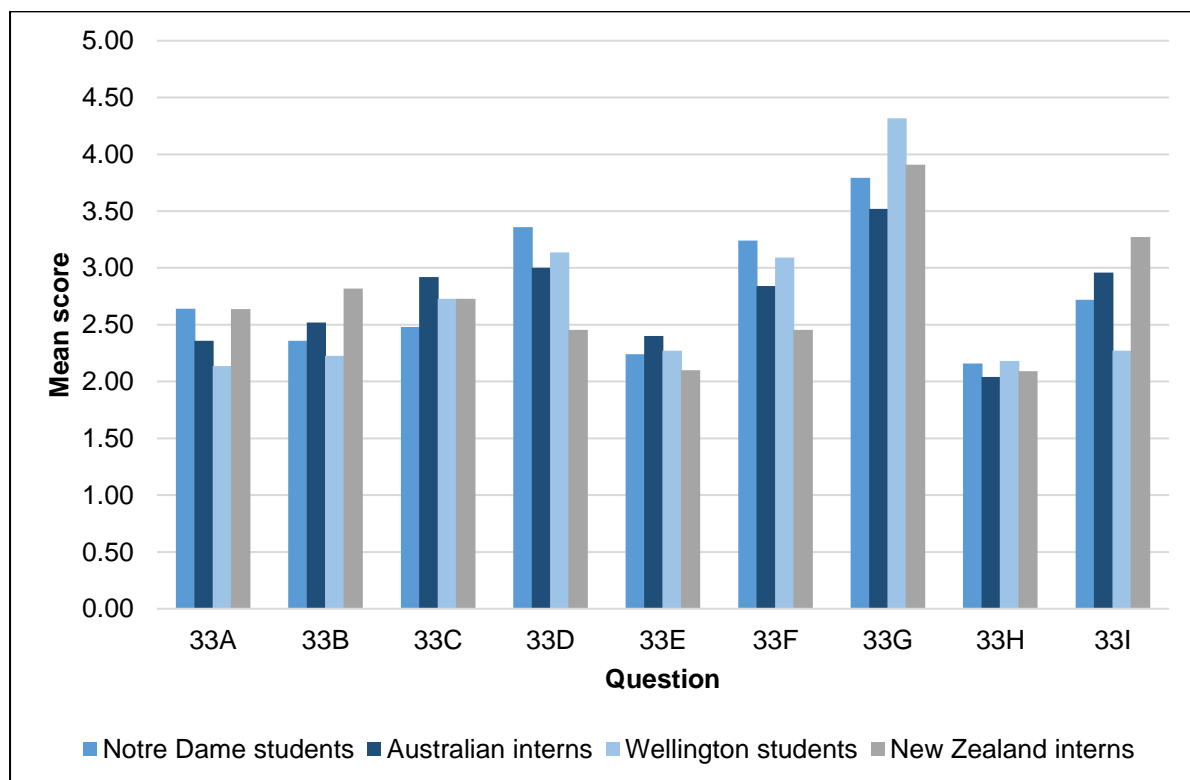


Figure 10. Mean Likert scores for the sample of students and interns in Australia and New Zealand.

5.2 Results of pain medicine objective structured clinical examination assessment

5.2.1 Overall student performance

Twenty-one final-year students participated in the OSCE assessment. The standard set pass mark was estimated statistically (using the borderline regression method) to be 53.46% (*SD* of 8.29; *SEM* of 4.1) indicating that this was the minimum adequate level of competence required to define student who had performed satisfactorily. Seven students (33.3%) scored in the 'outstanding' or 'above expectation' categories, whereas three students (14%) were 'below expectation' (see Table 17). The standardised patients indicated that they were satisfied with the performance of 17 (81%) of the students (see Table 18).

Table 17. Student performance indicators based on the internal benchmark standard scale of the University of Notre Dame Fremantle School of Medicine.

Performance standard	Scale with reference to standard set pass mark (as operationalised in the study context)	<i>n</i>	%
Outstanding	< 2 <i>SEM</i> below the TOP mark	4	19
Above expectation	> 2 <i>SEM</i> above the pass mark	3	14
At expectation	> 1 <i>SEM</i> above the pass mark	4	19
Borderline	< 1 <i>SEM</i> above or below the pass mark	7	33
Below expectation	> 1 <i>SEM</i> below the pass mark	3	14
Serious deficiency	> 2 <i>SEM</i> below the pass mark	0	0

Note. *SEM* = Standard error of measurement.

Table 18. Standardised patients' rating of whether they would want to see this doctor again.

Type of score	Scale	<i>n</i>	%
SP Rating Score	0 = No	4	19
	1 = Yes, wouldn't mind	9	43
	2 = Would actively seek the doctor out	8	38

The average mean performance scores (combined mean performance rating plus correct item on the checklist) for each subtask of the station are presented in Table 19. The highest overall mean score was for treatment history (86%), description of pain (74%) and building relationships (72%). The lowest scores were for social history (43%), impact on self (42%) and impact on activities/function (36%).

Table 19. Overall performance in main subtasks (combined performance rating plus correct item on checklist).

Subtask	% mean performance score of students
Description of pain	74%
Treatment history	86%
Impact on activities/functions	36%
Impact on self	42%
Past pain experiences	50%
Past medical history	61%
Social history	43%
Process skills—Gathering information	66%
Process skills—Building relationship	72%
Diagnosis	61%
Treatment	49%

5.2.2 Assessment of history-taking knowledge and skills

The students asked clinically relevant questions during the history-taking examination, especially questions related to the duration, onset, location and quality of the pain as well as associated symptoms (pins and needles, numbness) (see Table 20). Most students correctly asked about previous pharmacological treatment (100%) and medical history (95%). Few students directly asked questions addressing whether the patient experienced allodynia (33%), the impact of pain on the patient's daily functioning (social activities—28%, ability to brush hair—33% and activity levels—14%), and the patient's current level of anxiety (9%) or mood (19%). A third of students (33%) asked the patient about smoking or alcohol consumption.

Table 20. Correct scores on the Pain Assessment Checklist.

Category Item on checklist	<i>n</i>	%
Description of pain		
Onset	18	86
Duration	20	95
Progression (improvement or getting worse)	13	62
Frequency	16	76
Location	19	91
Radiation	14	67
Quality—itchy/pins and needles/burning/stabbing	18	86
Allodynia	7	33
Intensity	14	67
Aggravating factors	15	71
Improving factors	8	38
Associated symptoms	21	100
Treatment history		
Medication (paracetamol)	21	100
Medication (ibuprofen)	21	100
Impact on function		
Stopped going to bridge/shopping	6	29
Can't brush hair	7	33
Limits activity	3	14
Impact on self		
Anxious that pain may not be relieved	2	10
Frustrated and short-tempered	4	19
Difficulty falling asleep/tired during the day	12	57
Past medical/Surgical history		
Medical history—hypertension	20	95
Surgical history	11	52
Other medication	19	91
Over-the-counter medication	8	38
Allergies	12	57
Drug intolerances	13	62
Smoker	7	33
Alcohol intake	7	33
Social history		
Support at home	8	38
Other psychosocial problems at home	8	38

5.2.3 Assessment of communication skills

Students displayed a range of verbal and non-verbal communication skills during the interview with varying levels of proficiency (see Table 21). Twenty students (95%) listened attentively, minimising interruption and leaving space for the patient to respond, whereas only six students (29%) actively explored the patient's beliefs, concerns and expectations regarding their symptoms.

Table 21. Correct process skills scores.

Category	<i>n</i>	%
Gathering information		
Listens attentively, minimising interruption and leaving space for patient to respond	20	95
Encourages patient to tell the story of the problem in her own words	15	71
Uses open and closed questions, appropriately moving from open to closed	16	76
Actively determines and explores patient's beliefs, concerns and expectations	6	29
Encourages patient to express feelings	11	52
Building the relationship		
Demonstrates appropriate non-verbal behaviour, e.g. eye contact, posture, position, movement, facial expression, use of voice	19	91
Acknowledged patient's views and concern; is respectful and non-judgemental	15	71
Uses empathy to communicate appreciation of the patient's concerns	14	67

5.2.4 Assessment of treatment knowledge

In terms of treatment of post-herpetic neuralgia (PHN), 12 students (57%) named at least one class of medication and 11 students (52%) provided an example of a medication within this class (see Table 22). Eight students (38%) identified three different classes of medications, and five students (24%) provided specific names of medication from these three different classes. Eight students (38%) did not provide any correct information regarding appropriate medication used to treat PHN.

Table 22. Treatment responses.

Treatment	<i>n</i>	%
Medication 1—class	12	57
Medication 1—name	11	52
Medication 2—class	12	57
Medication 2—name	10	48
Medication 3—class	9	43
Medication 3—name	6	29

5.3 Summary

This chapter presented the results of Phase 2 of the study. First the results of the assessment of students' pain medicine knowledge and attitudes using a questionnaire tool were described.

Gaps in students' pain medicine knowledge were demonstrated in the areas of basic concepts of pain processing (including allodynia and central sensitisation), clinical assessment of pain, management of acute back pain, clinical pharmacology (opioids, non-steroidal anti-inflammatory drugs and tricyclic antidepressants) and opioid-induced ventilatory impairment. Students were supportive of the concept that chronic pain is a disease in its own right and agreed that patients with pain in Australia or New Zealand have unequal access to pain management. Male students indicated lower levels of anxiety when exposed to a distressed patient in pain compared with females. Students exposed to prior pain management training were more confident about working in a multidisciplinary team than students with no previous pain training.

Lower levels of pain medicine knowledge were correlated with students who expressed anxiety when faced with a distressed patient, lacked confidence about their ability to work together with other health professionals and felt that relieving pain had not been given a high priority in their medical training.

Interns scored higher in terms of pain medicine knowledge compared with medical students in New Zealand but there was no significant difference in pain medicine knowledge between medical students and interns in Australia. There was no

significant difference in attitudes to pain medicine between the students and interns in either country.

The second part of this chapter described the results of the assessment of students' pain medicine competencies using an OSCE format. Students asked clinically relevant questions during the history-taking examination related to a description of pain and treatment history. Students failed to include questions about the patients' social history, beliefs and expectations, and the impact of pain on daily functioning, mood and anxiety. Overall, final-year medical students displayed adequate communication skills. Basic pharmacological management of a neuropathic painful condition was not well performed.

Chapter 6: Results of Qualitative Analysis—Phase 3

This chapter presents the findings of the qualitative analysis of Phase 3 of the study. This entailed interviews with health professionals (including interns) and medical students who work with interns to answer the fifth research question, What are the perceptions of pain medicine stakeholders in Australia and New Zealand regarding the existing pain curricula for medical students in terms of preparing interns to manage patients with pain? Following an overview of the demographic characteristics of the participants, findings from the interviews are presented thematically rather than chronologically, which is consistent with the inductive approach.

6.1 Demographics of participants

Five groups of stakeholders were identified: nursing/allied health practitioners, medical practitioners, specialist pain medicine physicians (SPMPs), first-year interns and final-year medical students. Three representatives from each group of stakeholders were interviewed. Eight participants (53%) were located in New Zealand (four cities/towns) and the remaining seven (47%) in Australia (five cities). Twelve (80%) of the participants were based in large metropolitan hospitals, and three (20%) in medium to small district hospitals. The medical practitioners were practising in the specialities of obstetrics, anaesthetics and rural hospital medicine. There was one registered nurse (acute pain team), a physiotherapist (emergency department [ED]) and a pharmacist (medical ward). The interns were completing placements in general medical, rehabilitation and orthopaedic surgical departments. One student indicated that he had worked as a qualified pharmacist in a hospital setting with interns prior to his medical training, and one student had previously worked as a paramedic. Further demographics are displayed in Table 23.

Table 23. Demographics of the 15 participants.

Characteristic	<i>n</i>	%
Gender		
Male	4	27
Female	11	73
Actively or recently involved in a medical school education programme		
Medical practitioner	1	7
SPMP	3	20
Student	3	20
Intern	3	20
Nursing/Allied health practitioner	1	7
Actively involved with hospital- or community-based pain-related education		
Medical practitioner	2	13
SPMP	3	20
Student	0	0
Intern	0	0
Nursing/Allied health practitioner	3	20
Member of a hospital-based acute pain team		
Medical practitioner	2	14
SPMP	3	20
Student	0	0
Intern	0	0
Nursing/Allied health practitioner (Registered nurse)	1	7

6.2 Findings from the interviews

Three major themes were identified: (1) gaps in the current medical school curriculum with regard to pain medicine education, (2) mismatch between interns' competency and their pain medicine responsibilities and (3) impact of interns' inadequate pain medicine competencies. These themes emerged from the analysis of the different stakeholders' perceptions as a whole. The abbreviations used to identify the quoted sources are nursing/allied health practitioner (A), medical practitioner (D), intern (I), medical student (S) and SPMP.

6.2.1 Theme 1: Gaps in the current medical school curriculum with regard to pain medicine education

Participants stated that gaps were evident in the medical school curriculum in terms of general adequacy, responsibility for providing pain medicine education, value given

to pain medicine education, curriculum organisation and structure, pain medicine topics, teaching methods, teachers and assessment methods.

6.2.1.1 General adequacy

All participants, including students who had observed interns, agreed that interns started their first year in the workplace with inadequate pain medicine knowledge and skills considering the level of care they were required to provide.

Two SPMPs involved in medical school education indicated that while they were confident about the adequacy of the pain medicine education at their universities, there was room for improvement in these programmes too.

6.2.1.2 Responsibility

Participants representing each of the stakeholder groups agreed medical schools have the responsibility of ensuring that graduates are competent in pain medicine.

One medical practitioner indicated that medical schools did not always accept this responsibility:

I think the medical schools largely abdicate responsibility for trying to get the curriculum sorted. (D2)

Two SPMPs and the physiotherapist stated that it was important to encourage collaboration between the medical schools and hospitals so that the interns were not presented with conflicting information.

One SPMP and the registered nurse highlighted the needed for more uniformity in terms of the pain medicine content taught at different medical schools as well as nursing and pharmacy schools.

One medical practitioner added:

It needs to come from Government, to be prepared to say okay we will fund this, we are committed to this throughout Australia. (D2)

Two SPMPs indicated that ensuring that pain medicine was embedded into the curriculum required getting key people at the university involved:

Getting people involved and getting the curriculum changed, which I am doing locally myself. That's the only way forward. It's not going to happen by itself.
(SPMP3)

6.2.1.3 Value

Two SPMPs stated that pain medicine was not prioritised in general by medical schools:

Pain is not ... on the horizon of the medical curriculum and the medical schools.
(SPMP3)

The registered nurse, one intern and one student reported the need for recognition of the importance of pain medicine education, for example:

I guess research and health economics-wise it's probably going to become even more important as we go forward. It's going to become more essential as part of the core curriculum because if it's a huge burden on our communities and on the health system, then actually we need to know how to deal with acute and chronic pain better and getting people back into the workforce as best we can. (I2)

Medical practitioners, SPMPs and medical students gave suggestions as to how to raise the value of pain medicine in the medical curriculum, for example:

First of all the medical schools have to recognise that it does need to be taught better. There needs to be a willingness and acceptance that it is poorly taught and an acceptance that it must be done better and then a commitment to pay for and access the wealth of information that's available. (D2)

Highlighting it [pain management] as something that's not done well and emphasising the importance of pain management in all levels of medical staff is where it has to start. (S3)

An intern and a medical student stated that it was important to give pain medicine education higher prominence so that students realised the value of acquiring pain management competencies in preparation for their clinical responsibilities after graduation.

One SPMP recommended that there be a method to ensure accountability for the delivery of pain medicine education.

6.2.1.4 Curriculum organisation and structure

The registered nurse, one medical practitioner, two SPMPs and one intern stated that there was a need for a formalised structured curriculum. One intern suggested that it would be helpful to have defined pain medicine competencies.

One medical practitioner and one SPMP highlighted the need for a coordinated approach to facilitate communication between the various people teaching pain medicine, including those working in the clinical environment:

In order for us to know what the other's teaching then we'd all have to communicate with each other. So there'd have to be a significant integration and a willingness and that would take time and time costs money. (D2)

Two interns indicated a lack of teaching during their medical training. For example:

I can recall the few, maybe four pain lectures that we had, there wasn't that many, or tutorials, but I definitely remember them. (I2)

Lack of coordination of pain medicine education was highlighted by one student:

When I was reflecting on how much I've been taught, it does seem that there's a bit of a discrepancy—how important pain is, because it's considered a component of a lot of diseases, it's almost assumed it will be covered in teaching ... I know when we did arthritis this was a classic one. When in preclinical, covering the content on that, there was a pharmacology lecture about arthritis, and pain management in arthritis was covered really well, but then in the clinical setting that hasn't been backed up when I've been doing rheumatology attachments. (S3)

Participants from all five stakeholder groups felt that it would be useful to have some defined standalone pain modules with some focused pain education taught within each speciality, for example:

I think it should be integrated into other subjects largely, but not just anaesthesia. I think that each area needs to have pain as a subheading ... for example, orthopaedics, diabetes, neurological conditions, multiple sclerosis, post-stroke pain, gastrointestinal, gynaecology, obstetrics ... pain should be a subheading of all of these. (D2)

In sixth year, I do a two-hour practical prescribing session in groups of 20, prescribing for acute pain and neuropathic pain. Then in the last week I take them through scenarios, a pain crisis, one of them will be a medical emergency presenting in acute pain. Then I do another one with pain scores that are very high where it is all psychosocial and they need to address the anxiety. (SPMP2)

6.2.1.5 Topics

A few topics appeared to be well taught at medical schools, as described by three of the participants. For example, the medical practitioner stated:

For acute pain, the vital sign has been sort of drilled into them, and the WHO ladder of analgesics. (D3)

However, other participants (a medical practitioner, an intern and two SPMPs) thought that some topics were not well taught. For example, one medical practitioner stated:

Practical solutions aren't focused on so often because you're not actually taught practical solutions in medical school, you're taught about pharmacology. (D1)

Participants from each of the five stakeholder groups suggested a wide range of topics be included in the medical school curriculum covering the multidimensional nature of pain, pain assessment and management in a variety of clinical conditions, and the specific needs of different groups of patients:

A recognition of the impact of psychosocial issues on the pain experience but also an understanding of the difference between the pain experience and nociception. (D2)

There needs to be more application, considerations for what type of pain, what cohort of people would benefit from this better than others. (S2)

6.2.1.6 Teaching methods

While participants from each stakeholder group stated that medical students needed to spend more time with acute and chronic pain services to appreciate the many factors involved in pain management, one medical practitioner highlighted that medical students are seldom exposed to clinical teaching in these settings:

I can probably count on the fingers of one hand the number of medical students that come through the chronic pain service. (D3)

One medical practitioner stated that the medical curriculum lacked exposure to patients living in the community with chronic pain.

One SPMP stated that medical students need to spend time with allied health practitioners at a chronic pain service:

[To] see what a biopsychosocial assessment is like. (SPMP3)

The need for applied clinical teaching was emphasised by medical practitioners, SPMPs, interns and students:

I think just practice. For example, we get practice drug charts that we prescribe antibiotics on and we check it with whoever's supervising us to see if it's right. Joe Blog will come in with this type of pain—all right, what are you going to prescribe? Everyone might suggest something to prescribe and then they match it with what the suggested answer is and then the rationality of that. (S1)

6.2.1.7 Teachers

Two SPMPs indicated that pain medicine educators needed to have clinical experience. One intern suggested that medical schools include teaching from interns who could present true real-life scenarios to provide students with a better understanding of what would be expected of them in the workplace and to encourage learning.

The risk of interns learning poor pain medicine practices from other junior or senior medical professionals was highlighted by two medical practitioners, two SPMPs and two students. For example:

The medical students are taught by general practitioners, and the general practitioners themselves are very focused with medication and don't have the hugest knowledge of chronic pain. (SPMP1)

6.2.1.8 Assessment

Greater emphasis on assessment of pain medicine competencies was recommended by all groups of stakeholders. These participants suggested a variety of assessment methods such as an open book test, an objective structured clinical examination (OSCE), oral examinations or assignments.

One student highlighted that assessment of pain medicine competencies were lacking:

Mechanism of action or indications of antibiotics, we get grilled on those, but for the pain medications, definitely not, you don't really get strictly grilled for those even though it can lead to death. (S2)

A variety of purposes for assessment were identified by a medical practitioner, SPMP, intern and student:

If there was like a fifth-year pain OSCE, for example, that would be really good because it's examinable, so it will be taught, it will be studied and it will be discussed in their study group and it will be taken seriously ... "I have to know this to pass". (D1)

One SPMP suggested introducing benchmarks for pain medicine to assess whether there were individual universities underperforming and to plan how to address this, and a student stated that assessments were useful to hold people accountable to a specific standard of practice.

6.2.2 *Theme 2: Mismatch between interns' competency and their pain medicine responsibilities*

Participants stated that interns had clinical responsibilities for managing patients' pain, but there were gaps in their competencies to perform pain assessments, make a pain diagnosis, manage pain using pharmacological and non-medical treatments, manage the discharge process, work as part of a multidisciplinary team and display empathy.

6.2.2.1 Interns' clinical responsibilities regarding pain management

All stakeholders agreed that interns were responsible for pain management. Specifically, they reported that interns should be responsible for acute pain, and the registered nurse highlighted the responsibilities interns have to perform acute pain assessments in the ED:

They do most of the assessment, initially anyway, and present that to their registrar. (A1)

Interns would be required to provide for the acute pain management needs of patients for the entire duration of their stay in hospital (as indicated by SPMPs and medical practitioners). For instance:

Interns are always the first doctor to be called for any acute pain issue, because they're first in the chain and so their responsibilities would be to respond to any change in pain need from admission to discharge in the hospital system, and as an inpatient to provide scripts on discharge. (D1)

Participants provided examples of different wards where interns would be required to provide acute pain management for patients, such as in an ED, or surgical, medical, rehabilitation, orthopaedic, neurology or gynaecology wards. One medical practitioner stated:

They'll be looking after pain for patients who come to the ED and are discharged home, so sprains and aches and pains, and then people who are admitted with more complex injuries such as multiple rib fractures, pancreatitis, they're responsible for prescribing. (D2)

Two SPMPs stated that interns had responsibilities for managing acute pain, at times unsupervised. For example:

A lot of them had the majority of the responsibility that sometimes, scarily, they even managed the acute pain management alone. (SMP1)

Participants from each stakeholder group agreed that interns did have exposure to patients with chronic pain but would be less involved with pain management for this group compared with patients with acute pain. The pharmacist explained this further:

It's usually just continuing their usual medications, usually don't touch the pain medications because they're established. It's only when they complain of extra pain on top of that, then it becomes more of an acute pain relief on top of the chronic. (A3)

An intern and a medical practitioner indicated that when interns were involved in the care of a patient with a palliative diagnosis who was also experiencing pain, they would usually include the palliative care team in the pain management programme.

However, they also perceived gaps in their abilities to carry out these responsibilities competently. Perceived gaps are outlined below.

6.2.2.2 Pain medicine knowledge and skills (assessment)

All participants, apart from one student, agreed that interns would at some point use the visual analogue scale (VAS) to measure the intensity of pain. The physiotherapist, registered nurse, one medical practitioner, one SPMP and one intern stated that the VAS was used only occasionally (such as on admission or on surgical rotations) rather than routinely on the ward to measure pain intensity. The FACES pain scale was mentioned by the registered nurse, one SPMP, one intern and one student.

One SPMP stated:

I would love to have seen them use more Functional Pain Scales. (SPMP1)

Interns' routine lack of a systematic approach to pain assessment was identified by stakeholders from each group. The SOCRATES mnemonic was identified by one medical practitioner, two interns and two students as a tool used by interns to structure the pain assessment:

From early training we learnt the SOCRATES kind of history, which can give you a good feel for the acute pain. (I1)

The physiotherapist stated that focused assessments would most likely be done in certain departments, such as a neurology ward.

Participants from each stakeholder group indicated that interns would not routinely question a patient about allodynia or hyperalgesia as part of a pain assessment. One SPMP indicated that interns graduating from one particular medical school would

include the terms allodynia and hyperalgesia in a pain assessment because this topic had been taught at medical school, whereas interns from another university would not. Another SPMP indicated that interns would use the terms hyperalgesia and allodynia in less than 20% of assessments:

Hyperalgesia, not much allodynia. I don't think a lot of them actually know much about allodynia. (A3)

All nursing/allied health practitioners, medical practitioners and students, and two SPMPs agreed that interns would ask basic questions about the patients' physical function when undertaking a pain assessment. This was possibly limited to interns working on orthopaedic, rehabilitation or medical wards.

All participants, apart from one SPMP and one student, indicated that questions related to the psychosocial functioning of the patient (such as sleep, mood and anxiety) were not usually included when an intern undertook a pain assessment:

I'm not sure if I'd ask those questions specifically in relation to pain but it might come into my assessment of the patient as a whole. So, I might ask about sleep and mood anyway and that would just be in relation to the presenting complaint. (I3)

The one SPMP stated that interns' inclusion of psychosocial questions in the pain assessment was variable:

Not students from all universities. But University A students, yes, most of them do because they get taught that psychosocial issues are as important in the treatment of chronic pain. (SPMP2)

6.2.2.3 Pain medicine knowledge and skills (Pain diagnosis)

The registered nurse, two medical practitioners and one SPMP indicated that many interns would have difficulty differentiating between acute and chronic pain, and between nociceptive and neuropathic pain. For example:

They do come across patients with chronic pain but I don't know if they really have the experience to know what they're looking at. (A1)

One SPMP stated that some interns were able to identify the different types of pain:

Most of them understand inflammatory pain or nociceptive pain. Neuropathic pain—some of them have a grasp and some of them do not. (SPMP3)

6.2.2.4 Pain medicine knowledge and skills (Pharmacological pain management)

Three medical practitioners, two SPMPs, three interns and two students stated that interns were able to follow the WHO ladder for prescribing analgesia and had basic prescribing skills:

They do really well with less complex acute pain management. (SPMP2)

The registered nurse, two SPMPs, and three interns stated that interns were lacking in knowledge and skills related to how to manage a patient's pain that was more complex or managing a patient with chronic pain. For example:

Without that teaching that we got from the Acute Pain Service Clinical Nurse Specialist, first run, I wouldn't have felt so comfortable in managing someone's pain, especially dealing with opioids ... and managing really comorbid problems; patients where their renal function is poor. (I3)

One SPMP indicated that interns did not always understand that pain scores should not be seen in isolation and that a high score did not necessarily mean more opioid analgesia:

This is dangerous, you shouldn't take pain scores in isolation, the pain scores should have been noted but not acted on. (SPMP2)

One medical practitioner added:

People get very focused on one little tiny body part and the biomedical treatment of that and totally lose focus of what's attached to it. (D3)

The registered nurse and pharmacist stated that, in general, interns prescribed opioid analgesics in a safe and appropriate manner for routine basic pain management, especially when they had guidelines to follow. However, the pharmacist, three medical practitioners, three SPMPs, three interns and two students stated that interns had variable abilities to prescribe opioids in a safe and appropriate manner in clinical situations that were more complex. For example:

They have a very basic level of preparation, a low level of ability when they arrive. They're pretty good at prescribing Panadol and NSAIDs [non-steroidal anti-inflammatory drug] possibly, and they know to prescribe opioids but they don't always get the doses correct. (D2)

Examples of areas of difficulty in terms of opioid prescribing were provided, such as multiple opioid agents for one patient (SPMP), different types of opioids and dosages (pharmacist) and discharge prescribing (medical practitioner). One medical practitioner stated that:

They're a heterogeneous bunch and some of them prescribe appropriately and some of them inappropriately in terms of dosing, dose interval and drug chosen. (D2)

Participants from each stakeholder group indicated that interns did not routinely prescribe anti-neuropathic medications. Reasons for this were varied, including the physiotherapist working in ED stating:

It's difficult to start them on something like that and then send them straight out the door. (A2)

The registered nurse, pharmacist, three medical practitioners and three students stated that anti-neuropathic medication was more likely to be prescribed after consultation with more senior medical practitioners. Two interns expressed the same sentiment:

I always get advice because for some reason it seems scarier to start prescribing these drugs. Because they're not routinely prescribed I felt almost being cowboyish. (I1)

I'd definitely ask my registrar before I did it. (I3)

Two SPMPs and one intern indicated that anti-neuropathic medication was routinely prescribed by interns. One SPMP stated the following:

So they are actively prescribing a lot of that. I don't think sometimes they're appropriate. (SPMP1)

6.2.2.5 Pain medicine knowledge and skills (Non-medical pain management)

Participants from each of the stakeholder groups agreed that interns were lacking in non-pharmacological pain management knowledge and skills, although physical measures such as ice, rest and elevation were routinely recommended by interns working on orthopaedic wards or in the ED.

One SPMP attributed the lack of non-medical pain management strategies to the interns having a biomedical and curative focus, and one medical practitioner stated:

You're not actually taught practical solutions in medical school, so then you think, "Oh well, what can I think about in my pharmacology classes that I learnt that's going to help this person?" (D1)

One intern stated that she might recommend a good sleep hygiene routine. One SPMP indicated that interns who had been taught about psychosocial pain management strategies might recommend distraction techniques such as use of electronic media.

One student and one SPMP indicated that interns who had a previous background in health management prior to starting at medical school had a better understanding of pain medicine than students with a science background or no previous training.

6.2.2.6 Pain medicine knowledge and skills (Discharging patients)

The registered nurse, medical practitioner and SPMP working in an acute pain service indicated that interns often consulted them for advice regarding discharging a patient who was still experiencing pain.

The registered nurse, pharmacist, three medical practitioners, three SPMPs and two interns indicated that some interns experienced difficulties with the pain management needs of patients being discharged from hospital. For example:

I do know that the discharge prescribing is problematic. (D2)

6.2.2.7 Pain medicine knowledge and skills (Working in a multidisciplinary team)

Participants from all stakeholder groups agreed that interns provided pain management as part of a multidisciplinary team including pharmacists, nurses and physiotherapists. The physiotherapist and two medical practitioners stated that interns

made referrals to physiotherapists more for assistance with getting the patients out of bed, general mobility and range of motion rather than for specific pain management input:

I've never been asked to see someone specifically for pain management strategies. (A2)

The three interns indicated that they would ask advice about pharmacological management from nurses, especially the more experienced nursing staff, clinical nurse specialists and registered nurses working in the acute pain service.

Three SPMPs and three interns agreed that interns did not refer patient for specific psychological pain management input because there were no clinical psychologists working in this field in the hospital setting:

There is no psychologist for an inpatient acute hospital. (SPMP3)

6.2.2.8 Attitudes

Participants from all five stakeholder groups indicated that interns were empathic towards their patients in pain. One intern stated:

I would always try and put my emotions aside and try to provide as much empathy as I can, and reassurance that we're trying our best to get their symptoms under control as best as we can. (I2)

The registered nurse, two medical practitioners, one intern and one student stated that there were some instances when interns displayed variable levels of empathy. For example:

The junior doctors who seem more confident in their job, in their role and with their skills would take the time to be with the patient, be empathetic, let them know that "we're going to try and find a solution" and sit with them. The ones who are less confident would maybe be a little less able to be there for the patient because they're concerned with what they're going to have to do and whether they know to do the right thing. (S3)

One intern felt that interns became less empathetic as the year progressed because of time pressures, stress and frustration at their lack of knowledge of how to manage different types of pain.

6.2.3 Theme 3: Impact of gaps in interns' pain medicine competencies

Participants stated that gaps in the interns' pain medicine competencies had an impact on individual patients as well as the wider community, the interns themselves, the hospital system and the specialised pain management resources in the hospital and community.

6.2.3.1 Impact on patients and wider community

The pharmacist, two medical practitioners and two SPMPs stated that gaps in interns' knowledge regarding prescription safety raised the possibility of serious iatrogenic injury. For example, one medical practitioner stated:

I've seen some really dangerous things. (D3)

Two SPMPs highlighted safety issues regarding interns prescribing another opioid or higher dose of opioid when the patient already showed signs of opioid sedation and not routinely checking sedation levels every time an opioid was charted:

What I saw happening a lot, you know, somebody was drowsy with an opioid and the answer to it is give them another opioid or a higher dose. (SPMP1)

These SPMPs referred to a legal case in Australia in which a patient had died from a high dose of opioid administered by a junior doctor while in hospital. The SPMPs highlighted the lack of knowledge regarding safe prescribing of opioids that resulted in this tragic outcome.

One SPMP suggested that patients were at risk of adverse outcomes such as organ toxicity from inappropriate prescriptions:

Prescribing an anti-inflammatory in people who are nil orally, they're still somewhat dehydrated and they're plying them with lots of different anti-inflammatories and not appreciative of what effects could be an issue. (SPMP3)

The problem of inappropriate dosages or large volumes of medication on discharge was identified by the pharmacist, three medical practitioners and one SPMP:

They were prescribing a whole month of morphine and no follow-up. (D1)

They escalate their medication, then they're out and then there's a problem for the community. (SPMP1)

The pharmacist, two medical practitioners and one SPMP indicated that some interns were unable to tailor pain management to the individual needs of the patient, such as in the elderly. For example, one medical practitioner stated:

Sometimes you see 90-year-olds being prescribed 10 milligrams of oxycodone which I think is too much and you see 20-year-olds being prescribed five milligrams when they've got a fractured femur, which I think is too small. So it's very variable. (D2)

Interns' failure to provide a high level of care for patients with chronic pain was identified by the registered nurse, one medical practitioner, one intern and one student. For example:

I think the patients with chronic pain—that's definitely sort of the response, like "oh, this one's got bad pain, I don't want to go see them", a lot of "leave that one to last"—leaving them to languish in the corner of ED for a long time because they're going to be just too hard. (D3)

One medical practitioner indicated that interns might neglect to make a diagnosis of neuropathic pain.

One medical practitioner indicated that interns could be at risk of casting doubt over the sincerity of patients' pain complaints:

If the patient seems to react more than you'd think pathology can find, then the doctor thinks they must be faking, malingering. (D3)

One medical practitioner stated that some patients might be incorrectly prescribed anti-neuropathic medications when these were not indicated. This problem was also identified by an SMPM:

The number of people on a gabapentin when they don't have a neuropathic entity, that's very common. (SPMP3)

The registered nurse and one SPMP identified that poor discharge planning was a missed opportunity to encourage patients to self-manage their pain.

6.2.3.2 Impact on interns

Inadequate pain medicine education leading to workplace anxiety was identified by the pharmacist, one medical practitioner, two SPMPs and two interns. For example:

When the ladder fails, it's that kind of panic of what's next? Do you go IV [intravenous], do you go sub cut, do you call an anaesthetist for a PCA [patient-controlled analgesia]? (I1)

One medical practitioner and two SPMPs identified that confusion could arise when pain management practices in the different clinical settings did not match the teaching from the medical school, or varied between departments and the intern had been taught different pain management strategies to what was being practised in the next clinical setting. For example:

What happens is they will follow whatever the mantra of the hospital is that they are working in ... not even just hospital specific but speciality specific within the hospital ... and that causes a bit of conflict for them because they say "we thought this was how to do it because this person is this expert". But we say "but you are dealing with a very different population", because they might have come from a trauma centre and they will come to a rehab centre and then the regime is different. (SPMP3)

6.2.3.3 Impact on hospital system

The physiotherapist, one medical practitioner and one intern indicated that poor pain management strategies led to repeat admissions to hospital:

There's always the repeat offenders when it comes to abdominal pain and we find no surgical cause ... we see these patients a few times over the course of 12 weeks and we keep them in for a few days, we controlled them symptomatically while they're here but then they're going to come back again and again. (I2)

6.2.3.4 Impact on specialised pain management resources in the hospital and community

One medical practitioner commented that interns made untimely or unsuitable requests for assistance from the acute pain team:

They don't even make a pain assessment because "ooh, that person's got pain I don't know much about, send them off to the (Acute) Pain Service". (D2)

The registered nurse and a medical practitioner stated that misunderstandings also occurred when interns had false expectations of what the acute pain service could achieve, such as weaning a patient off high doses of intravenous opioids a few hours prior to discharge.

The physiotherapist and two medical practitioners stated that interns possibly lacked the skills to make the referral to a chronic pain clinic:

We get so many inappropriate referrals to the pain clinic. (D3).

One medical practitioner stated that interns were unlikely to choose pain medicine as a career option because of lack of exposure to the discipline of pain medicine:

If people have no idea what a pain specialist does, then they are unlikely to choose this as a career. (D3)

Table 24 summarises these themes and subthemes with illustrative quotes from participants.

Table 24. Summary of themes and exemplar quotes.

Major themes	Subthemes	Student	Intern	Nursing/Allied health	Medical practitioner	SPMP/Educator
1. Gaps in the current medical school curriculum with regard to pain medicine education	<ul style="list-style-type: none"> • General adequacy • Responsibility • Value • Curriculum organisation and structure • Topics • Teaching methods • Teachers • Assessment 	<p>“At our university we do a four-year course, so it’s already a huge curriculum packed in and I think possibly one of the barriers is the mind frame that you will learn this (pain medicine) when you’re an intern, so we’ll focus on other things.” (S2)</p>	<p>“I think I’ve learnt more in my first three months of interning than I did in medical school at all.” (I2)</p>	<p>“I know their curriculum is very crowded now and they’re very busy people but that’s no reason not to have pain in there. I mean pain is so ubiquitous, just about every patient they see in their life will have experienced pain.” (A1)</p>	<p>“I think practical solutions aren’t focused on so often because you’re not actually taught practical solutions in medical school, you’re taught about pharmacology.” (D1)</p>	<p>“Pain is not ... on the horizon of the medical curriculum and the medical schools.” (SPMP3)</p>
2. Mismatch between interns’ competency and their pain medicine responsibilities	<ul style="list-style-type: none"> • Interns’ clinical responsibilities regarding pain management • Interns’ pain medicine knowledge and skills • Interns’ pain medicine attitudes 	<p>“We get drilled in the whole analgesic ladder from when we start working in third year ... it’s more navigating the individual hospital’s protocol and what we might need to prescribe that’s the challenging part.” (S1)</p>	<p>“So I did an awful job, and almost daily I would say, I have had a pharmacist pulling me about my opioid prescribing and how to make it better.” (I1)</p>	<p>“They don’t always quite understand the significance of different types of opioids, like morphine and oxycodone, and the dosing is completely different.” (A3)</p>	<p>“I think they have a lack of knowledge and experience in how to do a systematic pain assessment.” (D2)</p>	<p>“I think when there is pain crisis they don’t know where to turn.” (SPMP2)</p>
3. Impact of gaps in interns’ pain medicine competencies	<ul style="list-style-type: none"> • Patients and wider community • Intern • Hospital system • Specialised pain management resources 	<p>“The [junior doctors] who are less confident would maybe be less able to be there for the patient because they’re concerned with what they’re going to have to do and whether they know to do the right thing.” (S3)</p>	<p>“There’s definitely been occasions where I’ve felt overwhelmed with sending people home that I don’t feel quite ready to send home with their levels of pain requirement.” (I2)</p>	<p>“I did have one patient go home with a script for morphine immediate release tablets and the intern charted every two hours as required, give two weeks, so the patient actually ended up getting 168 morphine tablets.” (A3)</p>	<p>“The interns have an attitude of avoidance— ‘oh, this one’s got bad pain, I don’t want to go see them’, ‘leave that one’ to last, leaving them to languish in the corner of ED for a long time because they’re going to be just ‘sort of too hard’.” (D3)</p>	<p>“We see a lot of polypharmacy very early on in the patient’s stay and not all of it appropriate.” (SPMP3)</p>

6.3 Summary

This chapter presented the findings of Phase 3. It described the characteristics of the participants interviewed. The three themes that emerged from the interviews were presented. First, participants highlighted gaps in the current medical curriculum with regard to pain medicine education. Second, participants identified areas where interns' competencies did not match the pain medicine responsibilities in the workplace. Third, participants provided examples of how gaps in interns' knowledge, skills and attitudes affected the patients and wider community, the interns themselves, the hospital system and specialist pain medicine resources.

Chapter 7: Discussion

This chapter discusses the findings of the three phases of the research in the context of existing literature. The four-dimensional curriculum development framework (4DF) provides a mechanism to integrate the qualitative and quantitative data sets, to enrich the understanding of pain medicine education within the medical curriculum. The strengths and limitations of each phase are reported.

7.1 Study findings in the context of prior research

7.1.1 *Phase 1: Curriculum audit and Medical School Pain Curriculum Questionnaire*

The curriculum audit and Medical School Pain Curriculum Questionnaire (MPCQ) represented 19 of the 23 medical schools across Australia and New Zealand. Similar proportions of schools were offering four- (37%), five- (26%) and six-year (37%) medical courses. Participants completing the MPCQ were involved with pain medicine education at medical schools, teaching medical students across all years of medical school training.

The majority of participants (74%) in the MPCQ study favoured changes being implemented to the way pain medicine was taught at their medical schools. Almost half of participants (47%) in the MPCQ study stated that the medical school curriculum was inadequate in preparing interns to manage patients. The findings of the curriculum audit revealed that most medical schools in Australia and New Zealand did not have well-documented pain medicine curricula that were taught or assessed using pedagogic approaches that accommodated the complexity of the topic. Pain medicine education was limited, variable and fragmented. Pain-related learning objectives, when specified, did not reflect the learning objectives for pain education recommended by the International Association for the Study of Pain (IASP), and students were not required to display competencies in pain medicine for graduation. Multidisciplinary pain management (especially psychological pain management) ethics, and medico-legal aspects, as well as paediatric and geriatric pain were underrepresented in medical curricula.

These findings are similar to those of studies of pain medicine education in the existing literature. Internationally, the adequacy of pain medicine education at medical schools has been questioned.^{21, 26-28} A focused review of pain medicine education examined pain medicine curricula in the United States of America (USA), Canada, the United Kingdom (UK) and Europe.³⁴⁵ In general, these medical schools lacked dedicated pain medicine education that focused on the assessment, treatment and rehabilitation of people in pain. This review concluded that pain medicine education does not adequately respond to societal needs in terms of the prevalence and public health impact of inadequately managed pain.³⁴⁵

There have been repeated calls for the development of innovative, interprofessional and integrated pain medicine curricula, education and resources by internationally recognised experts in pain medicine education to ensure that medical practitioners entering the workforce are able to deliver safe and effective pain management.^{26-28, 47, 48, 157} Pain medicine education is seen as an important part of the solution to the public health problem of inadequate pain relief, prescription medication abuse and high healthcare costs.^{14, 28, 157, 346} Improved pain medicine education is necessary to bridge the gap between knowledge and practice.^{28, 157}

Six studies have described the process of developing a specific pain curriculum in Canada and the USA, and provided details of the teaching and learning associated with the course.^{32, 232, 237, 238, 241, 347} The revision of a pain medicine curriculum at one medical school in the USA over the period 2009 to 2011 has been documented.²³²

Five courses stood out as models advancing pain medicine curricula: the 20-hour interprofessional pain curriculum at the University of Toronto, Canada, which has been well described in the literature; the four-day course in pain medicine at the Johns Hopkins University, USA, which focused on establishing foundation-level knowledge while comprehensively addressing the emotional development of the student; the integrated pain curriculum offered at the University of Washington, USA; and the Pain Assessment and Management curriculum developed by the University of New York, USA.^{157, 232, 237, 238} The comprehensive e-learning resource in pain management from the Virginia Commonwealth University, USA, used innovative technology to make the learning resource available to a range of health professionals.²⁴¹ Evaluation of these courses indicated improvements in students' pain competencies and that they

generated a high degree of student satisfaction with both the content and process of teaching.^{32, 237, 238} Detailed description of curricular development processes and course delivery could be a useful source of information for other curriculum designers. There is little evidence that the emergence of these courses has profoundly influenced other medical schools in these two countries.

7.1.2 Phase 2: Medical Students Pain Attitudes and Knowledge Questionnaire

The Medical Students Pain Attitudes and Knowledge Questionnaire (MPAKQ) was completed by 360 final-year medical students from 10 universities (162 from New Zealand and 198 from Australia). The average age of the medical students was 25.28 years and the majority of students were female (59%). A total of 27 students (8%) indicated that they had been exposed to training specifically in pain management outside of their medical degree and 216 students (62%) indicated that either they or someone close to them had experienced chronic pain.

The MPAKQ was based on the *IASP Curriculum Outline on Pain for Medicine's* expected competencies for graduating medical students.³¹ Of the 32 multiple choice questions (MCQs) on pain medicine knowledge, the mean total correct score was 17.49 (55%). Considering that the MPAKQ was assessing expected foundational knowledge, a high number of students ($n = 131$, 37%) obtained a correct score of 16 or less (50% or less). Fifteen questions (47%) had a less than 50% correct response rate. Both knowledge recall questions ($n = 6$) and questions related to the application of knowledge to clinical practice ($n = 9$) were poorly answered (less than 50% correct response). No significant difference was noted between the mean score of females and that of males. Previous training in pain management did not influence the mean scores; nor did personal experiences of chronic pain.

Assessment of final-year medical students' pain medicine knowledge, skills and attitudes using the MPAKQ identified deficiencies in critical areas of pain competencies. Medical students had poor knowledge and skills regarding fundamental concepts of pain, pain assessment, pharmacological and non-pharmacological management of pain, and how different contexts influenced the management of pain. Students lacked knowledge of both acute and chronic pain.

The MCQs were carefully constructed to include plausible distractors that were either incorrect or reflected poor clinical practice. Medical students' choices of incorrect distractors indicated some areas of concern where knowledge was lacking or clinical skills were poor. The use of 'do not know' (DNK) as an option improved the ability to detect whether the students had a genuine lack of knowledge or had incorrect knowledge. By selecting the DNK option, students indicated that they lacked knowledge of epidemiology of pain, basic concepts of pain processing and the clinical management of pain.

Using the Kruskal–Wallis test to compare groups, students with higher knowledge scores were found to be less anxious about seeing a patient in distress due to their pain ($p = .01$), more confident about their ability to work together with other health professionals in the field of pain management ($p = .006$) and felt that relieving pain had been given a high priority in their medical training ($p = .02$).

In Australia, questionnaire-based studies have been used to assess medical students' knowledge and attitudes to pain medicine.^{51, 52} Research undertaken in Melbourne, Australia, in 1998 found that final-year medical students lacked knowledge regarding pain medicine concepts such as central sensitisation and complex regional pain syndrome, as well as clinical pharmacology of pain medicine.⁵¹ A study of health practitioner students in Western Australia in 2013 revealed that medical students displayed less helpful beliefs and knowledge of guideline-consistent recommendations regarding low back pain compared with physiotherapy and chiropractic students.⁵² Although the data are not directly comparable, the lack of pain medicine knowledge identified in the MPAKQ study is similar to medical students' lack of knowledge reported in these two studies undertaken in Australia.

The findings from the MPAKQ are consistent with international studies showing inadequate knowledge of pain medicine in medical students using questionnaires. Final-year medical students in Spain (2015) scored a mean of 54.38% correct responses on a 19-item Neurophysiology of Pain Questionnaire.²⁵⁶ In Saudi Arabia (2011), final-year medical students were found to have "poor knowledge and negative attitude" towards cancer pain.³⁴⁸ This study concluded that a structured pain medicine teaching programme was needed to improve the knowledge and attitudes of future doctors towards cancer pain management.³⁴⁸

International studies have also examined final-year medical students' attitudes to pain medicine using questionnaires. Medical students in Ireland (2014) had more negative beliefs about low back pain compared with physiotherapy students.³⁴⁹ A study of final-year medical students in the UK (2009) showed a lack of understanding of pain concepts such as fear-avoidance behaviour, and a number of students appeared to bring a curative focus to the treatment of chronic pain.³²² Although the data are not directly comparable, medical students in the MPAKQ had a good understanding of the concept of fear-avoidant behaviour, which contrasts with the findings of both these studies. Final-year medical students in Finland (2007) were found to have increased empathy towards elderly patients' pain, willingness to prescribe opioids and anxiety towards meeting patients suffering from chronic pain when compared with first-year students.⁴⁹

Medical students in Australia and New Zealand display gaps in proficiency in pain medicine knowledge, skills and attitudes. These competencies are essential for providing safe and effective pain management and improving the quality of life outcomes of patients in pain. International studies have shown that specific pain management modules can improve medical students' pain medicine competencies and confidence.^{236-238, 240-242, 323, 350, 351} These studies described courses using small-group formats, structured didactic lectures, case-based discussions, clinical teaching, standardised patient protocols, web-based modules, self-reflection and immediate feedback to students.^{236-238, 240-242, 249, 323, 350-352} These educational interventions focused on acute, chronic and cancer pain in special conditions and populations; assessment of pain; non-pharmacological and multimodal pharmacological treatments; emotional skills; and the biopsychosocial model of pain. Long-term retention of pain medicine knowledge and skills after an educational module has been demonstrated.^{238, 239, 242}

7.1.3 Phase 2: Pain medicine objective structured clinical examination

Twenty-one final-year students from one medical school in Australia participated in an objective structured clinical examination (OSCE) requiring assessment of an elderly patient with chronic neuropathic pain and planning of appropriate pharmacological treatment for the patient. The OSCE was developed using the *IASP Curriculum Outline on Pain for Medicine* as a reference.³¹

Based on the performance standard scale, 10 students (47.6%) were borderline or below the standard set pass mark and did not achieve satisfactory competence in overall pain medicine assessment, management and communication skills. This indicates a need to improve the focus on the attainment and assessment of clinical skills in pain medicine within the current medical curriculum.

These findings are similar to those of international studies using the OSCE to assess medical students' pain medicine competencies.^{50, 238, 353} A study of final-year medical students in Germany (2011) showed gaps in pain medicine competencies, such as the ability to make a differential diagnosis, undertake a physical examination and counsel a patient in pain.³⁵³ A control group of second-year medical students in the USA (2009) demonstrated inferior knowledge and skills for acute and terminal pain compared with second-year students exposed to a Pain Assessment and Management curriculum intervention.²³⁸ A study of medical students in Finland (2006) showed that while medical students used clinically relevant questions and had good communication skills, most failed to complete a comprehensive pain history.⁵⁰ These studies confirmed the importance of medical schools including comprehensive competency-based and practical pain medicine education during medical school training to ensure that medical practitioners are equipped to assess and manage pain.^{50, 238, 353}

7.1.4 Phase 3: Stakeholder interviews

Participants in this phase of the study were 15 healthcare personnel working with interns in the clinical setting, including specialist pain medicine physicians (SPMPs), medical and nursing/allied health practitioners, interns and final-year medical students. The sample of participants represented a range of disciplines at different locations across Australia and New Zealand.

Individual standardised open-ended interviews were undertaken. Analysis of the narrative data revealed three themes, namely, gaps in the current medical curriculum with regard to pain medicine education, mismatch between interns' competency and their pain medicine responsibilities, and impact of gaps in interns' pain medicine competencies.

All participants, including students who had observed interns, agreed that interns started their first year in the workplace with inadequate pain medicine knowledge and

skills considering the level of care they were required to provide. Participants from each stakeholder group reported challenges with the pain medicine curriculum structure and delivery at different medical schools. There was a wide range in levels of interns' pain medicine competencies for assessment, diagnosis, non-medical and pharmacological management in different contexts, discharge process and multidisciplinary care. Participants provided clinical examples of the impact of interns' inadequate pain medicine competencies.

The intern participants reported that they were not adequately prepared by their medical school for their pain medicine responsibilities as new interns. This finding is supported by a study in Australia that showed that interns did not feel well prepared by their university training for pain medicine tasks they were expected to perform.³⁵⁴

The interview findings are consistent with the international literature exploring academic pain educators' perceptions of factors that influence the inclusion of pain education in pre-licensure/undergraduate curricula.^{157, 355} Major themes reflecting the challenges associated with the introduction of pain education into UK universities included difficulties in identifying pain content in the curriculum; limited understanding of the biopsychosocial model of pain; perceived lack of importance; not enough time, resources and staff knowledge; and a diffusion of responsibility for pain education.³⁵⁵

Research in Canada identified three themes regarding pain curriculum challenges, namely, difficulty in quantifying hours related to pain education, particularly in clinical placements; difficulty in identifying hours allocated for specific pain content; and lack of interdisciplinary pain education.¹⁵⁷

A qualitative study was undertaken in Canada to identify gaps in knowledge with respect to pain management as perceived by students, patients and educators.²⁸² Five main themes were identified: the assessment of physical and psychosocial aspects of pain, the clinical management of pain with pharmacological and alternative techniques, communication and the development of good therapeutic relationships, the ethical considerations surrounding pain and the institutional context of medical education about pain.

The topic of pain medicine education is complex.¹⁹¹ Integration of pain medicine education into the medical curriculum is multifaceted and influenced by multiple

stakeholders.³⁵⁶ The next section of this discussion chapter will examine in detail the issues surrounding the delivery of pain medicine education based on the interpretation of the findings of the three phases of the research.

7.2 Pain medicine education in Australia and New Zealand—What are the gaps and what changes are needed?

Data from the three phases of this research showed that while medical schools in Australia and New Zealand include pain medicine as part of the medical curriculum, a more formalised approach to the development and delivery of a comprehensive pain medicine curriculum is needed to ensure that medical students are adequately prepared for their future workplace responsibilities. The results also identified a need for change in the way pain medicine is taught at medical schools across Australia and New Zealand.

The 4DF was used to provide a conceptual and organisational framework for structuring and interpreting the findings from this research.

7.2.1 Dimension 1: Identifying future healthcare practice needs in pain medicine

This dimension focuses on interpreting the findings from the research as they pertain to broad questions that inform curriculum planning, namely, what are the pain medicine workforce demands and why are pain medicine competencies important?

7.2.1.1 Workforce demands

Interview findings (Phase 3) showed that interns were responsible for managing patients with pain presenting to the emergency department (ED) or being admitted to hospital. Participants identified that interns' responsibilities included performing pain assessments, formulating a pain diagnosis and initiating and maintaining pain management (such as prescribing analgesia). Participants in the interviews indicated that interns were actively involved in the discharge process of patients. These findings are supported by published studies of interns undertaken in Australia and New Zealand.^{354, 357, 358} A mixed methods study to better understand the clinical placement experience of prevocational doctors in Australia found that interns prescribed pain therapies and participated in discharge planning for most of their patients.³⁵⁷ For some of their patients, they implemented a management plan and managed the patients'

medication throughout their stay.³⁵⁷ The Australian Curriculum Framework for Junior Doctors and the New Zealand Curriculum Framework for Prevocational Medical Training specify that interns should be able to provide safe treatment to patients by delivering appropriate clinical pain management, which includes prescribing “pain therapies to match the patient’s analgesia requirements” and identifying and justifying “the hierarchy of therapies and options for pain control”.^{327, 359(p19)}

While participants stated that interns routinely perform pain management tasks under guidance, two SPMPs indicated there were occasions when interns needed to manage acute pain unsupervised, for example, when senior medical practitioners were unavailable. The literature on levels of supervision of interns is mixed. A survey of new interns in Australia found that interns frequently performed pain management tasks without direct supervision during the first year after graduation.³⁵⁴ Conversely, a survey of junior medical staff working in Australian EDs found that 67% of ED directors and directors of emergency medicine training and 79% of junior staff (registrar/intern) agreed that interns received adequate supervision.³⁶⁰ The same study identified that levels of supervision decreased during night and weekend shifts and were dependent on service demands.³⁶⁰ In a survey undertaken in New South Wales, Australia, 70% of interns stated that they should be able to initiate preliminary investigation, management or treatment for post-operative pain without supervision; a further 16% of interns felt that they should have the skills to totally investigate and manage post-operative pain without supervision.³⁶¹

Barriers related to the provision of adequate supervision of junior doctors (including interns) in Australia, such as competing demands of hospital service, private versus public commitments of supervisors and lack of interest have been highlighted.³⁶² Inadequate monitoring of interns’ prescribing of analgesics has been described both in New Zealand and internationally.^{358, 363}

Participants from all stakeholder groups in the interviews identified that interns would be confronted with many patients experiencing acute pain in the hospital setting, and to a lesser extent, with patients experiencing chronic non-cancer pain (CNCP) and cancer pain. The interviews identified that interns would be exposed to patients in pain in a variety of settings, such as general surgical, general medical, orthopaedic, neurology, gynaecology and rehabilitation wards and in the ED. Participants indicated

that interns would have a range of different patients under their care in terms of their ages and comorbidities. They expressed concern that while interns were capable of managing simple pain scenarios according to the World Health Organization (WHO) pain ladder, they displayed limited understanding of the analgesic options available for complex pain problems for elderly patients, and for patients with comorbidities such as poor renal function. In addition, participants identified that interns lacked competencies such as the ability to differentiate between the clinical presentation of acute and persistent pain syndromes, and of nociceptive *versus* neuropathic pain. The *IASP Curriculum Outline on Pain for Medicine* states that new graduates should be equipped with these competencies.³¹

The MPAKQ and OSCE studies showed deficiencies in pain medicine competencies such as how pain was assessed, pharmacological management of pain, use of non-medical pain management strategies, and collaborative approaches to pain management. Participants in interviews reported a wide variability of new interns' pain medicine preparedness in terms of pain medicine, considering the level of care they were required to provide in the workplace. There are similar reports of new graduates from medical schools in the USA presenting at their first posts in hospitals with varying degrees of readiness to provide adequate pain management for their patients.³⁶⁴ Interns in the USA are generally poorly prepared to evaluate and treat acute pain, and find the complex problem of acute-on-chronic pain overwhelming.³⁶⁴ The same study showed that interns have difficulty with initiation and management of patient-controlled analgesia.³⁶⁴ A survey of interns in the USA found that 78% reported a lack of training and competency in the prescription of opioids for CNCP.³⁶⁵

Students are likely to enter medical school with little knowledge about pain.^{49, 256, 323, 366} Therefore, if pain medicine is not properly addressed in the medical curriculum, students will graduate without the necessary pain knowledge, attitudes and skills to manage patients in pain. Students need to acquire traditional basic foundational knowledge of pain medicine, such as neurobiology, pharmacology and pathology, as well as competencies to apply this knowledge to the clinical assessment and management of pain conditions in a variety of settings.²²⁹

7.2.1.2 Importance of adequate pain medicine competencies

Participants in the interviews identified that inadequately managed pain potentially had a negative impact on the patient and on the wider community, including the hospital system and specialist pain medicine resources.

Interns lacking in pain medicine education may contribute to higher levels of post-operative pain in patients because of their inability to diagnose the basic mechanism of pain (such as neuropathic pain) or failure to act timeously with effective pain management strategies. Although no studies have directly linked junior doctors with the undertreatment of pain in the hospital setting, it has been established that significant pain is common and often undertreated in both medical and surgical hospital inpatients in Australia.³⁶⁷⁻³⁷⁰ A study of opioid prescribing at a hospital in Australia showed that patients received inadequate analgesia because of medical practitioners' limited knowledge of pain assessment, opioid dose titration, available opioid preparations, lack of experience of multimodal analgesia and attitudes to opioids and pain relief.³⁶⁷

The findings of the MPAKQ and the interviews indicated that final year medical students' or interns' lack of knowledge regarding analgesic medications could put patients at risk of adverse outcomes. This finding is supported by a study of junior doctors' opioid prescribing practices in New Zealand that found dose errors were common (54%).³⁵⁸ While the majority of these were unlikely to cause harm, 19% were potentially harmful and 4% were potentially lethal.³⁵⁸ A systematic literature review regarding junior doctors' prescribing errors found this to be a widespread problem, and the main types of errors were the wrong dose or the wrong frequency.³⁷¹

While participants stated that interns are routinely expected to initiate or adjust the dose of opioid medication for patients, SPMPs were disturbed by interns' inattention to the sedation scores of these patients, rapid escalation of opioid doses and prescription of multiple opioids simultaneously. Concerns about opioid-induced ventilatory impairment (OIVI) are warranted, because deaths related to opioid administration in the acute pain setting continue to be reported.³⁷² Opioid-induced oversedation in a hospital setting has been linked to knowledge deficits of prescribers, the lack of prescriber warnings on electronic medical records and inadequate sedation monitoring.³⁷³

Participants recalled instances when interns prescribed unnecessarily high doses of opioids to patients on discharge with little attention to patient education. This finding is supported by a study of hospital-based directors of pharmacy in Australia.³⁷⁴ They indicated that discharge prescribing was often delegated to junior doctors, high doses of opioids were routinely prescribed and that provision of pain management plans for opioid de-escalation were rare.³⁷⁴ The study also found that opioids were prescribed on discharge 'just in case' even when the patient had not required opioid analgesia in the previous 48-hour period.³⁷⁴ Current practices of prescribing and dispensing of opioids at discharge results in quantities in excess of patient need, which has the potential to lead to preventable harm to the community.³⁷⁴

Interventions focused on a model of shared decision-making that incorporates education of patients about realistic expectations for pain control after surgery and the risks and benefits of opioid pharmacotherapy have been shown to reduce the reliance on opioid after discharge.^{375, 376} Since interns are responsible for discharge planning in a high number of in-hospital patients, they are ideally placed to identify at-risk patients who could be targeted for community-based pain management interventions.

Participants in this study identified that patients with chronic or more complex pain states (with co-existing medical and psychological symptoms) are at risk of inadequate pain management from interns through negative bias, lack of knowledge of evidence-based chronic pain management strategies, limited multidisciplinary collaboration and protocol-driven care. Chronic pain management requires patients and providers engaging with and learning from each other to build a therapeutic alliance.²⁴⁷ Voices of individuals and their families need to be considered in pain management planning and monitoring.²³ The Australian Commission on Safety and Quality in Health Care and the Health Quality and Safety Commission New Zealand maintain that "partnering with patients in their own care is integral to the delivery of safe and high-quality person-centred health care".^{377, 378}

Participants in this study indicated that interns' lack of pain management competencies may result in iatrogenic harm. Studies have shown that this may negatively affect the patient and hospital outcomes, which include opioid adverse effects, delayed discharge planning and increased length of stay.³⁷⁹⁻³⁸¹ Intern

education has been suggested as an excellent way to reduce medical errors and minimise hospitals' exposure to expensive litigation.³⁸²

Poorly managed chronic pain also affects hospital resources. Participants reported that during their internship, interns were not taught how to manage patients who repeatedly presented at EDs with acute-on-chronic pain. A multidisciplinary inpatient pain service in New Zealand has successfully reduced readmissions, thereby reducing costs to the hospital system.³⁸³ It is possible that exposing medical students to this approach of managing chronic pain would be beneficial for preparing them for their responsibilities as an intern.

The MPAKQ and interviews highlighted that medical students and interns experienced anxiety on occasions related to their pain medicine responsibilities, especially related to prescribing analgesia for patients with high levels of pain. These findings are supported by published studies in Australia and the UK.^{384, 385} A qualitative study in the UK found that junior doctors' emotional wellbeing was negatively affected by patients displaying distress during a pain assessment.³⁸⁵ An interview study in Australia of newly qualified medical practitioners' workplace stressors found that key themes included apprehension related to making autonomous clinical decisions and responsibility for writing prescriptions for opioid analgesics.³⁸⁴ A multistakeholder, multicentre qualitative study of newly graduated doctors' preparedness to practise in the UK identified stakeholders' perceptions that interns were unprepared for their prescribing responsibilities that included opioid prescriptions.³⁸⁶

While not specifically related to pain medicine, published reports in the Australia and the UK have described the impact of clinical uncertainty, such as making decisions without support from seniors and fear of making mistakes as contributors to psychological distress of interns.^{384, 387-389} Graduates need to be prepared to immediately begin practice as qualified medical practitioners. Preparedness implies that the graduates themselves are aware of their capabilities and are confident in their ability to safely begin work.³⁹⁰

7.2.2 Dimension 2: Defining and understanding capabilities

This dimension focuses on the specific knowledge, skills and capabilities that define competency in pain medicine. It also highlights the particular values that underpin the

discipline of pain medicine. The findings of the Phase 2 studies are interpreted under the lens of this dimension.

The *IASP Curriculum Outline on Pain for Medicine* describes the following principles necessary to guide pain curriculum for entry-level medical practitioners:

- *Pain is a multidimensional experience requiring comprehensive and ongoing assessment and effective management.*
- *Medical practitioners play an essential role in the prevention, diagnosis and management of acute and persistent pain.*³¹

The *IASP Curriculum Outline on Pain for Medicine* has identified pain medicine curriculum objectives. These require that medical students completing an entry-level pain curriculum would be able to:

1. *Recognize pain medicine as a necessary field in clinical practice for acute and persistent (chronic) pain conditions*
2. *Understand the basic science of pain-processing components such as anatomy, physiology, and pharmacology*
3. *Identify clinical presentation of acute and persistent pain syndromes or conditions*
4. *Recognize the multidimensional aspects of the pain experience and its related management*
5. *Understand pain management options appropriate for individual patients according to medical condition, medicine availability, risk-benefit balance, cost-effectiveness, culture, mental status, and evidence of efficacy*
6. *Know the indications, contraindications, and risks of the primary elements of multimodal pain management*
7. *Learn effective interaction with multi-professional teams involved in practicing pain medicine*
8. *Practice pain medicine according to ethical principles.*³¹

The *IASP Curriculum Outline on Pain for Medicine* was used as the standard by which to judge the level of adequacy of pain medicine competencies of medical students that emerged from the MPAKQ and OSCE studies. The following section examines medical students' pain medicine competencies under the heading of the *IASP Curriculum Outline on Pain for Medicine* objectives.

7.2.2.1 Recognize pain medicine as a necessary field in clinical practice for acute and chronic pain conditions

The MPAKQ study showed that 45% of medical students stated that they were neutral about or did not agree that pain medicine had been given a high priority in their medical training. A study of Finnish medical students (2005) found that students gave a low rating (mean 2–5 out of 10) for the pain teaching they had received at medical school.⁴⁷ While not directly comparable, a study of medical students in Melbourne (1998) found that 73% indicated they had inadequate pain medicine knowledge for their clinical needs,⁵¹ and a report in 2014 stated that medical students from New Zealand requested more teaching on pain medicine and practical clinical pharmacology.³⁹¹ It is clear that medical schools need to prioritise pain medicine education so that students recognise the serious public health burden of pain and the importance of developing proficiency in pain medicine competencies for the workplace.

7.2.2.2 Understand the basic science of pain anatomy, physiology, and pharmacology

The MPAKQ revealed that few medical students (9%) were able to correctly identify pain inhibitory neurotransmitters. This knowledge is important because it is essential that medical practitioners understand the influence of facilitation and inhibition on the pain experience since this mechanism forms the basis of a number of pain management strategies.³⁹²⁻³⁹⁴

A lack of knowledge regarding the definition of central sensitisation was identified (Question 8) in the MPAKQ study, with 52% of students either incorrectly answering this question or choosing the DNK option. It is essential that medical students understand the concept of central sensitisation because, clinically, this knowledge is needed to understand why some patients present with unexplained chronic pain, spontaneous onset of pain, spread of pain beyond the area of injury and with a heightened pain intensity.³⁹⁵ Although the data are not directly comparable, the lack of knowledge of central sensitisation shown in the MPAKQ is similar to that shown in the studies of medical students in the UK (2009) and Australia (1998).^{51, 322}

7.2.2.3 Identify clinical presentation of acute and chronic pain conditions

The MPAKQ showed that medical students were confused about the terms ‘allodynia’, ‘hyperalgesia’ and ‘neuralgia’ (Question 12) because 53% of students incorrectly

selected 'hyperalgesia' or 'neuralgia' as their answer for this question. It is important that medical students understand the difference between these concepts. Both hyperalgesia and allodynia reflect changes in pain perception threshold, and evaluation of altered perception can help to determine the underlying pathology and assist with treatment planning.^{20, 396} This knowledge is important for recognising chronic pain as a health condition in its own right.³⁹⁷ Medical practitioners lacking this knowledge are likely to view pain as a non-specific warning signal of a specific disease process, and focus attention on identifying a specific source of pain related to primary disease pathology or injury.⁶⁰

The majority of students (67%) in the OSCE study failed to ask about allodynia, which is an important sign of neuropathic pain and is useful to distinguish nociceptive pain from neuropathic pain.^{20, 396} This indicates a lack of understanding of the importance of this clinical symptom in terms of making a diagnosis of the type of pain a patient is experiencing.

The OSCE also showed that 39% of students were unable to make the correct diagnosis of post-herpetic neuralgia (PHN) based on the clinical assessment. It is important for medical students to be able to diagnose this condition because one in three persons develop herpes zoster during their lifetime, and it is estimated that up to 20% of those with herpes zoster go on to develop PHN.³⁹⁸ PHN is characterised by pain that lasts for many months and results in decreased quality of life and interference with activities of daily living for many sufferers.³⁹⁹ It is likely that patients will continue to suffer with PHN in the future unless changes are made to the medical curriculum to improve students' ability to diagnose this condition.

7.2.2.4 Recognize the multidimensional aspects of the pain experience and its related management

The OSCE showed that 71% of students failed to encourage patients to express their emotions related to their pain experience. Research has shown that patients' beliefs and expectations have a significant impact on the maintenance and entrenchment of chronic pain, and that effective treatment requires attention to these aspects of the multidimensional experience of pain as well.⁴⁰⁰⁻⁴⁰³

A high number of students in the OSCE study failed to inquire about the physical (67%), psychological (81%) and social functioning (78%) of the patient. A similar finding was noted in fifth-year medical students participating in a pain medicine OSCE in Finland.⁵⁰ The problem of medical schools neglecting the roles that anxiety, fear and the social environment play in modulating the experience of pain has been highlighted.³⁴⁶ Medical students' pain assessment skills, in particular, asking about the impact of pain on function, have been shown to improve after exposure to a targeted pain assessment and management curriculum.²³⁸ A simulation workshop with standardised patients has been shown to improve students' understanding of the physical, psychological and social aspects of pain, and to train students on the most effective way to discuss pain and educate their patients.³⁵² A comprehensive pain assessment necessitates a biopsychosocial focus to understand the context in which the patient is experiencing pain.⁴⁰⁴

Low numbers of students in the OSCE inquired about smoking (33%) and alcohol use (33%). Questioning patients about smoking and alcohol use is considered core medical practice, and should be included in all medical assessments.^{405, 406} Smoking is known to increase pain levels and may indicate potential dependency issues.⁴⁰⁷ It is important for medical practitioners to consider this when deciding to initiate prescription of analgesic medications with likely dependency properties (e.g. benzodiazepines and opioids).⁴⁰⁸ Excessive drinking and alcohol use disorder appear to be associated with deleterious pain-related outcomes.⁴⁰⁹ There are also significant interactions between alcohol and pain medications that would influence pharmacological intervention (e.g. risk of gastrointestinal bleeding, liver damage, increased depressive effects of opioids and benzodiazepines).⁴⁰⁹ Medical students need to know the risks of iatrogenic harm when prescribing analgesic medication for patients with high alcohol intake. This could affect not only the patient but the wider community if patients are sedated when driving.⁴¹⁰

7.2.2.5 Understand pain management options appropriate for individual patients

The MPAKQ found that students lacked knowledge in managing acute back pain, a common problem in Australia and New Zealand.^{111, 411} In Question 30 of the MPAKQ, 19% of students selected the option 'Bed rest' as the most appropriate management

of acute back pain. This is despite consistent guideline recommendations in Australia and New Zealand, as well as internationally, to remain active and avoid bed rest as first-line treatment of acute low back pain.^{207, 411, 412} Low back pain is the number one cause of disability in Australia and New Zealand.⁴¹³ It is important that medical practitioners provide evidence-based advice to patients with acute low back pain because medically certified sick leave due to low back pain hampers productivity growth, and contributes to the cycle of poverty and social inequality.⁴¹⁴⁻⁴¹⁶ In addition, liberal use of imaging, opioids, spinal injections and surgery results in high medical costs and more work absence.⁴¹⁷⁻⁴¹⁹

The use of strong opioids in the management of acute low back pain is not recommended.⁷⁴ However, 47.9% of students selected 'Paracetamol-Codeine' as the most appropriate analgesic for the management of acute back pain (Question 21). The NICE guidelines indicate that opioids should not be used routinely for acute low back pain. Weak opioids (with or without paracetamol) can be used for managing acute low back pain only if a non-steroidal anti-inflammatory drug is contraindicated, not tolerated or has been ineffective.⁴²⁰ Misuse or dependence on combination analgesics containing codeine can result in serious physiological and psychological harms.⁴²¹⁻⁴²⁴

More education is needed regarding the pharmacological effect of morphine. In Question 18, 22.5% of students felt that prolonged use of morphine could result in renal impairment. While morphine use is carefully monitored in renal impairment, this is because morphine may be associated with toxicity in patients with impaired renal function due to altered opioid metabolism.⁴²⁵ The concept of opioid-induced hyperalgesia as a result of long-term treatment for chronic pain with high-dose opioids has gained increasing evidence in the past 15 years.^{426, 427} It is possible that teaching on the topic of opioid-induced hyperalgesia has not yet been incorporated into the medical curriculum. It is important for medical graduates to recognise this condition in the clinical setting when an opioid treatment's effect decreases in the absence of disease progression, especially in the context of unexplained pain or diffuse allodynia not associated with the original pain, and increased levels of pain with increasing opioid dosages.¹⁰

The use of pethidine analgesia has been discouraged in Australia and New Zealand since 2005.⁴²⁸⁻⁴³⁰ Despite this, 21.7% of students selected pethidine as the most

appropriate analgesic for the management of renal colic (Question 13). It is possible that medical students were either taught the incorrect facts about pethidine or following a non-evidence-based protocol adopted in the clinical situation. It is important that medical students are equipped with evidence-based knowledge regarding opioid analgesics to improve clinical practice and ensure patients receive safe and effective pain management.^{430, 431}

The MPAKQ highlighted medical students' lack of knowledge of OIVI. In Question 20, 52% of students selected the incorrect or DNK option, indicating a poor understanding of the best early clinical indicator of OIVI.¹¹ Question 25 focused on OIVI in the clinical setting and was answered incorrectly by 30% of students; a further 29% selected the DNK option. In an inquest in Australia (2018) related to the death of a patient due to administration of high doses of opioids, the coroner attributed the death to a lack of detailed knowledge and training among the medical and nursing professionals (including an intern) regarding the inherent dangers of the use of opioid medications.¹⁸²

The OSCE study found that recall of knowledge regarding the pharmacological management of PHN was inadequate. A third of students were unable to name one medication or class of medication that would be suitable for treatment of PHN. The IASP recommends that graduating medical students be equipped with the knowledge of basic pharmacology (class, example and mechanism of action) and clinical pharmacology (indication and side effects) of medicines used to manage neuropathic pain.^{31, 33} A lack of pharmacological skills was noted in a cancer pain OSCE for medical students evaluating their clinical competence in the area of cancer pain management.⁴³² Students from this study performed poorly on their ability to prescribe analgesics used in the management of cancer pain. More focused pain medicine education is needed in the area of clinical pharmacology to equip medical students with the decision-making skills about appropriate analgesic options for individual patients according to their pain condition.

This contrasted with results from the MPAKQ, which indicated that 78% of students correctly identified the most effective medical for the treatment of PHN. It is possible that students have an adequate knowledge of pharmacology of anti-neuropathic medication but are unable to apply this in clinical scenarios.

7.2.2.6 Effective interaction with multi-professional teams involved in practicing pain medicine

Most medical students (66%) in the MPAKQ study indicated that they were confident in their ability to work with other healthcare professionals in pain management. However, those students who displayed less confidence had statistically significant lower scores in their knowledge of pain management ($p = 0.006$). In addition, students with no prior exposure to pain training displayed less confidence in engaging with health professionals than students with prior pain education ($p = 0.004$)

Discrepancies were noted in students' knowledge regarding the multidisciplinary team approach to pain management. In Question 26 of the MPAKQ, 92% of students in understood the importance of physical and psychological therapy for the management of chronic low back pain. In contrast, evidence of a lack of students' knowledge of effective physical strategies to manage pain was found in Question 27 (effective therapy for improving fibromyalgia symptoms) and Question 29 (physical therapies that are effective for acute pain) of the MPAKQ in that 45% and 70% of students respectively chose the incorrect or DNK option for these questions. The multidimensionality of pain often requires a collaborative interprofessional approach to its treatment.^{229, 433} Health professionals need to understand each other's roles and expertise to develop effective care plans for the management of pain.^{229, 433} It is possible that the students were confident of their ability to work alongside other health professionals in pain management but lacked a clear understanding of what pain management strategies would be used by these health professionals in the clinical situation.

7.2.2.7 Practice pain medicine according to ethical principles

It is a basic principle in pain medicine that the patient is the most competent authority to properly evaluate his or her pain.²⁰ In Question 11 of the MPAKQ, 66% of students selected 'observer estimation' as the most appropriate method to measure pain. Analgesics requirements (such as patient-controlled opioid doses delivered) are commonly used as a measure of pain experienced; these can be influenced by a variety of factors and should preferably be used in conjunction with the subjective assessment.⁴³⁴ Observation of pain behaviour should be reserved only for situations when self-reporting cannot be used.¹¹

Discrepancies were noted in students' attitudes, knowledge and practice regarding the importance of patients' subjective rating of their pain. On the one hand, in the MPAKQ, the majority of students (67%) indicated that they relied on the patients' own estimate of pain, yet 55% of students agreed with the statement that patients recording consistently high levels of pain in the face of minimal or moderate pathology were exaggerating their pain. This indicates that students lack an understanding that there is a poor correlation between the amount of pathology (as seen on scans or blood tests) and intensity of pain (e.g. low back pain, migraines and fibromyalgia).⁴³⁵ In addition, the Mann–Whitney test showed that students who believed that they would rely on patients' own estimate of their pain chose an answer in the MCQs (Question 11) that indicated they would disregard the patients' own assessment of their pain ($p < 0.05$). It appears that while the students have a theoretical knowledge of the importance of self-reporting by the patient, in practice, they place primary significance on objective measurements of pain levels or of what level of pain they expect the patient to experience in relation to the pathology involved. Research has shown that healthcare professionals generally underestimate patients' pain, especially when medical evidence of pathology is absent.^{173, 436} Further, in the presence of psychosocial influences, patients' self-reported pain is more likely to be discounted.^{173, 437} This may result in undertreatment of pain when the patient's need for analgesia does not conform to the given prescription or comparisons are made with other patients with similar surgery, diagnosis and prognosis.⁴³⁸ 'Being believed' is also an important component of the relationship between the health professional and the patient.⁴³⁸ This relationship is essential because pain management requires patients and providers to build a therapeutic alliance.¹⁹¹

In the MPAKQ, 64% of students reported that their cultural background would not affect their ability to assess and treat patients with pain. The literature indicates that healthcare professionals exhibit the same levels of implicit bias (for example, gender, ethnicity, nationality and sexual orientation bias) as do the wider population.⁴³⁹ This is important because racial and ethnic stereotyping by medical practitioners has been shown to affect prescribing patterns in pain treatment.^{440, 441} Cultural biases can influence diagnosis and treatment choices indirectly, by influencing the content and affective tone of the clinical encounter, and directly, by shaping provider decision-

making.^{439, 440} It is possible that many of the students were unaware of the role of cultural bias when interacting with patients experiencing pain.

The majority of medical students in the MPAKQ (73%) indicated that they were likely to experience a high level of anxiety when exposed to a patient in distress due to pain. Those students indicating higher levels of anxiety had statistically lower mean total scores on the knowledge questions ($p = 0.01$). This correlation may relate to the students feeling that their own capabilities of developing a pain management plan for the patient were inadequate.

The above findings are supported by international literature.^{49, 442} A study in Finland (2006) found that final-year students more often felt significantly anxious about seeing a chronic pain patient compared with first-year students.⁴⁹ The latter study posited that increasing anxiety of students was possibly related to an awareness of the complex multidimensional problems of a patient experiencing chronic pain, and the students being doubtful about their prospects of being able to relieve the suffering of their patients.^{49, 442} A qualitative study examining USA medical students' reactions to surgical patients in pain found that students described a range of reactions, such as being disturbed by patients' pain, wanting to relieve the patients' suffering, being unsure about how to respond and learning to distance themselves from the pain experienced by patients.⁴⁴³

The ideal pain medicine curriculum needs to develop the medical students' cognitive, emotional and reflective skills in conjunction with clinical knowledge.²⁴⁷ Medical schools need to prepare students for the ethical challenges of pain management.¹⁸⁶

7.2.2.8 Pain medicine competencies of medical students and interns

Intern training is an important component of the medical education process, designed to produce doctors with appropriate skills and competencies to meet the national healthcare needs.²⁷⁵ The aim of internship is to prepare graduates for the context in which they will be expected to work.²⁷⁵

The MPAKQ suggests that interns may not gain more knowledge regarding pain medicine during their first-year internship, since the pain medicine knowledge of the first-year interns at one centre in Australia did not differ significantly from the

knowledge of the final-year medical students. There was no difference in attitudes to aspects of pain medicine between the two groups. These findings are similar to research undertaken in Melbourne, Australia, in 1997 in which no significant differences were found between medical students' and interns' knowledge of pain mechanisms and management.⁵¹ An Australian study to examine junior doctors' knowledge about pain management and opioid use found that inconsistent training programmes and learning experiences had resulted in junior doctors having variable levels of pain management skills.⁴⁴⁴ It cannot be assumed, therefore, that new graduates in Australia will definitely be exposed to significant pain medicine education during their internship.

However, at one centre in New Zealand, there was a statistically significant difference between the knowledge of interns and that of students. This difference may be related to students at the university included in the study having the opportunity to undertake a defined pain course (this course was not continued in subsequent years). This course may have positively contributed to the interns having superior knowledge compared with current final-year students. However, the average score for the interns on the MPAKQ was still only 18.45, indicating that 42% of questions were incorrectly answered. Again, there was no difference in attitudes to aspects of pain medicine between the medical students and interns. There are no comparable studies of interns' knowledge skills and attitudes in New Zealand. It appears that not all interns in New Zealand will be exposed to significant pain medicine education during their first year after graduation.

These findings emphasise the need for medical schools to ensure that new graduates are equipped with the necessary pain medicine competencies to assess and manage patients with pain. These competencies are essential for ensuring that patients in pain receive adequate care.

7.2.3 Dimension 3: Teaching, learning and assessment

Dimension 3 addresses the teaching, learning and assessment practices involved with the delivery of the curriculum. The findings of the three research phases are interpreted by examining the practicalities of delivering a pain medicine curriculum, such as determining who is responsible for developing and articulating the pain medicine learning objectives for individual programmes, selection of appropriate

curricular topics pertaining to pain medicine, defining pain medicine learning objectives, selection of teaching and assessment methods, creation of interprofessional teaching opportunities and sequencing of learning activities.

7.2.3.1 Responsibility for developing and articulating pain medicine learning outcomes

Participants in the MPCQ were asked to state whose responsibility it was to ensure that pain medicine content was included in the medical curriculum. While all participants showed support for their university curriculum committees taking this responsibility, they also advocated for professional bodies such as the Australian Medical Council and the New Zealand Medical Council (47%), the Australian Health Practitioner Regulation Agency (26%) and the Faculty of Pain Medicine (10%) taking responsibility as well.

When asked to provide general comments regarding responsibility for pain medicine content in the curriculum, two participants recommended the inclusion of SPMPs and clinicians in the pain medicine curriculum development process. One participant recommended that patient consumer groups be consulted and a further participant suggested the government be involved in the curriculum development process.

Support for engaging other stakeholders in the pain medicine curriculum development was also found in the interviews. One medical practitioner recommended consulting with government agencies to obtain funding for pain medicine education. Two SPMPs and an allied health practitioner in the interview study indicated a discrepancy between the teaching on pain medicine at medical school and what was practised in the hospital.

Similar proposals have been made both nationally and internationally for initiatives and collaborations to mobilise medical education stakeholders (patients, medical practitioners, allied health professionals and governmental bodies) to integrate a formal comprehensive pain medicine curriculum into medical school training.^{15, 19, 41, 42, 187, 445} An academic–clinical partnership is needed to develop effective collaborative approaches to improving pain medicine competencies of medical students.

One SPMP and the registered nurse highlighted the need for more uniformity in the teaching of pain medicine at different medical schools as well as at nursing and

pharmacy schools. These findings are supported by the literature in that the problem of limited integration of pain content in pre-licensure health sciences curricula such as nursing, dentistry, occupational therapy, physiotherapy, pharmacy and social work has been identified across Canada, Europe and the USA.^{21, 23, 27, 151, 446, 447} An Australian study examining beliefs and clinical practice behaviours related to low back pain among multidisciplinary health professional students recommended more consistent alignment of evidence-based education regarding low back pain across disciplines.⁵² The delivery of effective pain management can be complex and requires collaborative, multidisciplinary team approaches.⁴⁴⁸ It is important that health professional students are provided with a common understanding of the basic principles of pain management in order to prepare them to work as part of an integrated multidisciplinary team.^{23, 449}

On a national scale, the Faculty of Pain Medicine of the Australian and New Zealand College of Anaesthetists (FPM ANZCA) has partnered with the Australian Government (through the Therapeutic Goods Administration) to support pain education for nurses and medical students. The Better Pain Prescribing initiative involves funding for nurses and medical students to access the Better Pain Management e-learning programme on the multidisciplinary, patient-centred approach to the assessment, diagnosis and management of people experiencing pain.⁴⁵⁰⁻⁴⁵²

Further support for improved pain medicine education at medical schools in Australia has been identified in the National Strategic Action Plan for Pain Management (the Action Plan).¹⁹ The Action Plan was developed by over 25 organisations, including those related to pain medicine, allied health, drug and addiction medicine, mental health, rural health, general practice and pharmacy as well as consumers and carers and is supported by the Australian Government.¹⁹ A key goal of the Action Plan (2018–2021) is to ensure that health practitioners are well-informed on the best practice evidence-based pain management and supported to deliver this care.¹⁹ The Action Plan aims to achieve this goal by developing an overarching education strategy to promote evidence-based pain management education across health practitioner disciplines.¹⁹ This would include standardisation of teaching curricula at universities and a focus on value-based health care.⁴⁵² Support would also be given to the development of national clinical guidelines on pain.¹⁹

7.2.3.2 Curricular topics

The curriculum audit showed that while 42% of medical schools had partially implemented the recommended *IASP Curriculum Outline on Pain for Medicine*, none had successfully achieved full integration of this comprehensive curriculum.³¹ A focused review of pain medicine education at medical schools internationally noted gaps in the breadth of core topics between the IASP-recommended pain medicine curricula and documented educational content.^{27, 28, 48, 157, 341, 345} The *IASP Curriculum Outline on Pain for Medicine* has been used as a reference for the structure of pain content of pain management courses in medical schools in Greece, the USA (Johns Hopkins University, Virginia Commonwealth University, New York University, University of Washington, State of Michigan medical schools), Finland, the UK and Canada (University of Toronto).^{27, 32, 47, 232, 236-238, 241, 323, 453}

The curriculum audit found wide differences in the range of pain medicine topics covered by the medical schools. The curriculum audit determined that pain medicine curricula in Australia and New Zealand focused mainly on the neurophysiology, clinical assessment and biomedical treatment of pain, primarily using analgesics. Few students (26%) had clinical experience of a multidisciplinary pain clinic. The literature shows that medical schools in the USA, Canada, the UK and Europe placed a strong emphasis on pain-related neurophysiology and pharmacology.³⁴⁵ These international surveys found that essential topics reflecting the biopsychosocial framework and multidisciplinary treatment of pain were underrepresented at most medical schools.⁹⁷

While the topic of the multidimensional nature of pain medicine was addressed by 90% of schools in the current study, topics such as psychological methods for managing pain, ethics and medico-legal aspects of pain medicine, geriatric pain and paediatric pain were neglected. These topics are intrinsic to the biopsychosocial model of pain management and the ability to tailor pain medicine interventions to individual patients.^{31 38, 232, 238} Medical students need to be equipped with an understanding of the psychological treatment strategies to assist patients with self-management of pain as well as the co-occurring symptoms such as fatigue, anxiety, mood and sleep disturbances. This is essential because management of pain frequently requires healthcare professionals to use a range of strategies and work together as a team, especially in cases of complex or chronic pain.²³

The lack of attention paid by 79% of medical schools to geriatric pain medicine is likely to result in future medical practitioners being inadequately prepared to manage the rising numbers of elderly patients with CNCP. Management of pain in older adults is complex because of age-related physiological changes (e.g. liver and renal compromise), sensory and cognitive impairments, polypharmacy and multiple comorbidities (including problems with balance and gait).⁴⁵⁴ It is essential that medical practitioners are educated about safe and effective pain management strategies for elderly patients using pharmacological and non-pharmacological approaches.⁴⁵⁴

7.2.3.3 Defined curricular objectives

The curriculum audit revealed that specific pain medicine learning objectives were not identifiable at 42% of medical schools, and when present, were predominantly limited to topics such as clinical assessment (58% of schools), neurophysiology (53% of schools) and analgesic pharmacology (47% of schools). There is a paucity of research on the integration of pain medicine learning objectives into the medical curriculum based on internationally recognised pain medicine curricula or learning objectives (such as the *IASP Curriculum Outline on Pain for Medicine*) or core competencies for pain management (as recommended by the Expert Interprofessional Pain Competencies Consensus Group).^{31, 229, 345}

Defined explicit objectives are the basis of modern curriculum design, to identify and align elements of the curriculum such as content, learning experiences, teaching strategies and assessment.⁴⁵⁵ What is intended that students should learn and achieve should ideally be clearly defined before the teaching takes place.²⁸⁴ Teaching methods should be selected to optimise engagement of the students in the learning activities so as to increase the achievement of the specified objectives.²⁸⁴ In the light of this, it could be inferred that in curricula whose content is not linked to learning objectives, there is no formal mechanism for ensuring that what is intended to be learned has been taught or, accordingly, assessed.²⁸⁴

7.2.3.4 Teaching practices

The curriculum audit showed that all medical schools used lectures as the main teaching method for pain medicine, in addition to other learning methods. This preference is also found in the literature: studies have shown that 95% of schools in

Europe and 88% of schools in the UK use didactic teaching methods.^{26, 27} Most medical schools in Europe used two or more methods.²⁶ Expert pain medicine educators have stated that students are more likely to be engaged in pain education with student-centred learning and problem-based learning that includes the use of personal stories of pain.⁴⁵⁶

Clinical teaching of pain medicine was identified by 84% of medical schools in the curriculum audit. This contrasts with findings in the literature. A study of 242 medical schools in Europe showed 48% used clinical placements.²⁶ Two studies described in the literature included a pain clinic or a hospice or home visit as a learning method.^{249,}

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Insufficient data were collected in the curriculum audit to further explore the depth of clinical teaching at these medical schools. One participant in the MPCQ stated that clinical placements were a challenge in terms of learning opportunities for students to interact with a broad range of patients. The literature points to challenges related to pain medicine being taught in the clinical environment.³⁵⁵ A survey of academic staff at 19 universities in the UK explored factors that facilitated the inclusion of pain medicine into the undergraduate curricula.³⁵⁵ One of the challenges highlighted was the potential for over-reliance on pain being taught in the clinical environment diffusing the responsibility for the pain curriculum outside the formal taught component. Participants in the survey also stated that when pain is taught in the clinical practice area, there was often a lack of parity across individual experiences.³⁵⁵

The potential for medical students to be taught by clinicians who have not been adequately trained in pain medicine was highlighted by six of the participants (allied health, medical practitioners, SPSPs and students) who were interviewed. These findings concur with the literature. Two qualitative studies exploring students' and educators' perceptions of pain medicine education at medical schools in Canada identified similar problems with lack of mentorship.^{281, 282} Both studies described the lack of exposure to role modelling of excellent pain medicine practice in the clinical setting, as well as negative attitudes of clinical teachers towards patients in pain. A literature review of perceptions of stakeholder groups in European countries regarding CNCP was published in 2015.²³ This review concluded that many medical practitioners provided suboptimal treatment for their patients experiencing pain, which had a

negative impact on undergraduate and postgraduate medical training. These findings highlight the need for clinical teaching of pain medicine to be built on previous learning and purposefully linked to the learning objectives of the pain curriculum. The challenge is to ensure that medical students are exposed to meaningful clinical learning opportunities in pain medicine.

A further issue related to mentorship by medical clinicians was identified during the interviews. Participants (SPMPs and medical practitioner) highlighted the problem of a lack of standardised pain medicine protocol and interns needing to adapt their clinical practice in different departments. This finding is supported by the literature, in which large variabilities in opioid prescribing practices by medical practitioners for painful conditions have been identified.^{457, 458} This indicates a need for students to be familiar with a broad understanding of pharmacological options for managing pain and equipped with competencies that will help them cope with changing clinical settings.

The curriculum audit showed that medical schools did not specifically include teaching or exposure to a multidisciplinary pain clinic (74%) or to an acute pain team (47%). The interviews identified that medical students were not routinely included in a variety of clinical settings such as multidisciplinary clinics or acute pain service rounds. The international literature supports this finding. There is little evidence of students being exposed to a variety of clinical experiences that are reflective of the clinical practice, such as multidisciplinary outpatient pain clinics, rehabilitation centres, general practice clinics, and workplace and home visits.³⁴⁵ The literature suggests that increased numbers of medical students in Australia plus insufficient medical workforce numbers have placed constraints on high-quality clinical placements for students.^{270, 271, 459}

The curriculum audit showed that medical schools used tutorials (47%), case-based learning (42%) and problem-based learning (26%) as methods for student learning in pain medicine. Eight participants (42%) in the MPCQ study recommended case-based and problem-based learning opportunities as an effective method for improving medical students' pain medicine competencies. International literature on the use of case-based learning methods is mixed. Studies have shown that 78% of schools in the UK and 26% of schools in Europe employed case-based learning methods for teaching pain medicine.^{26, 27} Studies in Europe, Canada and the USA have shown that case-based and problem-based learning methods are useful for improving medical

students' abilities to apply pain medicine knowledge in clinical situations.^{32, 49, 50, 236, 238-243}

The curriculum audit identified that medical schools use e-learning methods (20%), and self-directed learning (16%) for pain medicine. A similar finding has been identified by studies of medical schools in Europe and the UK.^{26, 27} Five studies described e-learning methods for pain medicine in the literature.^{239-241, 249, 460} These modules were found to be useful for improving medical students' pain competencies in acute, cancer, paediatric, chronic non-cancer and chronic low back pain. The e-learning resources were recommended because they provided resources to simulate authentic real-world contexts and had the potential to facilitate learning face to face or in remote settings.⁴⁶⁰

Simulation-based learning was used by 11% of medical schools in the curriculum audit. Six studies in the literature showed improved pain medicine competencies internationally using the formative OSCE, structured clinical instruction module and simulated patient exposure method.^{49, 50, 238, 249, 261, 461}

One study in the UK described the use of patient partner teaching with an interactive seminar, which was found to be useful for improving medical students' skills for managing low back pain.⁴⁶² It has been reported that including the person with pain in the educational process is helpful for students; by listening to patient narratives, they gain a better understanding of the patients' perspective on pain management and potential barriers to treatment effectiveness.³⁸ Other learning methods in the literature describe the use of self-reflection or assessment and reflective journal writing, pain narratives, and the use of fine-art images to strengthen medical students emotional pain medicine skills.^{237, 241} These teaching methods are not widely used at medical schools in Australia, New Zealand or internationally.^{26, 28, 38}

7.2.3.5 Interprofessional education

The curriculum audit of medical schools in Australia and New Zealand did not identify interprofessional education (IPE) as an approach for teaching pain medicine education. International literature shows a similar lack of IPE for medical students in the field of pain medicine.^{345, 448, 460} Individual studies have shown the effectiveness of IPE for improving medical students' abilities to use a team approach to provide pain management.^{46, 236, 244, 261, 433} Pain assessment and management provide an excellent

model of interprofessional teaching and learning because of the multidimensional nature of pain.⁴⁶³ However, in general, there are few models of interprofessional pain education at pre-licensure level internationally.^{21, 41} The interfaculty pain curriculum at the University of Toronto, Canada, includes interprofessional small-group sessions focused on developing assessment skills and management plans for patients using standardised patients.³² A pain medicine education course offered at the University of Washington, USA, includes interactive case-based learning, didactic lectures, an interactive workshop, clinical exposure and e-learning opportunities with an emphasis on IPE.²³² The e-learning Pain Education Interprofessional Resource delivered at the University of Toronto has been shown to improve health professional students' pain knowledge and understanding of collaborative care.⁴⁶⁰ The curriculum audit showed that medical schools in Australia and New Zealand did not focus on educational activities to prepare healthcare students for collaborative pain management, despite the recognition that pain is best managed in a multidisciplinary setting.²⁶ Medical schools need to build interprofessional teaching and learning opportunities into the medical curriculum to reinforce the importance of health professionals working together to effectively manage pain.

7.2.3.6 Assessment

Assessment of learning is essential to facilitate the desire to learn, focus attention on what is considered core knowledge and skills, and measure achievement of competencies. This curriculum audit showed that assessment methods for pain medicine in medical schools were predominantly MCQs (63%), short-answer questions (47%) and case-based reports (47%). International literature shows that assessments of the pain medicine learning at medical schools internationally are mostly performed using written examinations if undertaken at all.²⁵⁵ The review of the literature showed a large number of studies included MCQs to assess medical students' pain medicine knowledge.^{32, 47, 51, 236, 237, 240-243, 256, 321-323, 348, 350, 353, 464, 465} Still facial images, vignettes and written description of a clinical scenario have been used to examine medical students' treatment recommendations and attitudes towards patients with pain.^{47, 52, 54, 353, 466} A 'key features' problem was used in one study that involved the use of brief clinical scenarios of patients in pain to evaluate the students' pain diagnostic and management skills.³⁵³ One study used a paired-work assignment to assess clinical applications of cancer pain.²³⁷ MCQs, short-answer questions and

case-based reports are unlikely to assess pain competencies such as effective interaction with multiprofessional teams, empowerment of patients to self-manage their pain and the ability to display empathy.^{39, 229}

The curriculum audit showed that OSCE assessments were not used to assess medical students' pain competencies in 68% of medical schools in Australia and New Zealand. Similarly, OSCEs and practical assessments for pain medicine are used by very few medical schools internationally; less than 10% of medical schools in Europe use these methods.^{26, 27, 254, 341} The OSCE assessment has previously been used effectively for assessing medical students' clinical competencies such as empathy and communication as part of a pain assessment, as well as knowledge and attitudes to pain in a variety of contexts (acute, low back and cancer pain).^{50, 238, 239, 249, 253, 261, 432, 467} The OSCE assessment in Phase 2 was useful for exposing gaps in medical students' understanding of the need to enquire about psychosocial factors when taking a history from a patient experiencing chronic pain.

Four studies used a written-based assessment method in conjunction with an OSCE, clinical examination, vignette and facial images.^{157, 350, 353, 466} The use of multi-source assessments to assess students' pain attitudes was described in one study.²³⁷ The portfolios involved a compilation of short exercises, including writing a brief pain narrative, describing the pain depicted in a fine-art image, assessing personal responses to the experience of pain, drafting personal learning objectives for the pain course, defining the role of empathy and compassion in medicine, describing the relationship between pain and addiction, and reflecting on lessons learned from a pain expert panel and positive personal qualities exhibited by the pain expert clinicians.²³⁷

Greater emphasis by medical schools on assessment of pain medicine competencies was recommended by all groups of stakeholders in the interviews. Ten participants (52%) in the MPCQ stated that medical schools did not adequately assess students' competency in pain medicine. Sixteen per cent of medical schools lacked any pain-focused assessment. The findings suggest that it is unclear as to whether graduate medical students in Australia and New Zealand possess the range of pain medicine competencies to meet the complex needs of people in pain. Medical schools need to encourage systematic planning of pain medicine assessment to validate the objectives of the curriculum and to provide effective feedback to students.²⁵⁵ Assessments need

to focus not only on pain medicine knowledge but also on clinical skills and attitudes. It is essential that assessments of pain medicine competencies are performed to ensure that all students are competent and safe to enter the workforce upon graduation.

7.2.3.7 Sequencing of learning activities.

According to the curriculum audit findings, 95% of schools taught pain medicine as a topic integrated into other compulsory subject areas rather than as a distinct standalone module. Similarly, international studies have shown that medical schools in Finland (100%), the USA (80%), Europe (70%) and the UK (68%) offer pain medicine education within modules not specifically dedicated to pain.^{26-28, 47, 48, 157, 254, 347}

The literature supports the concept of dedicated pain medicine teaching in the medical curriculum to ensure that the topic is visible and to ensure that key elements of the pain medicine curriculum are thoroughly addressed.²⁶ Dedicated pain modules featuring team-based workshops, patient interactions, small-group sessions, laboratory work and expert-led teaching have been shown to significantly improve medical students' pain medicine competencies.^{38, 157, 232}

While no optimal model of delivery of pain medicine education has been identified, pain curricula can be successfully incorporated into the integrated model when delivered in a planned, comprehensive and measurable manner.^{26, 341}

7.2.3.8 Elective

In Australia and New Zealand, students who show interest in pain medicine are able to undertake an elective in pain medicine at 53% of universities. This finding contrasts with other regions of the world, such as the USA, where only 16% of medical schools offered a designated pain elective.²⁸ Electives are useful for increasing medical student knowledge and clinical skills, allowing students to participate in research and providing insight into a potential career choices path.⁴⁶⁸ Medical schools should be encouraged to offer elective placements in pain medicine.

7.2.4 Dimension 4: Supporting institutional delivery

This dimension focuses on interpretation of the findings of the three phases of the research that relate to the influence and challenges of pain medicine curriculum planning at the local medical school level, such as institutional priorities, coordination of curriculum content, time allocated to pain medicine in the curriculum, staff expertise and rurality, learning and teaching resources, and importance of local networking.

7.2.4.1 Prioritising pain medicine

The MPCQ and interview findings indicate that the lack of prioritisation of pain medicine at medical schools is a key challenge for including pain medicine content in the medical curriculum. The low priority of pain medicine at medical schools was highlighted by 32% of participants in the MPCQ. Nine participants in the MPCQ (47%) stated that a key barrier to effective pain medicine education was the lack of time allocated to the topic. Participants cited competition in a crowded curriculum and traditional medical specialities unwilling to free up time as reasons for limited time being allocated to pain medicine education. This theme of low priority of pain medicine was confirmed by participants from each stakeholder group in the interviews. These findings are supported by the literature. Education in pain medicine continues to be a low priority in medical curricula in the USA, Canada and Europe according to well-validated survey studies.^{26, 28, 157} Entrenched university systems perpetuate long-standing biases towards basic sciences as well as the value of one medical disease over another.²³² Curricular change is often difficult, because finding time in an already loaded medical curriculum that is tightly timetabled into a calendar year often requires that some other content be excluded.²³² The lack of priority given to pain content into pre-licensure education for nurses and physical therapists in the USA has also been identified.^{469, 470}

In contrast, 55% of students completing the MPAKQ indicated that pain medicine had been given a high priority in their medical training. It is possible that these students were unaware of the extent of inadequacy of their pain medicine competencies since it is clear from the findings of the curriculum audit that formal assessment of students' pain medicine competencies is limited at most universities in Australia and New Zealand. The medical students may not have felt comfortable portraying their course in a negative light. In addition, students might not be aware of the importance of this

topic in terms of the responsibilities of interns in the clinical workplace, as was indicated by an intern and student in the interviews.

Participants in the MPCQ suggested that medical schools could raise the profile of pain medicine with support for a chair in pain medicine education, regular e-communication regarding pain medicine updates (to increase the visibility of pain medicine) and the awarding of FPM ANZCA prizes in pain medicine. Currently, the University of Notre Dame Australia has the Churack Chair of Chronic Pain Education and Research, and the University of Sydney has a chair in pain medicine. There is no chair in pain medicine in New Zealand. To support the development of pain medicine curricula at medical schools in Australia and New Zealand, the FPM ANZCA offers an annual prize to the best medical student in pain medicine at each medical school. Most medical schools do not make use of this opportunity to raise the profile of pain medicine.⁴⁷¹

Participants in the interview study (medical practitioners, SPMPs and medical students) suggested ways to increase the prioritisation of pain medicine in the medical curriculum. These included highlighting the burden of pain on the community and health system and exposing the lack of learning and teaching on the topic. The findings are supported by the literature. Pain specialists in Canada, the USA and Europe have stated that pain has a low priority within medical education systems possibly because of a widespread lack of awareness of the magnitude and impact of pain, and because historically, teaching of pain medicine at medical schools has been lacking.^{23, 41, 97, 191} Those who have not been adequately trained in pain medicine may not recognise the need for curriculum reform.⁴⁷² Transformation of the value system in the curriculum is unlikely to succeed unless there is support from senior leadership for implementing these changes.⁴⁷³

7.2.4.2 Co-ordinated delivery throughout the curriculum

The MPCQ and curriculum audit identified challenges with co-ordinating different components of the pain medicine curriculum across the entire medical training. Five participants in the MPCQ (26%) highlighted the lack of a coordinated approach (for example, a curriculum map) as a barrier to effective pain medicine education. The curriculum audit found that pain medicine education was mostly included in anaesthesia, neurophysiology, pharmacology and palliative care modules, a similar

finding to studies of pain medicine education at medical schools in Europe and the USA.^{26, 28, 47} Most medical schools (74%) depended on the department of anaesthesia for the delivery of pain medicine content. The sustainability of anaesthetists continuing to teach pain medicine is under threat. For example, a recent study to develop curriculum priorities for the teaching of anaesthesia and anaesthetic topics to medical students in Australia and New Zealand revealed that while acute pain was still considered an essential topic to be included in an ideal curriculum, chronic pain was not.⁴⁷⁴ Furthermore, the ANZCA's revised curriculum (2013) specifically excluded a three-month pain medicine module that was previously part of the mandatory registrar rotation. Consequently, today's specialist anaesthesia trainees are not receiving a foundational understanding of the biopsychosocial model of pain medicine, or chronic pain medicine.⁴⁷⁵ Similarly to findings in other countries, there is also a real possibility that pain medicine is underexposed in Australia and New Zealand because of the limited representation of SPMPs as heads of anaesthetic departments as well as on curriculum planning committees.^{346, 476}

The curriculum audit showed a lack of evidence of coordinated planning for pain medicine education between departments or between clinical and non-clinical years at each of the 19 medical schools in Australia and New Zealand included in the curriculum audit. No mechanism was in place to ensure that the core elements of the topic were addressed and integrated into different subject areas. The lack of a coordinated curriculum was highlighted by 26% of participants completing the MPCQ and a further 11% indicated that there were problems with different departments presenting conflicting pain medicine content to students. This lack of coordination is likely to result in an ineffectual understanding of pain, and pain would be seen only as a symptom of other diseases rather than, in some circumstances, a disease in its own right.²³² The disconnect between teaching about pain in preclinical courses such as neuroscience and the translation of this knowledge to the challenge of chronic pain management has been previously identified.⁹³ Detailed analysis of one USA medical school's pain-related curriculum showed a fragmentation of pain content, and the presentation of chronic pain frequently associated with the topic of drug abuse and addiction.³⁴⁷ The problem of poorly coordinated pain medicine curricula at medical schools has been highlighted in Europe, the UK and the USA.^{27, 28, 48, 347} A curriculum map of pain medicine content across the entire medical curriculum has been

recommended as a useful tool for highlighting curricular overlaps and gaps in pain content.⁴⁷⁷

7.2.4.3 Time allocated to pain medicine education

The curriculum audit showed that an average of 19.6 hours (hr) (median [Md] 20 hr) was allocated for pain medicine education during the entire medical curriculum at medical schools in Australia and New Zealand. This commitment equates to approximately 0.3% of the minimum total teaching hours for undergraduate medical degrees in New Zealand (approximately 7,900 hr) and 0.4% of a postgraduate medical degree in Australia (approximately 5,640 hr). These findings are supported by the literature. Pain medicine education comprises 0.2% of the minimum total teaching hours for undergraduate medical degrees in Europe.²⁶ The proportion of time allocated to pain medicine education is comparable to countries in Europe (Md = 12 hr), the USA (Md = 9 hr), the UK (Md = 13 hr) and Canada (Md = 20 hr).²⁶⁻²⁸ In 2011, 20% of medical schools in the USA had less than five hours of teaching on the topic.²⁸ A study of medical schools in the UK in 2014 showed that a median of 13 weeks compulsory time (520 hr) was allocated to surgical specialities with an optional time of an additional eight weeks (320 hr) for student selected placements.⁴⁷⁸ These findings suggest that limited attention is paid to pain medicine in the medical curriculum both locally and internationally, which is problematic considering the global clinical and societal burden of pain disease.⁴¹³

7.2.4.4 Staff resources

While the majority of universities (90%) in the curriculum audit indicated that they had at least one member of staff who was an SPMP or recognised medical practitioner with expertise in the field of pain medicine to assist with the teaching of pain medicine, a lack of adequate resourcing in terms of teaching staff with expertise in pain management was highlighted by 52% of participants in the MPCQ. Two-thirds of universities lacked physiotherapy, psychology or nursing staff with specialist qualifications in pain management to deliver pain education.

There is a lack of qualified SPMPs in Australia and New Zealand, particularly in the rural setting.^{16, 111} Medical schools in Australia and New Zealand disperse students over a number of training centres, including rural sites.²⁷¹ A lack of allied health

professionals and general practitioners with professional training in pain management in rural districts has also been identified.^{272, 273} The literature supports the concept that pain medicine education is best provided by specialists (medical and allied) trained in pain medicine.^{41, 296} Lack of qualifications of teaching staff at medical schools to provide pain medicine education has been highlighted internationally.^{41, 479}

For students to effectively work in partnership with other health professionals when treating people with complex pain presentations, they need to understand and value other health professionals' roles and expertise.⁴⁴⁸ The challenge is to strengthen medical school teaching staff resources to provide evidence-based pain medicine education.

7.2.4.5 Learning and teaching resources

A lack of learning and teaching resources was identified by 47% of participants in the MPCQ. Medical schools in the curriculum audit reported (37%) limited use of specific resources for teaching pain medicine. The need for more research and development of pain education resources has been identified previously.^{191, 480} A systematic review of online pain resources for health professionals found that these show promise in improving learner knowledge and skills.⁴⁸⁰ It was noted that further research is needed to establish the effectiveness of these online educational interventions in achieving health outcomes for patients.⁴⁸⁰ These findings indicate that more support is needed for the development and distribution of pain medicine teaching resources to medical schools in Australia and New Zealand context.

7.2.4.6 Local networking

Two SPMPs in the interviews indicated that their success with integrating pain medicine into their existing curricula involved developing good relationships with key people at the medical school. This finding is supported in the literature. Pain specialists in the UK have advocated for local clinical and educational champions for pain education to build strong alliances with deans of medical schools and non-specialists in pain in their local schools to facilitate the incorporation of pain education into the curricula.^{22, 355}

7.3 Synopsis of interpretations

This research has shown that gaps in interns' pain medicine competencies have the potential to perpetuate the public health problem of inadequately managed pain and associated healthcare costs. It is essential that changes are made to the medical school curriculum in Australia and New Zealand to equip graduates with pain medicine competencies that will prepare them for the professional, personal and ethical challenges of caring for persons with pain.³⁸

The risk of not giving pain medicine the appropriate attention it deserves in medical pre-registration courses is likely to result in continuing suffering of patients in pain.^{41, 93, 345} Table 25 summarises the interpretations that emerged from the synthesis of the findings of the three phases of the research.

Table 25. Summary of Phase 1, 2 and 3 findings.

- Medical schools have not taken responsibility for ensuring that interns are prepared for their responsibilities to manage patients in pain.
- Medical schools need to collaborate with stakeholders to prioritise pain medicine education.
- Medical schools do not have well-documented and coordinated pain medicine curricula.
- Pain medicine curricula are not based on defined explicit objectives as recommended by the International Association for the Study of Pain.
- Pain content in the medical curriculum does not reflect the complexity of pain and variations of populations and settings.
- Final-year medical students display variable levels of pain medicine competencies to assess and manage patients with pain.
- Core values and principles of pain medicine such as the biopsychosocial model of pain, multidisciplinary pain management and individualised pain management are not purposefully integrated into the medical curriculum.
- Teaching and learning approaches are not specifically designed to ensure medical students are equipped with pain medicine core competencies.
- Medical students are not required to display pain medicine competencies for graduation.
- Limited time, visibility and resources allocated to pain medicine in the medical curriculum reflects a lack of priority given to pain medicine considering the public health burden of pain.
- The consequences of inadequately managed pain affects patients and the community, interns and the hospital system.

7.4 Strengths and limitations of the research

7.4.1 Phase 1: Curriculum audit and Medical School Pain Curriculum Questionnaire

Detailed information regarding the medical school curriculum was difficult to obtain. The poor documentation of pain medicine content in the curriculum suggests a lack of priority given to this aspect of medical education. The medical curriculum is not publicly available in New Zealand and Australia (for example, on schools' own websites, government websites or independent university guides) as it is in other countries.²⁶ More recent studies have used only web-based information to examine pain medicine education.^{26, 347} However, many universities in Australia and New Zealand are only in the developmental stages of using web-based curriculum maps to outline specific details of learning objectives, lecture content and delivery, and assessment methods. A specially designed curriculum audit questionnaire has been employed previously, and most, like the one used in this research, have been based on the IASP core curriculum.^{27, 47, 48, 157, 254} The data collected represent the perceptions of a limited number of individuals and these perceptions may differ from those of the broader academic community. This might have resulted in an overestimation or underestimation of the extent of pain medicine education. However, a key strength of this research was the recruitment of an interested participant who was active in the teaching of pain management at 83% of medical schools. In most cases, this person liaised with other educators involved with the teaching of pain medicine at the medical school. This reduced the non-response rate and provided a more accurate and comprehensive overview of the pain medicine teaching at each institution. The findings of this research are not directly applicable to the medical schools that did not participate in the research.

Whilst the IASP *Curriculum Outline on Pain for Medicine* provides a framework for topics to be included in a pain medicine curriculum for medical students, it does not detail specific content or levels of competency required for graduation. Whilst the IASP *Curriculum Outline on Pain for Medicine* is not necessarily the gold standard in terms of a pain medicine curriculum, it is the most comprehensive and authoritative reference document available for developing and testing a medical student pain curriculum. The authors of this IASP curriculum indicated that changing the curriculum of medical schools was challenging, and that the IASP *Curriculum Outline on Pain for Medicine*

would stimulate comments, criticisms and suggestions. They acknowledged that there are many different ways to cover the recommended topics. All aspects of the IASP curriculum may not be appropriate for medical students globally. Medical schools would need to adapt this curriculum to address the pain management needs of their own communities.

For instance, in areas where access to Specialist Pain Medicine Physicians is low, emphasis of the IASP *Curriculum Outline of Pain for Medicine* on interventional and surgical pain management techniques may be incorrect. However, medical students' training in large metropolitan or university teaching hospitals are likely to encounter nerve blocks and surgical techniques for alleviating acute pain, so including some information about these in the pain curriculum would be appropriate. In many cases, these topics are already covered by the departments of anaesthetics and surgery (including neurosurgery and orthopaedic surgery).

The same applies for radiofrequency procedures and implantation of spinal cord stimulators. Whilst these interventions are being used more frequently in countries such as the USA and Australia, the majority of patients globally would not have access to this form of pain management. Medical students in countries where these procedures are performed would not need detailed knowledge of these pain management techniques, but would benefit from a basic understanding of where these interventions fit in terms of pain management options for their patients.

7.4.2 Phase 2: Medical Students Pain Attitudes and Knowledge Questionnaire

The overall response rate was 25% after a large percentage of medical students chose not to participate in the study. Determining what factors influence survey non-response behaviour is difficult because this information is almost impossible to gather. Likely factors could include research fatigue (in addition to research projects, many medical schools require students to complete questionnaires regarding the course and their tutors on a regular basis), time constraints of a busy curriculum and the survey format. It would have been preferable to gather all the data by distributing the questionnaire by hand during a scheduled lecture. However, despite repeated requests, only two medical schools agreed to facilitate the distribution of questionnaires during scheduled lectures, and only parts of these year groups were accessed because of forthcoming

examination schedules. The time constraints of this research did not permit extending the collection of data to another year group in 2018.

The difference in the total mean score initial comparison of students from Australia and New Zealand was influenced by the high score of students from one school in Australia, rather than a large overall difference in means between the two countries. For this reason, the results of the research may possibly overestimate the actual level of knowledge of students across Australia and New Zealand since the results were pooled.

The attitudinal questions were rated using a Likert scale. These items were unrelated and therefore it was not possible to perform maximum likelihood factor analyses.

While statistical analysis of the differences between medical students and interns was conducted, the sample size of interns was very small, so the results needed to be interpreted with caution. With a larger sample, these differences could be examined in greater depth. In addition, the results pertain to only two geographical areas, and may not be representative of all universities. Therefore, it is not possible to generalise the results to Australia and New Zealand as a whole.

7.4.3 Phase 2: Pain medicine objective structured clinical examination

The OSCE was undertaken at one urban medical school. Logistical difficulties such as finding time in a fully loaded medical school curriculum, and accessing students prior to their final examinations prevented repetition of the OSCE at multiple institutions. The results may not be generalisable to all medical schools. While research has shown the OSCE format to be a valid predictor of future clinical performance, this OSCE would need to undergo further testing in order to make judgements of the effect of the curriculum on clinical practice in the workplace.⁴⁸¹ Broadening the OSCE to more than one station and testing candidates across a wide sample of cases (such as cancer pain or chronic pelvic pain) would increase reliability and validity.³³⁸ Inferential statistical analysis was not performed because of the limited numbers in this study. Higher numbers of students participating in the OSCE would increase the statistical validity of the results.

The design of the marking schedule was strengthened by the inclusion of three types of marking scales, namely, checklists, performance rating of each component and a global rating scale. While the rating of the student by the standardised patients (SPs) was not included in the calculation for station total score, it was noted that the performance of 81% of the students was rated as satisfactory. This measure correlates well with the results of the total score rating, which indicated that 86% of students were above the standard set pass mark. Research has shown that patients can provide reliable and valid global opinion that contributes to the assessment of a student's clinical skills.⁴⁸² In this case, the SPs were volunteers, which helped to reduce the cost of the examination. The inclusion of trained actors was especially useful because it was likely that this type of examination would be too intrusive and exhausting for actual patients.

Given the 10-minute time constraint of the station, the students may have focused more on making a medical diagnosis to the detriment of exploring the multidimensional nature of chronic pain presentation. In a comprehensive assessment, there is sometimes a trade-off between reliability and validity because complex skills, requiring an integrated professional judgement, may become fragmented by a relatively short station length.^{253, 481}

7.4.4 Phase 3: Interview process

Participants were asked how they perceived interns' pain medicine competencies in the clinical setting and how they related this to the current medical school training. There was a risk of bias that participants felt the need to be overly positive about interns' ability to perform pain medicine tasks because of a desire to protect their medical school from a perceived negative portrayal. It would have been valuable to include the perspectives of consumers/patients in this study. Patients were not included as a stakeholder group because it was felt they might have difficulty distinguishing interns from other medical practitioners in the hospital setting. In addition, they might have limited experience of being cared for by one or two interns in a very specific hospital setting. Because of the absence of research funding available for this research, interviews were not double coded, but a selection of the coding interviews were reviewed by two supervisors.

The purposeful selection of a range of interviewees from different-sized hospitals across nine different sites allowed a wide range of views to be gathered. This increased the transferability of findings to similar medical schools in Australia and New Zealand, noting that each individual medical school has its own context so not all findings will be applicable to all settings.

7.5 Summary

This chapter discussed the interpretation of the findings of the Phase 1 curriculum audit and MPCQ, Phase 2 MPAKQ and OSCE, and Phase 3 interviews in the light of Australian, New Zealand and international literature. The 4DF was a useful tool to explore and structure the complexity and nuances of pain medicine education at medical schools in Australia and New Zealand. A synopsis of the interpretations of the findings was presented. The strengths and limitations of the qualitative design were then discussed.

Chapter 8: Research Summary, Recommendations and Conclusion

This chapter reviews the research design and summarises the aims and findings of this research. The strengths and limitations of the mixed methods research design are discussed. The new knowledge that this thesis has contributed is outlined. The implications for medical education design and policy are discussed, with recommendations for future areas of research. Finally, the overall conclusions of the research are presented.

8.1 Research summary

The aim of this research was to examine the delivery of pain medicine education at medical schools in Australia and New Zealand, and to determine how effectively it equips medical students with the pain medicine competencies required for internship. The thesis started with a review of the literature regarding the integration of pain medicine into the medical curriculum using the Four-Dimensional Curriculum Development Framework (4DF) as a theoretical framework (Chapter 2). This review found that the topic of pain medicine education is complex, requiring a focus on the professional, regulatory, legal and clinical influences; the necessary pain medicine core competencies for effective pain management in clinical practice; and teaching, learning and assessment activities in the light of the local medical school context. Gaps in the literature were identified, which established the need for further research into the topic of pain medicine education for medical students in Australia and New Zealand. The pragmatic mixed methods approach was used to address the research questions as discussed in detail in Chapter 3.

Phase 1 of the research provided important baseline information regarding pain medicine education at medical schools in Australia and New Zealand, and these results were presented in Chapter 4. Based on the *IASP Curriculum Outline on Pain for Medicine*, this research found that there is a wide variation in the delivery of pain medicine education at medical schools across Australia and New Zealand. The findings of Phase 1 revealed that a more formalised approach to the development and delivery of a comprehensive pain medicine curriculum is needed to ensure that medical students are adequately prepared for their future workplace responsibilities.

Medical students' and interns' pain medicine competencies were assessed using a Medical Students Pain Attitudes and Knowledge Questionnaire (MPAKQ) and pain medicine objective structured clinical examination (OSCE) in Phase 2 of this research. The findings, which were presented in Chapter 5, showed that there is currently a wide variability in students' pain medicine competencies. Gaps in knowledge, skills and attitudes were demonstrated in the areas of basic concepts of pain processing, multidimensional aspects of pain, pain assessment and management in specific clinical contexts, multiprofessional approach to pain management and pain medicine ethics. Mastery of these areas have been identified as essential for competent clinicians who are able to treat pain effectively and safely.^{31, 229}

Interviews were used in Phase 3 to explore pain stakeholders' perceptions about the adequacy of the Australian and New Zealand medical school system to prepare interns for the task of managing patients in pain. The findings were presented in Chapter 6. Participants highlighted areas where the expected responsibilities of interns to provide pain management did not match their actual pain medicine competencies. Inadequate pain medicine competencies of interns were seen to negatively affect, not only the patients in their care, but also their own wellbeing, the health system and the wider community. This research identified the need for changes to the medical school curriculum to ensure that interns are equipped with the necessary pain medicine competencies when transitioning to clinical work.

Chapter 7 discussed the findings in the context of existing literature and considered the strengths and limitations of the quantitative and qualitative research designs. Using the *IASP Curriculum Outline on Pain for Medicine* as a benchmark, the findings of the three phases of this research were integrated using the 4DF to examine the complexity of pain medicine education in Australia and New Zealand. Attention was focused on understanding who is responsible for ensuring that interns are prepared for their professional pain medicine responsibilities in the workforce; what pain medicine competencies are required to ensure that interns are able to safely and effectively assess and manage pain; whether the learning, teaching and assessment practices are appropriate for the complexity of the topic; and what local medical school structures and culture shape the pain medicine curriculum design.

8.2 Strengths and limitations of mixed methods approach

Internationally, published studies on the topic of pain medicine education for medical students have predominantly reflected either a qualitative or a quantitative research orientation. This research synthesised qualitative and quantitative data in a mixed methods research design. The mixed methods design allowed for a deeper understanding of the necessity for, and challenges associated with, integrating pain-related content into existing medical curricula in Australia and New Zealand. In particular, this approach allowed for the lived experiences of stakeholders working with interns in the clinical setting to enhance understanding of the findings of the curriculum audit and assessments of final-year medical students' pain medicine competencies.

The mixed methods design highlighted the complexity of the topic. Phase 1 found that 37% of the medical school representatives completing the Medical School Pain Curriculum Questionnaire (MPCQ) stated that pain medicine education for medical students at their university was adequate. In Phase 2, 55% of students completing the MPAKQ indicated that pain medicine had been given a high priority in their medical training. In contrast, all participants in the Phase 3 interviews stated that their experience in clinical practice led them to believe that pain medicine education currently offered at medical schools was inadequate and that changes were necessary to medical curricula, even for schools that had been relatively successful at integrating pain content into the curriculum. The stakeholders in Phase 3 gave practical examples of situations in which interns' pain medicine competencies were lacking. In addition, the MPAKQ and OSCE assessments in Phase 2 provided evidence of a number of gaps in students' pain medicine knowledge. It is possible that medical school representatives were unaware of gaps in medical students' pain medicine education, since none were able to provide a formal outline or map of pain education in the medical curriculum. A further possible reason for medical school representatives' and students' unawareness of the extent of inadequacies of students' pain medicine competencies is the limited formal assessment of students' pain medicine competencies at most universities in Australia and New Zealand, which was identified in the curriculum audit and MPCQ.

The qualitative interviews enriched the quantitative findings in a number of key areas. First, the stakeholders highlighted reasons why the poor attention to pain medicine

education at medical schools is a substantial problem. They provided a range of examples from their own clinical experience of new graduates' lack of pain competencies limiting their capacity to alleviate suffering of patients and practise in a safe and ethical manner. New graduates needed independent decision-making skills regarding clinical pain management because supervision by a senior medical practitioner was not always available. The interviews brought to light the stress and anxiety new graduates experience when faced with pain management tasks that they did not feel confident to perform. In addition, the interviews increased awareness of the consequences of poor pain medicine practice on the wider community, for example, when large doses of opioids are prescribed to patients on discharge.

The qualitative findings deepened understanding of assessing and managing individual patients with pain in a variety of contexts. Participants gave examples of a range of complex pain-related issues faced by interns, such as the subjectivity of pain, refractory post-surgical pain, geriatric patients with poor renal function in pain, patients with opioid dependency and patients with unrealistic expectations of a cure for chronic pain. Participants also identified that interns were unlikely to gain clinical experience in effective management of patients with chronic pain. This is problematic because recent statements supported by governmental and non-governmental organisations reflect the increasing credence given to the public health problem of chronic pain at a population level in Australia and New Zealand.^{16, 19}

The qualitative research brought to light areas of pain medicine that had not been fully examined in Phase 1 or 2. Participants in the interviews highlighted challenges associated with clinical teaching, such as new graduates being taught values and practices by senior medical practitioners who are not necessarily well trained in evidence-based pain medicine. In addition, new graduates, lacking practical pain knowledge, rely on their junior colleagues or allied staff to provide the necessary information they need to undertake pain assessments and management duties.

Finally, participants in the interviews raised awareness of the need for education of medical students about how to manage the discharge process of a patient in pain. This highlighted that interns did not appear to understand the full journey of the patient in pain or the patient's experience outside the hospital. This problem has been identified with regard to intern training in general in Australia and New Zealand.²⁷⁵ This is a

significant finding because many interns will choose a future medical career outside of the hospital environment, so need to be prepared for managing patients with pain in the community setting.⁴⁸³

A limitation of using the mixed methods approach was that time and resources precluded an in-depth investigation of the topic using either a qualitative or quantitative approach.

8.3 Contribution to the literature

This research contributes to the international literature on pain medicine education for medical students. While pain medicine education has been examined in other countries, this is a unique mixed-methods-based study that explores the topic of pain medicine education at medical schools in Australia and New Zealand using a curriculum framework.^{26-28, 157} The MPAKQ and pain OSCE tools used in this research were purposely designed to assess the knowledge, skills and attitudes of final-year medical students. This research advances the potential for appreciating how mixed methods research can further enhance an understanding of the needs, challenges and barriers to improving pain management through education.

8.3.1 Tools for assessment of pain medicine competencies

8.3.1.1 Medical Students Pain Attitudes and Knowledge Questionnaire

The development of the MPAKQ has provided a useful tool to assess areas of pain medicine knowledge that Australian and New Zealand graduates ought to have covered during their medical training for them to be adequately prepared to manage pain.³¹ A review of the literature of methods used to assess medical students' pain medicine competencies showed a lack of shared pain medicine assessment tools that have been designed based on contemporary theories of educational assessment or on internationally recognised pain medicine curricula or learning objectives.²⁵⁵ In Australia, questionnaires used in the two studies by Trinca (1998) and Briggs (2013) were developed in the mid-1990s so some of the terminology used is now out of date, and some of the questions appear less relevant to current pain medicine practice.^{51, 52}

The MPAKQ tool is useful because it can be used by medical educators in the current format for formative purposes. If the questionnaire were to be used for summative

purposes, consideration would need to be given to setting the acceptable level of performance required of a medical student prior to graduation, using norm- or criterion-referenced methods.³⁴⁰ The questions could be adapted and further developed to assess other aspects of pain medicine content, for instance, by using different distractors in the multiple choice questions. It also assesses medical students' attitudes to aspects of pain medicine (an area that is not routinely examined), which could assist with focusing the students' attention on ethical aspects of pain medicine. The MPAKQ has the potential to be used by pain medicine educators to support accountability measures, ultimately leading to better pain education in health care.

8.3.1.2 Pain objective structured clinical examination

The OSCE format using standardised patients and a marking sheet was found to be a feasible, valid and reliable method to examine final-year medical students' pain medicine competencies of assessment and communication. This is the first study using a standardised assessment method to evaluate pain medicine clinical skills of medical students in Australia and New Zealand. Medical schools can be encouraged to include this OSCE (or similar) in the final-year assessment process to provide valid formative feedback for the students, to inform the institution on whether pain medicine educational goals are being satisfied, and to motivate and direct efforts to improve medical curricula.⁴⁸⁴

8.4 Implications for policy: The Pain Medicine Curriculum Framework

This research has highlighted the need for changes to be made to the way that pain medicine education is delivered at medical schools in Australia and New Zealand. The 4DF has proven to be a useful tool to structure the research, in terms of understanding the entirety of the medical curriculum as well as defining the complexities of curriculum design.⁶ Based on the recommendations that emerged from this research, the Pain Medicine Curriculum Framework was developed to conceptualise a purposeful approach to the complex process of curriculum change and to prioritise the actions needed to address the gaps in pain medicine education (see Figure 11).

The Pain Medicine Curriculum Framework encompasses the four elements of the 4DF with particular reference to the design and delivery of pain medicine education at medical schools.⁶

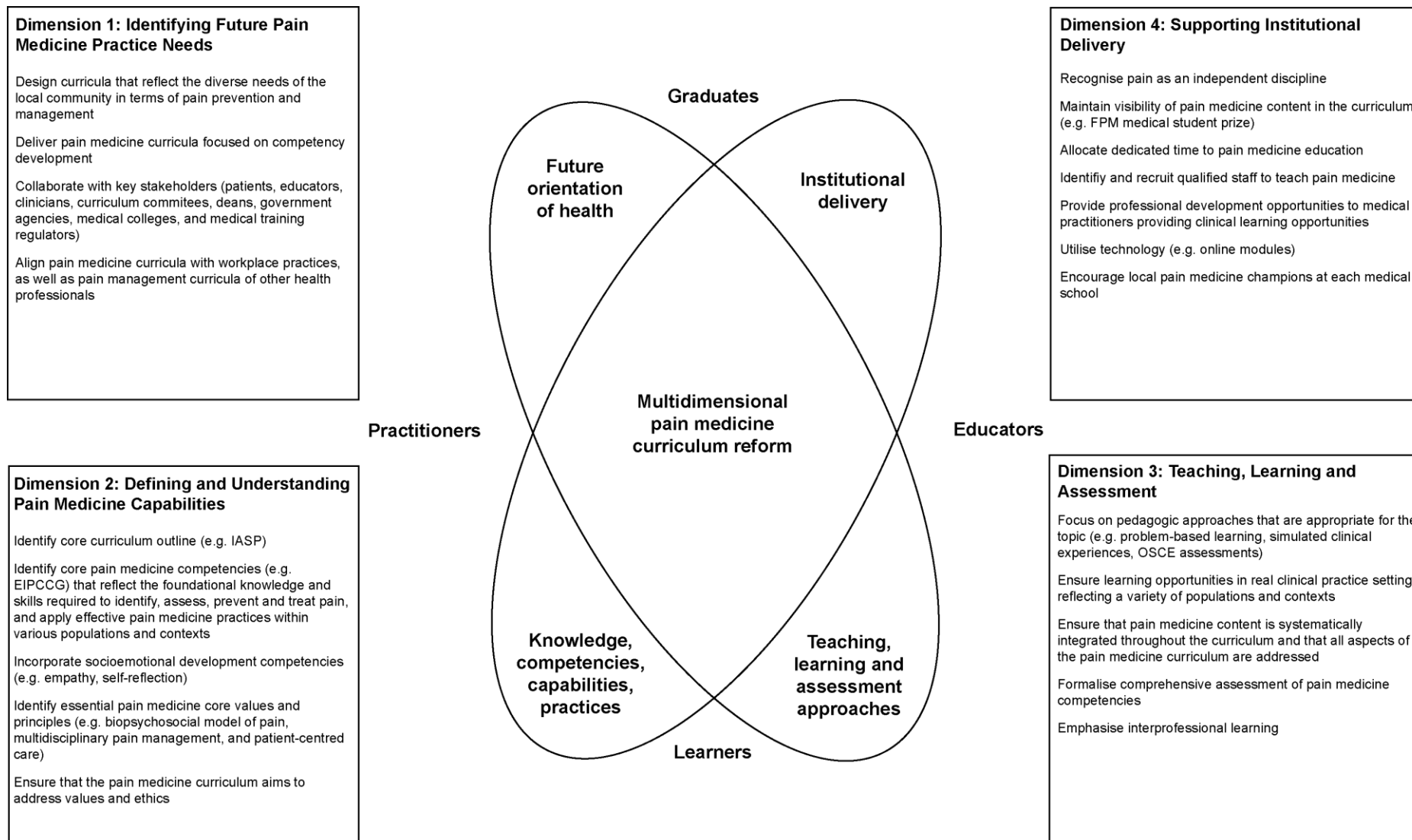


Figure 11. The Pain Medicine Curriculum Framework.⁶

8.4.1 Dimension 1: Future healthcare practice needs

This research has identified the need for medical schools to take more responsibility for designing curricula that reflect the pain management needs of the population. Delivery of a comprehensive pain medicine curriculum focused on competency development should be the goal of every medical school in Australia and New Zealand. Medical schools need to collaborate with different stakeholders (academics, medical training regulators, professional medical colleges, patient/consumer groups) to meet their responsibility for ensuring that pain medicine education is effectively integrated into the medical curriculum.

The findings of the interviews and MPCQ showed that medical schools need to actively work with health services to define the expectations of workplace readiness of new graduates, so as to align pain education with the practices and protocols of the clinical settings where interns will be employed. Collaboration with other health professions' educators and institutions would be helpful to encourage alignment of pain content in the various curricula and facilitate opportunities for interprofessional learning. This is important for ensuring that patients receive consistent pain treatment from various healthcare providers.

8.4.2 Dimension 2: Competencies and capabilities required of graduates

A key finding of this research was that medical schools lack well-defined pain medicine curricula specifically designed to provide medical students with these necessary core competencies as recommended by the International Association for the Study of Pain (IASP) and the Expert Interprofessional Pain Competencies Consensus Group.^{31, 229} Evidence from the interviews showed that medical graduates require a wide range of pain medicine competencies to undertake comprehensive assessments of patients in pain and to develop appropriate treatment plans that are individualised, yet evidence based and safe. The research also identified that pain medicine education needs to ensure that medical graduates are confident in their ability to respond to patients with pain, understand how the patient is experiencing pain, and recognise their own cultural and emotional response to pain. This research has shown that medical schools need to design pain medicine curricula that embrace the biopsychosocial model of pain, so that graduates understand, not only the biomedical mechanisms of pain, but also the

influence of affective, cognitive and social factors involved in the development and maintenance of pain.

It emerged from this research that medical schools have failed to embrace the multidisciplinary model of pain. This failure needs to be addressed so that graduates are equipped with competencies for effective collaborative pain management.

8.4.3 Dimension 3: Teaching, learning and assessment methods

This research has identified a need for medical schools to develop well-defined learning objectives to structure pain medicine content, teaching strategies and assessment. Problem-based and case-based learning depicting real-world scenarios were recommended by participants in the interviews and MPCQ to prepare new graduates for more complex pain management in the workplace.

The evidence from this research suggests that clinical teaching should expose students to a broad range of patients and pain conditions to facilitate application of pain competencies across the life span and in the context of various settings and populations. Increased use and sharing of online pain medicine education resources could potentially address the staff and learning resource deficit that was identified by medical schools. These e-resources need to be up-to-date and cost-effective.

It is clear from this research that there is no gold standard for delivering pain medicine education and each university would need to work out which model is most suitable for their local context. Pain education could be sequenced from more foundational concepts at the beginning of the medical course to more advanced curricula towards the final years of the course, with required competencies attained at different stages. A flexible modular approach integrated over the entire medical curriculum may be the best way to structure the pain curricula for some universities, with pain medicine a common theme throughout the curriculum and different specialities plus a dedicated pain medicine rotation. Pain medicine education needs to be systematically integrated into all disciplines since pain is ubiquitous in clinical settings. A curriculum map might be useful to sequence pain curricula and improve cohesion of the pain medicine teaching throughout the medical training programme.

This research has established that pain medicine competencies need to be assessed for formative and summative purposes to encourage learning, to enhance the importance of pain medicine education, to identify education gaps in the curriculum with respect to pain medicine and to ensure that new graduates are competent and safe to enter the workforce. A strong recommendation to emerge from this research is that medical schools prioritise systematic and comprehensive assessment of pain medicine competencies.

Medical schools fail to provide opportunities for students to learn about pain medicine with their interprofessional peers. Interprofessional education would deepen their understanding of allied health professionals' roles and encourage collaboration in developing effective care plans for the management of pain.

8.4.4 Dimension 4: Institutional parameters

This research has identified the need to address the challenges of building new ways of thinking into the local medical school context. Pain medicine education needs to be prioritised by medical schools to ensure that future medical practitioners are able to effectively and safely manage pain. This will require concerted collaborative effort and advocacy to ensure that greater time and resources are allocated to pain teaching. Raising the value of pain medicine education necessitates increased visibility of pain medicine in the curriculum and the recognition of pain medicine as an independent discipline rather than the domain of subspecialty training. Medical schools would benefit from identifying a local champion to drive integration of pain medicine education into the medical curriculum.

It has emerged from this research that medical schools need to commit to building a team of medical and allied health pain specialists who are equipped with the skills and teaching resources required to deliver comprehensive pain medicine curricula. It is also clear that continuing professional development for medical practitioners who oversee clinical learning opportunities would be useful to ensure that medical students are provided with consistent pain medicine teaching throughout their medical training.

8.5 Recommendations for future research

Research into pain medicine education needs to be undertaken for a number of purposes, such as to address accountability, to promote curriculum development and to examine the outcome of pain medicine educational interventions on students' pain medicine competencies. Further investigation is required to examine the translation of educational efforts into impact on patient outcomes.

It would be useful to refine the Pain Medicine Assessment Framework to form a validated tool that can be used for ongoing evaluation of individual students' pain competencies.²⁵⁵ This will also provide much-needed evidence for further periodic curriculum review and revision. It would also be useful to include multiple choice items related to the discipline of pain medicine in the Medical Deans Clinical Benchmarking Project, to enable schools to assess the performance of their students relative to other schools.²⁵⁹

In-depth studies of intern readiness would be useful to explore how interns cope with their lack of pain medicine knowledge and skills in the workplace. Formal assessment of interns' pain medicine competencies on completion of internship would be useful to understand the need for a formal approach to systematic pain medicine teaching and clinical practice during the internship period.

Finally, a pain medicine curriculum resource (designed from the Pain Medicine Framework in Figure 11) could be developed and piloted. Once it has been trialled and refined, it could then be provided to all medical schools in Australia and New Zealand as a pain medicine curriculum resource pack to be integrated into their curricula as needed.

8.6 Conclusions

This thesis set out to examine the delivery of pain education at medical schools in Australia and New Zealand, and how effectively it equips medical students with pain competencies required for internship. It sought to identify final-year medical students' attitudes, knowledge and skills across a broad range of pain medicine topics. It also undertook to explore a range of pain stakeholders' perceptions regarding the

adequacy of the pain medicine curriculum in terms of preparing newly graduated interns for their responsibilities in the workplace.

This thesis has presented comprehensive multi-site research to explore pain medicine education in Australia and New Zealand. Based on the *IASP Curriculum Outline on Pain for Medicine*, this research has highlighted the necessity for major changes to the current medical curriculum to adequately prepare medical students to address the pain management needs of the communities they will serve in the future. Key barriers to effective delivery of pain medicine education for medical students have been identified. A structured framework to enable effective implementation of pain medicine into medical curricula has been proposed. Appropriate implementation of these strategies to address the lack of pain medicine education is a priority.

While the findings of this thesis are particularly relevant to the Australian and New Zealand context, many of the findings will be applicable to medical schools internationally with similar medical education systems, when locally contextualised.

Pain medicine education at medical schools in Australia and New Zealand does not adequately respond to societal needs in terms of the prevalence and public health impact of inadequately managed pain. It is hoped that this Pain Medicine Curriculum Framework for improving pain medicine education will assist curriculum designers, specialist pain medicine physicians, healthcare providers, students and patients in Australia and New Zealand in the ongoing process of ensuring that medical graduates meet the professional and ethical challenges that arise in caring for those in pain.

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Appendices

Appendix 1: Publications and permissions

1. **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. doi:10.1007/s40122-018-0103-z. (12 citations)

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Author contributions: E.E. Shipton: study concept and design, literature search, data acquisition, analysis and interpretation of data, and drafting of manuscript. E.J. Visser, C. Steketee, F. Bate: study concept, analysis and interpretation of data, and drafting of manuscript. All authors read and approved the final manuscript

2. **Shipton EE**, Steketee C, Bate F, Visser EJ. Exploring assessment of medical students' competencies in pain medicine-A review. *Pain Rep.* 2018;4(1):e704. doi:10.1097/PR9.0000000000000704

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Author contributions: E.E. Shipton: study concept and Pain Medicine Assessment Framework design, literature search, data acquisition, analysis and interpretation of data, and drafting of manuscript. E.J. Visser, C. Steketee, F. Bate: study concept, analysis and interpretation of data, and drafting of manuscript. All authors read and approved the final manuscript

3. **Shipton EE**, Bate F, Garrick R, Steketee C, Visser EJ. Pain medicine content, teaching and assessment in medical school curricula in Australia and New Zealand. *BMC Med Educ.* 2018;18(1):110. doi:10.1186/s12909-018-1204-4 (5 citations)

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Author contributions: E.E. Shipton: study concept and curriculum audit tool design, literature search, data acquisition, analysis and interpretation of data, drafting of manuscript. E.J. Visser, C. Steketee, F. Bate: study concept and curriculum audit tool design, analysis and interpretation of data, drafting of manuscript. All authors read and approved the final manuscript.

Appendix 2: Medical School Pain Curriculum Audit Scoring Tool

Section 1. General questions:

1. Person responsible for ensuring that pain medicine is included in the curriculum at your medical school (Role at medical school and discipline)
2. Aware of any recommendations by local or international pain specialists for core competencies in pain medicine for medical students? (Yes – indicate which, No, Unsure)
3. International Association for the Study of Pain (IASP) core curriculum been implemented for your medical students? (Fully; Partially; Not implemented; Considered but rejected; Don't know)
4. Medical students share pain medicine content/modules with other non-medical health-care students? (Yes; No; Unsure; yes, please specify which disciplines are involved such as Dentistry, Nursing, Occupational Therapy, or Physiotherapy) and briefly describe how many hours are shared and method of teaching (e.g., shared lectures, interdisciplinary problem-based learning group, ward rounds, clinics)
5. School of Medicine have staff who are specialists or recognised experts in the field of pain medicine, to assist with the teaching of pain medicine to medical students? (Yes; No; Unsure; If yes, please specify field, e.g., Specialist Pain Medicine Physician; Pain Management Nurse Practitioner; Specialist Pain Physiotherapist; Specialist Pain Psychologist.)
6. Specific pain education resources (Yes – specify e.g. EMP (lite), e-modules, textbooks; No; Unsure)
7. Elective opportunities in pain management? (Yes; No; Unsure; If yes, specify for how long and through which department)

Section 2. For each major topic in pain:

8. Learning Objectives as specified in medical curriculum
9. Time allocated (hours or minutes. If one lecture covers a number of topics, please divide the hour by the number of topics covered.)
10. Pain medicine taught as a stand-alone pain module (yes, in part, no)
11. Department or speciality responsible for teaching this content? (Which department or other discipline such as anaesthesia, medicine, anatomy)
12. Personnel delivering the subject content (e.g. Medical specialist, Medical Registrar, Registered Nurse, Physiotherapist, University lecturer)
13. Compulsory teaching (if not, please indicate which category of students would NOT receive the teaching)
14. Type of teaching method (Didactic lecture (DL), Problem-based learning (PBL), Simulation-based learning (SBL), Team-based learning (TBL), Case-based learning (CBL); Clinical experiences (CE), e-learning (EL), or other (specify))
15. Assessment method (Multiple choice questions (MCQ), Short answer questions, Observed Structured Clinical Examination (OSCE), Case-based reports, other –specify)

Major Topics in Pain (examples of content)

1. Neurophysiology/pain mechanisms (Types of pain –eg neuropathic, nociceptive, Nociception, Perception, Modulation)
2. Neurophysiology of chronic pain (Peripheral/Central Sensitization)
3. Aetiology/prevalence of Pain (Incidence, Causes, Disability, Economics)
4. Clinical Assessment (Examination of patient with pain, clinical presentation of Chronic/Acute pain, Interviewing a patient with pain)
5. Multidimensional nature of pain (Subjective/Objective Interpretation of pain, Understanding the biopsychosocial aspects of pain, patients' pain beliefs, meaning of pain)
6. Management with Primary Analgesics (Placebo, Opioids, NSAID's, COX inhibitors, Lignocaine, Risk assessment and Monitoring)
7. Management with Adjuvant Analgesics (Tricyclics, SSRI, SNRI, Anti-epileptics specifically used for pain relief)
8. Medical Management Interventions (nerve blocks, injections, neuromodulation for pain relief)
9. Non-Medical Management Psychological (specific therapies for pain management, sleep/ mood/ anxiety therapy, goal setting, CBT, Hypnosis, Mindfulness)
10. Non-Medical Management Physiotherapy (Specific therapy pain management, Graded Motor Imagery, TENS, Acupuncture, Hydrotherapy, Exercise, Soft tissue mobilisation)
11. Ethics of Pain Management (the right to pain management, Therapeutic relationship of patient and health professional, Challenges of managing chronic pain patients, Self-evaluation of students' own attitudes to patients with pain)
12. Clinical Practice in Pain Medicine (Exposure to an acute pain service)
13. Clinical Practice in Pain Medicine (Exposure to a multidisciplinary pain clinic, Exposure to Rehabilitation/follow-up planning)
14. Medico legal aspects of Pain Management (Including: Substance abuse, Medico legal requirements, Sickness benefits)
16. Pain management of special groups of patients: Paediatrics
17. Pain management of special groups of patients: Geriatrics
18. Pain management of special groups of patients: Cancer/Palliative care

Appendix 3: Medical School Pain Curriculum Questionnaire (MPCQ)

Medical School Pain Curriculum Questionnaire (MPCQ)

Thank you for participating in our survey. Your feedback is important.

For the purposes of this questionnaire, pain medicine content includes the multidisciplinary nature of pain, pain assessment and measurement; management of pain and context of pain management, in terms of acute, chronic and cancer pain.

* 1. Consent:

I agree to take part in this research project. I have read the Information Sheet provided and been given a full explanation of the purpose of this study, the procedures involved and of what is expected of me. I understand that I may withdraw from participating in the project at any time without prejudice.

Yes

No

2. What is your role in the medical school?

Teaching

Administration

Research

Clinical

Other (please specify)

3. What is your occupation?

Medical Practitioner

Allied Health

Non-Health Professional

Please specify area/s of specialization, if any

4. How many years have you been involved in the medical curriculum?

5. What committees related to the medical curriculum are you currently a member of, or were you previously a member of?

6. If you teach medical students at your institution, what year group/s do you teach? (you may choose more than one option)

- First year
- Second year
- Third year
- Fourth year
- Fifth year
- Sixth year

7. Please indicate which curriculum structure best describes the one offered for medical students at your medical school (you may choose more than one option)

- Four-year course
- Five-year course
- Six-year course
- Integrated curriculum
- Separate preclinical and clinical curriculum

Other (please specify)

Medical School Pain Curriculum Questionnaire (MPCQ)

* 8. Undergraduate medical students should be exposed to a formal pain medicine curriculum in my medical school (NB: formal curriculum means that there are clearly specified learning objectives that are taught via specified learning activities, and assessed).

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 9. Overall, the current pain medicine curriculum in my medical school's program is adequate in terms of preparing interns to manage patients with pain in their clinical practice.

Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 10. The pain medicine curriculum in my medical school is adequately resourced in terms of teaching staff with expertise or a special interest in pain management (medical and/or non-medical).

Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 11. The pain medicine curriculum in my medical school is adequately resourced in terms of teaching staff having access to current, relevant teaching and learning resources.

Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Medical School Pain Curriculum Questionnaire (MPCQ)

* 12. The pain medicine curriculum in my medical school adequately assesses students' competency in pain medicine.

Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 13. I am confident that the current pain medicine curriculum at my medical school is preparing interns to:

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
Use appropriate tools for measuring pain.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand the biopsychosocial model of pain management.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prescribe appropriate analgesic medication for individual patients in pain.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work with other health professionals in managing patients with pain.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Practice pain medicine according to ethical principles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 14. I would like to see changes made to the way pain medicine is taught at my medical school

Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Medical School Pain Curriculum Questionnaire (MPCQ)

* 15. Which department/s do you feel are best placed to teach pain medicine to medical students?

16. What can you recommend from your school of medicine's approach to teaching pain medicine that might be useful for other Universities to utilize?

17. What barriers have you experienced in regards to the provision of student learning opportunities for pain medicine?

* 18. Ideally, whose responsibility do you feel it should be to ensure that pain medicine content is included in the medical curriculum? (you may indicate more than one group)

- AHPRA
- Medical Council
- University medical curriculum committee
- Individual departments
- Individual lecturers

Other, please specify

19. Any other comments regarding pain management content in the medical curriculum?

Medical School Pain Curriculum Questionnaire (MPCQ)

Appendix 4: Medical Students Pain Attitudes and Knowledge Questionnaire

Medical Students Pain Attitudes and Knowledge Questionnaire

Instructions

This is a pain knowledge and attitudes SURVEY, NOT an examination

Please choose the BEST answer from the four options in each question

IMPORTANT: Please DO NOT GUESS

If you DO NOT know the answer with certainty, please select option:

e. DO NOT KNOW

Although there is no time limit, we expect it will take approximately 20 minutes to complete this questionnaire

* 1. Pain is BEST described as

- Learned protective behaviour
- Nerve signal following injury
- Reflex defensive response
- Sensory and emotional experience
- Do not know

* 2. Which of the following is NOT a characteristic of chronic pain?

- Increased pain sensitization
- Protects patient from injury
- Psychosocial disability
- Social stigmatization
- Do not know

* 3. An example of a nociceptive pain condition is

- Dysmenorrhoea
- Fibromyalgia
- Phantom limb pain
- Shingles pain
- Do not know

* 4. Which of the following is a characteristic of visceral pain?

- Generated in deep muscles
- Minimal autonomic response
- Sharp, stabbing pain
- Referred pain
- Do not know

* 5. The percentage of the Australian and New Zealand population experiencing chronic pain is approximately?

- 5%
- 10%
- 20%
- 30%
- Do not know

* 6. Which of the following pairs of nerve fibres conduct noxious stimuli?

- A α and A β
- A β and C
- A γ and A β
- A δ and C
- Do not know

* 7. Nociceptive (pain) inhibition via descending spinal pathways is mediated by which of the following neurotransmitters?

- Acetylcholine
- Glutamate
- Noradrenaline
- Substance P
- Do not know

* 8. Central sensitization is BEST described by

- Amplification of nociceptive input in the spinal dorsal horn
- Ectopic discharges in the spinal dorsal root ganglion
- Opening up the 'pain gate' in the spinal cord
- Sympathetic nervous system activation by noxious stimuli
- Do not know

* 9. Local anaesthetics such as lidocaine act by blocking which receptor or channel?

- Acetylcholine receptor
- Calcium channel
- Opioid receptor
- Sodium channel
- Do not know

* 10. The risk of disability in a person with low back pain is MOST likely to be increased with

- Catastrophic thinking
- Early return to work
- Malingering
- Spinal degeneration on MRI
- Do not know

* 11. Which of the following is the most appropriate way to assess pain intensity in a 79-year-old man on the first day after a total knee replacement?

- Asking patient to score his pain as 'nil', 'mild', 'moderate', or 'severe'
- Observing the patient's pain behaviour
- Measuring his morphine use via a patient-controlled analgesia pump
- Using a faces pain scale
- Do not know

* 12. Pain caused by gently touching the skin of a patient with 'shingles' is called: -

- Allodynia
- Hyperalgesia
- Neuralgia
- Paraesthesia
- Do not know

* 13. A 30 year old man was admitted to the emergency department with renal colic. The most appropriate analgesic is an intravenous injection of

- Paracetamol
- Parecoxib
- Pethidine
- Tramadol
- Do not know

* 14. A patient visits your practice with a history of a dull headache each day for the past three years. Which aspect of their pain history is the MOST important?

- Analgesic medication use
- History of whiplash
- Migraine history
- Stress at work or home
- Do not know

* 15. The most important reason to order a spinal MRI in a 70-year-old man with *worsening* chronic low back pain is to

- Diagnose osteoporosis
- Identify the source of pain
- Reassure the patient
- Screen for spinal metastases
- Do not know

* 16. Which of the following is the MOST effective drug for post herpetic neuralgia?

- Amitriptyline
- Carbamazepine
- Celecoxib
- Oxycodone
- Do not know

* 17. Which of the following opioids has the LEAST risk of causing constipation?

- Codeine
- Morphine
- Oxycodone
- Tramadol
- Do not know

* 18. Prolonged use of high dose morphine may cause

- Hyperalgesia
- Hyperthermia
- Renal impairment
- Seizures
- Do not know

* 19. The MOST important feature of pharmacological dependence is

- Addictive behaviour
- Reduced drug effectiveness over time
- Repeated patient demands for dose escalation
- Withdrawal symptoms when a drug is ceased
- Do not know

* 20. The earliest reliable clinical indicator of impaired breathing due to opioids is

- Blue mucous membranes
- Increasing confusion
- Patient sedation
- Respiratory rate of ten per minute
- Do not know

* 21. The MOST appropriate analgesic for a 35-year-old bricklayer with three days of acute back pain is

- Celecoxib
- Diazepam
- Oxycodone
- Paracetamol-codeine
- Do not know

* 22. Which is the safest analgesic to use in a patient with chronic kidney impairment?

- Celecoxib
- Paracetamol
- Pethidine
- Tramadol
- Do not know

* 23. When prescribing a tricyclic anti-depressant for pain in an elderly patient, which of the following is the MOST appropriate advice to give?

- "Take the medication in the morning as it may cause insomnia"
- "This medication can cause addiction if you use it too long"
- "You will only need a small dose to give you pain relief"
- "You will need monthly blood tests to monitor your kidney function"
- Do not know

* 24. Compared to nonselective NSAIDs, COX-2 selective inhibitors such as celecoxib have

- Greater risk of renal failure
- Increased analgesic effectiveness
- Less adverse cardiovascular effects
- Lower risk of post-operative bleeding
- Do not know

* 25. A 23 year old patient is prescribed "7.5-15 mg SC morphine 1-hourly PRN" for pain relief after a laparotomy the day before. His last injection of morphine 15mg was 90 minutes ago. He is difficult to wake, but finally responds saying that his pain score is 9/10 and that he would like another morphine injection. You would

- Give 7.5 mg morphine by intramuscular injection for a more gradual onset of effect
- Give 10 mg of oral slow-release morphine for sustained pain relief
- Give 2 mg morphine for a shorter duration of effect
- Not give any morphine, despite his severe pain
- Do not know

* 26. A 40-year-old roof tiler with chronic non-specific low back pain states he is unable to return to work due to ongoing pain and stiffness. The most appropriate management is

- Clinical psychology and physical therapy
- Epidural steroid injection
- Spinal fusion surgery
- Workers' compensation pay out
- Do not know

* 27. Which of the following is the most effective therapy for reducing pain in fibromyalgia?

- Acupuncture
- Aerobic exercise
- Massage
- Transcutaneous electrical nerve stimulation (TENS)
- Do not know

* 28. The MOST appropriate analgesic following a tonsillectomy for a six-year-old child is

- Aspirin
- Codeine
- Dexamethasone
- Ibuprofen
- Do not know

* 29. Physical therapies that are effective for acute pain include all of the following EXCEPT

- Acupuncture for tension-type headache
- Post-operative local cooling
- Soft collars for acute neck pain
- Splints for joint sprains
- Do not know

- * 30. A 63- year-old man sees you with a three day history of low back pain after lifting a box at work. The MOST appropriate management is
- Bed rest
 - Diazepam
 - Hot packs
 - Spinal manipulation
 - Do not know
- * 31. An injured labourer who delays returning to work because he is constantly worried about re-injuring himself is demonstrating
- Factitious disorder
 - Fear-avoidance
 - Malingering
 - Somatization
 - Do not know
- * 32. Long-acting destructive nerve blocks with alcohol are MOST useful in the treatment of which type of pain?
- Pancreatic cancer pain
 - Chronic radicular leg pain
 - Shingles pain in V3 division
 - Chronic pelvic pain
- * 33. I feel anxious when I see a patient in distress due to their pain
- Strongly agree Agree Neutral Disagree Strongly disagree
- * 34. I rely on the patient's own estimate of their pain
- Strongly agree Agree Neutral Disagree Strongly disagree
- * 35. Patients suffering from chronic pain seldom receive adequate treatment in primary health care
- Strongly agree Agree Neutral Disagree Strongly disagree
- * 36. My cultural background could affect my ability to assess and treat pain
- Strongly agree Agree Neutral Disagree Strongly disagree

* 37. I feel confident about my ability to work together with other health professionals in the field of pain management

strongly agree agree neutral disagree strongly disagree

* 38. When I see consistently high scores on pain rating scales in the face of minimal or moderate pathology, I feel that this means that the patient is exaggerating their pain

Strongly agree Agree Neutral Disagree Strongly disagree

* 39. All persons living in Australia have equal access to pain management

Strongly agree Agree Neutral Disagree Strongly disagree

* 40. Chronic pain is a disease in its own right rather than just a symptom of a disease

Strongly agree Agree Neutral Disagree Strongly disagree

* 41. Relieving pain is given a high priority in my medical training

Strongly agree Agree Neutral Disagree Strongly disagree

Comment

Appendix 5: Classification of MPAKQ questions and attitude statements

Table A1. Classification of 32 questions in terms of pain topics addressed.

Heading	n	%	Question number
Acute pain	8	25	Q11, Q13, Q20, Q21, Q25, Q28, Q29, Q30
Chronic pain	11	34	Q2, Q5, Q8, Q14, Q15, Q16, Q18, Q23, Q26, Q27, Q31
Cancer pain question	1	3	Q32
General questions	12	38	Q1, Q3, Q4, Q6, Q7, Q9, Q10, Q12, Q17, Q22, Q23, Q24
Knowledge recall	9	28	Q1, Q2, Q5, Q6, Q7, Q8, Q9, Q12, Q18
Higher order thinking processes	23	72	Q3, Q4, Q10, Q11, Q13, Q14, Q15, Q16, Q17, Q19, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q27, Q28, Q29, Q30, Q31, Q32.
Paediatric pain	1	3	Q28
Geriatric pain	2	6	Q15, Q23
Fibromyalgia	1	3	Q27
Visceral pain	1	3	Q4,
Headache	2	6	Q14, Q29
Multidimensional nature and management of pain	8	25	Q1, Q2, Q5, Q10, Q14, Q26, Q30, Q31
Basic science (neurophysiology and neuroanatomy; pharmacology and psychology of pain)	4	13	Q6, Q7, Q8, Q9
Assessment	6	19	Q3, Q4, Q11, Q12, Q14, Q15
Clinical pain management -medical	13	41	Q13, Q16, Q17, Q18, Q19, Q20, Q21, Q22, Q23, Q24, Q25, Q28, Q32
Clinical pain management non-medical	4	13	Q26, Q27, Q29, Q30

Note. Totals do not add up to 100% as some questions were classified into more than one heading.

Table A2. Classification of 9 attitude statements in terms of pain topics addressed.

Heading	n	%	Statement number
Chronic pain	2	22	Q33C, Q33H
General questions	7	78	Q33A, Q33B, Q33D, Q33E, Q33F, Q33G, Q33I
Recognize importance of pain medicine	4	44	Q33C, Q33G, Q33H, Q33I
Ethical issues	2	22	Q33A, Q33D
Assessment	1	11	Q33B, Q33F
Clinical pain management	4	44	Q33A, Q33D, Q33E, Q33F

Note. Totals do not add up to 100% as some statements were classified into more than one heading.

Table A3. Classification of 41 questions and attitude statements according to IASP Curriculum.

IASP curriculum objective	n	%	Question number
Recognize pain medicine as a necessary field in clinical practice for acute and persistent (chronic) pain conditions	5	12	Q5, Q33C, Q33G, Q33H, Q33I
Understand basic sciences of pain processing components such as anatomy, physiology, neurobiology and pharmacology	4	10	Q6, Q7, Q8, Q9
Identify clinical presentation of acute and persistent pain syndromes or conditions	8	20	Q3, Q4, Q11, Q12, Q14, Q15, Q33B, Q33F
Recognize the multidimensional aspects of the pain experience and its related management	6	14	Q1, Q2, Q10, Q26, Q30, Q31
Understand analgesic options appropriate for individual patients according to medical condition, drug availability, risk-benefit balance, cost-effectiveness, culture, mental status and evidence of efficacy	13	32	Q13, Q16, Q17, Q18, Q19, Q20, Q21, Q22, Q23, Q24, Q25, Q28, Q32
Learn effective interaction with multi-professional teams involved in practicing pain medicine	3	7	Q27, Q29, Q33E
Practice pain medicine according to ethical principles	2	5	Q33A, Q33D

Appendix 6: Medical Students Pain Attitudes and Knowledge Questionnaire (MPAKQ) answers

Q1. Pain Is BEST described as (d) Sensory and emotional experience

Pain is a multidimensional “sensory and emotional experience associated with actual or potential tissue damage”.^{31, 485}

Q2. Which of the following is NOT a characteristic of chronic pain? (b) Protects patient from injury

Acute Pain is essential for survival, directing the person’s immediate attention to a threatening situation, promoting reflexive withdrawal or active defence, instigating actions (or inaction) to prevent further damage and thereby facilitate healing.⁵⁷ Chronic pain can result in secondary symptoms such as depression and anxiety; social stigmatization and in marked decrease of quality of life.^{57, 486} Chronic pain is associated with chemical, functional and anatomical changes throughout the nervous system resulting in hypersensitivity to peripheral stimuli.^{487-489 490-493}

Q3. An example of a nociceptive pain condition is (a) Dysmenorrhoea

The contraction of the ischemic uterus is the likely cause of dysmenorrhea pain.⁴⁹⁴ and can be classified as nociceptive pain. Post herpetic neuralgia and phantom limb pain are types of neuropathic pain.⁴⁹⁵ The fibromyalgia syndrome is likely to involve dysregulation of central pain processing which is not a type of nociceptive pain.⁴⁹⁶⁻⁴⁹⁸

Q4. Which of the following is often a characteristic of visceral pain? (d) Referred pain

‘True visceral pain’ arises as a diffuse and poorly defined sensation usually perceived in the midline of the body, at the lower sternum or upper abdomen.⁴⁹⁹ In patients, pain from different visceral organs can have differing areas of presentation, e.g. bladder to perineal area, heart to left arm and neck, left ureter to left lower quadrant and loin. This diffuse nature and difficulty in locating visceral pain is due to a low density of visceral sensory innervation and extensive divergence of visceral input within the CNS.⁴⁹⁹ Visceral pain is often associated with marked autonomic phenomena, including pallor, profuse sweating, nausea, gastrointestinal disturbances and changes in body temperature, blood pressure and heart rate.⁴⁹⁹ Spatial discrimination of visceral pain is thus typically referred to superficial structures to produce secondary hyperalgesia of superficial or deep body wall tissues due to viscerosomatic convergence.⁴⁹⁹

Q5. The percentage of the Australian and New Zealand population experiencing chronic pain is approximately? (c) 20%

Prevalence of chronic pain in Australia and New Zealand is 16-20%.^{110, 500}

Q6. Which of the following pairs of nerve fibres conduct noxious stimuli? (d) Aδ and C

There are predominantly two types of nociceptors involved in the pain pathway, namely, C fibres and A-delta fibres.⁴⁹²

Q7. *Nociceptive (pain) inhibition via descending spinal pathways is mediated by which of the following neurotransmitters? (c) Noradrenaline*

Cerebral mechanisms for descending pain control involves serotonin, noradrenaline, gamma-amino butyric acid, enkephalins, and dopamine.⁵⁰¹

Q8. *Central sensitization is BEST described by (a) Amplification of nociceptive input in the spinal dorsal horn*

The phenomenon of central sensitization is characterised by nociceptor inputs triggering a prolonged but reversible increase in the excitability and synaptic efficacy of neurons in central nociceptive pathways.³⁹⁶ It does not predominantly involve the sympathetic nervous system nor noxious stimuli. Dorsal root ganglia are not part of the central nervous system. The gate-control theory of pain does not currently form the mainstay of understanding about central sensitisation.⁵⁰²

Q9. Local anaesthetics such as lidocaine act by blocking which receptor or channel? (d) Sodium channel

Lidocaine is a sodium channel blocker.³⁹²

Q10. *The risk of disability in a person with low back pain is MOST likely to be increased with (a) Catastrophic thinking*

Major disability in a person with chronic pain is more associated with catastrophic thinking than depression, and malingering.⁵⁰³⁻⁵⁰⁶ Pain catastrophizing is an important predictor of pain outcomes even after controlling for depression.⁵⁰⁴ Duration and intensity of pain are not accurate predictors of disability.^{402, 507, 508} MRI findings were not related to the degree of disability or the intensity of low back pain.⁵⁰⁹ Early return to work is recommended to decrease disability.⁵¹⁰

Q11. *Which of the following is the most appropriate way to assess pain intensity in a 79-year-old man on the first day after a total knee replacement? (a) Asking patient to score his pain as 'nil', 'mild', 'moderate', or 'severe'.*

The best pain measures involve self-reporting by the patient rather than observer estimation.¹¹ Observation of pain behaviour should be reserved only for situations when self-reporting cannot be used.¹¹ FACES scale is more appropriate for patients with communication difficulties and in children. Analgesics requirements (such as patient-controlled opioid doses delivered) are commonly used as a measure of pain experienced but can be influenced by a variety of factors.⁴³⁴

Q12. *Pain caused by gently touching the skin of a patient with 'shingles' is called (a) Allodynia*

Allodynia is defined as pain produced by normally non-painful stimulation.^{2, 20} Hyperalgesia is an exaggerated response to normally painful stimulation and usually refers to an abnormally low pain threshold.²⁰ Neuralgia refers to pain taking place in the area of one or more nerves.²⁰ Paraesthesia refers to non-painful, spontaneous sensory phenomena such as "pins and needles" sensation or tingling.⁵¹¹

Q13. A 30 year old man was admitted to the emergency department with renal colic. The most appropriate analgesic is an intravenous injection of (b) Paracoxib

In kidney stone-related acute pain episodes in patients with adequate renal function, treatment with nonsteroidal anti-inflammatory drugs offers effective and most sustained pain relief, with fewer side effects, when compared with opioids or paracetamol.⁵¹² Renal colic data on the efficacy, safety, opioid-sparing effects, and cost-benefit analyses of IV acetaminophen for renal colic were weak.⁵¹³ Based on the available data, IV acetaminophen should not be considered as an alternative to opioids or nonsteroidal anti-inflammatory drugs for the primary management of renal colic in the ED.⁵¹³ Given the high rate of vomiting associated with the use of opioids, particularly pethidine, and the greater likelihood of requiring further analgesia, we recommend that if an opioid is to be used it should not be pethidine.⁵¹⁴ There is a belief that pethidine causes less smooth muscle spasm, however, it has been shown that there is no difference in analgesia when IV morphine and pethidine were compared in the treatment of renal colic.⁵¹⁵ Buscopan did not improve analgesia when combined with an NSAID, opioid and metamizole.^{514, 516, 517}

Q14. A patient visits your practice with a history of a dull headache each day for the past three years. Which aspect of their pain history is the MOST important? (a) Analgesic medication use.

The personal impact of medication overuse headache has been shown to be greater than that of migraine or tension-type headache in several European countries.⁵¹⁸ Compared with those who have migraine or tension-type headache, people with medication overuse headache are more likely to report adverse effects of headache on education, career, earnings, social acceptance, and feeling of control over their headaches.⁵¹⁸ Those with medication overuse headache also report more lost days for productive work, housework, and social activities.⁵¹⁹ Medication overuse headache is among the most costly of neurologic diseases⁵²⁰ and is the most costly among headache disorders.⁵²¹

Q15. The most important reason to order a spinal MRI in a 70-year-old man with worsening chronic low back pain is to (d) Screen for spinal metastases

Spinal MRI in a patient with chronic low back pain is useful to screen for metastases, but is less useful to diagnose the pain, minimise litigation, plan for spinal surgery.^{522, 523} MRI findings were not related to the degree of disability or the intensity of low back pain.⁵⁰⁹ Imaging findings of spine degeneration are present in high proportions of asymptomatic individuals, increasing with age. Many imaging-based degenerative features are likely part of normal aging and unassociated with pain.⁵²³ Routine imaging was not associated with psychological benefits, despite some clinicians' perceptions that it might help alleviate patient fear and worry about back pain.⁵²⁴

Q16. Which of the following is the MOST effective drug for post herpetic neuralgia? (a) Amitriptyline

The tricyclics have moderately strong evidence for efficacy when treating neuropathic pain.⁷⁷ Strong opioids (particularly oxycodone and morphine) have weak recommendations for use and are recommended as third-line.⁷⁷ SSRI antidepressants have inconclusive recommendations for their use in neuropathic pain.⁷⁷ Most studies using other antiepileptic drugs were negative, and carbamazepine had the poorest safety profile.⁷⁷ There are no randomised control trials with conventional non-opioid analgesics (NSAIDs, acetaminophen).⁷⁷

Q17. Which of the following opioids has the LEAST risk of causing constipation? (d) Tramadol

Tramadol has the least risk of constipation compared to Codeine, Morphine, Oxycodone and Fentanyl.⁵²⁵

Q18. Prolonged use of high dose morphine may cause (a) Hyperalgesia

Long-term use of opioids results in constipation, tolerance, endocrinopathies, sleep disorders, cognitive effects, respiratory depression, hyperalgesia, overdose and addiction.^{526, 527} Opioids can lead to bradycardia and vasodilation, and as a result can rarely lead to oedema, hypotension, orthostatic hypotension, and syncope when used at analgesic doses.⁵²⁸

Q19. The MOST important feature of pharmacological dependence is (d) Withdrawal symptoms when a drug is ceased

Pharmacological dependence is the manifestation of compensatory adaptations in the brain regions that control somatic functions, resulting in central neurological arousal and sleeplessness, irritability, diarrhoea, rhinorrhoea and psychomotor agitation when the opioid is withdrawn.⁵²⁹ This might result in the patient requesting a dose escalation but does not describe the most important characteristic of pharmacological dependence.

Q20. The earliest reliable clinical indicator of impaired breathing due to opioids is (c) Patient sedation

The earliest sign of an impending opioid overdose is sedation, which usually precedes respiratory depression.^{525, 530} Oxygen saturation levels are not accurate indicators of opioid overdose.^{525, 530}

Q21. The MOST appropriate analgesic for a 35-year-old bricklayer with three days of acute back pain is (a) Celecoxib

International clinical guidelines for the management of acute low back pain previously recommended analgesic medications such as paracetamol as the first option and nonsteroidal and anti-inflammatory preparations as the second option.^{525, 531, 532} However, a recent Cochrane review stated that paracetamol does not produce better outcomes than placebo for people with acute low back pain.⁵³³ For acute low back pain, evidence suggests that NSAIDs are associated with short-term reduction of pain and improved function.⁷⁴ Nonselective NSAIDs and COX-2 selective inhibitors are effective analgesics of similar efficacy for acute pain.⁵²⁵ There is no evidence for the use of opioid therapy for acute low back pain.⁷⁴

Misuse and/or dependence upon non-prescription combination analgesics containing codeine can result in serious physiological and psychological harms.⁴²¹ Codeine is converted into morphine and people can easily get addicted to it.⁴²² Paracetamol–codeine combinations have been linked with hepatotoxicity.⁴²⁴ Codeine-related mortality has increased in a number of countries.⁴²³ Benzodiazepines and opioids are less effective than NSAIDs for low back pain.⁵³⁴ Recent evidence was insufficient to determine effectiveness of benzodiazepines, or opioids versus placebo in patients with acute or subacute low back pain.⁵³⁵

*Q22. Which is the safest analgesic to use in a patient with chronic kidney impairment?
(b) Paracetamol*

Paracetamol is the safest analgesic in renal impairment compared to NSAIDs, Pethidine, and Tramadol.⁵²⁵

Q23. When prescribing a tricyclic anti-depressant for pain in an elderly patient, which of the following is the MOST appropriate advice to give? (c) “You will only need a small dose to give you pain relief”

Analgesic dose of antidepressants is lower than antidepressant dose.⁵²⁵ Tricyclics are usually taken in the evening due to their sedative effect.⁴⁹²

Q24. Compared to nonselective NSAIDs, COX-2 selective inhibitors such as celecoxib have (d) Lower risk of post-operative bleeding

COX-2 selective inhibitors do not impair platelet function; this leads to perioperative blood loss being reduced in comparison with nonselective NSAIDs⁵²⁵, COX-2 selective inhibitors and nonselective NSAIDs are associated with similar rates of adverse cardiovascular effects⁵²⁵, non-selective NSAIDs and COX-2 selective inhibitors are effective analgesics of similar efficacy for acute pain⁵²⁵, COX-2 selective inhibitors and nonselective NSAIDs have similar adverse effects on renal function.⁵²⁵

Q25. A 23 year old patient is prescribed “7.5-15 mg SC morphine 1-hourly PRN” for pain relief after a laparotomy the day before. His last injection of morphine 15mg was 90 minutes ago. He is difficult to wake, but finally responds saying that his pain score is 9/10 and that he would like another morphine injection. You would (d) Not give any morphine, despite his severe pain

A patient showing signs of sedation should not be given any further opioids. If he still indicates high levels of pain he would need to be given an alternative such as ketamine.¹¹

Q26. A 40-year-old roof tiler with chronic non-specific low back pain states he is unable to return to work due to ongoing pain and stiffness. The most appropriate management is (a) Clinical psychology and physical therapy

Multidisciplinary biopsychosocial rehabilitation interventions were more effective than usual care (moderate quality evidence), surgery and physical treatments (low quality evidence) in decreasing pain and disability in people with complex chronic pain.^{525, 536, 537} Multidisciplinary pain management may prevent unnecessary surgery.⁵³²

Q27. Which of the following is the most effective therapy for reducing pain in fibromyalgia? (a) Exercise

The American Pain Society, Canadian Pain Society, and Association of the Scientific Medical Societies assigned the highest ranking of recommendation to aerobic exercise, cognitive-behavioural therapy, amitriptyline, and multicomponent treatment.⁵³⁸ In contrast, the most recent EULAR guidelines assign the highest level of recommendation to exercise, Education, cognitive behavioural therapy and exercise has strong (level1A) evidence for efficacy in fibromyalgia.⁵³⁹ There is moderate evidence of important benefit of aerobic-only exercise in fibromyalgia on physical function and possibly on tender points and pain.⁵⁴⁰ Aerobic-only training has beneficial effects on physical function and some fibromyalgia symptoms. Strength-only training may improve fibromyalgia symptoms.⁵⁴¹ There have been studies showing positive results of diverse exercise interventions on pain, multidimensional function, and self-reported physical function.⁵⁴² There is low to moderate evidence in fairly large number of patients that walking exercise is useful for chronic musculoskeletal pain.⁵⁴³ There is only limited evidence to support spinal manipulation in fibromyalgia.⁵⁴⁴⁻⁵⁴⁶ A recent systematic review indicated that there is only low evidence for massage in fibromyalgia.⁵⁴⁷ A recent meta-analysis indicates that there is low quality evidence for the effectiveness of TENS on pain relief in patients with fibromyalgia.⁵⁴⁸

Q28. The MOST appropriate analgesic following a tonsillectomy for a six-year-old child is (d) Ibuprofen

Non-selective NSAIDs do not increase the risk of bleeding after tonsillectomy in children.⁵²⁵ Codeine should not be used in children, especially after adenoidectomy or tonsillectomy, due to its unpredictable effect of increased risk of opioid-induced ventilator impairment and death.⁵²⁵ The World Health Organization has removed codeine from the management approach to paediatric cancer pain.⁵²⁵ Aspirin should be avoided in children.⁵²⁵ Dexamethasone does not increase the overall risk of bleeding post tonsillectomy but increases the risk of reoperation for bleeding in children.⁵²⁵

Q29. Physical therapies that are effective for acute pain include all of the following EXCEPT (c) Soft collars for acute neck pain

Physical therapy in acute pain is least likely to include soft collars for acute neck pain.⁵²⁵ The other modalities have scientific based evidence.⁵²⁵

Q30 A 63- year-old man sees you with a three day history of low back pain after lifting a box at work. The MOST appropriate management is (c) Hot packs

Acute low back pain is best managed with advice to stay active and to continue working (despite having low back pain) and or return to work as soon as possible.^{525, 531} There is now broad consensus internationally that bed rest should be discouraged as a treatment for low back pain.⁵³¹ Given that most patients with acute or subacute low back pain improve over time regardless of treatment, clinicians and patients should select non-pharmacologic treatment with superficial heat (moderate-quality evidence), massage, acupuncture, or spinal manipulation (low-quality evidence for function, not pain). If pharmacologic treatment is desired, clinicians and patients should select nonsteroidal anti-inflammatory drugs or skeletal muscle relaxants (moderate-quality evidence). (Grade: strong recommendation).^{525, 531, 532, 535} There was also consensus that a supervised exercise programme (as distinct from encouraging resumption of normal activity) was not indicated for acute low back pain.^{531, 535} The use of spinal manipulation was considered contentious with some guidelines not recommending the treatment (Australia).⁵³¹

Q31. An injured labourer who delays returning to work because he is constantly worried about re-injuring himself is demonstrating (b) Fear-avoidance

Pain-related fear of movement resulting in altered physical behaviour is called fear-avoidance.⁵⁴⁹

Q32. Long-acting destructive nerve blocks with alcohol are MOST useful in the treatment of which type of pain? (a) Pancreatic cancer pain

Long-active destructive nerve blocks would be used infrequently in chronic radicular pain and V3 division pain. Chronic pelvic pain is not generally amenable to destructive nerve blocks.

Appendix 7: Pain medicine OSCE marking sheet

Page ID	Student ID
Pain 1 Pain1	<i>Affix Student Barcode Sticker here</i>

Legend (Performance Rating Scale)											
SD	Serious Deficiency	BE	Below Expectation	BL	Borderline	AtE	At Expectation	AbE	Above Expectation	OUT	Outstanding

**Please shade the appropriate checklist and performance rating bubble for item performed by student. Leave bubble blank if item not performed, performed in unacceptable manner, not answered or answered incorrectly.*

2018 MEDI6400 Formative OSCE (Pain Medicine) Marking Sheets										
Examiner's Name:				<i>Affix Examiner Barcode Sticker here</i>						
Marking Protocols				Checklist	Performance Rating					
				*Yes	SD	BE	BL	AtE	AbE	OUT
The student is required to take a pain-focussed history from an 80 year old female, Grace, who presents with severe pain over the right supraorbital area. If the student has not finished at EIGHT minutes, STOP them and ask the student the two questions.										
1. Description of pain										
a. Onset - <i>developed over a few days, associated with rash, no injury</i>	<input checked="" type="checkbox"/>									
b. Duration - <i>three months</i>	<input checked="" type="checkbox"/>									
c. Progression- <i>slightly better</i>	<input checked="" type="checkbox"/>									
d. Frequency- <i>constant with flare-ups</i>	<input checked="" type="checkbox"/>									
e. Location- <i>supraorbital</i>	<input checked="" type="checkbox"/>									
f. Radiation- <i>right mandible, trigeminal dermatome</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
g. Quality- <i>itchy, pins and needles, burning, stabbing</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
h. Quality- <i>allodynia (or sensitivity to touch)</i>	<input checked="" type="checkbox"/>									
i. Intensity- <i>2 to 8 out of 10 using a Verbal Rating Scale or similar</i>	<input checked="" type="checkbox"/>									
j. Aggravating factors – <i>touch, cold</i>	<input checked="" type="checkbox"/>									
k. Improving factors – <i>distraction</i>	<input checked="" type="checkbox"/>									
l. Associated symptoms – <i>numbness of the area above the right eyebrow, pins and needle sensation, no altered vision, photophobia, nausea, vomiting</i>	<input checked="" type="checkbox"/>									
2. Treatment history for this problem										
a. Currently taking Paracetamol 1000mg twice a day	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
b. Previously took Ibuprofen 200mg twice a day	<input checked="" type="checkbox"/>									
3. Coping methods										
a. Distraction- <i>watches TV</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
b. Limits activity	<input checked="" type="checkbox"/>									

Please turn over

Marking Protocols	Checklis	Performance Rating					
	*Yes	SD	BE	BL	AtE	AbE	OUT
4. Impact on activities/function							
a. Stopped going to play bridge or shopping	<input checked="" type="checkbox"/>						
b. Can't brush her hair on the right side	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
c. Has reduced her regular exercise	<input checked="" type="checkbox"/>						
5. Impact on self							
a. She is anxious that the pain may never be relieved	<input checked="" type="checkbox"/>						
b. She is frustrated and short-tempered	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
c. She has difficulty falling asleep and is tired during the day	<input checked="" type="checkbox"/>						
6. Past pain experiences							
<input checked="" type="checkbox"/> <i>She has no history of chronic pain, migraines or headache</i>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7. Past medical history							
a. Past medical history - <i>Hypertension</i>	<input checked="" type="checkbox"/>						
b. Past surgical history - <i>Nil</i>	<input checked="" type="checkbox"/>						
c. Other regular medication - <i>Antihypertensive</i>	<input checked="" type="checkbox"/>						
d. Over the counter medication - <i>Nil</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
e. Allergies - <i>Nil</i>	<input checked="" type="checkbox"/>						
f. She is <i>unable to tolerate codeine</i> (constipation) and <i>ibuprofen</i> (heartburn)	<input checked="" type="checkbox"/>						
g. She is a non-smoker	<input checked="" type="checkbox"/>						
h. Alcohol within recommended limit	<input checked="" type="checkbox"/>						
8. Social History							
a. She has good support at home	<input checked="" type="checkbox"/>						
b. She has no other psychosocial problems at home	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Process Skills							
9. Gathering Information							
a. Listens attentively, minimising interruption and leaving space for patient to respond	<input checked="" type="checkbox"/>						
b. Encourages patient to tell the story of the problem in her own words	<input checked="" type="checkbox"/>						
c. Uses open and closed questions, appropriately moving from open to closed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
d. Actively determines and explores patients beliefs, concerns and expectations	<input checked="" type="checkbox"/>						
e. Encourages patient to express feelings	<input checked="" type="checkbox"/>						

Page ID *Pain3* Pain3	Student ID <i>Affix Student Barcode Sticker here</i>
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Legend (Performance Rating Scale)											
SD	Serious Deficiency	BE	Below Expectation	BL	Borderline	AtE	At Expectation	AbE	Above Expectation	OUT	Outstanding

**Please shade the appropriate checklist and performance rating bubble for item performed by student. Leave bubble blank if item not performed, performed in unacceptable manner, not answered or answered incorrectly.*

Marking Protocols			Checklis	Performance Rating					
			*Yes	SD	BE	BL	AtE	AbE	OUT
10. Building the relationship									
a.	Demonstrates appropriate non-verbal behaviour e.g. eye contact, posture, position, movement, facial expression, use of voice		<input type="checkbox"/>						
b.	Acknowledged patient's views and concern; is respectful and non-judgemental		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c.	Uses empathy to communicate appreciation of the patient's concerns		<input type="checkbox"/>						
At EIGHT minutes, if necessary stop the student from neurological examination and ask the student to answer the following questions:									
11. Diagnosis									
Examiner to ask: "What is the most likely diagnosis for this patient?"									
Expected Answer: <i>"Post Herpetic Neuralgia"</i>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Treatment									
Examiner to ask: "What are three useful classes or types of medication used to manage this condition?"									
<i>N.B. Students are expected to state the name and class of medication to be deemed 'At Expectation' or above.</i>									
Expected Answers: <input type="checkbox"/> Antidepressant: <input type="checkbox"/> Anticonvulsant <input type="checkbox"/> Local anaesthetic <input type="checkbox"/> Counter-irritant: <input type="checkbox"/> Other opioid (Tramadol/Tapentadol)	a. 1 st medication	a. State the class	<input type="checkbox"/>						
		b. State the name	<input type="checkbox"/>						
	b. 2 nd medication	c. State the class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		d. State the name	<input type="checkbox"/>						
	d. 3 rd medication	e. State the class	<input type="checkbox"/>						
		f. State the name	<input type="checkbox"/>						

Please turn over

Global Score

The examiner’s judgment call on the quality of the integrative whole, i.e. the gestalt¹ that encapsulates knowledge, skills and attitudes, as demonstrated by the student in the clinical encounter

*Judgement appropriate for **final year undergraduate medical students, i.e. readiness for internship***

This global score will be used for standard setting to help determine the pass mark for this station

Clearly NOT MET Expected Standard			Not quite sure if the expected standard has been Met	Clearly MET Expected Standard		
Dangerous	Poor	Below Expectation	Borderline	Average	Good	Outstanding
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Justification for score if THREE (3) or LESS:

Note for Examiner (Patient Rating):**

When the student leaves the room, please ask the patient the following question and shade the checklist bubble accordingly for the patient’s response:

“WOULD YOU WANT TO SEE THIS DOCTOR AGAIN?”

No	Yes, wouldn’t mind	Would actively seek the student out
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

****Patient rating will not be included as part of the station total score.**

¹ **Gestalt:** An organized whole that is perceived as more than the sum of its parts (Oxford Dictionary)

Appendix 8: Interview guide used in Phase 3 qualitative stakeholder interviews

1. Can you briefly tell me about your role as a health practitioner? Is pain management part of your job description?
2. What experience do you have observing or interacting with interns in relation to their care of patients?
3. What responsibilities do the interns that you encounter have in terms of providing acute pain management for patients?
4. What responsibilities do interns that you encounter have in terms of providing chronic pain management for patients?
5. In terms of describing interns' competence in caring for patients with pain:-
 - a. Have you observed them using specific tools such as a pain scale to measure the intensity of the pain? If so, which ones? If you have not observed them using tools, how would they estimate a patient's level of pain intensity?
 - b. Have you observed them using specific pain assessment tools (such as the SOCRATES pain assessment tool) or questions regarding allodynia, hyperalgesia, loss of sensation, temperature of the painful area, pins and needles in the area when taking a history from a patient with acute or chronic pain? If so, what specific tools or questions do they ask? If you have not observed them using these pain assessment tools, why do you think this is the case?
 - c. Have you observed them including questions regarding loss of function related to the pain when taking a history from a patient with acute or chronic pain? If so, is this routinely done? If you have not observed them including loss of function questions, why do you think this is the case?
 - d. Have you observed them taking into consideration the psychosocial dimensions of a person's pain experience (these would include asking the patient about anxiety, mood, sleep, stress, work and social factors)? If so, can you state which aspects of the psychosocial presentation were considered? If not, why do you think this is the case?
 - e. Have you observed interns including physical strategies in their pain management plans, such as exercise, elevation, cold? If so, how would you describe their competence in this regards? If not, why do you think this is the case?
 - f. Have you observed interns including psychological strategies in their pain management plans, such as meditation, relaxation therapy or music therapy? If so, how would you describe their competence in this regards? If not, why do you think this is the case?
 - g. Do you feel that interns prescribe opioid analgesics in a safe and appropriate manner for patients during their stay in hospital and for discharge? What evidence do you see of this?
 - h. For patients with neuropathic pain, do you see evidence of interns including adjuvant analgesics (such as Gabapentin/Pregabalin or

- Amitriptyline) in the analgesia scheme they prescribe? If yes, how often do you see this occurring? If no, why do you think this is so?
- i. Have you observed interns collaborating with other health professionals in managing a patient with acute/chronic pain? If yes, can you describe what you observed and how frequently you see this occurring in clinical practice? If no, why do you think this is so?
 - j. How would you describe the interns' general ability to show empathy towards a patient suffering with pain?
6. Do you feel that interns start the year with adequate pain medicine knowledge and skills considering the level of care they are required to provide? If yes, in what areas do they have adequate knowledge and skills? If no, what areas of knowledge and skills do you think are lacking?
 7. Can you give any examples of where you have seen interns providing excellent pain management?
 8. Can you give any examples where an intern's pain management approach was inadequate?

Considering that we now know from the research that chronic pain is the leading cause of disability in Australia and New Zealand superseding cardiac disease and diabetes, secondly, that the current pain medicine curriculum at medical schools in New Zealand and Australia appears to be limited and ill-defined, and thirdly, that there are significant gaps in medical students' knowledge, attitudes and skills in the area of pain medicine, I would like to ask you these further questions:

9. What are your thoughts on those findings? (I.e. are you surprised, does it match your experience, agree/disagree).
10. In your opinion, who is responsible for ensuring that interns are taught about pain management? (for instance, is it the medical school's responsibility or the hospital's responsibility)
11. What sorts of things can be done at medical school to better prepare interns in managing patients with pain? (E.g. change of curriculum, practical exposure, and interprofessional education).
12. How should pain medicine be included in the medical curriculum? Should it be a subject in its own right, or is it okay if it's integrated into other subjects (e.g., anaesthesia)?
13. What year should it be taught? How much time should be allocated? What are some barriers to the implementation of pain medicine education at medical schools?
14. How might these barriers be overcome (i.e., what would facilitate and enable the implementation of pain medicine in the medical curriculum?)
15. Can you suggest what needs to be done for pain medicine to be better regarded and taught in medical curricula across Australia and NZ?
16. What can be done to ensure the public's confidence that the doctors graduating from medical school will have the appropriate pain medicine knowledge and skills to assist people in pain? Any further comments?

Appendix 9: Codebook used during in Phase 3 data analysis

Nodes

Name	Description
1.Gaps in the current medical school curriculum with regard to pain medicine education	
Assessment or examination	Summative or Formative assessment, OSCE, examinations of student's competencies
Curriculum organisation and structure	Specific pain medicine curriculum organisation and structure currently in medical schools or recommended by participants
General adequacy	Comments about the adequacy of the medical curriculum in general in terms of pain medicine education
Ideas for improvement	Ideas for improvement of the curriculum
Responsibility	Who should be responsible for teaching pain medicine to interns
Teachers	Pain medicine knowledge and skills of teachers at the university
Senior staff	Teaching from senior clinical staff in hospital
Teaching methods	Teaching methods used to facilitate learning with regard to pain medicine within the medical course
Teaching method- Clinical exposure	Clinical exposure in the workplace to teach pain medicine
Teaching methods - clinical problem solving	Using clinical cases to teach pain medicine to medical students
Teaching methods other	Other suggested teaching methods for pain medicine
Topics	Specific topics to be covered
Value	The value placed on pain medicine curriculum by university and students
2.Mismatch between interns' competency and their pain medicine responsibilities	Competencies of interns for expected responsibility in the clinical setting
Interns' clinical responsibilities regarding pain management	These are the roles/duties/ responsibilities of interns focussed on pain management

Name	Description
Acute Pain	These are the roles/duties/ responsibilities of interns focussed on acute pain
Chronic Pain	These are the roles/duties/ responsibilities of interns focussed on chronic pain
Palliative Care	These are the roles/duties/ responsibilities of interns focussed on palliative pain
Pain Medicine Attitude	The intern shows an interest in pain medicine, sees it as important, shows empathy to the patients, is interested in learning about pain, and focusses on the pain needs of a patient.
Empathy	Does the intern show empathy to the patient
Pain Medicine Skills and Knowledge	The clinical skills and knowledge of interns related to pain medicine
Assessment	Intern competency with regard to a structured, specific pain assessment including measurement and recording of pain intensity, as well as impact of pain on function and psychological status
Measuring Pain Intensity	The use of scales of tools related to measuring pain intensity
Psychosocial approach to assessment	Inclusion of questions regarding physical and psychological function with relation to pain.
Specific pain assessment	Specific pain-focussed assessment including terms such as allodynia, hyperalgesia, numbness, pins and needles
Collaborate with team	Does the intern engage other health practitioners to assist with the pain management
Diagnosis	The ability of interns to differentiate between acute and chronic pain or neuropathic vs nociceptive pain
Discharges	Interns involvement with patients' discharge process from hospital
General Pain	General approach of interns to pain management
Management	Strategies used by interns to manage pain
Non-medical strategies	The ability of the intern to incorporate physical and psychological strategies to manage pain
Prescribing anti-neuropathic medication	Did the intern show that they were capable and safe when prescribing targeted neuropathic pain medication

Name	Description
Prescribing opioids	Did the intern show that they were capable and safe when prescribing opioids
3.Impact of interns' inadequate pain medicine competencies	
Hospital system	Impact of lack of pain medicine competency on the Hospital system
Intern	Impact of lack of pain medicine competency on the Intern
Anxiety	Does the intern show anxiety when faced with a patient in pain
Avoidance	Intern avoid patients in pain
How do interns learn to manage	What support is there for interns and who do they learn from
Pain Management resources	Resources within the hospital or community to manage both acute and chronic pain
Pain Management in the community	Impact of lack of pain medicine competency on specialist pain management community clinics
Pain Management within the hospital	Lack of pain medicine competency on the Acute Pain Service in the hospital
Patient and wider community	The impact of the lack of pain medicine competency on the patient and wider community
Community health system	Impact of lack of pain medicine competency on the Community Health system

Appendix 10: Phase 3 Code frequency table

Nodes		Search Project	
Name	Files	References	
General adequacy		14	57
Ideas for improvement		15	66
Responsibility		12	18
Teachers		11	24
Teaching methods		15	44
Topics		13	52
Value		13	28
2. Mismatch between interns' competency and their pain medicine responsibilities		15	478
Interns' clinical responsibilities regarding pain management		15	50
Acute Pain		15	27
Chronic Pain		13	19
Palliative Care		4	4
Pain Medicine Attitude		14	25
Empathy		14	25
Pain Medicine Skills and Knowledge		15	403
Assessment		15	108
Collaborate with team		14	48
Diagnosis		9	15
Discharges		15	62
General Pain		14	41
Management		15	129
Non-medical strategies		14	59
Prescribing anti-neuropathic medication		15	26
Prescribing opioids		15	44
3. Impact of gaps in interns' pain medicine competencies		15	195
Hospital system		8	16
Intern		15	116
Pain Management resources		5	6
Patient and wider community		12	38

Appendix 11: Ethics approval



THE UNIVERSITY OF
NOTRE DAME
AUSTRALIA



CELEBRATING
25 YEARS
1989-2014

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29 August 2016

Professor Eric Visser & Mrs Elspeth Shipton
School of Medicine
The University of Notre Dame Australia
Fremantle Campus

Dear Eric and Elspeth,

Reference Number: 016134F

Project Title: "An examination of pain education, knowledge and attitudes of medical students in Australia and New Zealand."

Your response to the conditions imposed by a sub-committee of the university's Human Research Ethics Committee, has been reviewed and assessed as meeting all the requirements as outlined in the *National Statement on Ethical Conduct in Human Research* (2014). I am pleased to advise that ethical clearance has been granted for this proposed study.

Other UNDA students and researchers identified as working on this project are:

Name	School/Centre	Role
Prof Carole Stekettee	School of Medicine	Co-Supervisor
A/Prof Raymond Garrick	School of Medicine, Sydney	Co-Supervisor
A/Prof Frank Bate	School of Medicine	Co-Supervisor

All research projects are approved subject to standard conditions of approval. Please read the attached document for details of these conditions.

On behalf of the Human Research Ethics Committee, I wish you well with your study.

Yours sincerely,

Dr Natalie Giles
Research Ethics Officer
Research Office

cc: Dr Raoul Oehmen, Acting SRC Chair, School of Medicine

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Appendix 12: Medical Students Pain Attitudes and Knowledge Questionnaire: Individual question analysis

Table A4. Individual question analysis.

Question number and description	Answer options	Frequency	Percent (*indicates correct response)
1. Pain is BEST described as	Learned protective behaviour	4	1.1
	Nerve signal following injury	21	6.0
	Reflex defensive response	10	2.8
	Sensory and emotional experience	316	90.0 ^{*a}
	Do not know	0	0
2. Which of the following is NOT a characteristic of chronic pain?	Increased pain sensitization	14	4.0
	Protects patient from injury	320	91.2 ^{*a}
	Psychosocial disability	5	1.4
	Social stigmatization	8	2.3
	Do not know	4	1.1
3. An example of a nociceptive pain condition is	Dysmenorrhoea	198	56.4 [*]
	Fibromyalgia	15	4.3
	Phantom limb pain	18	5.1
	Post herpetic neuralgia	74	21.1
	Do not know	46	13.1
4. Which of the following is often a characteristic of visceral pain?	Generated in deep muscles	38	10.8
	Minimal autonomic response	15	4.3
	Sharp, stabbing pain	27	7.7
	Referred pain	257	73.2 ^{*a}
	Do not know	14	4.0
5. The percentage of the Australian and New Zealand population experiencing chronic pain is approximately?	5%	12	3.4
	10%	83	23.6
	20%	75	21.4 ^{*b}
	30%	35	10.0
	Do not know	146	41.6
6. Which of the following pairs of nerve fibres conduct noxious stimuli?	A α and A β	11	3.1
	A δ and C	171	48.7 ^{*b}
	A β and C	10	2.8
	A γ and A β	16	4.6
	Do not know	143	40.7

7. Nociceptive (pain) inhibition via descending spinal pathways is mediated by which of the following neurotransmitters?	Acetylcholine	42	12.0
	Glutamate	57	16.2
	Noradrenaline	34	9.7 ^b
	Substance P	69	19.7
	Do not know	149	42.5
8. Central sensitization is BEST described by	Amplification of nociceptive input in the spinal dorsal horn	167	47.6 ^b
	Ectopic discharges in the spinal dorsal root ganglion	5	1.4
	Opening up the 'pain gate' in the spinal cord	43	12.3
	Sympathetic nervous symptom activation by noxious stimuli	10	2.8
	Do not know	126	35.9
9. Local anaesthetics such as lidocaine act by blocking which receptor or channel?	Acetylcholine receptor	27	7.7
	Calcium channel	16	4.6
	Opioid receptor	5	1.4
	Sodium channel	274	78.1 ^a
	Do not know	29	8.3
10. The risk of disability in a person with low back pain is MOST likely to be increased with	Catastrophic thinking	251	71.5 ^a
	Early return to work	12	3.4
	Malingering	19	5.4
	Spinal degeneration on MRI	41	11.7
	Do not know	28	8.0
11. Which of the following is the most appropriate way to assess pain intensity in a 50-year-old man on the first day after a total knee replacement ?	Asking patient to score his pain as 'nil', 'moderate', or 'severe'"	52	14.8 ^b
	Observing the patient's behaviour	89	25.4
	Measuring his morphine use via a patient-controlled analgesia pump	141	40.2
	Using a Faces Pain Scale	48	13.7
	Do not know	21	6.0
12. Pain caused by gently touching the skin of a patient with 'shingles' is called	Allodynia	156	44.4 ^b
	Hyperalgesia	110	31.3
	Neuralgia	77	21.9
	Paraesthesia	2	.6
	Do not know	6	1.7
13. A 30-year-old man is admitted to the emergency department with renal colic. The most appropriate analgesic is an intravenous injection of	Paracetamol	40	11.4
	Parecoxib	112	31.9 ^b
	Pethidine	76	21.7
	Tramadol	59	16.8
	Do not know	63	17.9

14. A patient visits your practice with a history of a dull headache each day for the past three years. Which aspect of their pain history is the MOST important?	Analgesic use	211	60.1*
	History of whiplash	6	1.7
	Migraine history	22	6.3
	Stress at home or work	85	24.2
	Do not know	27	7.7
15. The most important reason to order a spinal MRI in a 70-year-old man with worsening chronic low back pain is to	Diagnose osteoporosis	5	1.4
	Identify the source of pain	56	16.0
	Reassure the patient	4	1.1
	Screen for spinal metastases	270	76.9 ^a
	Do not know	15	4.3
16. Which of the following is the MOST effective drug for post herpetic neuralgia?	Amitriptyline	274	78.1 ^a
	Carbamazepine	43	12.3
	Celecoxib	3	.9
	Oxycodone	1	.3
	Do not know	30	8.5
17. Which of the following analgesics has the LEAST risk of causing constipation?	Codeine	12	3.4
	Morphine	2	.6
	Oxycodone	18	5.1
	Tramadol	253	72.1 ^a
	Do not know	66	18.8
18. Prolonged use of high dose morphine may cause	Hyperalgesia	152	43.3 ^b
	Hyperthermia	2	.6
	Renal impairment	79	22.5
	Seizures	8	2.3
	Do not know	109	31.1
19. The MOST important feature of pharmacological dependence is	Addictive behaviour	18	5.1
	Reduced drug effectiveness over time	95	27.1
	Repeated patient demands for dose escalation	17	4.8
	Withdrawal symptoms when a drug is ceased	199	56.7*
	Do not know	22	6.3
20. The earliest reliable clinical indicator of impaired breathing due to opioids is	Blue mucous membranes	2	.6
	Increasing confusion	35	10.0
	Patient sedation	170	48.4 ^b
	Respiratory rate of ten per minute	116	33.0
	Do not know	28	8.0
21. The MOST appropriate analgesic for a 35-year-old bricklayer with three days of acute back pain is	Celecoxib	145	41.3 ^b
	Diazepam	5	1.4
	Oxycodone	13	3.7
	Paracetamol-Codeine	168	47.9
	Do not know	20	5.7

22.Which is the safest analgesic to use in a patient with chronic kidney impairment?	Celecoxib	2	.6
	Paracetamol	282	80.3 ^a
	Pethidine	10	2.8
	Tramadol	12	3.4
	Do not know	45	12.8
23.When prescribing a tricyclic anti-depressant for pain in an elderly patient, which of the following is the MOST appropriate advice to give?	"Take the medication in the morning as it may cause insomnia"	58	16.5
	"This medication can cause addiction if you use it too long"	9	2.6
	"You will only need a small dose to give you pain relief"	125	35.6 ^b
	"You will need monthly blood tests to monitor your kidney function"	51	14.5
	Do not know	108	30.8
24.Compared to nonselective NSAIDs, COX-2 selective inhibitors such as celecoxib have	Greater risk of renal failure	16	4.6
	Increased analgesic effectiveness	16	4.6
	Less adverse cardiovascular effects	62	17.7
	Lower risk of post-operative bleeding	139	39.6 ^b
	Do not know	118	33.6
25.A 23-year-old patient is prescribed "7.5-15 mg SC morphine 1-hourly PRN" for pain relief after a laparotomy the day before. His last injection of morphine 15mg was 90 minutes ago. He is difficult to wake, but finally responds saying that his pain score is 9/10 and that he would like another morphine injection. You would	Give 7.5 mg morphine by intramuscular injection for a more gradual onset of effect	13	3.7
	Give 10 mg of oral slow-release morphine for sustained pain relief	52	14.8
	Give 2 mg morphine by IV injection for a shorter duration of effect	38	10.8
	Not give any morphine, despite his severe pain	146	41.6 ^b
	Do not know	102	29.1
26.A 40-year-old roof tiler with chronic non-specific low back pain states he is unable to return to work due to ongoing pain and stiffness. The most appropriate management is	Epidural steroid injection	9	2.6
	Physical therapy and clinical psychology	323	92.0 ^a
	Workers' compensation pay out	1	.3
	Do not know	18	5.1
27.Which of the following is the most effective therapy for improving fibromyalgia symptoms?	Exercise	191	54.4 [*]
	Massage	7	2.0
	Transcutaneous electrical nerve stimulation (TENS)	33	9.4
	Do not know	120	34.2
28.The MOST appropriate analgesic following a tonsillectomy for a six-year-old child is	Aspirin	2	.6
	Codeine	37	10.5
	Dexamethasone	20	5.7
	Ibuprofen	193	55.0 [*]
	Do not know	99	28.2

29. Physical therapies that are effective for acute pain include all of the following EXCEPT	Acupuncture for tension-type headache	56	16.0
	Post-operative local cooling	71	20.2
	Soft collars for acute neck pain	104	29.6 ^b
	Splints for joint sprains	14	4.0
	Do not know	105	29.9
30. A 63-year-old man sees you with a three day history of low back pain after lifting a box at work. The MOST appropriate management is	Bed rest	66	18.8
	Diazepam	12	3.4
	Hot packs	217	61.8 [*]
	Spinal manipulation	6	1.7
	Don't know	49	14.0
31. An injured labourer who delays returning to work because he is constantly worried about re-injuring himself is demonstrating	Factitious behaviour	2	.6
	Fear-avoidance	326	92.9 ^a
	Malingering	6	1.7
	Somatization	7	2.0
	Do not know	10	2.8
32. Long-acting destructive nerve blocks with alcohol are MOST useful in the treatment of which type of pain?	Chronic pelvic pain	4	1.1
	Chronic radicular leg pain	34	9.7
	Pancreatic cancer pain	37	10.5 ^b
	Shingles pain in V3 division	22	6.3
	Do not know	254	72.4
33a. I feel anxious when I see a patient in distress due to their pain.	Strongly agree/Agree	257	73.2
	Neutral	58	16.5
	Strongly disagree/Disagree	36	10.3
33b. I rely on the patient's own estimate of their pain	Strongly agree/Agree	235	67.0
	Neutral	83	23.6
	Strongly disagree/Disagree	31	8.8
	Missing	2	.6
33c. Patients suffering from chronic pain seldom receive adequate treatment in primary health care	Strongly agree/Agree	178	50.7
	Neutral	108	30.8
	Strongly disagree/Disagree	65	18.5
33d. My cultural background could affect my ability to assess and treat pain	Strongly agree/Agree	128	36.5
	Neutral	74	21.1
	Strongly disagree/Disagree	149	42.5
33e. I feel confident about my ability to work together with other health professionals in the field of pain management.	Strongly agree/Agree	231	65.8
	Neutral	83	23.6
	Strongly disagree/Disagree	36	10.3
	Missing	1	.3

33f. When I see consistently high scores on pain rating scales in the face of minimal or moderate pathology, I feel that this means that the patient is exaggerating their pain	Strongly agree/Agree	90	25.6
	Neutral	101	28.8
	Strongly disagree/Disagree	159	45.3
	Missing	1	.3
33g. All persons living in Australia or New Zealand have equal access to pain management	Strongly agree/Agree	38	10.8
	Neutral	35	10.0
	Strongly disagree/Disagree	276	78.6
	Missing	2	.6
33h. Chronic pain is a disease in its own right rather than just a symptom of a disease	Strongly agree/Agree	292	83.2
	Neutral	40	11.4
	Strongly disagree/Disagree	18	5.1
	Missing	1	.3
33i. Relieving pain is given a high priority in my medical training	Strongly agree/Agree	192	54.7
	Neutral	89	25.4
	Strongly disagree/Disagree	69	19.7
	Missing	1	.3

Note. *denotes correct answer; ^a denotes well answered; ^b denotes poorly answered.

Appendix 13: Mean Likert score for medical students and interns in two geographical areas

Table A5. Mean Likert score for medical students and interns in two geographical areas.

Question	Mean Likert score for individual groups	SD	Combined Mean Likert score (SD) N=83	Kruskal-Wallis Test significance	χ^2 (df, p)
Q33A	Group 1=2.640 Group 2=2.360 Group 3=2.636 Group 4=2.136	Group 1=.9950 Group 2=.7000 Group 3=.8090 Group 4=.7102	2.422 (.828)	P=.121	12.388 (9, .192)
Q33B	Group 1=2.360 Group 2=2.520 Group 3=2.818 Group 4=2.227	Group 1=.7000 Group 2=.8226 Group 3=.8739 Group 4=.6853	2.434 (.768)	P=.222	11.038 (12, .526)
Q33C	Group 1=2.480 Group 2=2.920 Group 3=2.727 Group 4=2.727	Group 1=1.1944 Group 2=.6403 Group 3=1.0090 Group 4=1.0771	2.711 (.994)	P=.348	20.840 (12, 0.53)
Q33D	Group 1=3.360 Group 2=3.000 Group 3=2.455 Group 4=3.136	Group 1=1.0755 Group 2=1.1547 Group 3=.8202 Group 4=1.2834	3.072 (1.145)	P=.183	11.817 (12, .460)
Q33E	Group 1=2.240 Group 2=2.400 Group 3=2.100 Group 4=2.273	Group 1=.5228 Group 2=.8660 Group 3=1.1005 Group 4=.8827	2.280(.806)	P=.610	17.020 (12,.149)
Q33F	Group 1=3.240 Group 2=2.840 Group 3=2.455 Group 4=3.091	Group 1=.9256 Group 2=.9434 Group 3=.9342 Group 4=.8679	2.976 (.937)	P=.084	13.011 (12,.368)
Q33G	Group 1=3.792 Group 2=3.520 Group 3=3.909 Group 4=4.318	Group 1=1.0206 Group 2=.7703 Group 3=1.2210 Group 4=.9455	3.866 (.991)	P=.008 (difference between interns in Australia and medical students in New Zealand)	25.305 (12, .013)
Q33H	Group 1=2.160 Group 2=2.040 Group 3=2.091 Group 4=2.182	Group 1=.6880 Group 2=.9345 Group 3=1.0445 Group 4=.8528	2.120 (.847)	P=.723	14.570 (12, .266)
Q33I	Group 1=2.720 Group 2=2.960 Group 3=3.273 Group 4=2.273	Group 1=.9798 Group 2=1.0599 Group 3=1.1037 Group 4=.9847	2.747 (1.057)	P=.040 (difference between medical students and interns in New Zealand)	15.389 (12, .221)

Note. Group 1 = Australian students, Group 2 = Australian interns, Group 3 = New Zealand interns, Group 4 = New Zealand medical students.