Shaping the undergraduate pain management curriculum in prehospital emergency care education: toward a curriculum and competency framework for South Africa.

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Even though my name is on this thesis, it is not I alone who can take credit for this work.

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DECLARATION

I, *Ryan Ernest Matthews* hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I authorise the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

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Abstract

Title: Shaping the Undergraduate Pain Management Curriculum in Prehospital Emergency Care Education: Toward a Curriculum and Competency Framework for South Africa

Introduction: Managing patients' pain is a common necessity in Prehospital Emergency Care. Research evidence suggests that pain and nociception are not optimally managed by Emergency Medical Services. One reason for this suboptimal management may be education that is misaligned with clinical and contextual needs. The knowledge gap is that Prehospital Emergency Care has not systematically developed evidence-informed competencies for pain management.

Aim: This research aimed to develop a competency framework and provide recommendations for curriculum implementation to shape and guide the design of contextually relevant pain management curricula in South African Prehospital Emergency Care education.

Methods: Subsequent to a narrative analysis of pain discourse, the research employed a scoping review of therapies to identify quality and therapeutic possibilities as evidentiary basis for competencies. Semi-structured interviews with educators explored contemporary education practice and documented knowledge broker perspectives on educational needs through thematic analysis. The initial competency framework was inductively derived from the above analyses. Content analysis of contemporary curriculum documents mapped key graduate attributes and identified deficient or absent learning intentions and related success criteria. An expert consensus panel provided critical input into the draft competency framework and made recommendations toward curriculum implementation.

Findings: Contemporary curricula are fragmented and misaligned with pain assessment and management needs. Seven competency domains (given expression to by specific competency statements) should guide curriculum development: 1. Clinical Pain Praxis, 2. Foundational Sciences, 3. Practitioner Wellness and Safety, 4. Communication and Collaboration, 5. Duty of Care and Predisposition for Caring, 6. Ethical Practice, and 7. Scholarship. The expert panel made ten recommendations for implementing the framework in curricula, including the use of a ‘spiral’ curriculum, focusing on the multidimensional nature of pain, and building relationships with clinical mentors.

Conclusion: The novel output of the study is an evidence-based competency framework, compatible with micro credentialing or for local adaptation and progressive inclusion into emergency care curricula. This framework redresses the practice difficulties experienced by key stakeholders and enables higher education institutions and professional regulators to comprehensively and inclusively guide education providers in the noble pursuit of quality and equity in pain assessment and management across the lifespan and across clinical acuity and pain causation.

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Definitions of terms

Analgesia	*"Absence of pain in response to stimulation which would normally be painful."*[1]
Capability:	The integrated and adaptive capacity **o**f an individual to apply knowledge, skills, values, and behaviors effectively in complex, changing, and uncertain environments.
Competence:	The integration of Knowledge, Skills and Attributes in a contextually relevant manner to perform a task that renders a service to society, and which changes appropriately over time.
Competency Framework	A representation of categories of practice outcomes, the attainment of which constitutes competence.
Curriculum	A program of learning.
Guideline	A document detailing recommended practice or advice to help inform decisions.
Nociception	*"The neural process of encoding noxious stimuli."* [1]
Nociceptive Pain	*"Pain that arises from actual or threatened damage to non-neural tissue and is due to the activation of nociceptors."* [1]
Pain	"*An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage."* [1]
Pain Management	Pain management involves the systematic assessment of pain and nociception by a practitioner, followed by the application of either pharmacological or non-pharmacological therapies, or both in an integrated manner, aimed at enhancing patient comfort, alleviating distress and mitigating noxious stimulus.
Protocol	A set of mandatory rules or procedures.

Abbreviations

ACGME:	Accreditation Council For Graduate Medical Education
ANT:	Ambulans Noodsorg Technicus [1]
ARV:	Anti-retroviral
BEMC:	Bachelor Emergency Medical Care
CBME:	Competence-based Medical Education
CDST:	Clinical Decision Support Tool
CHE:	Council on Higher Education
COEC:	College of Emergency Care
CPD:	Continuous Professional Development
CPG:	Clinical Practice Guideline
DALYs:	disability adjusted life years
EC:	Emergency Care
ECA:	Emergency Care Assistant
ECP:	Emergency Care Practitioner
ED:	Emergency Department
EMS:	Emergency Medical Services
EST:	Ecological Systems Theory
GBD: :	Global Burden of Disease
HCPC:	Health and Care Professions Council
HEI:	Higher Education Institution
HEQSF:	Higher Education Qualifications Sub-Framework
HIV:	Human Immunodeficiency Virus
HPCSA:	Health Professions Council of South Africa
HPE:	Health Professions Education
IASP:	International Association for the Study of Pain
KAP:	Knowledge-Attitudes-Practices (Survey)
KSA:	Knowledge, Skills, and Attributes

[1] Ambulance Emergency Technician

LBP:	Lower Back Pain
NECET:	National Emergency Care Educational and Training policy
NEMSIS:	National Emergency Medical Services Information System
NGT:	Nominal Group Technique
NQF:	National Qualifications Framework
NRS:	Numerical Rating Scale
OTFC:	Oral Transmucosal Fentanyl Citrate
PBEC:	Professional Board for Emergency Care
PCA:	Patient Controlled Analgesia
PEC:	Prehospital Emergency Care
PECP:	Prehospital Emergency Care Provider
QC:	Quality Council
RCPSC:	Royal College of Physicians and Surgeons of Canada
SAHPRA:	South African Health Products Regulatory Authority
SANC:	South African Nursing Council
SAQA:	South African Qualifications Authority
SAS:	Substance Abuse Syndrome
VNRS:	Verbal Numerical Rating Scale
YLD:	years lived with disability

Chapter 1: Introduction and Background

1.1 Introduction

The relief of discomfort, distress and pain indicates quality care [2] and should be a primary goal of Emergency Medical Services (EMS) and Prehospital Emergency Care (PEC). [3] Unmanaged pain and nociception has deleterious effects on physiology, emotional wellbeing [4], delays healing and reduces quality of life. [5] The potential for progression of unrelieved acute pain to chronic pain, and the associated costs, [6] situates acute pain as a public health issue. Pain management's importance stems from its moral and ethical imperative[7], professional responsibility and far-reaching effects on society.[8]

The proximal positioning of Prehospital Emergency Care Providers (PECPs) in the care pathway make them ideally positioned to contribute to addressing these ethical, moral, and biomedical imperatives as a priority role. That pain management should be reflected in both practice and education is a reasonable expectation, yet the PEC literature shows that pain management practice is poor and is silent on pain education.

This thesis aims to develop a Competency Framework that will give structure and contextual expression to PEC pain education. The thesis also aims to make recommendations for curriculum implementation that provide guidance to autonomous Higher Education Institutions (HEIs) for the incorporation of the framework into their curricula. The ultimate aim is to improve practice.

The research will first delineate the problems of pain and nociception management practice, and of education for this practice; then explore the current approach to pain management practice and education; develop appropriate competencies as end points of education; and finally, will make recommendations for the implementation of the competencies in curricula.

1.2 Clarification of key terms

This section explains key terms used in this thesis. The centrality and importance of these terms in this research requires elaboration beyond definition.

1.2.1 Pain

The International Association for the Study of Pain's(IASP) definition of pain [9] is "*An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage*"

The definition allows for a biopsychosocial model, acknowledging pain as an experience to which emotions are attached. Experiences are shaped by different elements and vary between individuals even in similar injuries. It is also inclusive of pain when no discernible tissue injury is present.

Nociceptive pain results from either trauma or inflammation causing tissue damage. Neuropathic pain results from nerve damage, such as in diabetic neuropathy. [10] Some pain conditions such as fibromyalgia, are neither nociceptive nor neuropathic in origin. The IASP developed the term 'Nociplastic' pain as a mechanistic descriptor for pain resulting from sensitisation of the peripheral and central nervous systems. Many pain states are a mixed typology, resulting from more than one mechanism. [11]

Chronic pain is defined as pain lasting, or recurring, longer than 3 months and acute pain less than 3 months. [6] Both acute and chronic pain may result from nociception or neuropathy. Nociplastic pain is usually chronic in nature.

Pain should be distinguished from "nociception", which occurs in response to a noxious stimulus and is a neural process. While they are related, pain is a personal experience, which is distinct from the biomedical process of nociception. [9]

1.2.2 Prehospital Emergency Care (PEC)

The Regulations Defining the Scope of the Profession of Emergency Care: Health Professions Act (Act 56 of 1974) defines Emergency Care (EC) as:

"*…the rescue, evaluation, treatment and care of an ill or injured person in an emergency care situation and the continuation of treatment and care during the transportation of such person to or between health establishment(s*)"

Per this definition, Emergency Care may also be provided by persons such as physicians and nurses and the term is used by the African Federation for Emergency Medicine (AFEM) to denote a multidisciplinary approach to emergencies. [12]

As this research deals only with providers who are not physicians or hospital-based nurses, the term **Prehospital Emergency Care Providers (PECPs)** is used for reporting clarity and to avoid ambiguity in description of providers. In this research emergency care, inter-facility transfer and Critical Care Retrieval (CCR) provided by PECPs is termed **Prehospital Emergency Care (PEC).**

1.2.3 Prehospital Emergency Care Provider (PECP).

The Regulations Defining the Scope of the Profession of Emergency Care: Health Professions Act (Act 56 of 1974)[13] define 'Emergency Care Personnel' as:

"…persons registered under section 17 of the Act as paramedics, ambulance emergency assistants, basic ambulance assistants, operational emergency care orderlies, emergency care assistants and/or

persons who hold a valid first aid certificate issued by a first aid organisation accredited by the Professional Board for Emergency Care personnel"

The term 'Emergency Care Practitioner' (ECP) denotes a category of registration with the Professional Board for Emergency Care (PBEC). The term 'Paramedic' is protected for use by specific categories of emergency care personnel. [14] The research aims to be inclusive of all categories of registration and avoids choosing a term associated with only one category of professional registration. The term **Prehospital Emergency Care Provider (PECP)** is used to include all qualifications and registrations categories currently in use. This term excludes physicians and includes nurses who have completed specialist training with the intention of providing PEC, such as those working in Sweden.

1.3 Background and Rationale

To meet clinical needs, practitioners must apply relevant Knowledge, Skills and Attributes (KSAs) in context. Pain management in PEC is unique and differentiated from other health contexts, but it is not isolated from them. This research was initiated in the African context, against a backdrop of global pain care. This section situates PEC pain care within broader healthcare and problematises pain care within PEC.

1.3.1 Prevalence of Pain Presentations in Emergency Care

Pain is the main reason for seeking healthcare. [6] Prevalence rates of pain in hospitalised patients range from 37.7% to 84%, with severe pain present in up to 36% of patients. [5] In the Emergency Department (ED) pain accounts for up to 78% of visits [15-17] with 53.1% of paediatric ED patients reporting pain. [18] A minority (32.46%) of ED patients receive pain therapy [19] and up to 86% of patients are discharged from the ED with pain. [20]

In Europe, the prevalence of pain presentations to EMS are estimated to be between 27.7% [21, 22] and approximately 50% of ambulance cases. [23] Rwandan EMS data shows a pain prevalence of 55% (n=6,168) for patients reporting to an urban EMS , the predominant cause being trauma (n=5,724, 93%). [24] A comprehensive description of the burden of prehospital pain isn't available and pain types like neuropathic, chronic and cancer pain do not feature in PEC research. Global disease trends elevate the potential for the exposure of PECP's to pain presentations other than acute nociceptive pain, discussed next.

The Global Burden of Disease (GBD) estimates place pain and related conditions to be in the top 20 causes of Disability Adjusted Life Years (DALYs) [2] i.e., ischaemic heart disease (position 2), road injuries (position 7), lower back pain (position 9), headache disorders (position 15), and other musculoskeletal disorders (position 19). Conditions which may either cause pain, modify pain or be responsible for pain interference are diabetes (position 8), HIV/AIDS (position 11) and lung cancer

[2] Disability-Adjusted Life Year: an epidemiological risk measure which counts both years of life lost due to premature death as well as years of healthy life lost due to disability.

(position 17). [25] Low back pain(LBP), chronic neck pain, musculoskeletal disorders, osteo arthritis and migraine and medication overuse headaches contribute prominently to Years Lived with Disability (YLD) in every region, including Sub-Saharan Africa. [26] Chronic pain conditions are increasing globally, in part due to aging populations. [26, 27] Chronic pain prevalence rates in the United States of America (USA) and United Kingdom (UK) are between 11% and 43.5%[28], and vary between 13% and 49.9% in developing countries. [29] Important acute and chronic pain conditions are Migraines, Low Back Pain (LBP), neck pain, 'other musculoskeletal conditions, osteoarthritis and urolithiasis. [26] Risk factors for chronic pain such as psychological trauma, interpersonal violence and low socioeconomic status are prevalent in developing countries.[29]

Other drivers of global pain include diabetic neuropathies, obesity, inactivity, herpes zoster, cancers, sickle cell disease and amputations from war and conflict. Up to 57% of people with HIV still experience antiretroviral (ARV) related sensory neuropathy (despite the withdrawal of toxic ARVs). [26] Women, low-socioeconomic groups, military veterans, and people in rural areas are disproportionately affected by chronic pain. [6] These potentially add to prevalence in emergency care. Approximately 12%-16% of visits to the ED in the USA and 10.4% of visits in Canada are related to chronic pain. Presentations of LBP made up 3.17% of presentations to a Canadian ED.[30] In a Polish EMS neuropathic and chronic pain accounted for 4.82% and 1.85% of pain presentations, with 59.92% of presentations acute in nature. [31]

There appears to be an emerging role for PECPs in palliative care, in South Africa [32-34] and internationally. [35, 36] Another emergent role is community paramedicine[37], a community focused model of care distinct from other EMS roles , and which may require new skills sets.[38] While hospital pain prevalence data shows potential for multiple pain typologies presenting to PECPs, so does the emergence of new roles. The need for KSA's enabling the management of pain states other than acute nociceptive pain is present. Unfortunately, the management of acute nociceptive pain still faces challenges, discussed in the following sections.

1.3.2 Pain Management in Prehospital Emergency Care

It is apparent that pain is undertreated in PEC. Up to 79.7% of ambulance patients with pain receive no pharmacological analgesia, and of those treated, less than half achieve clinically significant pain reduction. [23] In other work, less than one fifth of patients in moderate or severe pain, or with potentially painful injures, received analgesics. [39]

Almost 77.4% (n=2826) of patients in the United Kingdom (UK), with either acute myocardial infarction (AMI) or fracture, were assessed for pain and analgesics only administered in 38.2% (n=1412) of cases (80% of patients with AMI did receive nitrates, which may have alleviated pain). [40] Norwegian trauma patients with severe pain received morphine in only 31% of cases. [41] This data was collected in Europe and shows undermanagement of acute pain. The African picture appears similar.

The only African epidemiological study of pain in PEC [42] examined high acuity trauma in patients older than 15 years in the Western Cape, South Africa (N=24 575). Only 18.1% (n=435) of patients had a pain score recorded and of these 97.2% (n=423) experienced pain, with a median Numerical

Rating Scale (NRS) score of 6/10. The high acuity trauma focus, low rate of reporting and omission of paediatrics in this sample means there is no comprehensive epidemiological description of prehospital pain in South Africa.

The use of analgesics in South Africa may also be deficient. A sample of 530 cases in which analgesic drugs were administered showed the median morphine dose was 4mg (IQR 3–6) administered as a single dose in 268 (72.2%, 95% CI, 67–77) cases. [43] Second doses were administered in 86 (23%, 95% CI, 19– 28) and third doses in 18 (5%, 95% CI 3–8) cases, raising the maximum mean dose to between 6 and 8mg when multiple dosing took place. [43] Practitioners were not routinely documenting pain assessments, with only 21% (n=111) of cases documenting a pain score and only 6% (n=34) documenting a second score. [43]South African PECPs use small doses of morphine with many preferring lower dose options (0.05mg/kg boluses followed by 0.25mg/kg boluses) and most never exceeding 5mg as a single bolus. [44] African data for pain management in PEC is sparse.

The frequency of pain presentations to EMS could position pain management as a PEC imperative and argue for competence in this role. The continued evidence of sub-optimal practice implies that frequency of presentation has not positioned pain management in this core role. The following sections explore additional rationale for pain and nociception management in PEC, and the consequent need for competency development as a form of redress.

1.3.3 The Ethical and Moral Imperative to Manage Pain

The management of pain and alleviation of suffering is of moral and ethical importance[8] and considered central to healthcare. [45] The International Association for the Study of Pain(IASP) has declared pain management a human right. [7] The ethical principles of Autonomy, Beneficence, Nonmaleficence and Justice provide a paradigm for ethical pain management. [46]

Beneficence requires that healthcare providers act to benefit the patient (Positive Beneficence) while weighing the possible deficits of their treatments (Utility). Nonmaleficence requires that the risks of treatment be considered, so as not to cause harm. The interplay between these principles is often referred to in practice as “risk-benefit analysis”. [47] Beneficence alone justifies pain management. Failing to manage pain violates Nonmaleficence. [45]

Patients are autonomous and should participate in their healthcare in an informed manner that is free from coercion (Autonomy). Unrelieved pain may prevent the sufferer from making informed choices, while managing pain restores Autonomy. [45] The principle of Justice denotes appropriate and equitable treatment and in healthcare often refers to resource allocation. Justice requires that patients are allocated fair resources according to their needs regardless of socioeconomic status. Healthcare providers are required to manage patients to the best of their abilities; however, Justice also imposes obligations on patients – that their need for pain management is genuine and avoids secondary gain (such as drug seeking behaviour). [46]

1.3.4 Physiological Consequences of Unmanaged Prehospital Pain

Acute pain triggers complex molecular and cellular responses at the site of injury, in the neurons, spinal cord and brain and organs remote from the injury. These responses may delay recovery or result in secondary complications. Stress and inflammatory responses lead to elevated sympathetic activity which affects the cardiovascular, gastrointestinal, and respiratory systems, coagulation, and immune systems. Protein catabolism, lipolysis, hyperglycaemia, and hyperalgesia are secondary negative effects. [4] The progression of acute to chronic pain is an additional risk. A history of pain experiences, emotional and various psychosocial factors are predisposing factors. [11] Chronic post-surgical pain has an estimated incidence of between 5% and 85% and is severe enough to affect quality of life in 2% to 15% of cases. [48]

1.3.5 Psychological Consequences of Unmanaged Pain

There is an association between chronic pain and Post Traumatic Stress Disorder (PTSD). [49] The relationship between pain and Post Traumatic Stress Symptoms (PTSS) may be mediated by shared neurobiological mechanisms, enhanced endocrine activity and noradrenergic activation. These encode readily retrievable traumatic memories which act as triggers for PTSS. [50]

Severe pain is associated with the development of PTSS in children [50] and vulnerable inner-city women, where higher pain intensity on ED presentation was directly linked to PTSD symptoms. [49] Analgesia at the time of the painful event reduces the likelihood of PTSD [51]. Unrelieved pain strips patients of their autonomy, through demoralisation, anxiety, feelings of helplessness and inability to think. [4] Some authors have suggested a link between unrelieved prehospital acute pain and PTSD [52, 53] , though this has not been studied directly. In keeping with pain's biopsychosocial nature, patients with PTSD, or depression, experience greater interference (impact on their lives) from pain, independent of the pain intensity. [54].

1.4 Statement of the Problem

Pain is commonly encountered by PECPs and has ethical, physiological, psychological, and public health consequences. The descriptions of practice above suggest that PECPs may not be meeting the pain management needs of their patients with sufficiency. Additional healthcare roles and expanding analgesic capabilities continuously add to the professional responsibilities of PECPs. With uncertainty of extent to which analgesia needs were and are being met, and expanding analgesic roles and responsibilities without a well-defined quality improvement system), knowledge and practice gaps are probable Evidence in respect of pain management in PEC appears diverse and fragmented, hampering the identification and development of appropriate pain management competencies. The educational needs of PEC have not yet been defined and systematically categorised in a way that fosters the design of comprehensive and contextually appropriate curricula.

Prescriptive regulatory standards focus on immediate, acute care. [55-58] These standards do not comprehensively describe the educational need nor consider shifting needs and new roles. With resource constraints and an uncertain clinical need a risk develops that educators and curriculum designers default to these standards as the only inputs into educational content. Because they influence practitioner registration, these standards are high stakes requirements. Standards are legitimate but should be seen as minima.

The nature and content of current education is unknown and the educational base for pain practice is uncertain. For undergraduate education to effectively contribute to improved pain management practice curricula need to be shaped [3] and designed to effectively and comprehensively address KSAs which are contextually relevant to the needs of clinical practice, and which provide for competency in pain management. Curriculum designers and PEC educators may be working blindly or in an *ad hoc* fashion when curriculum planning or conducting teaching activities for pain management. The comprehensive identification, systematic categorisation and representation of KSAs as a framework could guide autonomous and contextually appropriate curriculum development. Placed together with recommendations for curriculum implementation, a framework should foster the performance of consistent, comprehensive, and appropriate pain management education in the PEC context.

Some health professions have systematically and purposively developed competencies and curricula to meet the educational needs of the profession and their patients. [59]This work is predicated on the assumption that PEC should do the same. Notwithstanding the state of analgesic practice, a competency framework for pain management by PECPs is the knowledge gap that this study addresses.

1.5 Motivation for the Study

The IASP curriculum framework [60] is influential in healthcare education, but the developmental process excluded the emergency care professions. The competencies also have a distinctly North American bias [60], and the cultural and contextual transferability to South African PEC curricula is unknown. Unknown transferability does not negate the IASP framework as suitable for guiding African PEC curricula, it means the application is uncertain, and untested in PEC education.

PEC practice has unique characteristics different to in-hospital practices, such as the unstable environment and the regulatory limitations placed on PECPs. Unique PEC contexts coupled with a poor description of these contexts creates the additional risk of omissions of content and competencies from curriculum. Competency development and relevant curriculum design should empower practitioners to manage a specific healthcare issue. Curricula for undergraduate PECPs should be able to target inadequate and deficient pain management. Unfortunately, nothing is known of PEC pain management education and curriculum in South Africa. With the possibilities that research findings are not being incorporated into curriculum, and that both curriculum and teaching events are being developed without guiding frameworks, the risk is that current educational practice

[3] Curriculum shaping are all the activities that precedes curriculum writing.

does not meet the needs of practice. The consistent description of sub-optimal practice argues that this is the case.

Much of PEC practice is influenced by context and a single generic curriculum relevant to all contexts would not just be impossible to design but undesirable. Emerging roles in PEC, such as palliative care add extra layers to a complex and opaque educational landscape. A systematically derived competency framework will allow for flexible and contextually relevant curriculum design which is portable across contexts, health systems and qualification levels while fostering comprehensive, appropriate, and equitable pain management with a degree of baseline standardisation.

1.6 Contribution of the Study

This research explored pain practice and described the scope of pain therapies applied by PECPs. With this description as a foundation, it explored and described contemporary curriculum and educational practice. It also developed a comprehensive framework to guide contextually relevant curriculum development and teaching. Ultimately, the research aspired to better pain and nociception management practice, notwithstanding professional gains made.

1.7 Aim

The aim of this research was to develop a competency framework and make enabling curriculum implementation recommendations to shape and guide the design of contextually relevant pain management curricula in South African Prehospital Emergency Care education which enable patient centred care.

1.8 Research Question

What are the competencies underpinning effective prehospital analgesic practice and how could these competencies be integrated into existing emergency care programs to enable appropriate pain and nociception assessment and management in South Africa?

1.9 Objectives

1. To explore and map the evidence for pain management therapies applied by prehospital emergency care providers, as a basis for identifying competencies.
2. To explore the contemporaneous curricula and approach to PEC pain management education in South Africa.
3. To describe the competencies required for comprehensive, appropriate, sufficient and patient centred pain management practice.

4. To develop recommendations for integrating patient-centred pain and nociception management competencies into prehospital emergency care education, to foster compassionate and effective practitioners.

1.10 Description of Context: Legal and Regulatory frameworks

The competency framework and curriculum recommendations are intended to be relevant and implementable in the South African context. The following sections outline the regulatory and legal frameworks for South African PEC education and practice.

1.10.1 The South African Higher Education System

Education and training in South Africa is subject to the provisions of the National Qualifications Framework (NQF)[61]. The NQF is a single integrated and comprehensive system for '*classification, registration, publication, and articulation of quality assured national qualifications*'.[61] The NQF consists of three sub-frameworks, each overseen by a Quality Council (QC). Emergency Care programs conform to the structure of the Higher Education Qualifications Sub-Framework (HEQSF) overseen by the Council on Higher Education (CHE) as the QC [4]. The HEQSF is a 10-level framework which guides the design of all educational programs. [62] The CHE is the only body which may accredit higher education qualifications and publishes rules and standards. [61]. The South African Qualifications Authority (SAQA) is the oversight body for the NQF. Higher education is governed in terms of the Higher Education Act (101 of 1997) [63] and which also makes provision for the functioning of the CHE.

1.10.2 The South African Prehospital Emergency Care Educational Framework

The National Emergency Care Education and Training Policy (NECET) [64] describes a three-tier education framework aligned to the HEQSF. It consists of a one-year Higher Certificate (HC) in Emergency Medical Care, a two-year Diploma in Emergency Medical Care and a four-year Degree in Emergency Medical Care. These qualifications are all standalone qualifications although graduates can articulate between them.

The HEQSF describes the characteristics and purpose of each qualification type. Both the HC and Diploma provide industry specific knowledge and practical skills. The degree provides a broad theoretical knowledge base and intends to enable graduates to shoulder professional responsibility for practice.[62] The qualifications progress in complexity and are aligned to a hierarchal regulatory categorisation; system, with increasing capabilities. This is explained in the next sections.

[4] The other two structures are the General and Further Education and Training Qualifications Sub-Framework (GFETQSF), overseen by the QC Umalusi, the Occupational Qualifications Sub-Framework (OQSF) overseen by the Quality Council for Trades and Occupations (QCTO).

1.10.3 Regulation of Prehospital Emergency Care Providers

The relationship between individual practitioners and the public is governed by the Health Professions Act (no 56 of 1974). [65] This act establishes the Health Professions Council of South Africa (HPCSA) and its twelve Professional Boards which exercise authority in respect of the education, training, and practice of the professions within their ambit. The Professional Board for Emergency Care (PBEC) regulates the profession of Emergency Care[66] nationally. Emergency Care Providers register with the PBEC on national registers, and registration is portable across provincial boundaries. The HPCSA also deals with professional conduct and discipline.

The profession is empowered to practice through the Scope of the Profession [13](which define the acts of the profession). A 'Scope of Practice' defining the procedures and processes a PEC professional may undertake during the performance of those acts has not been published. This function is currently fulfilled by an annexure to Clinical Practice Guidelines (CPGS) [58] which matches clinical skills and a medicines formulary to the different categories of professional registration [58].

1.10.4 Categories of Registration with the PBEC

The PEC professional registers are organised into six hierarchical categories of registration (*Table 1*). [5] It is the category of professional registration, not attainment of qualification, which determines capabilities of practice. One example of how this affects pain management is that the higher categories of registration have regulatory access to morphine, fentanyl and ketamine while the lower categories do not. The PBEC engages with the South African Health Products Regulatory Authority (SAHPRA) on the necessary approvals and authorisations.

Table 1: Current HEQSF aligned Emergency Care Qualifications aligned to HEQSF type descriptors

Qualification type	NQF Level	Minimum duration (years)	NQF Credits	**Regulatory registration category**	Example of qualification name [6]
Qualifications which allow graduates to register with the PBEC and allow for the professional practice of Emergency Care.					
Professional Bachelor's degree	8	4	480	Practitioner (ECP)	Bachelor Emergency Medical Care (BEMC)
Diploma†	6	2	240	Technician (ANT)	Diploma in Emergency Care
Higher Certificate	5	1	120	Assistant (ECA)	Higher Certificate in Emergency Medical Care
Qualifications aligned to the profession of Emergency Care, but which are not registerable at the PBEC, and which do not allow for professional practice of Emergency Care					
Master's degree	9	2	180	N/A	Masters in Emergency Medical Care
Doctoral Degree	10	2	360	N/A	PhD Emergency Medical Care

[5] Graduates of legacy qualifications are still practicing and provision for their professional registration is made in the registers

[6] Individual HEIs may use slightly different names for their qualifications, such as Bachelor Emergency Medical care or Bachelor of Health Sciences: Emergency Medical Care.

Advanced Certificate	6	1	120	N/A	Advanced Certificate in Medical Rescue
†Current offerings approved by the PBEC are of the 2-year, 240 credit variant. This qualification will change to the 3-year, 360 credit variant also at NQF level 6.					

The PBEC has published minimum practice standards for HEQSF aligned qualifications. [55-57] These are not standards for program accreditation, which is the role of the CHE. The PBEC evaluates and approves programs to allow for graduate registration. If the program does not allow graduates to meet prescribed minimum standards, they may withhold professional registration (of graduates) but cannot prevent an HEI from issuing a qualification. The implication for curricula is that HEIs set their own curricula and make autonomous determinations about their programs. If programs are to gain accreditation, they need to meet the requirements of the CHE. If graduates are to practice, programs need to meet the requirements of the PBEC.

1.10.5 Regulatory Standards, Medical Authority and Practice Guidelines

The PBEC recently adopted an evidence-based Clinical Practice Guideline (CPG) [58] and supporting Clinical Decision Support Tool (CDST)[67] for national implementation and these make some recommendations for pain management. The guidance is not comprehensive for all the pain scenarios South African providers may encounter. The approved CPG, while reflecting best available evidence, is not necessarily a reflection of pain management need, nor educational need, for South African EMS. There is evidence to show that a CPG on its own does not improve practice and requires practitioners with adequate competencies and attitudes to properly implement them. [68-70] The risk for education is that regulatory standards and criteria dictate curriculum, focusing on accreditation and approval while neglecting clinical need. This is a risk in South Africa as neither of the three minimum standards[55-57] for educational programs published by the PBEC address the management of pain. Curricula must meet minimum quality, regulatory and practice standards, but should be guided by need, and not regulatory decree.

1.10.6 Regulation of Medicines and Scheduled Substances and Medical Devices

The South African Health Products Regulatory Authority (SAHPRA) regulates and controls the use of medicines and medical devices (human and veterinary) in South Africa. [71] SAHPRA makes recommendations to the Minster of Health to approve medicines for use by PECPs for defined purposes. This contrasts with medical practitioners and dentists who may prescribe substances in accordance with best medical practice and evidence. SAHPRA acts as the intermediary between the professional, represented by the professional boards, and the Minister of Health, for the approval of the use of medical devices and medicines. The use of medicines or medical devices by PECPs may be enabled, or prevented, by SAHPRA.

1.10.7 The South African Emergency Medical Services System

In South Africa, health services are a concurrent National and Provincial Legislative Competence [72], and the National Health Act (Act 61 of 2003) [73] establishes a system of decentralised management of health. Provincial health departments or municipalities are responsible for provision of health services. Each of the nine provinces provides for EMS, resulting in nine independent public sector EMS in the country. Provinces can make provincial legislation and regulations pertaining to ambulance services. The South African National Defence Force (SANDF) also operates an autonomous military health service, though South African military PECPs also register with the national regulator and are subject to regulation. Provision for private EMS is made in the National Health Act. [73] Practitioner education and capabilities are centrally regulated, and practitioners in the same registration categories have identical capabilities, regardless of their location. Each service, public or private, provides for its own operational procedures and policies, subject to the laws of the country. Private services vary in size, from large, corporatised services owned by hospital groups, to small community services. PECPs provide their expertise and services within an EMS which provides equipment and medicines as well as a management framework. These EMS can directly or indirectly limit or enable clinical management through control of resources and enactment of policies.

1.11 Overview of the Thesis

This section provides an overview of the research methods and procedure and is intended to orientate readers. A detailed description of the methods is contained within Chapter 3.

1.11.1 Structure of the thesis

The research conducted a problem identification and general needs assessment for pain and nociception management [74], and then constructed a competency framework to address those needs. The thesis also provides expert consensus recommendations for integration of the competency framework into curricula, and guidance on the structuring of pain and nociception learning in curricula.

The literature review reveals the evidence gaps and provides context for practice, and education. Data collection proceeded in four phases (Figure 1)(page 13). These phases will be highlighted in red to locate the reader in the thesis.

The scoping review established the foundation for pain and nociception management therapies in PEC, identifying evidence quality and therapeutic possibilities. It ensured rigour and prevented selection bias, contributing to a draft competence framework refined by later data through inductive analysis.

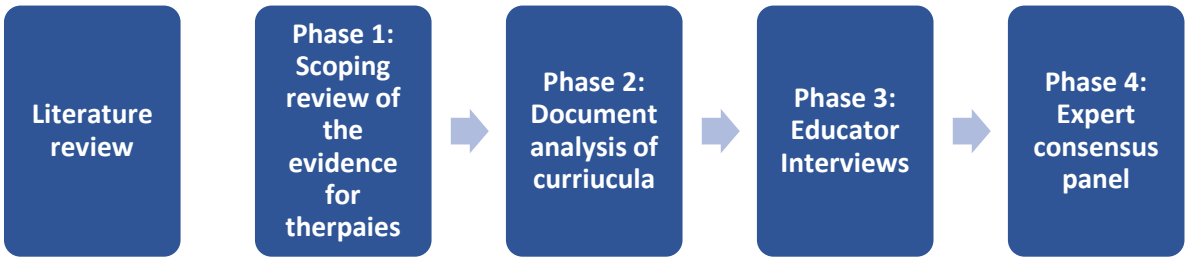


Figure 1: Schematic of data collection

Phases two and three defined the problem space and gaps in contemporary teaching versus desired curriculum. Phase 2 used content analysis and curriculum mapping to identify key pain elements. Phase three involved interviews with PECP educators, exploring their experiences, curriculum expression, and future pain education opinions. These phases integrated findings with the draft framework to define competency domains. The competency framework links education and practice, with appropriate clinical practice enabled by suitable competencies developed through curricula and learning programs. [75] Phase four involved an expert panel from various fields, providing consensus on framework implementation in diverse PECP curricula and discussing the competency framework. Figure 1 provides a diagrammatic overview of the data collection phases. At the beginning of each chapter a diagrammatic overview of chapters is provided, with the relevant chapter highlighted in red, to assist with navigating the thesis.

1.11.2 Setting and Participants

The setting was PEC higher education, and practice in South Africa. The specific context was pain and nociception management in these two fields. Interviewing educators is legitimate, as all educators were also experienced clinicians, and how they enacted curricula may shape clinical practice.

The education field was evaluated through data collected from educators teaching on HEQSF aligned PEC programs at both HEIs and Colleges of Emergency Care (COEC). Data on education policy was collected from curriculum documents and learning outcomes. The educators and the curriculum documents were linked to HEQSF aligned programs only. The expert panel was constituted of acknowledge experts in the field of EMS, pain management, health care regulation and EMS leadership.

1.12 Assumptions

A premise of the study was that HEIs are autonomous and would develop their own curricula. Developing a full curriculum is thus inappropriate for this study. Another premise is that the problems and challenges affecting pain management and PEC education are unknown and deserve exploration. Development of a guiding framework which curriculum designers can use to frame locally relevant curricula has more utility and probative value than writing, and then imposing, a curriculum.

1.13 Statement on Positionality

As an author's lens is informed by their experience, it is prudent to share my positionality and posture.[76] I am a PECP with 25 years' working experience in the military and civilian EMS in South Africa and abroad. I have spent the last 12 years in academia. As a clinician I realised that pain was present in almost every patient I managed, and that I, and my colleagues, 'glossed' over it. I also realised it had barely been covered in my undergraduate education, save for a lecture or two on pharmacology. I consider myself a utilitarian, and working in education, I wanted my teaching to be relevant and provide benefit for the most people possible. I also realised that existing curricula did not treat pain management as being as important as some other competencies. I felt compelled to rectify this gap or at least give other educators an option to do so in their teaching.

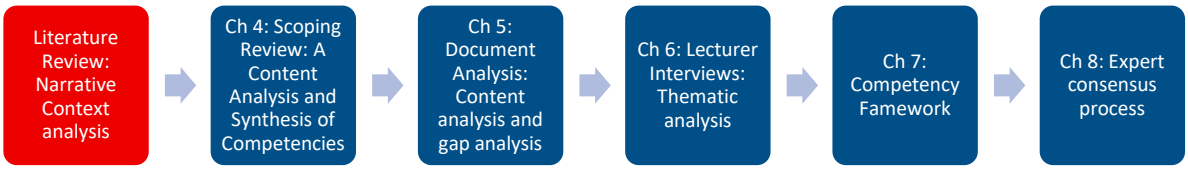
The presence of an educational gap is an *a priori* assumption on my part. This gap was my lived experience during clinical practice, and teaching, and a realisation I reached during my MPhil study.[43] To guard against bias, deep reflection and extensive baseline data analysis has taken place. Constant discussions with supervisors have also been used to guard against bias unduly influencing the research.

In alignment with the interpretive nature of this study, I adopt a relativist ontological stance, which holds that reality is not fixed or singular, but constructed through individual and collective experiences. This view resonates with my own clinical and academic journey, where I have come to understand pain not merely as a physiological signal, but as a deeply contextual and subjective experience shaped by social, cultural, and professional environments.

Epistemologically, I embrace a subjectivist position, recognising that knowledge is co-constructed between the researcher and participants. My interpretations are inevitably shaped by my background as a clinician and educator. Rather than striving for detached objectivity, I have engaged in reflexive practice throughout the research process—through critical self-reflection, supervisory dialogue, and grounding my analysis in rich, contextual data—to ensure transparency and trustworthiness in the knowledge produced.

This concludes the introduction to the study. The following chapter reviews the relevant literature and isolates gaps in the literature. The literature review forms an integral part of the research, acting as a baseline and comparator for the findings in later chapters.

Chapter 2: Literature Review



2.1 Overview of the Chapter

This chapter explores key concepts in education and prehospital pain management. The review has two sections. Section one summarises prehospital pain education in the education of health professionals and explores competency frameworks and pain competencies in HPE. Section two problematises prehospital pain practice and explores the potential for future EMS roles.

This literature review aims to explore the intersection of education and prehospital pain management, with a particular focus on the development and application of competency frameworks within HPE. The review is structured to examine both the educational underpinnings of pain management competencies and the practical challenges faced in prehospital emergency care (PEC). This chapter seeks to identify key themes, gaps, and contextual considerations that inform the development of locally relevant and socially responsive educational strategies. The search strategy and inclusion criteria, detailed in Section 2.2, guided the selection of literature to ensure a rigorous and transparent narrative analysis.

2.2 Methods

Literature searches were conducted using the EBSCOhost platform provided by the University of Cape Town Health Sciences library. Databases included Pubmed, Cumulative Index of Nursing and Allied Health (CINAHL), Google Scholar and the Educational Resources Information Centre (ERIC). Citation lists were manually searched for additional articles. Searches were iterative, repeated as new concepts and understandings emerged. The key words are listed below:

Search 1 - Prehospital pain practice: emergency medical services or EMS or prehospital or pre-hospital or paramedic AND pain management AND barriers and facilitators

Search 2 – (emergency medical service* OR emergency care OR EMS OR paramedic* OR EMT OR emergency medical technician*) AND (education OR curricul* OR curriculum develop* OR educational OR training OR instruction OR course) AND (pain manage* OR pain control OR analgesi*) pain intensity, vital signs, emergency department.

For studies of competence, competence frameworks and curriculum, work was limited to HPE, without a limit on dates. For studies of prehospital practice, work was limited to non-physician practitioners, and date limited from 2012 to October 2024. Only work in English was reviewed when the full text was available. The search strategy is presented to evidence transparency and rigour in this narrative analysis.

2.3 Competence and Competence Frameworks

2.3.1 The Concept of Competence

Conceptions of competence guide stakeholder expectations of professionals and drive competency standards [77] and certification making it a high stakes concept. [78-81] The meaning of 'Competence' is contested[78] and differs between disciplines. [82, 83] , risking malalignment between educational goals and professional standards. [77] This thesis will clarify terms used in *this* research and not establish a universal definition.

Competence is a performance – what matters is what a person can *do*, not how they got there. This is reflected in Bloom's Taxonomy of Educational Objectives[84], organised as the Cognitive [85], Psychomotor [86, 87] and Affective[88] domains. The taxonomy hierarchical categorisation of end points of learning arranged by complexity, not learning processes or events. [89] In Health Professions Education (HPE) competence often contains the components of Knowledge, and Skills. Thereafter definitions comprise an eclectic mix including professional judgement, reasoning, professional socialisation, reflection, attitudes, quality and communication. [82] The mix of attributes were classified as Abilities, such as reasoning and cognitive reasoning processes, and Attitudes and/or Values. These are personal traits developed from complex factors such as experience. These traits allow professionals to manage complex and ambiguous problems and make decisions amidst uncertainty. [82] Hager and Gonczi [77] argue for an approach to competence which integrates lower order tasks, with higher order attributes. How these tasks and attributes interact to produce a performance will determines competence. Key is that framework developers first evaluate the profession for tasks central to the practice of the profession, then general attributes key to proper performance of these tasks. Developers can then integrate attributes with profession-specific tasks into competency standards. This conception of competence selects KSAs and applies them to specific tasks characteristic of a profession. [77]

Service to communities features strongly as a component of competence [90] Possessors of competence demonstrate they are qualified to deliver said service, and in exchange receive status and exclusivity of practice. [82] Competence is thus socially relevant. Competence is influenced by context, as attributes key to one profession may be less relevant to another. Context defines competence and competence in one context does not mean competence in another.[82] Competence also changes over time [91], with professionals progressing in ability (as described in the Dreyfus Model [92]), or regressing after certification. [91]

2.3.2 The Concept of Capability

A concept related to competencies, is that of a 'capability'. In the literature, a capability, particularly in the context of healthcare professionals, refers to the integrated and adaptive capacity **o**f an individual to apply knowledge, skills, values, and behaviors effectively in complex, changing, and uncertain environments. Unlike competencies, which are often task-specific and measurable, capabilities emphasize adaptability, innovation, and the ability to respond to novel situations. Jain et al. [93] describe capability as the "justified confidence in one's ability to take appropriate and effective action" in both familiar and unfamiliar settings.

Capabilities may be associated with performing work amid complex and evolving contexts. Competence (and competencies) must be embedded in broader frameworks which include personal qualities, to allow individuals to manage unpredictable, real-world practice. [94] Capability aren't merely an extension of practice, but a threshold concept that shifts the educational focus from box ticking to developing reflective, adaptive and holistic practitioners. [94] Thus, capabilities encompass leadership, mentorship, strategic thinking, and the ability to integrate within clinical contexts.[95] Capabilities are not static; they evolve with experience and are essential for sustaining a research culture within healthcare systems.[95] This concept is especially relevant in high-stakes, dynamic environments like PEC, where clinical decisions often require more than just technical proficiency—they demand judgment, flexibility, and emotional intelligence.

This broader, more holistic view of professional development ensures that healthcare professionals are not only competent in performing tasks but are also capable of leading, innovating, and adapting in a rapidly evolving healthcare landscape.

2.3.3 The Conception of Competence in this Research

The conception of competence used in this thesis requires professionals to 'do' things successfully, either by complying with professional standards, or applying judgement in uncertain circumstances. Professional tasks are accomplished using relevant KSAs. Professionals do not use these attributes in isolation but combine and integrate them to solve problems or render a service in a *context*. Competence is specific to a community and serves that community, promoting social justice. Though KSAs are generic and generalisable, a professional is only competent once they can combine those generic traits in a locally relevant manner. Competence is temporal. Competence at graduation does not mean that person is still competent a few years later. Best practice may also change over time. Competence requires four things: 1 *Integration* of KSAs 2. in a *context* 3. to perform a *task* which renders a *service.* 4. Professionals should reflect on their practice and circumstances to either maintain their abilities in a context or adapt abilities should needs change.

Graduates of PEC programs cannot be focused on knowledge of theory to the exclusion of practical skills, and vice versa. They require the higher order attributes, and attitudes, to integrate knowledge and skills for service delivery. Competencies, curricula, and educational programs designed to enable graduates in one profession or context, such as nursing or the developed world, may not transplant effectively to another profession or context. This argues for the development of locally relevant and contextually aligned competencies and curricula. This may seem closer to the concept of

'capabilities' and does overlap with the capabilities concept. This is unavoidable, as there is an inherent overlap, and the one would not be possible without the other. However, as this research aims to develop pain management education as a *single component* of PEC, and is not a standalone professional task, the terms competency, and competency framework are used, with recognition that to be competent a practitioner would also need to be capable.

Competence as a goal of education emphasises outcomes and abilities, not time spent in a program. Competence requires a focus on the learner, and their abilities at the end of the program. [91] A focus on outcomes, and the use of the "competency" to frame learning (rather than knowledge objectives) is the method of competency based medical education (CBME). The concepts CBME and competency framework will be explored in the following sections.

2.3.4 Competency Based Medical Education (CBME)

Outcome based thinking stemmed from the Tyler Rationale [96] and was further developed by Benjamin Bloom et al, in A *Taxonomy of Educational Objectives*.[85-88] Outcomes-based education specifies the end result of an educational process (outcome), not the process. The learning and assessment activities are developed from the prespecified exit outcomes. [97] The intention is to reduce the capabilities gap between the classroom and practice. [98]

The results focused, outcome emphasis found traction as business leaders in the 1960s expressed concern that university graduates lacked the skills required in the workplace. [79] In medicine, this meant concern over the quality and capability of healthcare providers.[99] Competencies were introduced to serve competitive economies and the needs of business.[81] Competency Based Education (CBE) focuses on performances of graduates, or the end state of education, rather than time spent in instruction, content and/or method. [100]. CBE gained popularity in medical education [82], because it has a utilitarian stance and ensures graduates meet the requirements for clinical care. [81] At its core, CBE focusses on measurable performance *after* instruction, having first defined what needs to be learned.

CBE is criticised for being reductionist, favouring the acquisition of measurable skills, at the expense of professional expertise[82], making objectives, not excellence the target.[91] The extensive logistical, administrative and financial burden, a focus on utility which cuts out broader experiences and a necessary investment in infrastructure are criticisms of CBE. [91]

2.3.5 Competency Frameworks

A competency framework *"…defines the set of knowledge, abilities and behaviors that professionals need to excel in the performance of their job functions"* [101]

The identification and formulation of competencies helps define a profession and frame the expertise of the professional, set assessment standards and promote competence in professionals. [102] As a link between education and practice, competency frameworks can be used to inform curriculum design *and* professional accountability. Batt [102]refers to 'upstream and downstream'

processes, with the required competencies for a profession forming a conceptual bridge. Changing practice can influence changes in the framework and the framework informs education. [103]

Competency frameworks offer structured, standardised, and integrated depictions of KSAs and practice requirements in a specific context [104] and hold professionals to account. [79] Competence frameworks are seldom perfectly generalisable and contextual development of competency frameworks is a legitimate and worthy endeavour. [105]

2.3.6 The South African NQF as a Competency Framework

The South African Qualifications Authority (SAQA) adopts 'Applied Competence' as its underpinning philosophy of competence, [106, 107] and aligns competence to an Outcomes-Based conception. [108] Applied competence is defined as:

"*The ability to put into practice in the relevant context, the learning outcomes acquired in the process of obtaining a qualification or part qualification…"* [106]

Applied Competence is a combination of Foundational Competence, Practical Competence and Reflexive Competence. Foundational Competence is the "*…demonstrated ability to perform a set of tasks and actions in authentic contexts (situations),"* Practical Competence the *"The demonstrated understanding of what we are doing and why we are doing it,"* and Reflexive Competence the *"…demonstrated ability to integrate our performances with our understanding so that we are able to adapt to changed circumstances and explain the reason behind these adaptations". [107]*

Foundational competence embraces the intellectual/academic skills of knowledge together with analysis, synthesis and evaluation, which includes information processing and problem solving. Practical competence includes the concept of operational context; and reflexive competence incorporates learner autonomy. [108] The NQF emphasises demonstration of performance in authentic contexts, integration of attributes, knowledge, and skills, and awareness of self and own understandings.

The NQF is organised as a matrix of 10 generic competencies, stratified into 10 complexity levels, colloquially known as 'NQF Levels". *[108]* The NQF levels describe learning outcomes and achievements in ten levels in ascending complexity; [108]; Level 1 (NQF 1) is approximately the complexity level of high school Grade 9 and Level 10 (NQF 10) is the complexity level of a doctoral degree.[108] The generic competencies are listed in Table 2 (page 20):

Table 2: Generic competencies of the South African NQF

	Generic Competencies
i.	**Scope of knowledge**
ii.	**Knowledge literacy**
iii.	**Method and procedure**
iv.	**Problem solving**
v.	**Ethics and professional practice**
vi.	**Accessing, processing, and managing information**
vii.	**Producing and communicating of information**
viii.	**Context and systems**
ix.	**Management of learning**
x.	**Accountability**

Qualifications are pegged to complexity levels and need to demonstrate achievement in combinations of the generic competencies and specific competencies consistent with professional discipline or field of study. In this way the NQF acts as a generic competency framework for South Africa.

2.3.7 Competency Frameworks in Healthcare

Curricula planned around outcomes risk long, unmanageable lists of specific outcomes which are difficult to apply in practice. [97] Presentation of end points of learning in a framework, or "sets" of outcomes, or categorised attributes - or domains - allows the outcomes to be more easily understood, compared and applied. [97] Each attribute is usually comprised of progressively smaller and more detailed statements describing the units of knowledge, skills and abilities. These attributes (domains) are multidimensional groupings of abilities which professionals must access to perform their tasks, i.e. practice competently. [91] Attributes and constituent competencies may be displayed in a model that allows specification while allowing individual education programs to develop their own curriculum. [97] One early model guiding outcomes-based design was a "three-circle" model, which placed performance of tasks at the centre, surrounded by a concentric circle describing the approach to the task and an outer circle describing professionalism. [97]

The Royal College of Physicians and Surgeons of Canada (RCPSC) developed the CanMEDS framework to direct medical speciality education in Canada. CanMEDS is the founding document for all standards. The framework ensures physician education is responsive to societal needs and organises "key competencies" into domains, termed "roles". [109, 110] The roles are the tasks and behaviours expected of specialist physicians. The key competencies consist of smaller "enabling" competencies." The framework centres the role of 'Medical Expert", who integrates competencies from the other 6 roles. These are 1. Communicator, 2. Collaborator, 3. Leader, 4. Health Advocate, 5. Scholar, and 6. Professional. The framework [111] will be revised in in 2025, and preliminary research has identified several themes which may influence the competencies of physicians. These include Equity, Inclusion, and Social Justice; Diversity, Anti-racism; Physician Humanism; Complex Adaptive

Systems; Data-Informed Medicine; Clinical Learning Environment; Virtual Care; Clinical Reasoning; Adaptive Expertise; and Planetary Health. [112]

The Accreditation Council For Graduate Medical Education (ACGME) organised competencies for physicians into six domains of competence (categories of competence) [78] The domains are; 1. Practice-Based Learning and Improvement, 2. Patient Care and Procedural Skills 3. Systems-Based Practice 4. Medical Knowledge 5. Interpersonal and Communication Skills and 6. Professionalism [113] The South African Nursing Council (SANC) published a series of documents detailing competencies in 6 nursing specialities, as well as 10 documents detailing competencies for Advanced Practice Nurses. [114] These documents outline the context and nature of the nursing speciality, and lay out domains of competence, consisting of core competencies and their constituent sub competencies. The domains for the speciality of emergency nursing are 1. Professional, Ethical and Legal Practice, 2. Clinical Practice – Care Provision and Management, 3. Quality of Practice, and 4. Management and Leadership.

The HPCSA adopted a framework for clinical associate, medical and dental programs, based on CanMEDS, which also consists of roles, key competencies and enabling competencies. [115]
The roles in this framework are termed 1. Healthcare Professional (in the centre), 2. Communicator, 3. Collaborator, 4. Leader and Manager, 5. Health Advocate, 6. Scholar and 7. Professional. An example of a role and competencies is shown in Table *3*.

Table 3: Example of a role in the Health Professions Council of South Africa Clinical Associate Competence Framework

Role (Domains) 1 of 7	Key Competency (1 of 5 in the Role)	Enabling Competencies
Communicator	Develop rapport, trust and ethical therapeutic relationships with patients/clients, families and communities from different cultural backgrounds.	a) Retrieve patient/client-specific information from a clinical data system. b) Deliver information to a patient/client and family, communities, colleagues and other professionals in a humane manner and in such a way that it is understandable and encourages discussion and participation in decision-making. c) Present well-documented assessments and recommendations effectively in written and/or verbal form in response to a request from another healthcare professional. d) Compile accurate reports as needed and required for statutory and professional purposes

Adapted from: Medical And Dental Professions Board. Core competencies for undergraduate students in clinical associate, dentistry and medical teaching and learning programmes in South Africa. Health Professions Council of South Africa; 2014 February 2014.

These competency frameworks shape both the practice and education of professionals. Competencies within domains or roles are made up of smaller, more detailed units, as shown in Table 2. The typical organisation is for specific (detailed) competencies to be organised into mid-level groups, which then cluster into broader domains of competence or roles. Next, we will explore competency frameworks specific to PEC.

2.3.8 Competence Frameworks in Prehospital Emergency Care

The body of evidence outlining frameworks that guide the education and practice of PECPs is presented through research evidence (including secondary sources) and regulatory documents that detail frameworks for licensing and practice. A scoping review identified common elements influencing EMS education, considered to be essential competencies. [116] These were 1. Occupational Safety, 2. Demonstration of Knowledge, 3. Formulating and Delivering Clinical Practice, 4. Criticality Assessment and Clinical Skills, 5. Professionalism, 6. Ethics and Law, 7. Clinical Decision Making, 8. Communication, 9. Identifying and Assessing Mental Care, 10. Identifying and Assessing Social Care, 11. Identifying and Assessing Health Care, 12. Academic Skills and 13. Interprofessional Skills. [116]

In the development of core competencies for Taiwan's 3 tier EMS system [117] competency items were grouped into broader domains (factors). These differed between the three tiers. Grouped by qualification, with the most basic qualification first and the most advanced last, factors were as follows: (EMT-I) 1. "*Professionalism and Safety Behaviour*", 2. "*Continuing Professional Development and Caring Network in Community",* and 3. "*Communication skills*". (EMT-2) 1. "*Professionalism and Safety Behavior",* 2. "*Continuing Professional Development and Collaboration Communication Skills"*, 3. "*Performing Clinical Reasoning Skills and Providing Integrated Caring Network In Community*". For EMT-Ps, factors were: 1. *Clinical Competency and Professionalism"*, 2. "*Patient Centered Practice"*, and 3. "*Continuing Professional Development*" [117]

Tavares et al.[118] conceptualised Canadian PECP practice in terms of contemporary and future roles. The conceptual model displayed contexts of practice, cross-cutting themes as well as 6 distinct roles which PECPs play in practice. These are 1. Clinician, 2. Team Member, 3. Health And Social Advocate, 4. Educator, 5. Reflective Practitioner, 6. Professional. These roles are framed by the contextual concepts, a. variable context of practice, b. embedded relationships, and the c. health and social continuum. Cross cutting themes were i. Patient Safety, ii. Compassion, iii. Adaptability and iv. Communication. [118] These can be seen as 'generic competencies', which are present in all roles.

A scoping review of core competencies for *student* PECPs [119] identified five critical themes; Communication, Teamwork, Decision Making, Critical Thinking, Professional Behaviour and Clinical Skills. [119] This review included roles such as community paramedicine. This review included the standards of the South African "Clinical Associate' competencies published by the HPCSA. Notably, standards published by the PBEC for PECPs were not included. In addition to research evidence, regulatory authorities adopt competencies and competence frameworks as standards for certification and practice.

The Paramedicine Board of Australia has adopted capability statements for registered paramedics [120] and Australian PECPs. These statements identify the KSAs required of Australian paramedics, for safe and professional practice. Capability statements identify and group the knowledge, skills and professional attributes required, and paramedics should integrate and apply these KSAs during practice. The capabilities are organised in domains; 1. Professional and Ethical Practitioner, 2. Communicator and Collaborator, 3. Evidence-Based Practitioner, 4 Safety and Risk Management Practitioner and 5. Paramedicine Practitioner. Domains contain statements which identify the scope of capabilities. The framework is presented as competencies within domains and is matched to lists of behaviours which will constitute evidence of achievement of the competency. [120] An example is shown in Table *4*.

Table 4: Example of a domain in the Australian Paramedics Capability Framework

Domains (1 of 5)	Competency (1 of 4 in domain)	Evidence
The professional and ethical practitioner	Assume responsibility, and accept accountability, for professional decisions	• Recognise and respond appropriately to unsafe or unprofessional practice. • Integrate organisational directives, policies, procedures and guidelines with Professional standards. • Apply relevant quality frameworks and processes to practice.

Adapted from: Paramedicine Board. Australian Health Practitioner Regulation Agency 2021. Professional capabilities for registered paramedics. 2021

The Health and Care Professions Council (HCPC) in the UK have published Standards of Proficiency for paramedics. The standards are presented as lists of statements and sub-statements which may be interpreted to be analogous to competencies, though not explicitly presented as such. [121] An example is show in Table *5*.

Table 5: Example of a proficiency standard for paramedics from the Health and Care Professions Council

	Statements
Look after their health and wellbeing, seeking appropriate support where necessary	- identify anxiety and stress in themselves and recognise the potential impact on their practice - understand the importance of their own mental and physical health and wellbeing strategies in maintaining fitness to practise - understand how to take appropriate action if their health may affect their ability to - practise safely and effectively, including seeking help and support when necessary - develop and adopt clear strategies for physical and mental self-care and self-awareness, to maintain a high standard of professional effectiveness and a safe working environment

Adapted from: Health and Care Professions Council. Standards of Proficiency for Paramedics. Health and Care Professions Council.2023

The HPCSA has produced minimum standards for the 3 HEQSF aligned qualifications [55-57]. The HPCSA standards define graduate attributes, in the categories of 1. Knowledge, 2. Skills and applied competencies, and 3. Professional attributes, and go on to suggest a curriculum structure and specific learning outcomes. [55-57] By shaping the qualification standards, the HPCSA indirectly shapes practice, through defining and prescribing intended learning outcomes. Strictly speaking these are not competency frameworks, which are situated midstream between upstream professional practice and downstream curriculum. [103] The HPCSA is essentially prescribing curriculum, which is potentially regulatory over-reach. The frameworks presented the sections above guide the practice of professions. The next section will review frameworks guiding the practice of pain management *within* a profession.

2.3.9 The IASP Competence Framework.

Some healthcare disciplines have used competency frameworks to strengthen pain teaching and development in their educational programs. The IASP[7] has developed core curricula for health professions, underpinned by a framework of core competencies (Table *6*) and underpinning values (Table *7*). The competencies are organised in four domains [60] , framed by the IASP's core values.

Table 6: The International Association for the Study of Pain's competence domains

Domain nr	Domain Name
Domain 1	The Multidimensional Nature of Pain (What is Pain)
Domain 2	Pain Assessment and Measurement: (How is pain recognised?)
Domain 3	Management of Pain (How is pain relieved?)
Domain 4	Clinical Conditions (How does pain context influence pain management?)

From: Fishman, S. M., Young, H. M., Lucas Arwood, E. et al. 2013. Core Competencies for Pain Management: Results of an Interprofessional Consensus Summit. Pain Medicine, 14, 971-981.

Table 7: The core values of the International Association for the Study of Pain

• Advocacy	• Empathy
• Collaboration	• Ethical treatment
• Communication	• Evidence-based practice
• Compassion	• Health disparities reduction
• Comprehensive care	• Interprofessional teamwork
• Cultural inclusiveness	• Patient-centred care

From: Fishman, S. M., Young, H. M., Lucas Arwood, E. *et al.* 2013. Core Competencies for Pain Management: Results of an Interprofessional Consensus Summit. *Pain Medicine,* 14**,** 971-981.

This framework is intended to guide integration of pain learning outcomes and content into health professions curricula. [122] Following the trend for team-oriented, interdisciplinary pain management [123], the IASP has also developed an interdisciplinary pain management curriculum. [122, 124] Some North American and European Higher Education Institutions (HEIs) have used this framework to develop and refine both undergraduate (prelicensure), post graduate and specialist pain education in multiple healthcare disciplines [125-127] and to guide Continuing Professional Development (CPD) programs in hospital and dentistry settings. [128]

The IASP has developed core pain management competencies for prelicensure healthcare professionals (undergraduate). Arranged in the four domains, 21 competencies describe the minimum performance in respect of pain management for prelicensure health professionals and could guide the development of pre-licensure (undergraduate) pain curriculum and teaching [60] . The emergency medical professions (emergency physicians, emergency nurses and PECPs) were not represented during the development of the framework. The framework also has a North American bias, and no representation from Africa was on the developmental team. The IASP has also not developed curricula for any of the emergency professions. Published research on pain management education and curriculum in South Africa was not found in this search.

[7] International Association for the Study of Pain

2.4 Pain Education in Healthcare

Historically, health program curricula marginalised pain, with teaching and content being obscure and fragmented. [129-131] Review of the research from the last decade shows little has changed.

A survey of 25 Norwegian programs (Occupational Therapy, Psychology, Nursing, Pharmacy, Dentistry, Medicine, and Veterinary Science) found 14 programs had mandatory pain education, with the remaining 11 integrating pain teaching into other modules. There was between program variance of structure and time spent on pain (median of 45 hours, range 2 - 454 hours) and topic variance between disciplines. [132]

A survey of 249 medical schools in 15 European countries found dedicated pain units in 31% of curricula. In more than half (55%) pain was taught within non-pain specific modules. An integral approach was used in 7% of curricula and 7% of curricula showed no pain teaching. Of the curricula with dedicated pain modules, only 18% were compulsory. [133]

A survey of health programs in 11 Catalan (Spain) universities (Dentistry, Dietetics, Medicine, Nursing, Occupational Therapy, Pharmacy, Physiotherapy, Podiatry, Psychology and Veterinary Science) also found pain teaching to be lacking. Of the 550 participating programs, 244 contained pain content. Dentistry and Veterinary Science showed the highest mean proportion of curricula spent on pain management, 3.8% and 3.4% respectively, and Psychology the least (0.1%). Nursing showed the highest range, with some programs showing up to 9.6% of content related to pain. Pain in clinical conditions showed the highest amount of content (13.62%) while the management of pain showed the least content (10.28%). Pain in children (4%), older adults (5%) and special populations (5%) occurred least frequently.[134]

Out of 19 undergraduate Medicine programs in Australia and New Zealand only one offered a standalone pain module. All others integrated pain teaching into other topics and modules. [135] A SR of undergraduate Medicine programs found all medical schools in Finland, most in Australia and New Zealand (95%) as well as 80% in the USA, 70% in Europe and 68% in the United Kingdom (n=19) taught pain medicine within other modules. In the USA and UK 96% of schools and 83% of medical schools in Europe had no compulsory, stand-alone pain teaching. [136]

A survey of Brazilian Physical Therapy (Physiotherapy) programs (n=399) found only 26 had a dedicated pain module, all being either elective modules, or not obligatory. Pain modules had a mean duration of 44.3 hours (SD = 5.2; range = 36–60) [137] Handling pain in an 'optional' manner in physiotherapy is unusual, as earlier surveys of physiotherapy programs showed this discipline to provide more pain education than other disciplines.[138]

The limitation of curriculum surveys are that they examine the explicit curriculum, or what educators believe is happening. Research into student opinions provide alternate perspectives. A survey of Canadian medical students found most students recalled a few hours of pain teaching per year (a median of between 2 hours (IQR=4) and 5 hours (IQR=3.75) hours per year) This contrasted with the findings of a mapping exercise of the curriculum which showed 54 hours of pain management education in years 1 and 2-, and 26-hours education in years 3 and 4. In all four years, only 1 hour was dedicated to paediatric pain management. Ultimately, 22% of these students were generally uncomfortable with treating pain in adults, and 75% were uncomfortable treating paediatric pain. Students felt pain management to be extremely important, but that pain education was not prioritised in the teaching. [139]

Omission of pain teaching is an obvious risk for poor clinical management, though adding pain outcomes to a program without a strategy can also be detrimental. While education has improved student attitudes and knowledge [140], ad hoc programs have resulted in unintended and undesirable results, such as an increase in negative attitudes to pain management. [141]

Surveys of curricula focused on how pain teaching is structured in programs, what topics are taught, how much time is dedicated to pain teaching as well as teaching and assessment methods. These surveys provide valuable insights, but not having a dedicated pain module, or identifying minimal *proportions* pain content are not necessarily cause for concern on their own. Given the volume of work presented in undergraduate programs, small percentages of the curriculum devoted to pain content, may total a sizeable volume of work. The studies did not evaluate relevance of the pain content for the discipline, or whether the content that *was* taught was appropriate. Of concern were the number of programs which did not contain pain teaching or made pain courses an elective.

Some opinion is that pain is treated as a symptom, not a disease, with the underlying pathology being given attention to the neglect of the pain. [142] Other opinion is that pain teaching is conducted without a guiding framework or paedogogical strategy, and pain content needs to "fit in", or is lost, alongside other objectives. [135, 142]

Some medical schools have developed core pain competencies for Primary Physicians using the ACGME competency domains. [113] Emergency Medicine has unique challenges with pain management and education, i.e., exposure to a variety of pain types, competing priorities, brief periods spent with the patient and diverse patient populations. A pain management curriculum for Emergency Medicine (EM) physicians has been developed [143] as have consensus recommendations for curriculum implementation in EM residency programs. [144]

Amongst EM residencies in the USA, approximately 5.7 hours of instruction are devoted to pain education, though some programs do not spend any time on pain instruction. The majority of programs (63%) provided opportunity for residents to rotate through a specialist pain service as an elective module. (37%) of programs offered no such opportunity). Only 4.84% of EM programs reported a good level of collaboration with pain specialists. Programs with greater collaboration with pain specialists reported greater use of techniques such as regional anaesthesia. [145]

Other than the Brazilian study of physiotherapy curricula [137], these surveys have been conducted in high income countries. [146] Like Brazil, South Africa is an upper-middle-income country in 2024 but is plagued by inequality. [146] The country has unique pain challenges, such as those resulting from Human Immunodeficiency Virus (HIV)[147], and generalisability is difficult. Differing contexts may have different requirements of pain curricula; for instance, North American curricula place high value on teaching the responsible use of opioids amidst the opioid crises the USA is facing. [148] This argues for contextually relevant, deliberate, and targeted educational development. Low-Middle- and Low-Income countries are silent in the body of research. Education in PEC has a limited presence in the literature. This will be explored next.

2.5 Problematising the Practice of Prehospital Pain Management

The section problematises pain management practice as an ecological framework, which emphasises the interconnectedness of factors influencing pain management. While elements have clear

boundaries, they are affected by their relationship with other elements.[103] Bronfenbrenner's Ecological Systems Theory (EST) [149] is used as a frame, organising the literature into micro systems (the immediate clinical practice environment – patient and practitioner) and the mesosystem (the interactions between people and policies). [103] The Exosystem refers to pain management at the service level while the macro-system involves government policies, culture and societal issues. [103] The Chronosystem shows the influence of time. Organising the literature ecologically allows for the complexity of the problem to become visible.

2.5.1 Pain Management at the Microsystem level (Patients and Practitioners)

2.5.1.1 Knowledge, skills and attitudes

PECPs' knowledge, skills and attitudes may hamper pain management. Research shows inconsistent assessment and documentation of objective pain scores. [42, 43, 150] Fear of adverse events and dosing errors is a recurrent theme in PEC literature. [68, 70, 151, 152], and management may be adjusted in response to these fears. [44] Differing vital parameters and weight calculations in paediatrics cause anxiety in PECPs and may lead to cautionary underdosing [153] or deferment of analgesic administration to hospitals and physicians. [68]

Fear of adverse events is cited as a barrier to care in the Netherlands, leading PECPs to either withhold Fentanyl, in contravention of national guidelines, or to administer lower doses.[154] Pain management has been described as not worth the risk of overdose, unless the pain had major traumatic origin. [155] In the UK PECPs prefer using low doses to "…*take the edge off*" rather than properly managing pain, despite none of the participants having experienced serious adverse events with morphine. [156] Caution with morphine administration leads many to use small doses, never exceeding 5mg as a bolus and 10mg as a total dose. [44] This dosing is demonstrated in quantitative work where morphine doses were recorded as 4mg administered once off. [43]

Knowledge and attitudinal deficits such as a belief that children needed less analgesia due to immature nervous systems[68] and that out-of-hospital analgesics mask symptoms and hamper in-hospital diagnosis are present (though not universal). [156] The end-goals of care are disputed; some PECPs believe they should only palliate pain and others wish to relieve pain, with doses selected accordingly. [44] There is some evidence that while patients (and providers) expect pain relief, they accept there are constraints, and valued a professional approach even if therapies could not be provided. [157] Some medicines are perceived to be of limited potency and result in only a moderate reduction in pain. Some PECPs believe they have a moral duty to relieve pain a bit, but not completely. [156]

A recent Knowledge, Attitudes and Practices (KAP) survey in South African PECPs documented a predilection for the use of placebo to confirm presence of pain. Ignorance of cultural and spiritual influences on pain expression and lack of knowledge of the reliability of vital signs and behaviour as pain indicators were present. [158] PECPs frequently work at the limits of their knowledge, in environments which hinder thorough clinical examination and history taking. This creates stress and anxiety. [151]

2.5.1.2 Assessment of pain

An important interaction occurs during pain assessment, which is a recurring problem for PECPs. Assessment is blurred by PECPs' belief that their own judgement and experience is superior to patient self-report in determining pain severity.[68] This is a diagnostic risk as PECPs have difficulty applying pain assessments in context and seem unaware of cultural differences in pain expression. [158] The use of validated scoring tools improves the rate of pain management in some settings. [154], though there seems to be a pervasive reluctance to base decisions solely on pain scoring instruments. PECPs rely on indicators such as judgement, general impression, and vital signs, [24, 154]as wells as behavioural indicators. [24, 44, 152]

Language and communication are barriers [44], as are innumerate patient populations. Pain is difficult to articulate and many patients have difficulty with scoring tools. [152]. Simplifications of tools, such as dichotomisation to "pain or no pain" has shown some success. [159] Some PECPs mistrust pain scales [152], and doubt patient honesty. [154] PECPs perceive pain tools to create opportunity for patients to misrepresent their pain to gain faster access to scarce emergency resources [152] and enable malingering. [156]

2.5.1.3 Pain severity

Related to pain assessment, pain severity influences decision making. Patients with severe pain, a score of 8-10 on Verbal Numerical Rating Scale (VNRS), are administered opioids more often (OR1.74, 95%VI; 1.64-1.85, P<0.0001) [160] and show greater odds of receiving analgesia than those in moderate pain - (OR 4.94, 95%CI;4.75-5.15, p<0.0001) [160] and (OR 5.29, p<0.001). [150] Analysis of mild pain was omitted in both these studies. In the USA, a higher proportion of patients with high pain scores received any analgesia (42% when pain score >8 and the proportion declining for lower scores). [161] This might be systematic in that PECPs in this study population only carried morphine, in contrast to the Australian PECPs who carried a variety of medicines. Higher pain scores are associated with greater pain reduction, with scores of median 8 (IQR 7-9) achieving pain reduction and median scores of 5 (IQR 5-8) not achieving pain reduction. [162]

Almost 91% of Australian children reporting severe pain received an analgesic whereas only 39% with mild pain were treated. Severe pain also resulted in better pain reduction (OR 7.5) than moderate (OR 3.9) pain. [163] Children presenting with higher median VNRS score (IQR) (7 [5-8] vs 5 [4-7]; P b .001) we more likely to achieve pain reduction and be administered analgesia. Elsewhere, almost all severe pain cases (91%) received analgesia while milder pain was treated at a lower rate (39%). [69] Emergency Centre staff felt PECPs managed severe pain well but not mild and moderate pain. Overall, practitioners felt there was scope for widening pain assessment and management options, specifically routes of medicine administration and non-pharmacological methods. [157] Mild pain appears under investigated, as many pain studies omit persons with pain scores below four from analysis.

2.5.1.4 Pain aetiology

Aetiology also influences selection of therapies. In a UK study, Entonox™ was used for fractures and morphine for cardiac pain. [157] Morphine was reserved for longer travel times and rougher roads and Entonox for shorter times. [157] In Sub-Saharan Africa trauma was a leading cause of pain accounting for 93% of pain cases(non-trauma accounted for 7% and obstetric cases for 1% of pain presentations). [24] The patients in these groupings received analgesics in 93%, 6% and 1.5% of cases, respectively. Of the 1781 (1%) obstetric cases less than 1% (n=8) were documented as being in pain. [24] In Australia trauma cases have much larger odds of receiving analgesia than non-trauma cases (OR 3.142, p <0.001). [150] Some PECPs are more likely to manage pain if physical signs of pain are present.[156]

2.5.1.5 Patient diversity

2.5.1.5.1 Paediatrics

The diversity of patient groups, particularly paediatrics, significantly influences pain therapy. Interactions with children often cause anxiety for PECPs [153, 164] and they are less likely to treat pain in children (P<0.001). [68]. Some PECPs prioritise treating children over adults. [151] An Australian records review of children under 15 (n=15 016), found that analgesic administration increased the odds of pain reduction by six times (AOR 6.6; 95% CI, 5.9-7.3)[163] Children aged 5-9 (AOR, 0.7; 95% CI, 0.6-0.95) and 10-14 (AOR, 0.5; 95% CI, 0.4-0.6) had less pain reduction than children under 3. Mild pain cases were excluded. Older children were less likely to receive opioid analgesia (OR 0.93; CI 0.88–0.98). [69]

Barriers to pain care in children include fear of IV catheter placement, parental influence, and difficulty assessing pain. [70] Successful IV access significantly increased the odds of receiving opioid analgesia [69] Successful IV access significantly increased the odds of receiving opioid analgesia [165], highlighting IV access as a significant enabler of pain management.

Communication barriers between PECPs and children significantly impact pain assessment. Children are six times more likely than adults to be assessed by clinical judgement alone (31% vs 5%). [68] PECPs often replace pain scoring tools with clinical judgement, leading to more aggressive treatment of visible aetiologies like trauma [151] Trauma is more 'visible' and perceived as more likely to achieve pain reduction. [166]Age-appropriate scoring tools are a necessity and constant use increases confidence in them. [151] Some PECPs believe younger children cannot differentiate pain severity; they either have pain or they don't [166]

Prehospital nurses have developed strategies to manage the stress and anxiety of treating paediatrics. They cope by being receptive and focusing on care, building trusting relationships, and providing professional nursing care. [153] Parents are considered crucial, with one team member often dedicated to them. Trust with the child is built through age-appropriate language and distractions like toys [153] While paediatric pain scales are used, practitioners often rely on judgement adjusted for the child's age and prefer non-IV routes like intranasal administration [153]

Taking an interest in the patient's "lifeworld" demonstrated caring and proved effective. [167] This lifeworld approach approaches management from the children's' point of view, imagining how the child was experiencing the event. This required acceptance that pain caused suffering which changed the child's lifeworld, and nurses took responsibility for alleviating that suffering. [167] Empathy acts as a facilitator of pain management. [152]

Understanding the child required the formation of relationships and trust. Communication occurred using familiar people such as parents, soft toys as well as playfulness and a soothing voice tone. [164] Adjusting the clinical encounter, like sitting at eye level, helped. [153] Young children displayed true emotions easier, lived in the moment and were easier to distract. [166] Being a parent helped with entering lifeworld's, and with speaking to children, as well as making parents part of the management plan. [151] PECPs often didn't know how to deal with parents, who were frequently a barrier to care, though forming alliances with parents facilitated management and eased the encounter. [153, 155]

PECPs' difficulty with paediatrics stemmed from fear, unfamiliarity and lack of child specific education and experience. Skills beyond biomedical pain management, such as forming partnerships and alliances with patients and parents, facilitated management, as did attributes such as empathy. The practitioners in these studies were prehospital nurses, a discipline which emphasises 'Caring' as one of its core skills. This study is not necessarily generalisable pure 'PECP' practitioners but does offer useful insight to designers of EC programs for expansion of skills sets.

2.5.1.5.2 Gender & Age

In older adults, findings vary. Women over 64 were less likely to receive analgesics for mild and moderate pain than younger women, but more likely for severe pain [168] Men over 64 were less likely to receive analgesics than younger men, regardless of pain severity [168] A three-way analysis showed women had slightly lower odds of receiving analgesics than men (OR 0.75; CI 0.73-0.70). Overall, older patients were less likely to receive analgesics, including opioids, with odds ratios between 0.29 to 0.57. These differences persisted despite a non-discriminatory pain protocol, suggesting PECP responses to patient characteristics influence care more than protocols [168]

In Australia the odds of receiving any analgesia decreased with age, with adults aged 16-39 having an OR of 1.23 (95%CI 1.17-1.30) and adults older than 80 an OR of 0.59 (0.55-0.62) [160] A separate study found patients 45-69 years of age least likely to achieve a significant reduction in pain after treatment (OR 0.94; 95%CI, 0.89 – 0.99) than patient both older and younger than them. Both the youngest (<15) and the oldest (+85) had the greatest odds of achieving meaningful pain reduction (OR 1.60 and 1.28 respectively) [162] Later work found no difference with age. [169]

In children, more males than females received analgesics (79.8% vs 77.1%; P < .001), though more males reported pain than females (n=60.7%). Males had slightly greater odds of pain reduction (AOR, 1.1; 95% CI, 1.1-1.3). [163] A mixed methods study in the UK found greater proportion of male children were administered effective pain management (57.1% vs 42.4% females), and univariable analysis showed greater odds for males on achieving pain reduction (OR 0.23 95%CI :1.04–1.46, p= 0.015) though multivariable analysis showed no significant difference (OR 1.17 95% CI:0.98–1.39,p= 0.090) [170]. The qualitative reporting on this study showed PECPs did not expect there to be a difference in

pain management between the sexes, saying perhaps boys displayed more bravado than girls and were more likely to say the pain had disappeared. [166]

The effect of age in adults on PECP pain practice is uncertain. Older people appeared to receive less analgesia than younger people. The difference is statistically significant, but small. The question for education to answer is does this represent systematic discrimination and bias, representing the attitudes of PECPs, or are there confounding factors responsible for these apparent differences?

An Australian study found no difference between male and female patients for administration of any analgesia (Methoxyflurane, Fentanyl or Morphine) (OR 1.04 95% CI 0.95-1.07 for males, p=0.07) but males had higher odds of receiving opioid analgesia than females (OR 1.58 95% CI 1.49-1.68 p<0.001) (there was no difference in pain severity or type of clinical condition). Multivariate analysis did not find that the gender of the treating PECP influenced analgesic administration overall, however both male and female PECPs gave opioids to male patients more frequently ($p < 0.0001$). [160] A Swedish study of hip fracture found that males tended to administer analgesia more often than female PECPs (51% versus 47% of cases), but the difference was small. [171]

In Rwanda men reported pain almost 5 times more often than women and had higher odds of receiving pain medication (OR 3.8, 95% CI (3.5, 4.1), p< 0.01). Amongst patients reporting pain, men also had higher odds of being treated. (OR = 1.5, 95% CI (1.3, 1.7), p< 0.01). [24] In the UK no significant difference was found between men and women for the administration of morphine (OR for males 1.06, 95%CO 0.82-1.38, p=0.65). [172] With increasing presence of women on the battlefield, military research has evaluated pain practices and has not found biased pain management practices on the battlefield. [173, 174]

Intersectionality of sex and gender is present in every clinical interaction, though in the PEC pain literature sex is the element most studied, and gender is omitted as a variable. While there are differences in pain management based on sec, they appear to be small and often contrast. A recent rapid review by Dahoud et al. [175] found that there may be a sex disparity for pain management in PEC. Specifically, that females receive opioid analgesia at lower rates than males, despite showing higher pain scores. Almost half of their included studies did not find gender disparity. The review also concludes that the evidence base is small, and mostly observational and retrospective in nature. [175] Pain management in transgender patients in PEC are a significant research gap, with no research found.

2.5.1.5.3 Race

Race is an element often studied in the USA, and seldom elsewhere. A single service survey showed African-American, Asian and Hispanic patients (in the USA) were between 21% and 32% less likely to receive pain management than white patients. [176]. A survey of records in a PECP student data base (FISDAP Skills Tracker, Inc., Minneapolis) found Hispanic (OR 0.81 (0.70–0.93) p<0.01), African American (OR 0.60 (0.53–0.69) P<0.001) and Asian 0.79 (0.55–1.15) patients to have to have lower odds than white patients of receiving analgesia for painful conditions. Native Americans had similar odds 1.08 (0.62–1.87). [169] Studies of the National Emergency Medical Services Information System (NEMSIS) show similar results, at a national level. Pacific Islanders (60.5%, 95% CI 56.6, 64.4) were most likely to have pain recorded and Native Americans least likely (18.9%, 95%CI 17.4, 20.4]. In general, Hispanic patients were more likely than non-Hispanic patients to have pain recorded (44%,

95% CI (43.6, 45.1) vs. 31% [95% CI 30.8, 31.2], p < 0.001). In Both adults and paediatrics, African American and Native American patients were less likely than white patients to receive pain medications for the treatment of their pain. [177]

This trend continues in more contemporary studies. Racial groups other than Whites have lower odds of pain scores being recorded, and records with pain scores show racial disparities when compared with Whites. Multivariate analysis, including adjustments for pain severity, show Black patients and Native Americans/Alaskans half as likely as White patients to receive pain medicines (adjusted odds ratio of 0.53) [178] For patients with long-bone fractures, with non-white patients less likely to receive analgesics compared to White patients (adjusted OR:0.65, 95% CI:0.53 to 0.79) [179]

2.5.1.6 Substance abuse syndrome

Substance Abuse Syndrome (SAS) appears to influence the clinical interaction. Drug abuse by patients causes uncertainty amongst PECPs, who are distrustful and fearful of patients who display perceived drug-seeking behaviour. PECPs would rather withhold analgesia in these circumstances. [68, 156] In Sweden ambulance nurses lacked specialised knowledge of SAS and felt underserved by guidelines. They found it easy to mistrust these patients, especially when visible injuries were lacking, or patients were knowledgeable about medicines and doses. [180]This conflicted with professional values and ethics of nurses who felt an ethical obligation to treat addicts as humans and deliver quality care; they were uncertain which decisions were ethical. Nurses often experienced frustration if their treatment goals did not align patients' expectations, with re-addiction a major fear for both parties. [180]

Coping strategies included asking advice from other professionals, developing empathy and opening dialogues with patients. Practical measures included only administering analgesics in the ambulance if they believed patients would refuse transport once the drug had been administered. [180] Another study showed ambulances are used as safe havens, in that medicines are only given when they can get away from family and friends, who sometimes complicate matters. [152] The privacy and safety of the ambulance enable communication, including through body language and eye contact. [167] The possible existence of vulnerable groups raises the possibility of discrimination in healthcare, and exploring the behaviour of PECPs becomes important.

2.5.1.7 Pain Education in PEC

Few studies have directly addressed prehospital pain management education, with no evidence of needs assessment or deliberate curriculum development. Two U.S. studies evaluated the effect of pain management training for PECPs without detailing therapies, competencies, or curriculum. The earliest study (2006) [181] investigated whether a three-hour educational intervention (EI) improved the pain principles knowledge base and pain documentation and management. Post the EI, documentation, pain assessment and use of both non-pharmacological and pharmacological therapies improved.

In 2013 the same author re-evaluated knowledge and perception amongst PECPs. [182] This study included an evaluation of a Standard Operating Procedure (SOP) allowing PECPs to administer morphine without prior authorisation from a control centre (except for abdominal pain). Documented field management [182] of pain improved and better baseline knowledge and perceptions were evident, but the same EI did not produce further improvements. This may be because entry to practice programs contained more pain management content than in 2006. In both studies [181, 182] the only drug available to PECPs, morphine sulphate, required authorisation from a physician. The minimal change in the use of pharmacology, and the higher baseline in the later study poses the question whether a medical control acts as an enabler, or barrier to care.

Elsewhere, researchers evaluated trauma and burns patient's records before and after the implementation of a general pain management protocol and an EI targeting paediatric pain management. [183] Pain score documentation improved from 13.36% of cases to 32.48%, but this was not sustained. Opioid analgesia administration showed sustained improvement from 6.86% of cases to 17.51% after the EI and to 23.59% after protocol implementation. Despite these improvements, only half of eligible patients received therapy. [183] In this study the EI addressed paediatrics, but in evaluating effectiveness the authors looked at adult trauma victims only[183], without explanation. Potentially this work shows the cross utility of any education on pain management in adults. Given the well documented vulnerability of paediatrics to oligoanalgesia and PECPs' hesitancy with paediatric pain management [68, 70, 153, 155, 165], it does not show effectiveness of the EI.

These were all CE interventions, administered to qualified practitioners in response to a narrow and specific need in that EMS. While they demonstrate the utility of CE, they are not useful for informing future curriculum development. No research dealing with undergraduate pain education in PEC was found. The paucity of education literature on prehospital pain management demonstrates a knowledge gap. The next section will contrast the PEC literature with work done in other healthcare disciplines.

2.5.1.8 Professionalism

Patients valued efficiency and competency of care and valued actions such as handholding. Older patients wanted PECPs to speak to them instead of gathering information from relatives and disliked being ignored or excluded. [184]

Displaying professionalism reassures patients [157] and PECPs equate caring for patients with the ability to remain calm in difficult circumstances [167] Patients have an expectation for pain relief, but are reasonable, and accept the constraints of the prehospital environment. They will endure some pain if constraints are present. Many patients would rather stay at home than go to hospital, and a trusting relationship built on dignity is necessary to explain options. Some PECPs don't offer effective explanations. [157]

Patients sometimes misunderstand pain management. Patient perception of oral acetaminophen and ibuprofen as ineffective, low-potency medicines caused frustration. Medical protocols for mild pain became impossible to implement and negatively affected this option being offered in future cases. [159]

At the microlevel, some adjustments to care show coping with the challenges of pain management. Tailoring care to context, emphasising patient comfort and not practitioner convenience and disregarding scene times to allow for therapy were applied by some ambulance nurses. Effective pain management strategies often involved communication with patients, allowing them input into management strategies. Empowering patients to be involved in their own care was effective, even if it meant disregarding protocols. [185] This required development of attributes such as "caring" and "judgement", rather than an exclusive reliance on biomedical skills. (Berben 2012)

2.5.2 Pain Management at the Mesosystem level

This section explores how pain management is influenced by the interactions between patients and PECPs, centred on the attributes of patients and PECPs.

2.5.2.1 Interaction between PEC and hospital professions

PECPs fear criticism and interrogation of their management.[165] and don't want attention from authority figures. Almost a third of practitioners (30.4%) reported negative responses from ED staff, though only 8.8% of practitioners deferred analgesia because of it. A minority (11.8%) of PECPs defer analgesia to avoid negative attention from superiors, though only between 4.8% and 11.9% of PECPs reporting receiving negative responses from superiors. [70] Only a minority of PECPs (7%) feared punishment for incorrect application of the protocols, but a perception of, or culture of, punitive feedback may hamper drug administration. [159]

Interdisciplinary communication is inadequate [154] and prehospital staff feel other professionals disapprove of prehospital analgesic administration and do not understand the physical challenges of the prehospital environment. Some of these challenges are unique, such as hostile and abusive crowds and bumpy roads. [152] There isn't a shared perspective on pain management between the different professions, leading to conflict. (Berben 2012) PECPs are frustrated by continuously having to explain qualification systems and capabilities. [152, 157] Good relationships with hospital staff and immediate superiors were an enabler. [154] Where interprofessional, communication, collaboration and joint decision making occurs patients benefit[164], and ED staff find value in obtaining information of the scene from PECPs. [157] There seems to be a desire for community of practice, with support from technically proficient PECPs[151], and mentorship [155] found to be enablers.

Deferment was also driven by a belief in the superiority of hospital care and avoidance of conflict with ED staff. [155] In some cases, PECPs fear pain management itself. [68]In studies of out-of-hospital burn care, unrelieved pain was seen as the greatest barrier to optimal burns care (cool running water), and pain relief was the greatest facilitator. [186]. This may place pain at a point of tension in the clinical interaction; reluctance to manage pain, with the recognition of the clinical facilitation pain management offers.

Lack of exposure to paediatrics during clinical learning placements education, CE and clinical practice, [68, 151, 155, 165] is a universal problem. This meant unfamiliarity and hesitance with performing skills such as IV lines required for analgesic administration [68, 70, 151, 153, 155] and difficulty dealing with

children's fear of needles[153]. Initial education and training de-emphasised paediatrics, with documented 'stinginess' with analgesic medicine administration attributed to having been taught to look for reasons not to give these medicines. [155] Having strong mentorship and senior staff to consult and assist with reflection on significant experiences with paediatrics enabled pain management. [155, 164]

2.5.3 Pain Management at the Exosystem (Services and Hospitals)

2.5.3.1 Time spent in care

The influence of time spent in care is placed in the exosystem as limits on time spent In care are often driven by service level or local government policy. The probability of opioid administration increases by 7% per additional minute spent with the patient (OR 1.07; 95% CI 1.04–1.11). [69] In Australia the change in analgesia administration rate at less than 30 minutes, 30-59 minutes and >60minute was 41%, 61% and 75% respectively. [160] Shorter distances to hospital affect PECP's decision making in that they may prefer to defer analgesia to hospital.[151] None of these studies offer explanation for this the influence of time. Increased time in care may offer greater opportunity for pain management. Deferring to hospital may be untenable over longer periods and may become 'worth it.' Administration of analgesia prolonging case times cannot be ruled out.

2.5.4 Pain Management at the Macrosystem (National Policies, Laws and Culture)

2.5.4.1 Qualifications and capabilities

The capabilities a PECP has are often regulated by regulators, or the qualifications they hold. PECPs who hold higher qualifications typically have greater depth of understanding, higher levels of skill and access to more therapeutic options. Higher qualifications have shown greater odds for administering opioids (OR 1.40 95%CI: 1.32-1.48) [160] Meaningful pain reduction is associated with the presence of a higher level PECP on the ambulance crew (OR 1.52, 95% CI; 1.14 to 2.04, $p < 0.01$). [172] More qualified PECPs provided more effective management (OR1.45 95%CI; 1.21-1.75, $p<0.001$), though when this finding was put to PECPs in a later qualitative study it caused conflict. PECPs were adamant that there was no difference. [166]

Research into differences in pain management based on scope of practice (determined by qualification) did not find significant differences in management between Australian Intensive Care PECPs (ICP) and Ambulance PECPs (AP). Multivariable analysis showed qualification did not explain variation in pain management as significantly as did pain severity and pain aetiology. [150] In South Africa, a statistically significant difference in pain knowledge is present between PECPs with higher and lower qualifications. Advanced practitioners scored 76.67% (IQR = 56.67–80.00), intermediate practitioners 56.67% (IQR = 47.50– 66.67) and basic practitioners 46.67% (IQR = 40.00– 50.00) in a KAP survey. [158] Some PECPs with lower qualifications are required by the regulator to consult with an authority to administer medicines like morphine. Consultation between PECPs is seen as beneficial,

though some practitioners resent the requirement for consultation. [152] The level of qualification represents a somewhat artificial association. Many EMS systems operate with PECPs on different levels of care, determined by their qualifications, which are linked to authorised practices and drugs formularies. Much of EMS practice is protocolised, with differing levels of PECP authorised differently in respect of analgesics. Differences in management practices may represent a difference in regulation, given expression through qualifications, rather than the education program itself. This lack of access to pharmacology is a considerable frustration for some PECPs, who feel they should be doing more. [152] In this instance regulatory requirements cause frustration.

2.5.4.2 Policy and guidelines

A lack of guidelines, and inadequacy of available pains assessment techniques and management options act as a barrier to pain management. [164] PECPs felt the need for more management options and broader strategies [157], with specifically intranasal options for children being wanted. [151] In some countries PECPs feel the national guidelines are inadequate. [154]Unfamiliarity with especially paediatric protocols caused anxiety and reluctance to manage pain. [155] Implementation of a guideline did not necessarily improve pain management. [69] and guidelines themselves do not take away fear of using analgesics, [151]Protocols and directives need buy in from PECPs as their attitudes to analgesics may influence patient compliance and if they misunderstand protocols omission is a risk.[159] The South African regulator (HPCSA) has recently published a CPG[58] and a CDST[67] which make recommendations for and guide pain management, however these are still relatively new and untested, and the effectiveness, and adoption, is as yet unknown.

2.5.4.3 Culture of Pain Management

In a study of pain in paediatrics the majority of PECPs majority viewed paediatric pain management as unimportant, even not part of their job, which was to 'save lives'. [156] This attitude was present in more than one study, and caused some confusion as to roles, as many PECPs believed they were not there for the less emergent cases [157], and pain was not life threatening. (Berben 2012) Generally, pain management is considered less of a priority [152] Not all PECPs felt this way, with some claiming pain management to be important. [157]

2.4.5 Pain management in the Chronosystem (Time)

2.4.5.1 Working experience

Years of working experience may influence management. A Swedish study found female PECPs with less than 10 years' experience administered analgesia at higher rates than those with greater than 10 years' experience, with males showing consistent management regardless of experience. [171] PECP comfort with managing children improved with experience[70], but the likelihood of analgesia

administration did not. Older (P=.0001) and more experienced PECPs (P=.0001) reported greater comfort levels with children, though advanced PECPs were less comfortable than the more basic qualifications (P= .004), who only had access to inhaled Nitrous Oxide. [68] More 'newer' PECPs learned paediatric pain management during their course than 'older' PECPs (40.5% vs 20.0%) , who learned from self-education (compared with newer PECPs - 37.6% vs 16.7%; P < 0.05)

2.6 Summary and Conclusions

The review aims to outline a conception of competence rather than define it. In HPE, competence guides teaching, assessment, and practice, demonstrated through professional performance. Rooted in rationalism and empiricism, this performance requires evidence and integrates KSAs. True competence involves applying KSAs in practice and is contextual. Professionals must promote social justice, and competence evolves over time, necessitating ongoing reflection and training. Competence frameworks standardise and structure KSAs within specific domains, making professional competencies visible and outlining expected capabilities. They bridge practice and education, guiding educational goals. While competence frameworks are used in HPE and beyond, they often require adaptation for different fields. They guide education, certification, and practice.

The IASP has developed a competence framework for pain management, including curricula for various health professions, though emergency health professions were not included. Despite existing frameworks, pain management teaching is often underemphasised in many healthcare programs, including undergraduate PECP education. Research into PEC education for pain management is a gap. However, present evidence is that pain management in PEC remains insufficient. An ecological framework identified elements influencing pain management without establishing causal links. Many factors are found in the immediate environment of PECPs and patients (microsystem). Key areas for improvement include enhancing KSAs among PECPs and addressing pain assessment challenges. Pain severity is linked to management practices, with more severe pain receiving higher treatment rates. Non-traumatic, obstetric, non-nociceptive pain, and chronic pain represent significant research gaps.

Vulnerable populations, such as children, non-white patients, and women, often receive inadequate pain management. Paediatric pain management faces unique challenges, including communication difficulties and equipment adaptation. PECPs appear unprepared for patients with specific needs, and pain education PEC training is largely lacking. Research on managing pain and discomfort in neonates by PECPs is absent. Professionalism among PECPs may also influence pain management.

While there is less evidence regarding the influence of exo, macro, and chronosystems on pain management, these factors are still significant. Influences extend beyond practitioner attributes and patient interactions. Time spent in care, affected by geographical location and EMS policy, relates to management practices. At the macrosystem level, PECP capabilities and qualifications, shaped by national legislation and policy, determine pain therapies and are beyond individual control. Cultural aspects may further de-emphasise pain management, leading to poor outcomes, as does confusion regarding PECP roles. Lastly, the working experience of PECPs impacts the therapies they provide. This concludes the literature review; the next chapter will outline the research methods employed, including a scoping review.

Chapter 3: Research Methodology

The research aimed to develop a competency framework for pain management in South African PEC and recommend curriculum implementation, using a Qualitative Descriptive design. This chapter details the setting, participants, research design, sampling frame, methods, and procedures, with instrumentation in the Appendices. It concludes with discussions on trustworthiness and ethics. The study was conducted in four phases (Figure 2), each with distinct methods and participants, described separately for clarity, with commonalities addressed collectively where relevant.

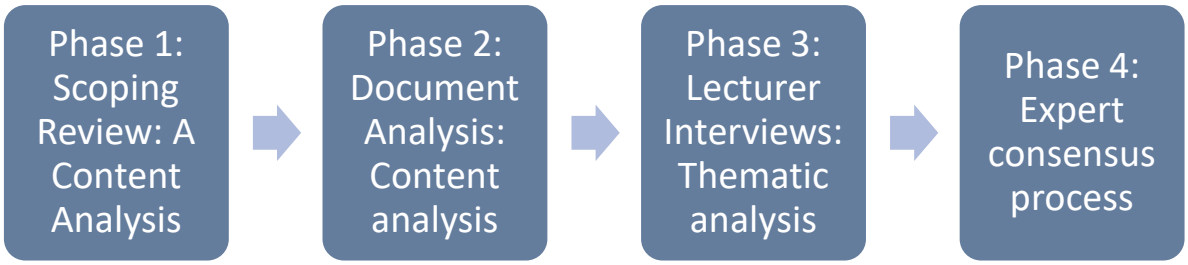


Figure 2: Overview of the phases of data collection

3.1 Setting and Participants

The research made use of two settings, each with unique participants; South African Higher Education (HE) and broader clinical practice. This is appropriate as competency frameworks are situated between practice and education. The HE participation was limited to PEC programs registered on the HEQSF, and educators teaching on these programs. The setting and participants per phase follow next.

Phase one Scoping Review: The scoping review focuses on pain therapies applied by PECPs published in international literature. The setting was the virtual environment. Online academic databases were searched for published literature, focusing on peer reviewed research evidence which met inclusion criteria. **Phase two Document Analysis**: Content analysis was performed on curricula from HEQSF-aligned emergency care education programs. This allowed for comprehensive analysis of South African PEC curricula. The intention was to identify pain content within these programs. **Phase three Educator Interviews**: Semi-structured interviews with educators responsible for pain teaching on HEQSF-aligned programs were conducted. Educators contributed data to both the analysis of contemporary education as well as pain practice. **Phase four Expert consensus panel**: Once the competency framework was constructed experts in pain and education provided input on the integration of the framework into existing, autonomous curricula. Sampling of the participants is addressed in the next section.

3.2 Sampling Frame

The sampling frame (Table 8) for phase one was published research evidence which met inclusion criteria. Phases 2 and three were sampled simultaneously. There are three HEQSF aligned PEC qualifications: A Higher Certificate, a Diploma and a Professional Degree. At data collection seven HEIs (public and private) were CHE accredited to offer these programs. Three HEIs partnered with four COECs, which lacked independent accreditation, to deliver programs. The subject learner guides (SLGs) containing pain intended learning outcomes (ILOs), and the educators responsible for pain teaching on these programs (HEIs and COECs), formed the sample for phases 2 and three. For phase 4, the expert consensus panel, a multidisciplinary panel of clinical pain management experts, PEC educators, researchers and healthcare leaders, were recruited.

All sampling was purposive. A criticism of qualitative approaches is that small numbers of participants risk lack of generalisability to larger groups, and that the bias of a few individuals may result in invalid opinions. [187] Purposive sampling mitigates this. Participants from all institutions that had given permission to participate were included, representative of gender, race and geographical location. Table 7 shows the sampling frame per phase of study and displays sample sizes and scope of the phases.

Table 8: Sampling Frame

Data Collection Method	Population	Sample	Scope
SEQUENTIAL QUALITATIVE DATA COLLECTION			
Phase: 1 Scoping review	Search of 3 major databases	n=140 included studies	Description of the evidence base for therapies. Inductive exploration of KSAs enabling application of therapies
Phase: 2 Document analysis	7 HEIs	5 participating HEIs	Description of pain management content in 79 existing subject learner guides.
Phase: 3 Semi structured Interviews	7 HEIs (30-40 staff) 3 CoEC (30-40 staff)	20 participants	Problematisation of pain practice and education. Description of the competencies enabling pain management.
CONSENSUS DEVELOPMENT			
Phase: 4 Expert consensus panel	Indeterminate	15 panellists	Aggregated expert opinion on dilemmas of curriculum implementation

3.3 Research Design

The research used a Qualitative Descriptive (QD) design [188], an Interpretive paradigm and proceeded in four phases. The QD design provides an overview of a phenomenon of which little is known. [189] Often criticised as being superficial, as it is the least theoretical of the qualitative approaches, QD provides straightforward descriptions of phenomena [188], the *"…who, what and where…"* . [190] Criticisms of superficiality are misguided, as QD still provides interpretive descriptions, and is suitable when researchers wish to remain close to the data. When used correctly it is a valid qualitative design [188] and is useful for novice researchers and doctoral students. [190]

Competence is rooted in context, and overly abstract or deep interpretations take the research too far away from data. Similarly, curriculum recommendations can be seen as implementable policy. For both of these reasons abstraction too far away from the data is inappropriate, making QD an acceptable design. [188] The emphasis on description, and the minimisation of theory allowed questions such as "what competencies are required" and "how must curriculum be adapted" to be directly answered.

3.3.1 The Research Paradigm: Interpretivism

A paradigm is a philosophical stance, a system of beliefs and ideology coalescing to form a perspective of the world (worldview). [191] Paradigms form the base from which a researcher produces knowledge. [187] The research adopts the Interpretivist paradigm. [187, 192], seeking to understand participants' perspectives and realities, without having them co-construct the thesis's realities of output. [192] The goal was understanding (*Verstehen)* of the needs, not explanation (Erklärung). [192] With little contextual knowledge available, I needed to construct the outputs from the ground up. Some of the barriers to effective pain care and the educational needs involve feelings, emotions, self-conceptions, and interpretation of context. Pain itself is a pluriversal experience. [9] Interpretivism is best aligned to study and understand these 'pluriversal'.[8] factors.

3.3.2 Ontology and Epistemology

Aligned with Interpretivism, this research adopts a relativist ontology, where reality forms when consciousness engages with meaningful objects, mediated by language [193] Each individual constructs their own reality. The epistemology is subjective; knowledge is constructed by the mind. Interpretivists participate in the world, moulding and constructing meaning, which varies between individuals. [193] . This research interprets data subjectively, shaping it into appropriate outputs.

[8] A concept acknowledging and embracing multiple realities and perspectives, rather than a single uniform reality.

3.4 Methodology and Methods

Methodology refers to the strategy behind data collection and sampling, explaining how the researcher investigates reality. Methods allowing a "thick description" of participants' perspectives were used. Given the value-laden and idiographic nature of the data [193], inductive analysis was used. Data collection methods included document analysis, interviews, and review methodologies. The consensus process examined and analysed individual perspectives.

The research focuses on pain management in South African EMS, with education as a goal. It assumes differing viewpoints and experiences among role players, affecting their perspectives. To interpret multiple realities, Interpretivism was chosen. While methods are often associated with specific paradigms, all paradigms can use qualitative or quantitative data [193] Health Sciences researchers may pragmatically borrow methods from different ontologies and epistemologies. A consistent and coherent paradigm driving data analysis and conceptualisation is imperative. A paradigm is a tradition of thought, not a set of practices. [187]

3.5 Theoretical Framework

Following Batt's recommendations [103], this work uses Bronfenbrenner's Ecological Systems Theory [9] (EST) for analysis and discussion [149]. In this model, the individual's attributes, such as personality, experiences, and culture, influence their interactions. This model explains human development through nested structures, visualised as concentric rings, with the individual—here, the student PECP—at the centre.

Each ring represents an environmental level affecting the individual. The microsystem includes immediate environments, such as family and educators, where bidirectional interactions occur. The mesosystem involves connections between different microsystems, like the relationship between the HEI and clinical workplace. The exosystem includes external factors that indirectly impact the individual, such as policy changes. Macrosystems encompass broader societal influences, shaping perceptions and cultural norms regarding PECPs. The chronosystem considers changes over time, including technological advancements [195]. Throughout the research, data and analysis are organised according to these nested structures of EST. A diagram of the research overview is displayed on the following page.

[9] The ecological model was originally proposed by Bronfenbrenner in the 1970s, to explain human development and the impact of context on that development. [194.]

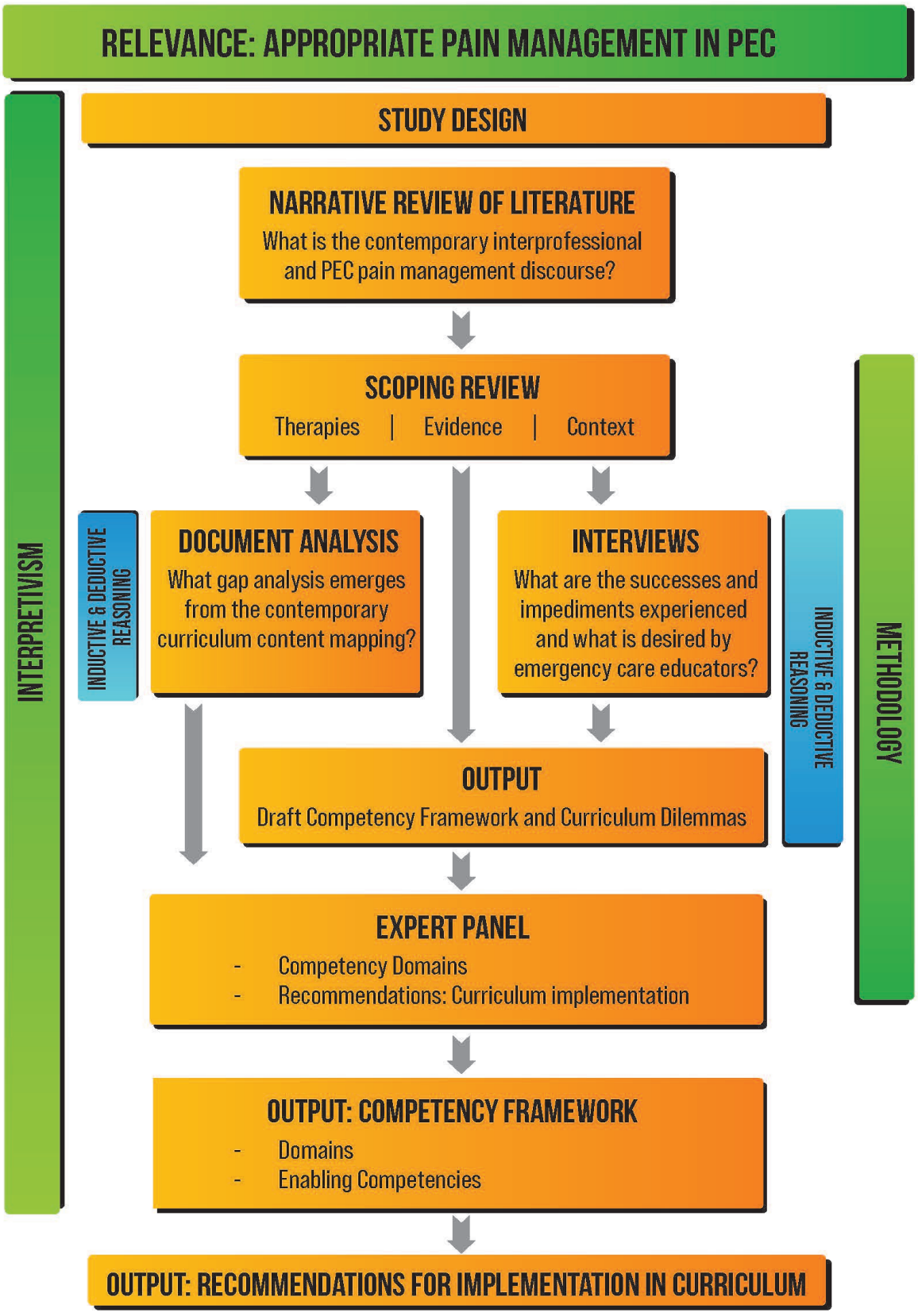


Figure 3: Overview of the Study

3.4 Phase 1: Scoping Review of Pain Management Therapies Applied by PECPs.

3.4.1 Rationale (Problem/Purpose/Objectives)

Evidence synthesise assist practitioners to make sense of large volumes of healthcare evidence. [196] The scoping review mapped the evidence base for the application of pain management therapies by PECPs, described the tasks, and summarised the contexts, of practice. The KSAs required for a discipline can be induced from the activities of the discipline. [77] Mapping the broader evidence for therapies allowed for description of task beyond narrow contextual or local regulatory prescript or the opinion of a single region's practitioners.

Scoping reviews are exploratory and can act as a precursor to a systematic review or to disseminate research findings. [197] They also map key concepts and theories, identify types of evidence and research methods in a field and highlight gaps in the body of knowledge [198]. Scoping review was appropriate because the question is broad and does not answer narrow questions around therapies. [198]The review conforms to the methodological guidance of the JBI Institute [198] and is reported in accordance with the Preferred Reporting Items for Systematic reviews and Met-Analysis extension for Scoping Reviews (PRISMA-ScR). [199]

This synthesis of the evidence also informed draft KSAs that acted as one of the initial elements from which the framework was constructed. This synthesis must be accurate, dependable, and contextually relevant if it is to guide effective and ethical education and an accepted and rigorous method of evidence synthesis was used.

3.4.2 Objectives of the Scoping Review

The purpose is to map the research done and range of pain therapies provided by PECPs. Specific objectives were:

1. Identify types of evidence and research methods in PEC
2. Map the geographical distribution and contexts for evidence for pain therapies
3. Map the extent, typology and contextual application of pain therapies
4. Map the temporal distribution of PEC pain research
5. Highlight gaps and omissions in the evidence for pain management in PEC.
6. Inductively extract the KSAs underpinning therapy application and thematically arrange KSAs into competency domains.

Objectives 1-5 are descriptive and form a picture of the evidence. Objective 6 required interpretive and inductive coding and categorisation of the evidence. Text describing the requirements, application and problems encountered during application of pain therapies were interpreted and categorised as either Knowledge, Skills or Attitudes (KSAs). [200] These codes describe the foundational KSAs required to apply the therapies in context. The scoping review makes use of both the JBI scoping review methodology, and thematic analysis. [201]

3.6.3 Question Formulation

The Population, Concept, Context (PCC) [198, 202] framework was used to formulate the question. The overarching question was divided into sub-questions to guide the search for evidence.

Table 9: Research Question Framework

Term	Description
Population	Prehospital Emergency Care Providers.[10]
Concept	Pain management therapies applied by PECPs
Context	Prehospital Emergency Care.[11]

The primary question for the scoping review was:

> **What is the evidence for the use and application of pain management therapies by prehospital emergency medical care providers in prehospital emergency care?**

Secondary questions were developed to guide the search strategy and selection of studies and categorised as evidence for pharmacological therapies, or non-pharmacological therapies. The secondary questions were:

> **What is the evidence for the use and application of pharmacological pain management therapies used by prehospital emergency care providers in prehospital emergency care?**

and,

> **What is the evidence for the use and application of non-pharmacological pain management therapies used by prehospital emergency care providers in prehospital emergency care?**

3.4.4 Protocol and Registration

The *a priori* protocol for the scoping review was drafted by the research team and registered on the Open Science Framework (https://osf.io/dfwge/?view_only=2faffbb3705b4986bbfcd72050342c40). There were no recorded contestations or enhancements.

3.4.5 Eligibility Criteria

Evidence needed to be from the PEC context, or multiple contexts where one was the PEC context. Only evidence where the therapy was applied by PECPs was charted, evidence for therapy

[10] See section 1.2.3 for a description of this term
[11] See section 1.2.2 for a description of this term

application by physicians was excluded. Types of evidence were Synopsis and Summaries of Reviews, Systematic Reviews, Narrative and Scoping Reviews, Qualitative Evidence Synthesis, Randomised Controlled Trials, Cohort Studies, Observational Studies, Mixed Method studies and Case-Control studies. Evidence dealing exclusively with epidemiology of prehospital pain were excluded. Thesis, dissertations and abstracts or conference posters and abstracts were excluded. Evidence was limited to English, as this is the language limitation of the author.

3.4.6 Information Sources

Database and internet searches were complemented by manual searches of reference lists, citation tracking using electronic tools in databases and researcher knowledge of resources. Search terms were reviewed by a health sciences librarian at the University of Cape Town and who also provided input into the use of the database search engines.

Table 10: Databases, repositories and websites searched

Bibliographic databases	Websites
Medline via Pubmed	Health Professions Council of South Africa https://www.hpcsa.co.za
CINAHL	Emergency Medicine Society of South Africa https://emssa.org.za
Scopus	African Federation of Emergency Medicine https://afem.africa/resources/
Web of Science (WOS)	South African Society of Anaesthesiologists https://www.sasaweb.com/Home/Home
	Canadian Agency for Drugs and Technologies in Health https://www.cadth.ca
	Trauma Society of South Africa http://www.traumasa.co.za

3.4.7 Pilot Search and Review

A pilot search was conducted for secondary evidence to allow the research team to familiarise themselves with the databases, keywords used in the field. The software to be used for the review, the reference manager EndNote™ 20 (Clarivate Analytics LLC, Philadelphia, PA) and a web-based systematic review application Rayyan [203] were tested. The pilot search and review is described in APPENDIX 1: SEARCH STRATEGY: PILOT SEARCH

3.4.8 Search Strategy

Following the pilot search, the keywords and search strategy was refined. A multi-level, search of bibliographic databases was conducted on 23rd December 2022 and updated on the 17th of July 2024. To compensate for the accepted limitations of bibliographic data base searching [204] the search was supplemented by hand searching of reference lists and citation pearl-growing [12]. (Booth, 2008) The search was iterative, with the search strategy being refined and repeated as the literature revealed additional sources, keywords, contexts, and concepts. Search terms and results are displayed in Table 11.

3.4.9 Evidence Screening and Selection of Studies

Records were downloaded from the databases as .ris files (nbib for Pubmed) and then imported into RAYAAN [203] Duplicates were excluded and two reviewers independently screened the titles and abstracts in accordance with inclusion/exclusion criteria. Full text versions of records were obtained and read independently by two reviewers. Disputes were resolved by discussion, with a third reviewer available as an arbiter if disputes arose. Full text articles were imported into Endnote™ 20 (Clarivate Analytics LLC, Philadelphia, PA) reference management software for data charting. Quality Appraisal was not conducted, nor required by the JBI method.[198]

3.4.10 Data charting and extraction

The primary researcher developed the data charting tool. This tool was piloted independently by two researchers and refined using twenty-five arbitrarily selected articles. The researchers discussed and refined the tool. The final instrument was converted to an online form using Microsoft Forms (Microsoft LLC, Redmond, CA) and the included records were charted independently by two researchers. The researchers met to discuss the results. The variables charted are listed in *Appendix 2: Data Extraction tool and explanations.* Inductive, descriptive qualitative analysis was also undertaken to identify competency elements from which to develop a draft competency framework. Data was coded, with the codes being iteratively compared and altered to form the final codes. These codes became the framework elements.

[12] Pearl-growing is a systematic and iterative search technique whereby the citation lists of manuscripts found through search terms are mined for additional relevant citations. Manuscripts that cite specific sources are also obtained and included in the search. The process is systematic and thorough, which differentiates it from selective or purposeful inclusion of citations which may be viewed as 'cherry-picking'.

3.4.11 Data synthesis and presentation of results

The search for evidence is reported according to the PRISMA-ScR checklist. [199] Basic descriptive analysis of the evidence was completed as frequency counts and identification lists. Results were displayed in tables, diagrams and narrative text. Data presentation on therapies includes only data from primary evidence. Secondary studies are mapped in the presentation as an indicator of breadth of evidence.

Additional analysis, beyond what is typically found in a JBI scoping review[198], is presented in Chapter 7. Data underpinning the KSAs required for therapy application was inductively coded and analysed using content analysis, for inclusion into the competence framework.

Table 11: Search Strategy and Search Terms

Pubmed
Pubmed Search 17 July 2024: Pharmacological Therapies. Results = 2954
((((Emergency Medical Technician OR EMT OR Paramedic)) OR ("Emergency Medical Technicians"[Mesh])) OR (((Emergency Medical Service OR EMS OR Ambulance Service OR Ambulance OR Pre-hospital OR Prehospital OR Extended Practice OR Community Paramedicine OR Helicopter Emergency Medical Services OR Aeromedical OR Critical Care Retrieval)) AND ("Emergency Medical Services"[Majr]))) AND (((Pain management OR pain reduction OR analgesic)AND (Drug Therapy OR Opiate OR Opioid OR Morphine OR Fentanyl OR Tramadol OR Ketamine OR Methoxyflurane OR Entonox® OR Nitrous Oxide OR Paracetamol OR Non-steroidal anti-inflammatory drug)) OR ((("Analgesics"[Mesh]) AND ("Analgesics, Non-Narcotic"[Mesh] OR "Analgesics, Opioid"[Mesh] OR "Analgesics, Short-Acting"[Mesh] OR "Pain"[Mesh] OR "Narcotics"[Mesh] OR "Anti-Inflammatory Agents, Non-Steroidal"[Mesh] OR "Analgesia, Obstetrical"[Mesh] OR "Ketamine"[Mesh] OR "Analgesia"[Mesh])) AND ("Pain Management"[Majr]))) Filters: English
Pubmed Search Results 17 July 2024: non-Pharmacological therapies: Results = 538
(((Emergency Service* OR EMS OR Ambulance Service OR Ambulance OR Pre-hospital OR Prehospital) OR (Emergency Medical Technician OR EMT OR Paramedic)) AND ((Pain management OR pain reduction OR analgesi*))) AND ((Nonpharmacological analgesi* OR nonpharmacological pain management OR Nerve Block OR TENS OR Transcutaneous Electrical Nerve Stimulation OR Acupuncture OR Acupressure)) Filters: English
CINAHL
CINAHL Search 17 July 2024: Pharmacological Therapies. Results = 2309
((Emergency Service* OR EMS OR Ambulance Service OR Ambulance OR Pre-hospital OR Prehospital) OR (Emergency Medical Technician OR EMT OR Paramedic)) AND ((Pain management OR pain reduction OR analgesi*)) AND ((Pharmacological pain management OR Drug Therapy OR Opi* OR Morphine * OR Fentanyl OR Tramadol OR Ketamine OR Methoxyflurane OR Entonox OR Paracetamol OR Ibuprofen OR Ketorolac)) LIMIT ENGLISH
CINAHL Search Results 17 July 2024: non-Pharmacological therapies: Results = 521
((Emergency Service* OR EMS OR Ambulance Service OR Ambulance OR Pre-hospital OR Prehospital) OR (Emergency Medical Technician OR EMT OR Paramedic)) AND ((Pain management OR pain reduction OR analgesi*)) AND ((Nonpharmacological analgesi* OR nonpharmacological pain management OR Nerve Block OR TENS OR Transcutaneous Electrical Nerve Stimulation OR Acupuncture OR Acupressure)) LIMT - ENGLISH
Scopus
Scopus Search 17 July 2024: Pharmacological Therapies. Results = 2134
(TITLE-ABS KEY ((emergency AND medical AND technician OR emt OR paramedic OR emergency AND medical AND services OR prehospital)) AND TITLE-ABS-KEY (((pain AND management OR pain AND reduction OR analgesi*) OR (drug AND therapy OR opiate OR opioid OR Morphine OR Fentanyl OR tramadol OR Ketamine OR methoxyflurane OR Entonox OR nitro us AND oxide OR paracetamol OR non-steroidal AND anti-inflammatory AND drug)))) AND (LIMIT-TO (LANGUAGE , "English"))
Scopus Search Results 17 July 2024: non-Pharmacological therapies: Results = 1938
((emergency AND medical AND technician OR emt OR paramedic)) OR ((emergency AND medical AND service* OR ems OR ambulance AND service OR ambulance OR pre-hospital OR prehospital OR extended AND practice OR community AND paramedicine OR helicopter AND emergency AND medical AND services OR aeromedical OR critical AND care AND retrieval)) AND (((pain AND management OR pain AND reduction OR analgesi*) AND (nonpharmacological OR nonpharmacological) AND (pain AND management) OR (nerve AND block OR regional AND anaesthesia) OR (tens OR transcutaneous AND electric AND nerve AND stimulation))) AND (LIMIT-TO (LANGUAGE , "English"))
Web of Science
Web of Science Search 17 July 2024: Pharmacological Therapies. Results = 1291
[((Emergency Medical Technician OR EMT OR Paramedic OR Emergency Medical Services OR EMS)) AND (((Pain management OR pain reduction OR analgesi*)AND (Drug Therapy OR Opiate OR Opioid OR Morphine OR Fentanyl OR Tramadol OR Ketamine OR Methoxyflurane OR Entonox® OR Nitrous Oxide OR Paracetamol OR Non-steroidal anti-inflammatory drug)))] AND English
Web of Science Search Results 17 July 2024: non-Pharmacological therapies: Results = 163
((Emergency Medical Technician OR EMT OR Paramedic) (All Fields)] OR ((Emergency Medical Service* OR EMS OR Ambulance Service* OR Ambulance OR Pre-hospital or Helicopter Emergency Medical Services OR HEMS))] AND [(((Pain management) OR analgesi*) AND (Nonpharmacologic* OR non-pharmacologic*)) AND English

3.5 Phase 2: Content Analysis and Mapping of Curricula

3.5.1 Rationale

This phase evaluated contemporary pain curricula in South Africa, mapping key content and concepts in pain education and exploring their relationships. Content Analysis was used to extract and analyse data, while curriculum mapping was employed to situate pain teaching and learning within curricula, and to show the underlying structure of the content. This allowed identification of gaps and omissions and informed the recommendations for implementation of the competency framework. The data represents the declared (explicit) curriculum, not the enacted (taught) or null (omitted) curriculum. Data were obtained from the Intended Learning Outcomes (ILOs) in the Subject Learner Guides (SLGs).

3.5.2 Content Analysis

The research employed Content Analysis (CA) [205], a systematic method for analysing and categorising communication content, including text, images, and audio [206]. CA identifies patterns and themes, providing insights into the data. It is not tied to a specific philosophical approach, requiring only a qualitative perspective from the researcher [207]. CA can also be applied in quantitative studies, distinguishing it from other qualitative methods [207]. This flexibility raises questions about rigor, making trustworthiness crucial. There are two primary types of CA: Manifest CA, which focuses on observable data close to the text, and Latent CA, which seeks deeper meanings and intentions [208]. This phase utilised Manifest CA to identify and map pain-related content, knowledge, concepts, and topics in SLGs [208].

3.5.3 Curriculum Mapping

Curriculum maps were developed by English [209] as a means of describing teaching time, content and sequence in order to make curricula more effective. Maps can also depict student progression and promote student performance. [210] Harden [211] has applied curriculum mapping to medical education, to implement outcomes based education and track outcomes are realised.

A curriculum map is analogous to a geographical map, which shows different information and portray different aspects of an area. Curriculum maps give a transparent and clear spatial representation of a learning program and the relationships between elements.[211]. Maps may be used to integrate content with occupational competence, link with regulatory standards and show gaps.[212] Curriculum elements may be viewed through different perspectives, termed “Windows”. Windows organise data around concepts and to show the relationships between them [211], providing a multidimensional view of the curriculum. Harden [211] offers examples of four main Windows; 1.

Learning Opportunities, 2. Learning Outcomes, 3. Assessment and 4. Content. Maps do not need to be limited to these four. To meet the aim of the research, the following windows were used:

1. **Organisation of pain curricula**, portrayed by the period of study, subjects types and names and whether a dedicated pain unit was present or not.
2. **Context and patient groups**, outlining the patient groups curricula prepare graduates for as well as the modes of EMS operations.
3. **Learning Domains of pain curricula**, defined by Bloom's Domains of Learning [213] These consist of the Cognitive, Affective and Psychomotor domains.
4. **Content**, defined by topic areas and Intended Learning Outcomes (ILOs)

The insights gained through these windows were expressed as propositions in respect of the aggregated curricula.

3.5.4 Window (Category) Development

Both inductive and deductive Content Analysis (CA) were utilised [206, 207]. I applied deductive a priori codes based on established meso-level curriculum characteristics for window one, and deductive categories from literature for windows two and three. For window four, codes emerged inductively and were grouped into categories to form content areas. The categories for window one served as labels for the map's rows and columns, represented by colour codes. Codes for windows two to four were placed in the coordinate fields at the intersections of these rows and columns, resulting in a completed table that formed the map.

Table 12: Windows1-3 and corresponding map fields: Deductive codes

Window	Description	Deductive Code
1	Program	Bachelor
		Diploma
		Higher Certificate
1	Year of Study	First year
		Second year
		Third Year
		Fourth year
1	Dedicated Pain Unit of Study	Yes/No
1	Subject	Clinical Theory Subject Clinical Practice subject Workplace learning subject Anatomy and Physiology Pharmacology Pathology
2	Patient Groups	Paediatrics
		Not differentiated
	Pain contexts	Acute trauma pain
		Critical Care Retrieval
		Labour and Delivery
		Undifferentiated
3	Learning Domains	Cognitive
		Psychomotor
		Affective

Table 13: Window 4 and corresponding map fields: Inductive codes

Window	Inductive Categories	Inductive Codes (Topics)
4	Anatomy and Physiology	Categories of pain
		Central Processing
		Conduction
		Modulation
		Pathology and pathophysiology
		Pathways
		Purpose of pain
		Nociceptors
		Stimuli
	Pharmacology	Pharmacodynamics
		Pharmacokinetics
		Medicine classes (Anaesthetics)
		Medicine classes (Local Anaesthetics)
		Medicine classes (Opioids)
		Medicine classes (NSAIDS)
		Medicine classes (Paracetamol)
		Misuse, dependence and addiction
	Pain Assessment	Risk Identification
		Pain assessment (general)
		Pain assessment (paediatric)
		Pain assessment (tools and scales)
		Communication
		Patient factors
	Pain Management	Pain Management (General)
		Pain Management (Paediatric)
		Pain management (musculoskeletal trauma and burns)
		Procedural pain management (intubation)
		Procedural pain management (labour)
		Procedural pain management (cardioversion)
		Procedural sedation and analgesia (trauma)
		Application of non-pharmacological therapy
		Application of pharmacological therapy
		Clinical decision making
		Risk assessment
	Pain as Symptom	Gastrointestinal Pain/Abdominal Pain
		Cardiac Pain
		Gynaecological Pain
		Spinal Tenderness
	Ethics	Patient rights
	Provider Factors	Cultural, Racial and Gender Competence
		Provider as a person

3.5.5 Data Collection

Access to the SLGs was obtained by applying to the gatekeeper portals of the participating HEIs. One application made for both phases 2 (Document Analysis) and 3 (Educator Interviews). The researcher then consulted the relevant head of department (HOD) to identify subjects and SLGs that included pain teaching. The HODs forwarded these SLGs via email, each SLG being a unit of analysis.

The learner guides were imported into NVIVO 12 (Lumivero, Denver, CO) and reviewed for explicit intended learning outcomes (ILOs) related to pain. Text was coded according to predetermined codes for windows 1, 3, and 4, while window 2 text was inductively coded and iteratively renamed or merged to create a uniform codebook. The coding process was qualitative, focusing on whether content areas appeared in the ILOs rather than counting occurrences.

Once all data was coded and standardised, the codes were organised into tables using Microsoft Excel (Microsoft Corporation, Redmond, CA), with a matrix of columns and rows representing the program, year of study, subjects, and topic areas. These tables constituted the 'maps' as they were descriptive, provided direction and located the topics relative to each other.

3.5.6 Analysis

Manifest content analysis was used to code and aggregate topics present in curricula. Manifest Content Analysis does not look for hidden meanings or conduct any interpretation of the data. [207] Deductive coding was used as the code book was created *a priori.* The codebook was imported into NVIVO 12 Pro (Lumivero, Denver, CO) and the ILOs dealing with pain management isolated.

3.6 Phase 3: Educator perceptions of pain practice and approaches to pain education.

3.6.1 Rationale

Phase 3 used semi-structured interviews to explore educators' perceptions of pain practice and education to problematise these concepts. Educators are responsible for enacting curricula, and their views on pain practice and education may influence lesson structure and content. They experience barriers and enablers to pain teaching which may influence education. Educators also provided their views on requisite KSAs, and proposed curriculum content and structure. Lourens et.al. had already examined clinical practice in the South African context [42, 152, 158] and these findings already dealt with in the literature review. As educators are also clinicians, and have valid views on pain practice, coupled with insight as to the KSA s required to bring students to the point of sufficient pain practice. Interviewing educators is thus a legitimate activity for this research.

3.6.2 Data Collection

Interviews were structured in three parts. Part one explored educators' views on the role of EMS in healthcare and their experiences with clinical pain management. Part two gathered their perceptions of educational needs and contemporary practices. Part three explored contemporary and future competencies and curriculum need. The interviews used a semi-structured guide (Appendix 3: Semi-structured Interview Guide) with open-ended questions to stimulate

conversation, informed by the literature review and earlier phases. This format allowed participants to steer discussions and enabled the interviewer to ask probing questions.

Interviews were conducted face-to-face in Cape Town and via Microsoft Teams (Microsoft Corporation, Redmond, CA) for participants in other regions of South Africa. Audio recordings were transcribed, and transcripts were imported into NVIVO 12 Pro (Lumivero, Denver, CO) for coding and analysis.

3.6.3 Thematic Analysis

This study employed reflexive thematic analysis (RTA) as described by Braun and Clarke [201, 214, 215], which recognises the active and interpretive role of the researcher in the development of themes. RTA was chosen over other qualitative approaches such as phenomenology or grounded theory, as the aim was not to explore the internal lived experiences of educators or to generate a theory of practice [216], but rather to identify and interpret patterns of meaning related to pain education and practice in prehospital emergency care.

Coding was conducted inductively and recursively, with themes constructed through deep engagement with the data rather than discovered as pre-existing entities. The process was not governed by a fixed codebook; instead, codes evolved as understanding deepened, and were refined through iterative cycles of reading, coding, and theme development. The primary researcher read and re-read transcripts to familiarise himself with the data, generating initial descriptive codes that were gradually developed into broader patterns and themes. These themes were then reviewed, defined, and named to form a coherent narrative.

The analysis remained relatively close to the data, as the resulting themes were intended to inform curriculum design and policy. Interpretation was necessary, however, as participants did not always articulate their views using the formal language of competencies. Reflexivity was maintained throughout the process via supervisory dialogue, and critical reflection, ensuring that the researcher's positionality and assumptions were acknowledged and managed.

This approach aligns with the interpretivist paradigm underpinning the study and supports the generation of nuanced, contextually grounded insights into educators' perspectives. It contrasts with the document analysis conducted in Phase 2, which was primarily descriptive and aimed at identifying characteristics of curriculum documents without interpretive depth. While both methods are valid within QD [217], RTA was more appropriate for the exploratory and interpretive aims of this phase.

3.7 Expert Consensus panel

3.7.1 Rationale

The consensus process incorporated expert input to integrate the competency framework into existing PEC curricula. The data identified key challenges in implementing the pain curriculum but provided no clear guidance. Due to the unique nature of PEC contexts, the literature also lacked specific direction. Additionally, constructing the competency framework and defining competencies posed dilemmas. Experts reviewed and modified the competencies, leveraging aggregated expert opinion to address ambiguous issues and enhance portability across programs.

3.7.2 Objectives

To obtain expert, multi-disciplinary recommendations on:

1. the fostering of mutually beneficial relationships between the educational field and the field of professional practice.
2. the structuring of pain education within PECP curricula.
3. the pain typologies South African PECPs should be prepared to manage.
4. whether South African PECPs should be developed as communicators or as multidisciplinary collaborators in pain care.
5. To stimulate discussion by multi-disciplinary experts on the roles and competencies of South African PECPs in pain management.

There is no best method for expert panel discussions. The broad process is that prior to the conference available evidence is synthesised and presented by topic experts to a neutral, representative panel. The panel is then asked to formulate their recommendations based on this evidence synthesis. This phase follows the framework developed by Black et al. [218] for structuring a conference:

1. Setting the Task
2. Selecting participants
3. Presentation of the Scientific Data
4. Structuring the Interaction
5. Synthesis of the Data

The panel outcomes are reported using the Accurate Consensus Reporting Document (ACCORD). [219, 220]

3.7.3 Setting the task

The intended output of the session was a series of consensus statements to guide implementation of the competency framework in curricula. The statements are not curricula or competencies themselves. These recommendations are intended to allow for integration of the competency framework while allowing for autonomy of curriculum design. Statements were derived as themes from the discussions held by the panel.

The discussions were cued by questions posed to the panel which were representations of the dilemmas and ambiguities to emerge from the data. Questions were contextualised with hypothetical pain management scenarios constructed around the research findings and key constructs for deliberation. [218] Care was taken to remain grounded in data and not emphasise or value or cue over another. [218]

3.7.4 Selection of the panel

Panellists were invited based on their situation as key informants on aspects of pain management, or education. The questions posed were transdisciplinary in nature, and experts from a single discipline may not have been sufficient. Multiple healthcare disciplines were represented to enhance credibility and to avoid the imposition of a single disciplinary view. [218]

Inclusion criteria for membership were:

1. A professional bachelor's degree or Post Graduate Diploma in a healthcare discipline.
2. At least 5 years' experience in one of the following roles: clinician, educator, regulator, or researcher.

Together with one or more of the following:

3. Currently be in clinical practice in their discipline and have managed pain.
4. Currently be working in or actively engaged in healthcare education or research
5. Currently be working in or actively engaged in healthcare or education regulation or program accreditation.

Sampling was purposive, based on the relevant expertise of panellists. Panellists were invited by email. If invitees were unavailable another panellist with similar expertise was invited. Recruitment was discussed and supervised by the primary researcher and research supervisors. Panellists were known to the research team or identified following research into their experience and professional background. A total of sixteen invitations were sent out by email.

The expert panel was led by the primary researcher, who also presented the evidence and posed the questions. The panel was co-chaired by a study supervisor and assisted by a person experienced in the conduct of expert panels. The co-chairs assured freedom of speech, participation by all, and non-coercion or undue influence in commentary. They were briefed to be deliberately provocative or controversial in their questioning if a need arose to stimulate debate. A rapporteur was appointed to make notes on discussions and record proceedings.

3.7.5 Presentation of the scientific data

An overview of the method, a description of the South African EMS and education context and a problematisation of PEC pain management were emailed to experts beforehand. This was essential for contextualisation. The information pack contained an explanation of the proposed competency framework and a synthesis of the findings of data collection phases one to three.

At the face-to-face meeting, the first session provided data and context on the qualification and regulatory structures and problematised pain practice derived from data captured in preceding phases. The primary researcher presented the evidence synthesis of phases one to three to the panellists and unpacked and explained each problem. As far as possible, evidence was summarised as diagrams and tables to facilitate ease of engagement.[221] The competency framework was also presented to the panel. A description of the problems and dilemmas for discussion were presented. A question session after each presentation allowed panellists to ask questions and reflect on these presentations.

3.7.6 Structure of the interaction

The face-to-face session was structured as a series of sessions at which data was presented to panellists. At each session a dilemma, or dilemmas were detailed to panellists, who were then asked for comment and input into solutions for the dilemma. Each presentation concluded with a question and panellists then held a chaired discussion. At the end of each discussion panellists took a brief break, during which the rapporteur, primary researcher and co-chair discussed themes to emerge. The themes were phrased as statements and entered into the polling software WooClap™ (WooClap SA, Brussels, Belgium). [222]

Once reconvened panellists were presented with the statements and asked to vote. Panellists accessed the poll by scanning a QR code with their mobile phones. Voting options were 1. “Agree”, 2. “Disagree”, or 3. “Amend” the statement. After voting the results were displayed. In the event of a vote to amend the statement, further discussion ensued and another statement formulated and put to a second vote. In the case of a decision to reject, a period of discussion was held during which reasons for rejection were discussed. For accepted decisions, any dissenting votes were given an opportunity to make a further statement and this was captured for analysis and reporting. The results of each vote was discussed regardless of outcome. All discussions were audio recorded and transcribed with due regard for privacy of personal information.

3.7.7 Analysis

Consensus was defined as 80% of panellists voting for the same outcome. The process adopted the principle of ‘sufficient consensus’ and perfect consensus was not required. [223]

3.7.8 Data synthesis

Results of voting were downloaded from the WooClap™ platform[13], and presented as statements and recommendations, together with descriptive data of voting rounds. A summary narrative of the discussions are also reported to act as a transparent and verifiable underpinning for the consensus recommendations. Voting outcomes required 80% to be adopted. This level was selected to ensure a high level of agreement for each statement. Allowing a simple majority of '50% plus one' introduced the potential to leave a large proportion of opinions excluded from final decisions. Setting the level at 80% ensured the adopted statements carried sufficient gravitas and avoided the potential for the process to stall if 'perfect consensus' was not achieved.

3.7.9 Data Safety and Monitoring

Curriculum documents, audio recordings and interview transcripts were stored on a password protected cloud storage platform [Microsoft One Drive (Microsoft Corporation, Redmond California)] only accessible to the researcher. Each artifact (SLG, Audio recording and transcripts) were only available to the researcher and were assigned a pseudonym for analysis and reporting. The pseudonym was assigned on a password protected spreadsheet, (Microsoft Excel (Microsoft Corporation, Redmond California)). No documents or data were discussed or disseminated outside of the ethical framework of this research.

3.8 Ethical Considerations for data collection.

The research was approved by the Human Research Ethics Committee (HREC) of the University of Cape Town with the approval number 614/2020. The principles of informed consent, voluntary participation and anonymity were applied at all times. Access to curriculum documents and educators were obtained through the relevant institutions' gatekeeper portals and their procedures were complied with. The COECs are provincial government entities and requests were first made to the respective provincial government ethics committee through the National Health Research Database (NHRD) in accordance with National Department of Health (NDOH) ethics regulations[224].

Curriculum documents were obtained with the consent and participation of the departmental heads, who could withdraw consent at any time. The HODs also provided the contact details for the educators, though participation was voluntary and was never reported to HODs nor were details of the interviews shared. Educators participated voluntarily, and they could also withdraw consent at any time.

To maintain anonymity institutions and individuals were assigned a unique identifier, which was used in all reporting. Due to the small number of HEI's eligible for inclusion, and the unique

[13] The electronic platform allowed control of the process and ease of voting. The platform allowed ease of editing statements following votes. The electronic platform also produced a verifiable and auditable trail of the voting

curriculum structures and characteristic combinations of program offerings, there is the risk that informed readers could work out institutional identities. Pseudonymisation was maintained at all times, and institutions consented to the research. Program combinations in each department were not reported, as a measure to preserve anonymity. The purpose of the research and the use of the data was explained to all participants, verbally and in the consent letter (Appendix 3: Participant Information sheet and Consent Forms).

Expert consensus panel participants were approached in their individual capacities, following the same informed consent and confidentiality processes as the interview participants. Institutions and educators were not aware of the identities of the other participants; however, the expert panellists became aware of identities of others due to the nature of the expert panel. Panellists were bound by the confidentiality agreement not to reveal the identities of other panellists. No participants were coerced for participation. Expert panellists were all established and autonomous experts, and likely resilient to attempts at coercion. Notwithstanding, the panel chair ensured that discussions were fair, representative and free from coercion. Panellists stood to benefit from interdisciplinary engagement.

Data was only used for the purposes of the research. Data and signed consent forms were stored on password protected cloud storage [Microsoft One Drive (Microsoft Corporation, Redmond CA)with only the primary researcher having access. No participants paid or was remunerated for participation, though refreshments and lunch was provided at the expert panel.

Institutions may experience indirect benefit through improved curriculum renewal and development Educators stood to benefit from being placed in a situation in which to reflect on their practice and teaching.

3.9 Synthesis of framework

The competence framework was synthesised by integrating the provisional codebooks developed from scoping review and educator interview findings, both analysed in adherence to the naturalistic paradigm. The scoping review provided direct evidence of the application of pain therapies and allowed induction of essential/core competence elements required for the same. The scoping review evidence was analysed using qualitative Content Analysis. [205] Codes were either direct – explicit in the data – or indirect – induced from the data.

The code book from the educator interviews was induced using Braun and Clarke's Thematic Analysis. [201] The educator interviews provided data on the problems in contemporary education, and practice. They also provided data on the competence and curriculum requirements for pain management as perceived by educators. Elements (codes) were thus direct and induced from the problem identification. The code books provided the underpinning data from which the framework was synthesised using inductive thematic analysis. The original (conceptual) codes remain proximal to the data, however, development of the themes (competence domains) required supplementation from the literature for some components. Often educators were uncertain as to what the problem was or lacked relevant terminology to better articulate the matters. In these instances, relevant terminology was attributed using literature sources, to avoid undue researcher influence.

These two codebooks were merged following the broad process for thematic analysis described above [201], with adaptations made as the recursive coding began with existing codes, not raw text. The steps were as follows:

1. The researcher reviewed both codebooks and familiarised himself with the data.
2. Overlapping codes were merged into a single code, retaining the essence of individual codes.
3. Codes were categorised into broader themes, or competency domains.
4. Through constant comparison and iterative refinement, codes were renamed or data re-coded based on emerging meanings or categories.
5. Unified codes and themes were re-defined.

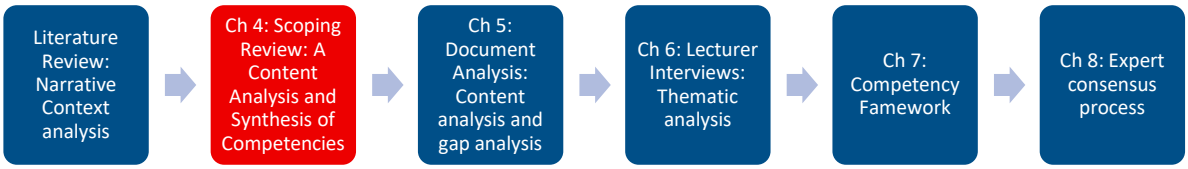
After data collection, during the coding of the two provisional codebooks, codes were classified as knowledge (K), skills (S), or attitudinal (A) codes. Knowledge codes denote competencies which reflect theoretical understanding of a topic and can be learned. Skills codes denote competencies which show the application of practical knowledge to perform a task and attitudinal codes denote traits, beliefs or mental dispositions in a professional context. [225] These correspond to Bloom's cognitive (knowledge), psychomotor (manual skills) and affective (attitudes) domains. [81] In this framework the skills codes include the practical application of knowledge – such as obtaining consent- together with manual handling skills such as manipulating a medical device.

Codes are categorised in posteriori themes, which are the organising elements for the competencies, keeping the framework grounded in data. The final framework is presented at the end of the chapter, with a discussion of its development for reverse contextualisation. No competency framework codebook was derived from the document analysis of curricula. This provided the evidentiary frame of the problems with contemporary pain curriculum and served as data for the problem analysis and enabled the design of future competencies. The document analysis also provided data informing the expert panel. The expert panel took place after synthesis of the competency domains. The panel provided input into the domains, and the enabling competencies, and domain names, were altered *post hoc* based on expert input.

3.10 Chapter Summary

This concludes the explanation of the methods. The study aims to identify problems and gaps in clinical pain practice, and education for pain management, and design a competency framework to address the gaps, together with recommendations for curriculum implementation. The scoping review describes the breadth of therapy application in PEC. The document analysis explores the structure of existing curriculum, describing content and analysing gaps. Educator interviews describe perspectives on practice, and education, and describe future competencies. The scoping review and educator interviews allowed for induction of competencies which were synthesised into a framework. An expert panel review the competency framework, and made recommendations, as well as providing guidance on curriculum implementation. The panel was informed by the document analysis of curricula, data from the other research phases, and own expertise. The following chapter presents the results of the scoping review.

Chapter 4: Results and Discussion: Comprehensive Scoping Review: Pain Management Therapies



4.1 Introduction

This chapter addresses the first objective of the thesis, to map the evidence for pain management therapies in prehospital emergency care as a basis for competency identification. The review will also inform curriculum-scoping decisions. The methodology is described in Chapter three.

4.2 Results

The search was conducted in December 2022 and updated in July 2024. The search strategy is reported in Chapter 3. The results are tabulated below.

Table 14: Search results: results of searches for pharmacological and non-pharmacological therapies by database and website

Databases	Pharmacological (n)	Non-pharmacological (n)
Pubmed	2954	538
CINAHL	2309	521
Scopus	2134	1938
Web of Science	1291	163
Websites		
Health Professions Council of South Africa https://www.hpcsa.co.za	0	0
Emergency Medicine Society of South Africa https://emssa.org.za	0	0
African Federation of Emergency Medicine https://afem.africa/resources/	0	0
South African Society of Anaesthesiologists https://www.sasaweb.com/Home/Home	0	0
Canadian Agency for Drugs and Technologies in Health https://www.cadth.ca	1	0
Trauma Society of South Africa http://www.traumasa.co.za	0	0

Database searches yielded 11 848 records; 28 records were identified through hand searching. After removing 2824 duplicates the abstract and title of 9052 records were screened and 8822 records removed. We searched for 230 full text articles and obtained 219. Full text evaluation excluded 79 articles and 140 articles were included in the study. The PRISMA-ScR [199] flow diagram is presented in Figure *4*.

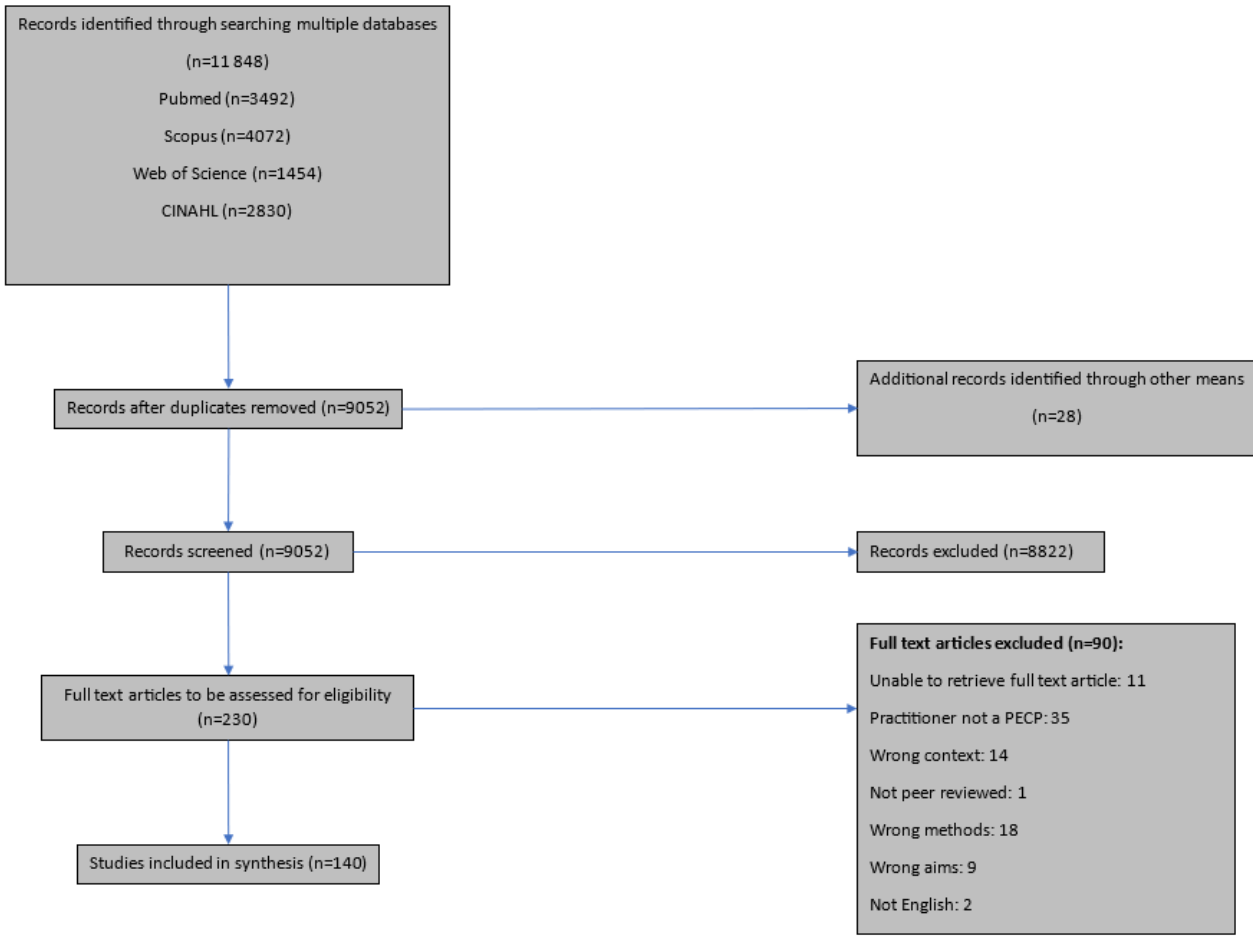


Figure 4: PRISMA-ScR- Flow Diagram

4.2.1 Characteristics of the evidence

Evidence for pain management interventions and therapies in PEC spanned from 1972 to 2024. Primary evidence predominated, with ninety-eight (n=98) peer reviewed articles. There were forty-two articles comprising secondary evidence (reviews). Most primary evidence originated in North America (USA and Canada), the UK, Australia and Europe. A description of evidence types and countries of origin is tabulated in Table 15 and Table 16.

Table 15: Description of Evidence Types

Primary Studies (n=98)	
Evidence type	n (%)
Cohort	21 (21)
Randomised Controlled Trials	19(19)
Analytic Cross Sectional	17(17)
Retrospective Cohort	13(13)
Descriptive Cross Sectional	9(9)
Quasi Experimental	6(8)
Case Series	5(5)
Case Control	3(3)
Qualitative	2(2)
Case Report	2(2)
Mixed Method	1(1)
Secondary Evidence (n=42)	
Narrative Review	18 (43)
Systematic Review	17 (40)
Scoping Review	3(7)
Rapid Review	2 (5)
Systematic Review with Metanalysis	2(5)

Table 16: Countries of primary data collection

Country	n (%)
United States of America (USA)	23 (24)
United Kingdom (UK)	13 (14)
Australia	12 (12)
Canada	10 (10)
Germany	7 (7)
Military medical systems (USA and UK) [14]	6 (6)
Austria	6 (6)
Sweden	6 (6)
Denmark	3 (3)
Iran	2 (2)
Central Europe [15]	2 (2)
Switzerland	2 (2)
France	1 (1)
Hungary	1 (1)
Iraq	1 (1)
Ireland	1 (1)
Singapore	1 (1)
the Netherlands	1 (1)

[14] There were 6 studies conducted in the military medical systems of the USA and the UK while conducting operations in Afghanistan, Iraq, and Syria and 2 questionnaires administered to veterans of these operations.

[15] Three different countries were represented in the research teams, but we could not discern which country data was collected in, though it was clear these were single site studies. Central Europe is the term used by the authors.

4.2.2 Contexts and Patient Groups

4.2.2.1 Patient Groupings

In primary studies, most studied adults (>18, n=48), followed by studies collecting data from both adults and patients younger than 18(n=40). Seven studies (n=7) made paediatrics the focus, excluding adult data. [226-232] Three (n=3) studies did not report on patient age. [233-235]

Mixed age and paediatric studies varied in their definitions for the upper and lower age bounds when classifying paediatrics. Older children were represented in the evidence, but younger children were commonly excluded by recruitment criteria. The lowest age present in the literature were "0.1 years" [228] (assumed to be 1.2 months old). Garrick et al. [236] and Oxer et al.[237] stated a lower age range of "0" years. It was not possible to properly determine the lower age point of children in the evidence.

At the other end of the age continuum, older patients were included in data sets, however only 2 studies studied patients older than 65 years exclusively. These were studies on auricular acupressure [238] and Fascia Iliaca Compartment Block (FICB). [239] All studies recruited both male and female patients, except for a single study which used Transcutaneous Electrical Nerve Stimulation (TENS) to manage acute (non-obstetric) pelvic pain , which only recruited female patients. [240]

4.2.2.2 Pain types and aetiologies

Acute trauma pain was reported in 91 studies, of which 38 only reported on trauma pain. Acute non-trauma pain was reported in 52 studies, though only 4 exclusively evaluated non-trauma pain.[234, 240-242] Two studies evaluated use of analgesics in cardiac pain [243, 244] though an additional 12[236, 237, 245-254] included cardiac pain with other aetiologies. Back pain was also reported as the focus in 1 study[255] and together with other aetiologies in 4 more. [247, 256-258]

Two primary studies reported on obstetric pain, together with other aetiologies, as an indication for therapy, one using Entonox™ [246] and the other addressing morphine, fentanyl and methoxyflurane. [259]

4.2.2.3 EMS mode

In 72 primary studies pain therapies were studied in primary response ground-based ambulance (Table 17) and in 3 studies in primary response in the aeromedical environment. [228, 260, 261] One study evaluated both primary response and critical care retrieval in the aeromedical environment. [262] A single study dealt with pain therapy in CCR[16] in ground ambulances. [263] There were 6 primary studies which deal with the military or battlefield environment. [264-269]

[16] Critical Care Retrieval

Table 17:Evidence Characteristics: Populations, pain types and modes of service

	Primary Evidence	Secondary Evidence
Exclusively Adults: >18	240, 242-244, 247, 251, 252, 256, 259, 264, 265, 267, 268, 270-301	302-322
Adults and Paediatrics	236, 237, 241, 245, 246, 248-250, 253, 254, 258, 260-263, 266, 323-344	345-358
Adults: exclusively >65	238, 239	nil
Paediatrics. < 18 (Youngest age 6 months)	226-232	359-362
Age not reported	233-235, 257	53, 359-364
Pain types and aetiologies		
Acute Trauma Pain	226-233, 235-239, 245-254, 256-301, 323-344, 355	53, 302-309, 311-322, 345-364
Acute non-trauma pain	226, 227, 230, 231, 234-237, 240-242, 245-247, 249-254, 256-259, 261-263, 272-274, 276, 280, 282, 284, 290, 295, 297, 300, 301, 323-325, 327, 329, 331, 332, 334, 335, 337-344	302-304, 308, 311, 312, 315, 316, 318, 319, 322, 346, 347, 350, 352, 353, 357, 359-361, 364
Cardiac Pain	236, 237, 243-254, 257	348
Obstetric Pain	246, 259	nil
Back Pain	247, 255-258	357
MODE		
Primary response - Ground ambulance	226, 227, 229-232, 234-259, 270-276, 278-301, 323-329, 331-335, 337-344	303, 305, 310, 314, 315, 318, 319, 321, 348-350, 354, 359, 362, 363
Primary Response- Aeromedical	228, 260-262	
Critical Care Retrieval Aeromedical	262	
Interfacility transfer – ground ambulance	263	
Contexts not differentiated		302, 306, 308, 311, 320, 345-347, 351-354, 356-358, 360, 361, 364
Military/Battlefield;	264-269	304, 307, 313, 355
Wilderness/Mountain;	233, 277, 330, 336	53

Table 18: Description of Therapies and Evidence

Nr	Therapy under study	Primary evidence	Secondary Evidence
NON-PHARMACOLOGICAL THERAPIES			
1	Acupressure/Auricular Acupressure	RCTs [238, 287, 289]	Systematic Review [311, 363] Scoping Review [314] Narrative Review [315]
2	Transcutaneous Electrical Nerve Stimulation (TENS)	RCTs [234, 240, 255, 288]	Systematic Review with MA [319] Systematic Review[363] Narrative Review [315]
3	Warming	RCT [242]	Narrative Review [315]
4	Splinting (Traction Splinting/Simple Splinting (Femur)	Quasi-experimental [328]	Systematic Review [363] Scoping Review[352] Narrative Review[53]
PHARMACOLOGICAL THERAPIES			
1	Entonox® (50% Nitrous Oxide/50% Oxygen)	RCTs[270, 276, 286] Cross sectional descriptive[235, 245, 342] Cross sectional analytic[251, 323, 337, 344] Cohort[233, 246, 331] Retrospective cohort[339] Quasi Experimental [340]	Scoping Review[352] Systematic Review [316-318, 347, 361, 363] Narrative Review[53, 303, 306]
2	Methoxyflurane	Case Series [226, 256] Cohort [237, 254, 284, 294, 329] RCT[333] Retrospective Cohort [227] Cross Sectional Analytic [259, 277] Retrospective cohort [241] Mixed Method[301]	Systematic Review [316, 317, 359, 361, 363, 365, 366] Narrative Review[53, 304, 306, 309, 313, 346, 354, 357, 364] Rapid Review [322]
3	Morphine IV	Cohort[243, 271, 285] RCT [244, 252, 253, 283, 286, 293] Cross Sectional Analytic [253, 257, 259, 297, 300, 325] Retrospective Cohort [227, 290, 334] Quasi Experimental [247, 328]	Narrative Review [53, 274, 303, 321, 355, 356] Systematic Review [302, 308, 316, 318, 347, 350, 356, Scoping Review[352]
4	Morphine Transmucosal (Nasal/Buccal)	Cross Sectional Descriptive [268]	Narrative Review [53]
5	Morphine IM	Cross sectional descriptive[266, 268] Cross Sectional Analytic [297]	Systematic Review[366] Narrative Review[313]
6	Fentanyl IV	RCT[244, 253, 280, 283, 292] Quasi Experimental [236, 299] Cohort [271, 281, 285] Retrospective Cohort [228, 260, 272, 332, 334] Cross Sectional Analytic[253, 257, 259, 261, 297, 325]	Narrative Review [53, 303, 321, 355] Systematic Review [302, 308, 316, 318, 347, 359, 361, Scoping Review[352]

Table 18: Description of Therapies and Evidence (continued)

	Therapy under study	Primary evidence	Secondary Evidence
PHARMACOLOGICAL THERAPIES Continued			
7	Fentanyl IM	Quasi Experimental [236]	nil
8	Fentanyl IN	Cohort studies[231, 249, 338] RCT[252, 338] Retrospective cohort [227, 241] Cross sectional analytic[232, 259]	Systematic Review [316, 347, 359, 366] Narrative Review[53, 306, 355] Rapid Review[362]
10	Fentanyl Subcutaneous (SC)	Cohort[338] Retrospective cohort[241, 250]	nil
11	Fentanyl Transmucosal (Oral)	Cohort[267, 336] Retrospective cohort[233, 269]	Systematic Review [316] Narrative Review[306, 355]
	Fentanyl Nebuliser	nil	Narrative Review[306]
	Sufentanil IN	nil	Narrative Review[306]
	Alfentanil IV	Cross Sectional Descriptive[341]	Systematic Review[316]
12	Tramadol IV	Quasi Experimental.[340]	Narrative Review [53, 303, 321] Systematic Review[308, 316, 347]
13	Tramadol IM	RCT[333]	nil
14	Pentazocine IV	Retrospective Cohort[291]	Systematic Review [302, 318]
15	Nalbuphine IV	Case Control[326] Case Series[282] Cross Sectional Analytic [258, 274, 300] Cohort[248, 343]	Narrative Review [274, 303, 321]
16	Nalbuphine IM	Cohort[248]	nil
	Metamizole	Cross Sectional Analytic[257]	nil
17	Ketamine/Esketamine IV	RCT[283] Retrospective cohort[272, 291, 334] Cross sectional descriptive[230, 265] Cross sectional analytic [229, 297] Cohort[285, 324]	Systematic Review [302, 307, 316, 318, 347, 350, 358, Narrative Review[53, 305, 321, 351, 353, 355] Scoping Review[352]
18	Ketamine IM	Cross Sectional Analytic [264, 297] Cross sectional descriptive[230, 265]	Narrative Review[53, 351, 353, 355] Systematic Review [302, 307, 358, 359]
19	Ketamine/Esketamine IN	Cross sectional descriptive[230, 265 327] Case Series[330] Case Control[239] RCT [270, 292] Cross Sectional Analytic[300] RCT [292]	Narrative Review[53, 351, 353, 355] Systematic Review [302, 358] Rapid Review[362]
20	Ketamine IO	Cross sectional descriptive [230, 265]	nil
21	Ketamine Sub-lingual (SL)	Cohort[254]	nil
	Ketamine Nebuliser	Case Series[295] Case Report[296]	nil
23	Ketorolac IV	RCT[335]	Narrative Review[53, 312, 321]
24	Paracetamol/Acetaminophen Oral	Case Control [273] Cohort[254]	Narrative Review[53, 355] Scoping Review[352]
25	Paracetamol IV	Case Control[273] RCT [286, 335] Cross Sectional Analytic [274, 300]	Systematic Review[53, 347] Narrative Review[53]

Table 18: Description of Therapies and Evidence (continued)

	Therapy under study	Primary evidence	Secondary Evidence
PHARMACOLOGICAL THERAPIES CONTINUED			
26	Ibuprofen Oral	Not studied in primary studies	Systematic Review[359, 361] Narrative Review[355]
	Meloxicam	Not studied in primary studies	Narrative Review[355]
	Rofecoxib	Not studied in primary studies	Narrative Review[355]
	Butylscopolamine	Cross Sectional Analytic[257, 300]	
PROCEDURES REQUIRING PHARMACOLOGY			
1	Fascia Iliaca Compartment Block (FICB) (Lidocaine with adrenalin) Chirocain	Quasi Experimental [275] Qualitative [278, 279] Case control[239] RCT [286, 293]	Systematic Review with Meta-analysis[320] Narrative Review[53, 310] Systematic Review[316, 349, 356, 363] Scoping Review[345] nil
	Femoral Nerve Block	Not studied in primary studies	Narrative Review[53]
2	Digital Nerve Block (Lidocaine 2%)	Case Report [298]	nil
ENABLING PROCEDURES			
1	Patient Controlled Analgesia	Cohort [263]	Narrative Review[310]
2	Telemedicine	Quasi Experimental [247] Cohort study [290]	nil
	- Piritramide IV		
	- Metamizole IV		
	- N-Butylscopolomine		

4.2.3 Pharmacological Therapies

4.2.3.1 Scope of pharmacological therapies

Of the primary evidence, 91 studies dealt with pharmacological therapies, or procedures requiring pharmacology. PECPs administered 18 different medicines using 10 routes of administration. Three medicines were discussed in reviews but not applied. In contrast, 8 primary studies dealt with 6 different non-pharmacological therapies. The scope of therapies and routes of administration is presented in Table 17. A summary of the application of therapies is presented in this section.

4.2.3.2 Opioid therapies

4.2.3.2.1 Morphine

Morphine was administered via the IV and IM routes with varied dosing methods. Buccal and IN administration is discussed, without evidence of application. [53, 268]Weight-based doses, for example, 0.1mg/kg to a max of 0.2mg/kg [285] as well as age-weight strategies were described. An example of an

age weight strategy is for children aged 5 to 12 years to receive 0.1mg/kg, and children older than 12 to receive 2.5 to 5mg.[227] Standard dose strategies were also used; for example 2.5mg to 5mg boluses [252] or 2 to 4mg boluses. [243]

Morphine by IM injection has a history of use in the military[266, 355], including by autoinjector. [266] This route was not popular with combat personnel who felt that IM morphine did not provide adequate analgesia. Smith, Russell [268] The IV route is now preferred due to delayed onset of analgesia, variable absorption, and the potential for overdose associated with IM administration. [355]

4.2.3.2.2 Fentanyl

Fentanyl was administered via the IV, IM, intranasal (IN), transmucosal (TM) and Sub-Cutaneous(SC). routes, with dosing strategies varying. Weight-based doses varied from 0.22µg/kg [228] to 3mcg/kg. [261, 280] Standard doses were also present in the evidence, such as 2µg/kg as a bolus. [272]. Age-weight strategies were also used, for example patients younger than 75years or heavier than 50kg were administered 50mcg boluses and those older than 75years or lighter than 50kg were administered 25mcg boluses. [244] Intramuscular doses of 1µg/kg, repeated every 5 minutes, were described. [236] Intranasal doses varied from 0.05-0.1mg every 3 to 5 minutes until a maximum of 0.3mg [253] Intranasal fentanyl is convenient for paediatric use, though it is used in adults. [338]

Doses of IN fentanyl could be standardised or weight and age based. For example standard doses of 100mcg for patients between 18 and 65 years and 50 mcg for patients younger than 18 or older than 65.[249], or 1.5mcg/kg for patients between 14 and 69 years and 50mcg for patients older than 70 years. [338] Subcutaneous dosing strategies were 1.5mcg/kg for patients between 14 and 69 years and 50mcg for patients older than 70 years. [338] Oral Transmucosal Fentanyl Citrate (OTFC) in the form of a lozenge was studied for battlefield use. [269]

4.2.3.2.3 Nalbuphine

Nalbuphine was primarily used in the United Kingdom (UK) [248, 282, 326, 343] with a single study of safety in the United States of America (USA). [258] It showed effectiveness and safety [258] though the IV and IM routes but has a risk of elevating opioid requirements in the ED because of its antagonist properties.[282] Nalbuphine was withdrawn by its manufacturer, worldwide, in 2004 [367], but has reappeared in recent German studies. [274, 300]

4.2.3.2.4 Pentazocine

A single primary study compares IV pentazocine for blunt trauma and ketamine IV for penetrating trauma in a civilian EMS in Iraq. [291] The pentazocine dose was 0.4mg/kg. There was no difference in effect on Physiologic Severity Score (PSS) between the two medicines though ketamine had a better

physiological outcome in more severely injured patients. Pentazocine was also included in 2 systematic reviews, as comparators to ketamine [302, 318]

4.2.3.2.5 Tramadol

Tramadol appeared in 2 primary studies. A randomised controlled trial (RCT) compares inhaled Methoxyflurane (MTF) with IM Tramadol for prehospital analgesia. Methoxyflurane provided better pain relief than IM Tramadol, though with more minor adverse effects such as drowsiness and headache. Statistically, Methoxyflurane was preferred by both PECPs and patients. The inhaled route was faster to administer. [333].In another comparison with inhaled analgesia, IV Tramadol was shown to be effective and safe in patients older than 12 years who were suffering from pain where Entonox® was either ineffective or contraindicated. [340] The effectiveness was statistically significant but small (1 point) and nausea in the Tramadol was higher than in the Entonox® group (30% vs 12%). The degree of analgesia may not be worth the risk.

4.2.3.2.6 Alfentanil

Alfentanil was described in a single cross sectional descriptive study [341] In this large retrospective observational study (n= 17796) Alfentanil reduced pain by a VAS score of 4 points (IQR 3) with serious adverse events identified in 0.01% of cases. [341]

4.2.3.3 Ketamine

Ketamine has been used in both adults and paediatrics using multiple routes of administration (IV, IN, IM, IO and TM). Dosing strategies use both weight-based doses and fixed doses and showed much variation. Weight based IV doses range from 0.25mg/kg to 0.5mg/kg. [230] Some studies declared maximum doses, for example a maximum of 3 doses in an hour. [272] An example of a standardised dose was 25mg for IV and IO use. [264] Examples of weight based IN doses of Esketamine were 0.5mg/kg to 1mg/kg for adults and 1.5mg/kg for paediatrics. [330] An example of a standard IN dose of Esketamine was a 50mg [247] An example of an intra-muscular dose is 50mg [264]

Ketamine IV appears to be an effective therapy reducing NRS score from 9/10 to 3/10 [262], and when used with morphine in a multimodal strategy was more effective than morphine alone. [283] Ketamine IV may also be more effective than fentanyl IV, with an NRS reduction of 5.5 points compared to 2.5points.[272] Transmucosal ketamine, administered as a sub-lingual wafer reduced pain from 9/10 to 3/10. [254] Ketamine IM reduced pain in 80% of patients from 'severe' to 'mild' pain. [264]

Racemic ketamine has been used intranasally at doses of 30mg for patients less than 50kg, 50mg for patients 50-100 kg and 75 mg for patients greater than 100kg. [270]0.75mg/kg. S-An example of per kilogram IN doses are 0.5mg/kg repeated as needed to a maximum of 1mg/kg for adults and

1.5mg/kg for children.[330] Other examples of paediatric doses are 0.25mg/kg either IV, IO or IM for analgesia and 1-2mg/kg IV or up to 3mg/kg for either IM or IN for procedural sedation.[230]

Doses on the battlefield have been described as 25mg IV/IO with a repeat of 20mg every 15-30 minutes or 50mg IM every 15-30 minutes as needed or until nystagmus across. [264] Ketamine is not associated with the same adverse effects as morphine, and the onset of analgesia, even by the IM route, is much faster. A SR of battlefield use found ketamine to be used mainly during evacuation and not at the point of injury, and to be used for more severe pain and in more severely injured casualties [307] Ketamine delivered by breath actuated nebuliser delivered at doses of 0.75mg/kg [296] and 1mg/kg [295] was also found to be safe and effective. Ketamine shows great versatility because of the large number of routes of delivery.

4.2.3.4 Inhaled therapies

Entonox® is a self-administered mixture of nitrous oxide and oxygen in a 50:50 ratio packaged in pressurised cylinders and administered through a demand valve and mask. [233] Entonox® has a long history in PEC [344] and is effective for pain management[276], though not necessarily for severe pain. [233]

The standard dose of methoxyflurane is 3ml of volatile liquid poured into a plastic vapouriser [333] methoxyflurane showed significant reductions in NRS scores, even when used in severe pain [256, 294, 333] Both Entonox® and methoxyflurane were used in multiple contexts, though methoxyflurane has additionally been considered in wilderness and battlefield contexts. [313] Entonox® was considered unsuitable for these applications [53, 233, 313], even though it has been applied in wilderness settings[233] This is due to unwieldly packaging

4.2.3.5 Paracetamol and Non-steroidal Inflammatory Drugs (NSAIDS)

In the primary evidence 1g paracetamol IV was found to reduce pain with a mean reduction of 14.9mm on a VAS, and is effective at reducing pain, though not as effective as 30mg ketorolac IV, which showed a mean reduction of 16mm. [335] Paracetamol IV was also more effective than 1g of the oral form, showing a mean improvement of 2.02 points on the NRS, versus 0.75 point improvement for oral paracetamol. [273] The comparison with paracetamol was the only primary evidence for ketorolac IV[335], or any NSAID. Neither paracetamol nor ketorolac displayed serious adverse events and are considered effective and safe. Paracetamol at a dose of 1g IV in combination with 0.2mg/kg IV of Nalbuphine has been found to be effective and safe for pain management. [274]

4.2.3.6 Peripheral Nerve Blocks

Fascia Iliaca Compartment Block (FICB) is a peripheral nerve block in which local anaesthetic is infiltrated into the fascia iliaca compartment to provide regional anaesthesia. [239, 275] A study of 108 patients (n=108) with suspected proximal femur fracture received FICB, with pain reduction from a

median NRS score of 8 to a median of 3 at 30minutes, with 96% success rate.[275] A feasibility study with thirty-five enrolled patients in the FICB arm, found FICB to be feasible, safe, and effective. Both PECPs and patients reported the procedure to be acceptable for use. Less Morphine was required in the FICB arm than in the usual care arm. [286]

A RCT comparing FICB to additional doses of IV morphine (all patients received 0.1mg/kg morphine prior to treatment allocation) found the procedure to be feasible and safe. Pain in the FICB group was reduced to greater extent at 15 minutes (median NRS score of 3 for FICB vs 7 for morphine group). By ED arrival the difference in pain scores was less, with FICB patients having a median score of 1 and morphine group a score of 3. Pain in the FICB group was less on bed transfer (dynamic pain), showing the procedures superiority over morphine for dynamic pain (pain with movement). [293] A retrospective case control study in Sweden also found that patients receiving FICB had a more marked reduction in pain than patients receiving standard care of opioids, ketamine, and benzodiazepines. It may be safer than femoral nerve block as the needle does not lie adjacent to the nerve and the risk of neuropraxia is therefore reduced. [239] Digital block for relocation of a digit was described in a single case report and reported as safe and effective. The procedure required additional training. [298]

4.2.3.7 Adjunctive modalities

Two adjunctive modalities enabled analgesia administration: telemedicine and patient-controlled analgesia (PCA). Both of these procedures were implemented in order to extend the provision of analgesia where regulatory environments limited medicine use by PECPs. Both are technology dependent and not necessarily available for use in all EMS systems.

4.2.3.7.1 Patient Controlled Analgesia

In Patient Controlled Analgesia (PCA) a pump is programmed to deliver doses of medication when activated by the patient. [263] The concept of patients controlling their analgesia was first introduced with the use of nitrous oxide. [344] The use of PCA pumps has been used in the ED with mixed results and is not routine in PEC. [263] A rapid review conducted in 2014 found no published studies or guidelines describing PCA in PEC. [310], though PCA has since been studied in a Canadian cohort study. [263] The Canadian PECPs supervising the transfer are not ordinarily authorised to administer opioids and PCA allowed analgesia to continue during transport without the need for an accompanying physician. The PCA pumps were prepared by physicians in the transferring hospital.

4.2.3.7.2 Telemedicine

Telemedicine systems capable of audio and data transmission have been applied to pain management in German PEC. In a pilot study, telemedically supported PECPs were able to provide analgesia of acceptable standard to patients using opioids and esketamine. [247] When telemedicine

was introduced into routine care it was found to be effective, safe, and comparable to analgesia provided by on-scene physicians. [290] Barriers are that telemedicine is not available in every EMS, and inconsistent network coverage. [257] Independent administration of opioids by PECPs has only been allowed by Germany's legal framework since August 2023, under specific circumstances, in part to allow for improved pain management. [257]

4.2.4 Non-pharmacological Therapies

Of 98 primary studies only eight exclusively dealt with non-pharmacological therapies. Studies were clustered between 2002 and 2012. Only a single article investigated splinting for pain management, even though this is a common procedure in PEC. Following is a summary of the evidence for non-pharmacological pain management therapies.

4.2.4.1 Acupressure and Auricular Acupressure

Acupressure stems from Traditional Chinese Medicine (TCM) and works by unblocking or altering the flow of life energy (Chi or qi), to stimulate healing or relieve pain. [238, 289, 311, 368] Acupressure differs from acupuncture, in that pressure is applied to pressure points to achieve relief, whereas acupuncture uses hair-thin needles inserted into acupoints to achieve pain relief. [289] Acupuncture was not used by PECPs.

Acupressure is studied in three RCTs, for traumatic pain. [238, 287, 289] Barker[238] studied auricular acupressure in older patients with hip fracture. Auricular acupressure uses the application of 1mm plastic beads to specific acupressure points on the ear. Kober [287] studied acupressure in victims of minor trauma and radius fractures respectively. All studies compared acupressure with sham acupressure. In these trials, acupressure was found to be effective, and safe, with no adverse events.

4.2.4.2 Transcutaneous Electrical Nerve Stimulation

Transcutaneous Electrical Nerve Stimulation (TENS) was studied in four RCTs [234, 240, 255, 288], though only one of these was for traumatic injury. [288] The procedure use electrical current delivered through electrodes to relieve pain. It was found to be safe, and effective in all the evidence.

4.2.4.3 Splinting

Traction splinting was compared with simple splinting for pain management in femur fracture in one study.[328] Traction splinting was found to provide statistically significant pain relief in comparison to simple splinting, however the clinical difference was described as 1.2 units at 1 hour and a mean

reduction of 0.66 units at 6 and 12 hours. The clinical significance of this is debatable. Both simple splints and traction splints are important methods of stabilising fractures. [328, 363]

4.2.4.4 Warming

The use of active warming using an electrical blanket was studied for pain relief in cholelithiasis [242], the only prehospital study found for the use of temperature in PEC. Warming was found to be safe and effective.

4.2.5 Assessment of Pain

Assessment of pain relies primarily on pain measurement scales, and the evidence shows the use of either patient-rated scoring tools or observer-rated scales (Table 19). Patient-rated scales are the Visual Analogue Scale (VAS) and the Numerical Rating Score (NRS), also known as the Verbal Numerical Rating Score (VNRS). These scales require numeracy on the part of the patient, and the cognitive ability to convert pain intensity to a number, or mark on a line. The VAS also requires the physical ability to hold a pen and to see the line. Alternative scales are adjective scales, which describe the pain as adjectives such as 'moderate,' 'severe' or 'very severe' to describe pain. [246, 323] [342] Some scales assign adjectives to degree of pain relief: such as 'no relief', 'moderate relief' or 'marked relief'. [235, 246, 323, 331, 344]

Pain assessment scales could be categorised according to age and developmental status. Pain assessment in paediatric populations use pictorial tools such as the Wong-Baker FACES® Pain Rating Scale [236], FLACC scale[231] and the Paediatric Faces Scale. [332] Older children may be assessed using the same tools as adults. Murphy et al… categorise pain tools this way; *"[FLACC] scale is the recommended scale for use in children younger than 5 years, the Wong-Baker scale is the recommended scale for children aged 5–7 years and the analogue pain scale is recommended for children at least 8 years old".* [231]

In observer-rated scales, an observer awards a score[331], or an adjective[264], based on observations of a patient's behaviour and/or clinical signs to indicate pain intensity. One example uses a three point adjective scale, 'mild', 'moderate' and 'severe', to describe patients' pain. [342] In a second example PECPs award a score of '1' for patients complaining of pain only when asked, '2' if patients complained of pain spontaneously and '3' if patients were writhing in severe pain. [331] In a third example PECPs assign one of three terms, 'mild', 'moderate' and 'severe' to a patients presentation. [369] The Pain Assessment in Advanced Dementia Scale (PAINAD) [236] also makes use of observed behaviour and clinical signs to assign scores from "0" to "2" to rate pain intensity in cognitively impaired patients.

The NRS/VNRS and VAS are prominent in contemporary literature, however, there still appears to be considerable heterogeneity in PEC pain assessment. Pain scales in PEC evidence are all unidimensional, providing only a measure of pain intensity, or degree of pain relief. Multidimensional pain assessment systems to do not appear in the PEC evidence.

Many analgesic medicines, such as the opioids, cause sedation or have haemodynamic effects. Several tools to measure sedation, physiological status or to assess risk are found in the evidence. Scoring systems include the Injury Severity Score [307] and the Physiologic Severity Score. [291] Sedation was measured using the Ramsey sedation score [256, 305, 307], or in children, the Wisconsin Sedation Score. [226]

Table 19: Pain Assessment and Risk Scoring Tools: Primary Studies

Tool	References
ADULTS	
Visual Analogue Scale	238, 240-242, 244, 248, 255, 258, 287-289, 294, 306, 328, 335, 341, 345
Numerical Rating Score, also known as Verbal Numerical Score	236, 239, 244, 245, 247, 249, 250, 252-254, 256, 257, 259, 261, 263, 267, 269-278, 280, 281, 283-285, 290, 292-296, 298, 300, 306, 320, 325, 327, 330, 333, 336, 338, 340, 343, 345
Adjective Scale	235, 246, 261, 264, 323, 332, 342, 344
Behavioural Scales	239, 251, 331, 337, 339
Pain Assessment in Advanced Dementia Scale	236
CHILDREN SPECIFIC	
Wong-Baker FACES® Pain Rating Scale	231, 232, 236, 334
11-point NRS	226, 227, 229-232, 236, 249, 250, 253, 254, 261, 269, 327, 330, 333, 336, 338, 340, 343
'Face, Legs, Activity, Cry and Consolability'	231, 236
INFANTS	
'Face, Legs, Activity, Cry and Consolability'	231, 236, 362
PATIENT SAFETY AND RISK STRATIFICATION AND MONITORING	
Physiologic Severity Score	291
Injury Severity score	307
Ramsey Sedation Scale	256, 305, 307
Adjective Scale of Patient satisfaction	256
Wisconsin Sedation scale	226
Disability scores	275
4-point sedation scale	285
Stockholm hospital scale And TPS	239
Richmond Agitation Sedation Scale	295

4.2.6 Temporal Analysis of the Evidence

This section displays the timing of publication of all *primary* research evidence in the literature for prehospital pain management. The timelines group publications by class of medicine and time and situates research evidence in relation to research on other medicines. Evidence spanned 52 years (1972 till 2024). The wide time range prevented sampling bias based on time. Timelines of primary research are presented in Figures 3-6 and appear to show temporal patterns in primary research.

The first published evidence of pharmacological therapy appeared in 1972 with a study of Entonox®.[246]

The timeline in Figure 3 shows studies for inhaled therapy, with the first Entonox® study published in 1972[246], and the last in 2019.[270] The only RCT for Entonox® study was published study was in 2013.[276] Most Entonox® studies are clustered between 1972 and 1991. Evidence for methoxyflurane in the PEC context was published between 2006 [226] and 2023.[277, 301]

In respect of Opioids, nalbuphine research appears in the literature first, between 1998 [258] and 2002. [343] Thereafter nalbuphine research in PEC disappears, probably due to its withdrawal in 2004 [367], to reappear again in 2023[300] and 2024[274]. The first evidence for Fentanyl appears in 1996 [260] with the bulk of published research appearing between 2004[267] and 2020[271]. The first appearance of morphine in a research study is in 2009 [285], after fentanyl has already appeared.

Research into the prehospital use of ketamine by PECPs is published for the first time in 2009, as multimodal therapy added to morphine. [285] Thereafter research dealing with ketamine applied PECPs is published regularly, and appears to be ongoing, with the last study appearing in 2024. [292]

Compared to pharmacological therapies, non-pharmacological therapies appear relatively late in the timeline Figure 4 and within a narrow window. The first published primary evidence appeared in 2002 [287] and the last in 2007. [288, 289] In terms of analgesic procedures which require pharmacology, five studies of FICB are present between 2015 [293] and 2021[239]. A single case report of digital nerve block appears in 2012. [298]

Technology driven enablers for pain management appear late in the timeline, with research into Telemedicine spanning the years 2016 [247] and 2017. [290] There is a single primary study of PCA using an infusion pump. [263]

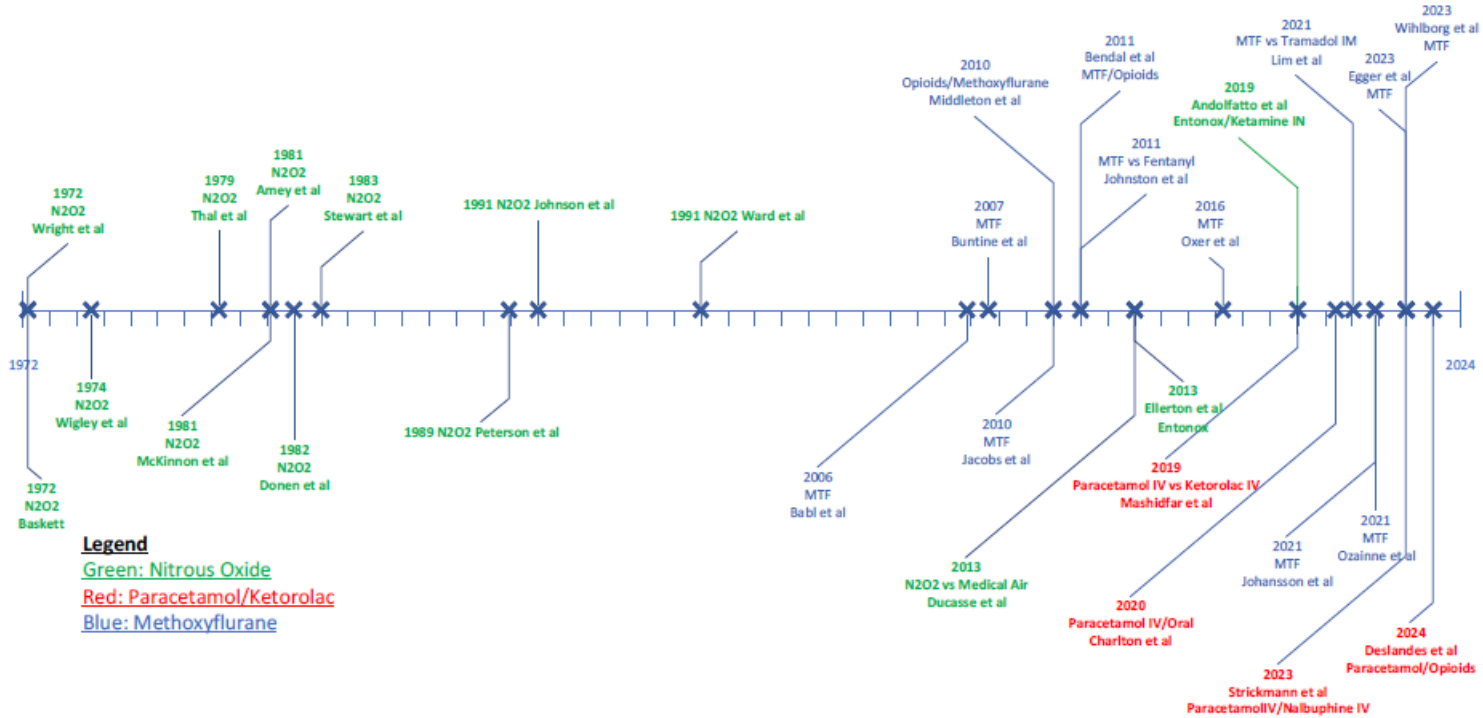


Figure 5: Timeline of primary studies of analgesic gases and paracetamol in prehospital use

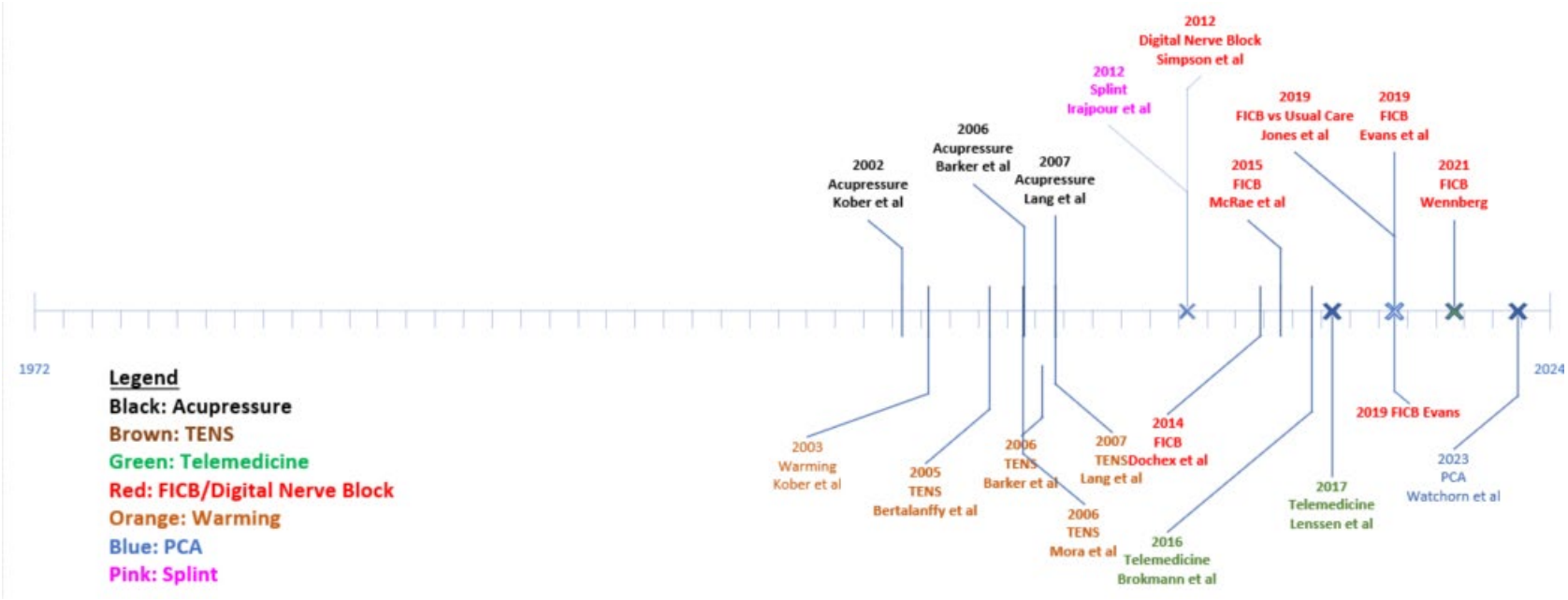


Figure 6: Timeline of primary studies of nonpharmacological therapies and pain-relieving procedures

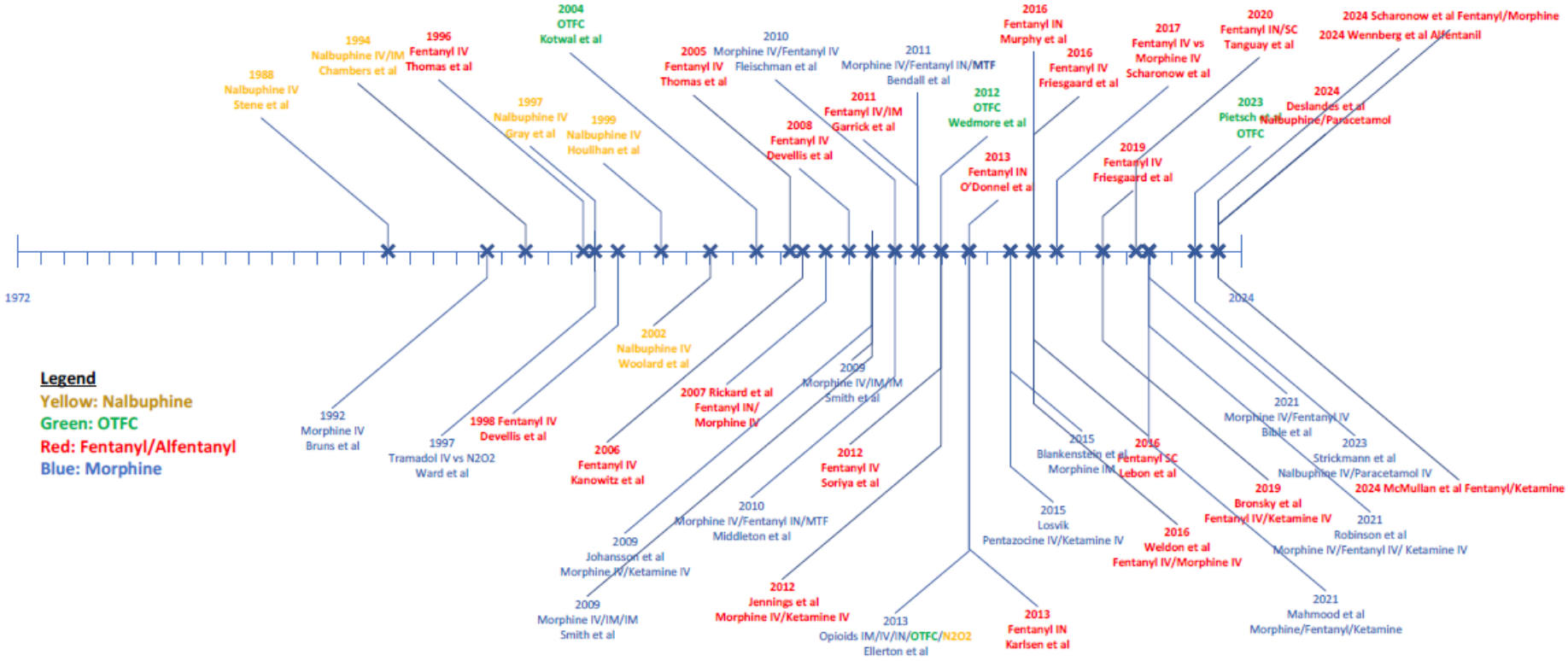


Figure 7:Timeline of primary studies of Opioid therapies

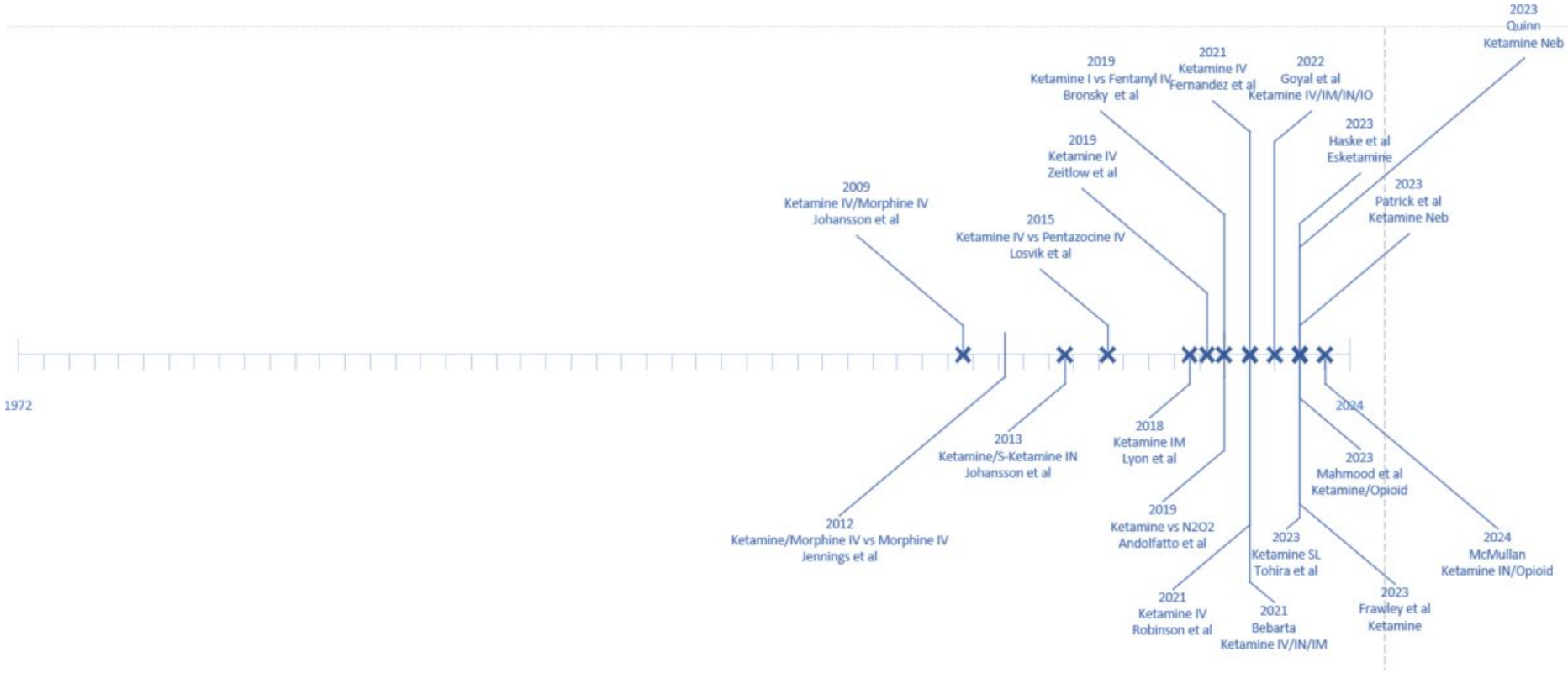


Figure 8: Timeline of primary studies of Ketamine therapies

4.3 Discussion

The evidence presented outlines the scope of and use of the pain management therapies which have been studied in the hands of PECPS, in the PEC context. With eighteen medicines represented in evidence and only five non-pharmacological therapies represented there does appear to be a research preference for pharmacological therapies. Only a single study[328] evaluated pain management using splinting, a basic procedure in PEC, and this is noteworthy. Either the procedure has low research status or is so commonplace its effectiveness and utility are widely accepted. An important omission was the lack of studies of cooling or ice for pain relief in PEC. Cooling was discussed as an ED therapy in a review, together with elevation, bandaging, and compression, [314], but not in PEC. Research into the use of non-pharmacological pain therapies by PECPs represents knowledge and research gap.

Pharmacological therapies seem largely dictated by regulation, and not practitioner autonomy and strength of evidence. All primary studies either collected data on therapies which were part of existing and approved formularies, or with permission of the regulating authority, were testing additional therapies. A third method involved testing therapies which did not seem to require regulatory permission. This was limited to non-pharmacological therapies. [234, 238, 240, 242, 255, 287-289] The EMS is a regulated and controlled environment, with practitioner autonomy limited and controlled by protocols. The selection of therapies found in this review probably says more about EMS regulation than about PECP's application of evidence-based practice. Regulation appears limited to pharmacology.

Opioids, ketamine and the inhalational analgesics methoxyflurane and Entonox™ appear to enjoy research prominence. Paracetamol featured in only six primary studies. [254, 273, 274, 286, 300, 335], including a comparison with ketorolac[335], which represented the only primary evidence of an NSAID in the hands of PECPs. The approved South African medicines formulary for PECPS lists paracetamol as approved for use, and also lists the class NSAIDS as being approved, without specifying a specific medicine. [58], though the CPG mentions ibuprofen in its recommendations, without limiting choices to ibuprofen. The recently published CDST[67] includes ibuprofen in its algorithms. Not having published the methods, it is uncertain which evidence was used to support ibuprofen's designation as the NSAID of choice in PEC. South African PECPs are required to extrapolate data from contexts other than PEC or use expert opinion when making decisions on paracetamol and NSAIDS, and this is likely the case with Ibuprofen. This is important, because secondary evidence makes important distinctions between NSAIDS based on their tendency to cause bleeding and selects NSAIDS based on context. [355]

Antispasmodics, in the form of butylscopolamine is present in two studies. [257, 300] The oral form of paracetamol, and medicines such as NSAIDs are understudied in comparison to IV medicines, and this may represent a research bias away from basic forms of therapy, or of milder pain.

In terms of geographical region, no primary studies of the application of pain therapies by PECPs originated from Africa, or South Africa, with only a single scoping review exploring pain management in Africa. [352] Examination of the primary evidence by country (Table 15) shows that North America, European, the UK and Australia produces almost all the primary research. The only evidence produced outside of the Western EMS emanates from Iran [328, 335] and Iraq [291] Both are classified as

upper-middle-income countries, together with South Africa [146] and should be comparative in context. South Africa has a large equality gap [146], and healthcare is also marked by inequality. The implication for education and practice is that South African practitioners need to be competent to perform in a health system with characteristics of both resource rich and austere environments.

Technology and devices were used to enable pain management in contexts where regulation limited PECPs abilities. Telemedicine in Germany and PCA in Canada allowed patients to be treated for pain where previously they may not have been. This relied on consultation with physicians, and in the case of PCA, for the physician to set the infusion of analgesics for continuation by the PECP. Theoretically, South African PECPs are required to use telemedicine when performing thrombolysis for ST elevation myocardial infarction (STEMI). [58] However, there is no evidence that South African EMS systems are capable of consistently supporting tele-consultations, and it does not appear as if telemedicine is a reliable modality in South Africa. There is no evidence of PCA use in South Africa.

The patient groups found in the evidence were notable for omissions. Paediatric studies were not as numerous as adults, and within the paediatric groups, it is uncertain as to what extent the data represents very young children and infants. Several studies mention inclusion criteria which might include children younger than 1 year [228, 230, 232 236, 237], but this would represent a minority of data. No studies made infants a focus, the literature is silent on neonates.

Obstetric pain management is mentioned as an incidental finding in 2 studies[246, 259], but is not the focus in either. Further, gynaecological pain is present in a single study only. [240] Aside from these 2 studies, no study exclusively examines a single sex, with both males and females recruited into all studies. There is this no unambiguous evidence of gender bias, though there may be a trend toward bias against females for the management of prehospital pain[175]. The lack of research into obstetric pain management may be considered a research gap. Transgender patients are also not mentioned in any work.

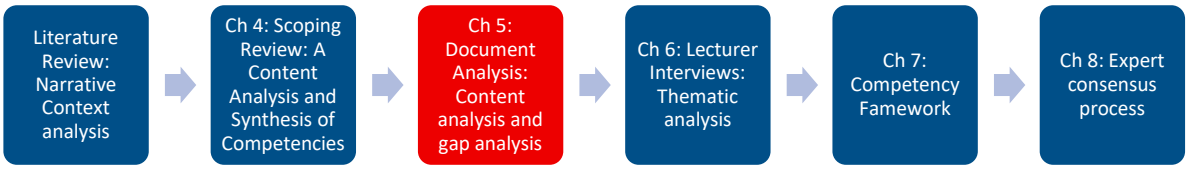
Unconscious and shocked patients are not represented in any primary or secondary evidence. One study does make provision for use of the PAINAD scale [236] for use in cognitively impaired patients but does not document whether it was used. Exclusion criteria for the primary studies excludes unconscious or severely compromised patients from their research, often using the risk scores tabulated in Table 19. This might be explained by research teams allowing for the contraindications and precautions of the medicines they are researching, especially the Opioids. The population of unconscious, shocked and severely injured patients is largely excluded from the evidence, though may be receiving attention of late. [370]

Serious adverse events were not present, and all therapies were concluded to be safe for use. For example, Wedmore *et al* [269]describe an adverse event rate of 3.5/1000 patients treated, with only one patient out of 197 in their study experiencing hypoventilation after 3,200mcg oral transmucosal Fentanyl citrate and IV 20mg of Morphine. The overall lack of adverse events I the evidence may represent selection bias, as high-risk patients were excluded from studies. Safety or appropriateness of analgesic medicines in high-risk patients appears to represent a research gap.

4.4 Chapter summary

This concludes the scoping review of the evidence as applied by PECPs. Several omissions and possible biases in the body of evidence were highlighted, which may have impact on PEC. Notably, almost all the evidence emanates from North America, Europe and Australia. There are also some notable omissions or de-emphasis of diverse patient groups in pain management evidence, possibly due to ethical risk. These are very young or very old patients, obstetric and gynaecological pain, unconscious and cognitively impaired patients and severely injured patients. The scoping review achieved the objectives set, by comprehensively describing the pain therapies applied by PECPs and the evidence for them.

Chapter 5: Content Analysis and Mapping of Curricula



5.1 Introduction

The literature review in Chapter 2 has described knowledge gaps in pain management practice. Chapter 4 mapped the pain management therapies applied by PECPs from a comprehensive scoping review. Chapter 5 addresses objective 2: To explore the contemporary curricula and approach to PEC pain management education in South Africa. This research phase mapped the organisation, content, and Intended Learning Outcomes (ILOs) for pain education present in contemporary emergency care curricula. The method is detailed in Chapter 3 and recapitulated here.

Curricula elements are viewed from different perspectives, designated as “windows” into the curricula. [211] These so-called windows organise data around concepts, allowing them to become visible, and to show the relationships between them. The windows through which the conceptual relationships were viewed are listed below.

1. **Organisation of pain curricula**: period of study, subject types and names and whether a dedicated pain unit was present or not.
2. **Context and patient groups**: patient groups, and modes of EMS operations.
3. **Learning Domains of pain curricula**, defined by Bloom’s Domains of Learning. [213] Cognitive, Affective and Psychomotor domains.
4. **Content**: topic areas and Intended Learning Outcomes (ILOs), excluding assessment criteria.

The elements were mapped, and analysis of the organised elements gave rise to propositions in respect of the characteristics and attributes of the ILOs and the organisation of learning and teaching in curricula. These propositions are presented below. The maps and specific observations relating to these windows are presented in Appendix 6: Curriculum Maps and Window Elements, for ease of reference. These display the underpinning codes, to show how the propositions give expression to the elements in the windows and vice versa. The ILOs are detailed in Appendix 7: Aggregated Intended Learning Outcomes for Pain. In the next sections, the characteristics of the sample are described, followed by the propositions, which are the major findings of the chapter.

5.2 Results: Description of the Sample

Following requests for participation to the seven HEIs offering PEC programs, Five HEIs agreed to participate, one declined, and there was no reply from another. Participating HEIs forwarded Subject Learner Guides (SLGs), containing the subject structures and Intended Learning Outcomes (ILOs) The sampling frame is shown in Table 20. Non-responses are coded as "no response". Each program was assigned a unique identifier (program code) to maintain anonymity.

Table 20: Sampling frame: Subject Learning Guides

	Number of participating HEIs (n)	Number of HEIs offering the program in South Africa (N)
Bachelor's degree	4	4
Diploma	2	4
Higher Certificate	3	5

BACHELOR'S DEGREE SUBJECT LEARNER GUIDES (SLGs)				
Program Code	Clinical Subjects (n)	Anatomy and Physiology Subjects (n)	Pharmacology Subjects (n)	Pathology Subjects (n)
1	12	3	1	1
2	12	No response	1	No response
3	12	No response	No response	No response
4	12	3	1	1
Total	52	6	3	2

DIPLOMA LEARNER GUIDES		
Program Code	Clinical Subjects(n)	Anatomy and Physiology(n)
5	9	2
6	6	2
Total	15	4

HIGHER CERTIFICATE LEARNER GUIDES		
Program Code	Clinical Subjects(n)	Anatomy and Physiology(n)
7	3	2
8	3	2
9	4	1
Total	12	5

5.3 Results: Propositions in respect of Intended Learning Outcomes and Curriculum Structure.

Analysis of the structure, context and content of the SLGs resulted in the following propositions regarding pain curricula in South African PEC.

5.3.1 Proposition 1: Curriculum structure differs between programs.

The structure of pain teaching differs between programs, with pain relatively well represented in the Bachelor's programs in a general sense. Clinical subjects were differentiated by learning type: theoretical/cognitive subjects (classroom based), psychomotor/practical (simulation laboratory based) or workplace learning (workplace based). Diploma program five further differentiated the theoretical/cognitive subjects contextually, with 'Medical Emergencies' and 'Trauma Emergencies'

subjects ('Medical Emergencies' dealt with non-traumatic disorders). Bachelor Programs three and four differentiated subjects by patient group (Paediatrics and Neonates, and Critical Care Retrieval[17]) in their fourth year of study, integrating theoretical/cognitive and psychomotor/practical ILOs into a single subject (A map of subject structures is displayed in Appendix 4: Curriculum maps and Window Elements). Pain ILOs were inconsistently aligned and unevenly distributed across any of these subject types, viewed by learning type, or contextually. There is thus no guarantee that teaching is structured to allow students to integrate theoretical knowledge, psychomotor skills and real-world experience, or form enabling attitudes toward patients.

The foundational subjects Anatomy and Physiology also showed inconsistent distribution of ILOs, and gaps in pain content, though there was missing data in the Bachelor's programs. These subjects did not address pain early on, leaving pain teaching to the second year of study in the Bachelor's programs, despite pain ILOs being present in the first-year clinical subjects. This poses a risk for learning integration. Students may be exposed to contextual, clinical applications before learning the generalisable and transferable theory of pain, risking learning remaining bound to context. In the Diploma and HC programs, the Anatomy and Physiology subjects contained no pain ILOs. Of further significance was that Bachelor's programs offered foundational theoretical subjects Pharmacology and Pathology, but the Diploma and HC programs did not, embedding all pain ILOs in the clinical subjects. This incurred the same risk to learning integration and transferability of theory. Subject names suggest an intention for integrated learning, without coordination in the ILOs giving expression to integrated learning.

A further structural difference concerned the presence of dedicated pain units of study within subjects. This was inconsistent, both within programs and across programs. Bachelor's programs contained more dedicated pain study units compared to the HC programs, which contained one in program nine, and the diploma programs which contained no dedicated pain study units. Pain management ILOs were not emphasised by units of study, the way ILOs in other topic areas were. All SLGs had sections dedicated to topic areas, for example, 'Triage,' or 'Musculoskeletal Disorders'. This in itself should not be a marker of malignment or omission. Pain is ubiquitous,[18] occurring in many types of emergencies, and ILOs could be embedded in units of study organised around body systems or pathologies. However, pain ILOs were not specific or not present in this study units. Mezei and Murinson [130] posit that locating a topic in many places means it has no "home". This seemed to be the case as most study units of disorders where pain is a possibility do not show related pain ILOs. Maps of the structure of pain teaching are displayed in Appendix 4: Curriculum maps and Window Elements

[17] *Critical Care Retrieval (CCR) is the term used to describe transfer of critical patients by EMS between health facilities. In the sample SLGs terminology differs. Alternate terms used were "interfacility transfer", "ICU transfer", "Intensive and Specialised Care" and "Critical Care Transport".*

[18] Ubiquitous: present or appearing everywhere.

5.3.2 Proposition 2: Lack of explicit diversity in patient populations

The aggregated curricula did not address diverse patient groups, and most ILOs were general in nature. Where any differentiation or specificity was present it was to differentiate or specify pain in trauma, or designate paediatrics. Paediatrics, and paediatric trauma were represented in the aggregated codes, with the exception of neonates, which were omitted save for a single ILO in Diploma program 5 [5_D_2_CCT]. Paediatric ILOs were inconsistently distributed within programs, for instance HC program 9 contained ILOs for paediatric pain assessment within the practical subject only, omitting management ILOs, or theoretical ILOs. Programs 7 and 8 omitted paediatric ILOs completely. This finding is influenced by the generality of ILOs, with many ILOs, using the umbrella term "pain without differentiating a patient group or context. Another example of the generality of terms was Bachelor's programs 3 and 4 containing subjects specific to paediatric and *neonatal* PEC, using general language which refer to the range of age groups, for example:

> "The management of pain in different paediatric age groups is discussed, and specifically the administration of opioid analgesics (within the confines of the HPCSA ALS protocols)" [4_B_4_PNEC]

Lecturers, and students, might include neonates in the noun phrase "different paediatric age groups" as the subject name contains the word "neonate', but this is an assumption without guarantee. The literature and scoping reviews identified paediatrics as a significant, and undermanaged group , which instil anxiety and fear in PECPs. [68, 69, 231] Even in the body of work dealing with this group, pain in infants appears in inclusion criteria only once [236], and neonates are omitted completely. While two programs did dedicate subjects to this patient group, paediatric pain was not well served by curricula, with malalignment of ILOs within and between programs. Of note, was the lack of paediatric pain ILOs in the workplace learning subjects. The literature review identifies lack of exposure to paediatric emergencies as a significant barrier to paediatric PEC in general, and pain management in particular.[68, 151, 155, 231] These curricula do not require students to meet any paediatric pain learning requirements while in the workplace. When paediatric ILOs were present, they were located in classroom-based subjects and cognitive in nature, requiring only a theoretical understanding of paediatric pain management. These curricula seem to lack comprehensive and considered representation of this group. Difficulty with communication with paediatrics and unfamiliarity with relevant pain assessment tools contribute to the formation of a management barrier. [68]

The literature shows variable findings for pain management in older patients. [168] [160] [169] [161] Much of the literature in chapters 2 and 4 include older adults in their data sets. Literature in some forms of trauma such as hip fracture[238, 239] exclusively contain older adults in their data sets, making this an important differentiated group. Adults are not referred to explicitly in pain ILOs, and adult age groups are not differentiated. The ILOs use general terms, such as:

> "Integrate pain management principles and techniques into the management of painful injuries and disorders." [1_B_3_EMCT]

Cognitively impaired patients and patients with substance abuse syndrome (SAS) are also marginalised in curricula. Cognitively impaired groups were identified in the scoping review [236, 239]

though this was limited to the potential for exposure, and identification of the PAINAD pain assessment tools[236] for cognitively impaired, rather than evidence of management.

The literature review found SAS patients to be complex to manage, with medical, interpersonal, health systems and ethical dilemmas, [180] for which PECPs lack the requisite KSAs. [68, 156] The literature does describe some pragmatic measures used by PECPs in managing these cases [152, 167, 180] Substance abuse was not dealt with in any of the evidence found by the scoping review. No ILOs addressing management of cognitively impaired or SAS patients were found in the curricula, save for a single ILO in a pharmacology subject:

> "Discuss the deleterious effects of drug misuse and dependence." [2_B_3_Ph]

Sex was identified in the literature as a potential influencing factor in pain management, though findings were conflicting.[24, 160, 161, 163, 170, 172] Gender is not explored at all. Of note, is that only a single program specified pain from gynaecological emergencies [1_B_3_GP], present in a non-clinical science subject. In the curricula neither sex, not gender, are differentiated or specified in ILOs on pain management and sex and gender appear to be an omission in both research and education. The literature review shows racial discrimination present in pain management practice. [169, 176, 177]. Attitudes to cultural expression are also responsible for some differences in management. [24] Consideration for one's race is not explicitly mentioned in the curricula as an ILO.

There was a sparsity of pain ILOs specifying diverse populations in workplace learning compared to theoretical subjects. This is concerning as a lack of exposure to paediatric patients during initial education has been documented as a significant barrier to pain management in paediatrics [68, 151, 155, 165], especially in the performance of procedures such as the establishment of an IV line [68, 70, 151, 153, 155] and dealing with children's fear of needles. [153] Aligning work-place learning, and mentorship [155, 164], to theoretical and practical ILOs is essential for learning about particular and diverse populations such as paediatrics. Problematically, the workplace-based subjects showed the least representation of pain ILOs, potentially de-emphasising this essential experience when students perform clinical tasks.

Table 21: Patient groups and contexts represented by explicit pain Intended Learning Outcomes in the Subject Learner Guides

Program	Higher Certificate Programs			Diploma Programs		Bachelor's Programs			
Program Code	9	8	7	6	5	4	3	2	1
List of codes: Patient Groups									
Paediatrics	✓			✓	✓	✓	✓	✓	
Not differentiated by age group	✓	✓	✓	✓	✓	✓	✓	✓	✓
List of codes: Pain Contexts									
Acute trauma pain					✓		✓		✓
Critical Care Retrieval					✓				
Labour and delivery (Obstetrics)	✓				✓				
Undifferentiated pain contexts	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 21 displays the representation of ILOs related to patient groups within programs, showing the undifferentiated nature of the ILOs and the lack of explicit diversity in patient groups. Addressing

pain in diverse groups appear to be a dependant on educator choice, without a requirement from the curriculum.

5.3.3 Proposition 3: Lack of explicit diversity in contexts and pain typologies

A significant role of EMS is CCR, however CCR as a pain management context was investigated only in a minority of evidence[262] related to pain therapies. Two Bachelor's programs [3_B_4_ISC; 4_B_4_ISC] and a single Diploma program [5_D_2_CCT] devoted subjects to CCR, however, only a single ILO specifying pain management in CCR was present in the data:

> "Discuss the use of sedation and analgesia during critical care transfer, in both mechanically ventilated and spontaneously breathing patients." [5_D_2_CCT)

The general nature of ILOs may *imply* pain management education, as ILOs relating to general care and use of drug infusions were found within all programs and within the CCR specific subjects. For example:

> "Discuss the basic principles and approaches to assessing, preparing and transferring a critically ill or injured patient in a mobile ICU." [3_B_4_ISC]

There is no finding that this teaching is omitted in the classroom, only that pain management is not explicit in CCR. This again leaves teaching to assumption and trust.

Pain in the context of trauma assumed significance in the curricula. Trauma was the major contextual differentiator in pain ILOs. Diploma program 5 determined the distinction important enough to offer subjects specified and differentiated as "trauma" [5_D_1_T;5_D_2_T] or "medical" (non-trauma) [5_D_1_M; 5_D_2_M]. When viewed through the context window, ILOs concentrate exclusively on nociceptive pain with an emphasis on acute traumatic pain, with non-trauma pain a minor scene, accounted for by general ILOs which may themselves include trauma. Nociplastic, neuropathic pain, and chronic pain are not reflected in the ILOs. One may argue that acute nociceptive pain is the business of PEC, and that the other pain categories are not, and the curricula reflect that view. The literature review argues that nociplastic and neuropathic pain, both acute and chronic, is significant in the emergency healthcare. There is little evidence for management of these pain types by PECPs, though publication bias cannot be excluded as a reason for this.

Emphasis on traumatic pain aligns to the reported PEC pain burden and is consistent with practice described in the literature review [24, 42, 150, 156] and these patients are more likely to receive analgesia. In South Africa education may be a driver of this management. The literature appears to show bias in favour of management of severe pain [150, 157, 160-163]. Curricula do not specify pain severity and there is no differentiation of management based on pain severity. The minority of ILOs specifying non-pharmacological therapy and oral medicines like paracetamol and ibuprofen show a bias toward management of severe pain using agents such as opioids. As with CCR, the lack of specific outcomes does not necessarily mean no teaching for these contexts and pain types takes place, as lecturers may interpret general outcomes to mean these contexts, but the curriculum does not explicitly require it.

Pain management ILOs during labour and delivery was only addressed in Diploma program five, in 1st and 2nd year non-trauma emergencies subjects. The ILOs were duplicated. Pain in labour was also addressed in the HC program nine. All ILOs emphasised Nitrous Oxide for pain management. The practical subject in program five made the statement that analgesia in labour would be taught, without explicitly wording it as an ILO [5_D_1_PHE]. Interestingly, no other ILOs related to pain management in labour were found in any programs. Table 2 above shows the pain contexts and type present in curricula.

5.3.4 Proposition 4: Incomplete curricula in technical aspects of pain management

The literature review identified several KSA deficits at the level of the practitioner. Knowledge and skill deficits were a fear of adverse events and a preference to use sub-optimal doses to manage risk [44], fundamental misconceptions in respect of the need for and importance of paediatric pain management [68] and general knowledge deficits in respect of pain management. [158, 182] The scoping review identified tools to help manage risk, such as the Physiologic Severity Score[291], Injury Severity Score [307], Ramsay Sedation Scale[256, 305, 307] and Wisconsin Sedation Scale [226] which provide objective measures of patient condition and allow for monitoring of patients for deterioration. The theoretical and practical subjects in program 2 shared an ILO in respect consideration for risks,

> "Identify the possible risks associated with the administration of analgesia in the pre-hospital environment." [2_B_3_EMCP; 2_B_3_EMCT]

And some general pharmacological ILOs mentioned adverse events, for example:

> "Explain the mechanism of action, actions, therapeutic uses, pharmacokinetics, adverse effects, tolerance and physical dependence and drug interactions of opioid agonists." [1_B_3_Ph]

Overall, curricula did not specify risk or adverse event monitoring and management for analgesia. Procedural analgesia was also inconsistently addressed, only a minority of potential painful procedures authorised for application by South African PECPs was specified. This included management of pain during labour and delivery, only three programs contained a single ILO each related to pain management for women in labour. This mirrors literature on pain practice, where a minority of pain practice was directed at women in labour. [24] The scoping found only one study which indirectly addressed obstetric pain management by PECPs. [246] General ILOs may be interpreted as including pain management. For instance, the following example may be interpreted to include pain management (but there is no guarantee):

> "Describe the management of long bone fractures." [8_HC_1_PEC]

An essential ability for management of pain is pain assessment. Chapter 2 identified pain assessment as poor and inconsistent[42, 43, 150] which was a barrier to effective management. Chapter 4 identified seventeen pain tools and scales for use in diverse populations. With the exception of one of the Diploma programs (HEI 1), all programs contained ILOs for pain assessment, though these were not systematic and comprehensive. For instance, program three contained ILOs for paediatric pain assessment but not for adults. These ILOs generally referred to the use of a validated tool, with only

the HC and Bachelor's programs for HEI 1 identifying tools. ILOs related to assessment of paediatric pain were present in all the Bachelor's curricula, at either third- or fourth-year level in either the theoretical or practical subjects though only a single subject explicitly named paediatric pain scales [1_B_3_EMCT]. In the Diploma curricula a single subject addressed appropriate paediatric pain tools, without individually identifying them. [6_D_2_EMCT]

Similarly, in the Higher Certificate, only a single subject addressed pain assessment, and explicitly specified pain tools. Two Bachelor's programs had subjects dedicated to paediatric and neonatal emergency care and both of these subjects had ILOs relating to the assessment of paediatric pain, without explicit identification of pain tools. Cognitive ILOs for pain assessment were represented, however, enabling abilities such as communication, and attitudinal attributes such as acceptance of the subjective nature of pain were not. Two ILO were found addressing interpersonal communication with patients, both in the same program. [1_B_1_EMCP; 1_B_1_CP] Overall pain specific communication was neglected in curricula, however, this finding must be interpreted with caution, as interpersonal and interprofessional communication may be addressed in other study units, or as part of general KSAs, even if they are not pain specific.

Barriers to pain management found in the literature include ignorance of cultural and spiritual influences on pain expression[68], and preferring own judgement over patient self-report when judging pain intensity. [158] Beliefs in pain being necessary for in-hospital diagnosis, and the hegemony of hospital care also hamper pain management. [156] Curricula did not deliberately foster positive attitudes in respect of the subjective nature of pain (attitudinal perspectives in respect of patient attributes, such as culture, are addressed in the section on the affective domain). Pain management as an ethical endeavour was not emphasised, with ILOs addressing patient rights present in only two SLGs. [1_B_3_EMCT; 8_HC_1_ECP]

PEC is undergoing a process of professionalisation [371] and transition to Higher Education (HE). This brings a shift in intent from producing skills-based technicians to evidence based, competency-oriented practitioners. New roles are forming, such as community paramedicine [37, 372] and palliative care practice. [32-36, 373, 374] Developments such as on-scene-discharge [375] require the profession to reconsider the requisite KSAs. To this end, some work has been done in identifying educational gaps and curriculum need for EMS in domains such as communication [376], gender and sexuality issues [377] and simulation. [378] Pain management curricula should also contribute to correcting the deficiencies in current pain management practice and allow for future roles.

Topics relating to ethics, decision-making programs (two and nine) and referral to higher care (program 8) were the most poorly represented. This category referred to ILOs which developed the provider as a person, or the development of attributes which influence the application of pain management. Only two programs contained ILOs which assigned significance to the attributes of the provider for effective pain management. The only code in the category of Ethics was "patient rights." Only two programs contained a single ILO each which explicitly addressed ethics in pain management. These were in Bachelor's program one and HC program nine. Developing provider characteristics were also found only in two programs, bachelor's program one and Diploma program five.

Table 22: Aggregated Topics list: Content window codes (Inductive)

		Bachelor's Programs				Diploma Programs		HC Programs		
Categories	**Codes (Topics)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Anatomy and Physiology	Categories of pain	✓	SLGs not submitted	SLGs not submitted	✓			✓	✓	✓
	Central Processing	✓			✓					
	Conduction	✓			✓					✓
	Modulation	✓			✓					
	Pathology and pathophysiology	✓					✓	✓	✓	✓
	Pathways				✓					✓
	Purpose of pain	✓			✓					
	Nociceptors	✓			✓			✓	✓	✓
	Stimuli	✓			✓					
Pharmacology	Pharmacodynamics	✓		✓		✓				
	Pharmacokinetics	✓		✓		✓				
	Medicine classes (Anaesthetics)	✓		✓	✓					
	Medicine classes (Local Anaesthetics)	✓	✓		✓					
	Medicine classes (Opioids)	✓	✓	✓	✓					
	Medicine classes (NSAIDS)		✓	✓	✓					
	Medicine classes (Paracetamol)	✓		✓	✓					
	Misuse, dependence and addiction	✓	✓							
Pain Assessment	Risk Identification		✓							
	Pain assessment (general)	✓	✓		✓					
	Pain assessment (paediatric)		✓	✓	✓		✓			✓
	Pain assessment (tools and scales)	✓					✓			✓
	Communication	✓								
	Patient factors	✓								✓
Pain Management	Pain Management (General)	✓	✓	✓	✓		✓			✓
	Pain Management (Paediatric)		✓	✓	✓	✓				
	Pain management (musculoskeletal trauma and burns)	✓	✓	✓						✓
	Procedural pain management (intubation)		✓	✓						
	Procedural pain management (labour)					✓				✓
	Procedural pain management (cardioversion)						✓			
	Procedural sedation and analgesia (trauma)					✓				
	Application of non-pharmacological therapy	✓								✓
	Application of pharmacological therapy	✓	✓	✓	✓	✓				
	Clinical decision making		✓							✓
	Risk assessment		✓							
Pain as Symptom	Gastrointestinal Pain/Abdominal Pain	✓		✓		✓				✓
	Cardiac Pain	✓		✓		✓				✓
	Gynaecological Pain	✓								
	Spinal Tenderness					✓				

Table 22: Aggregated Topics list: Content window codes (Inductive) (continued)

		Bachelor's Programs				Diploma Programs		HC Programs		
Categories	**Codes (Topics)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Ethics	Patient rights	✓								✓
Provider Factors	Cultural, Racial and Gender Competence	✓								✓
	Provider as a person	✓				✓				

5.3.5 Proposition 5: Pain curricula do not explicitly include the affective domain.

The basis of the affective domain are attitudes and values, and are expressed as beliefs, opinions and value statements. [379] Historically healthcare education has developed cognitive capacity at the expense of emotional skills.[380] This may be because attitudes, values and beliefs are difficult to teach and assess, and so may be neglected. [379, 380] The basis of the affective domain are attitudes and values, and are expressed as beliefs, opinions and value statements. [379] Historically healthcare education has developed cognitive capacity at the expense of emotional skills.[380] This may be because attitudes, values and beliefs are difficult to teach and assess, and so fall by the wayside. [379, 380]

Any cognitive or psychomotor objective has some affective component, even if it is just willingness to learn, and the affective domain is important not just for work as a clinician, but for learning itself. Instructional designers may think only in terms of student motivation, and design activities to stimulate students while neglecting attitudes towards patients. [381] Outcomes developing the affective domain should also develop values and attitudes and the expression of opinions and assessment of value. [380] Development of the affective domain has significance in pain management.

Pain is defined as an experience [9], and incorporates neurosensory and affective features. [380] The "subjectivity" of pain introduces the potential for conflict between the patient's experiences and the clinician's perceptions, attitudes and behaviours. Competent pain care demands emotional development. [380] Curricula may address cognitive and emotional development, reflection, skills, values, communication, clinical reasoning [90], relationships, moral development and empathy.[380]

The curricula evaluated displayed few ILOs which deliberately developed attitudes, beliefs and values. The ILOs require engagement with patient attributes other than their injuries or disorders. The patients' personal attributes may influence how they present to the PECP. The PECP's own attributes may influence how they perceive the expression of pain, and their clinical experience may modify what they believe in terms of the patient's account of the pain. Requiring tolerance and sensitivity to pain expression requires acceptance of subjectivity. This means the PECP must engage the patient at least at the "Valuing" stage of the affective domain. [88]

The following comparison of ILOs demonstrate this point. The cognitive and psychomotor ILO below requires a demonstration of assessment, and communication, however, does not require the PECP student engage with, or accept the patient's experience. The ILOs are cognitive and psychomotor,

and the student can follow a flowchart in terms of communication and assessment, without being required to change their own attitude or perception of the patient

> "Demonstrate the principles of pain assessment and communicating with patients in pain". [1_B_1_EMCT, 1_B_1_EMCP]

In contrast, the following ILO requires attitudinal changes, and engagement with the patient at a human level. They require the PECP to imagine the experience from the patient's point of view and understand their circumstances, i.e. show a level of empathy:

> "Display tolerance for culture, race and gender as influencers of pain expression" [1_B_3_EMCT; 9_HC_1_ECP]

The finding that the workplace learning subjects contain fewer pain ILOs than do the classroom and laboratory subjects show risk for underdevelopment of affect. Workplace subjects place students in contact with real patients in clinical situations. The curricula do not require students to confront or adjust their attitudes, perceptions or beliefs in respect of pain management, on real patients. Work has been done on using classroom techniques, such as simulation, role playing and personal reflection [380-382] in terms of developing the affective domain. These findings do not mean that educators neglect the affective domain in the classroom. They may develop attitudes through teaching techniques and exercises, and the very act of improving knowledge (cognition) influences affect. [381] Knowledge on its own though is not enough for attitudinal change. [74] Curricula do not explicitly require the development of the affective domain, and attitudes, values and beliefs may develop incidentally, if at all. The ILOs found in aggregated PEC curricula in South Africa focus mostly on cognitive and psychomotor domains, with affective domain de-emphasised or omitted.

5.4 Chapter Summary

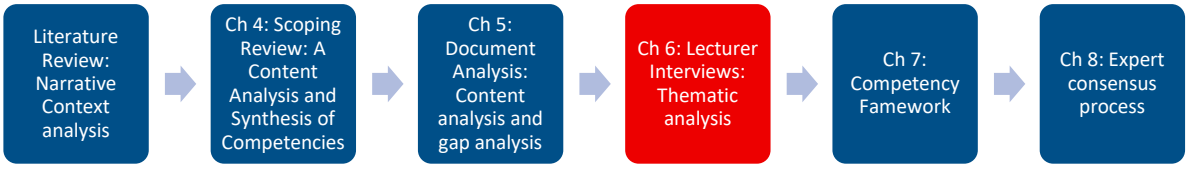
The Content Analysis approach satisfies questions of content – what is present and what is not. The autonomy of HEIs may lead to differing curricula, and this is evident in the structure of subjects and the teaching of pain management. This data does show differences between HEIs. Unfortunately, emergency care curricula also appear to be fragmented and incomplete. ILOs for pain education are not systematically and comprehensively placed within curricula. Extensive gaps in the techne of pain management are present, with omission of important topics. Curricula do not explicitly address the diverse populations, nor the diverse pain typologies which PECPs may encounter.

Pain ILOs do not integrate all types of learning (Cognitive, Psychomotor and Affective), with the affective domain showing the greatest omission. Pain learning also risks remaining rooted in context, as foundational theory is not systematically structured to underpin learning. Many pain ILOs are general statements that are open to interpretation, and do not necessarily provide explicit guidance. Comprehensive and structured pain teaching appears dependant on educator interpretation, engagement and diligence.

The reasons for these differences, gaps and omissions are beyond the scope of this chapter, and not necessarily relevant to the development of a competency framework. The review of the literature did not reveal an existing competency framework for pain management in PEC, and a possibility is

that this is the reason for the arbitrary and capricious nature of existing curricula. This chapter explored the explicit curricula, the written documents which outline the programs of learning. This does not necessarily reflect the enacted curriculum (what happens in the classroom), and the apparent null curriculum (what is missing, or not taught) does not necessarily derive from these documents. The following chapter explores the perspective of educators in respect of pain education, as well as the needs of pain management practice.

Chapter 6: Educator Interviews



6.1 Introduction

The literature review (Chapter 2) described knowledge gaps and the scoping review (Chapter 4) mapped pain management therapies. Chapter 5 mapped the organisation, content, and Intended Learning Outcomes (ILOs) for pain education present in contemporary emergency care curricula. This chapter (Chapter 6) presents the results of interviews with educators and analyses and synthesises their perspectives on pain management practice, pain education, and future directions for curriculum development. Braun and Clarke's Thematic analysis[201] is used as the method of analysis. The method is detailed in Chapter 3. The thematic development is presented together with discussion of relevant literature.

6.2 Description of the Sample

Twenty educators participated in interviews, conducted both 'face-to-face,' and using the electronic conferencing system Microsoft Teams (Microsoft Corporation, Redmond, CA). Interviews lasted between thirty-eight and seventy-three minutes.[19] Educators had between two and twenty years of clinical experience and between two and thirteen years of experience as educators in *addition* to their clinical experience. Eight of the participants were female and twelve were male. Nine participants lectured on a bachelor's degree program, five on a Diploma program and four on a Higher Certificate program.[20] Seven educators were employed at three institutions in the Western Cape, three were employed at one institution in the Eastern Cape, one educator was employed at one institution in Kwa Zulu-Natal, two educators were employed at one institution in the Free State and seven educators were employed at three institutions in Gauteng province. Most educators had performed roles in more than one province or had international experience. Two educators taught on both diploma and Higher Certificate programs. All participants had experience in both the clinical and educational environments and were competent to discuss both the education and practice fields. All participants held at least a degree in emergency medical care and were registered with the HPCSA as ECPs. The attributes of the sample are tabulated below.

[19] The internet connection was interrupted in one interview and could not be restored
[20] The Higher Certificate programs exit at NQF level 5. Diploma programs exit at NQF level 6 and degree programs exit at NQF level 8.

Table 23: Attributes of participants

Participant nr	Sex	Program lecturing on	Clinical Experience (years) [21]	Education Experience (years)	Duration of interview (minutes)	Interview Mode
1	Male	Degree	6	11	42	Face-to-face
3	Male	Degree	20	8	47	Electronic
4	Female	Degree	2	2	49	Electronic
5	Female	Degree	5	12	54	Electronic
9	Male	Degree	10	2	69	Face-to-face
10	Female	Degree	8	10	41	Face-to-face
11	Male	Degree	2	14	73	Electronic
12	Male	Degree	8	8	67	Electronic
19	Female	Degree	3	5	43	Electronic
20	Female	Diploma	3	6	64	Electronic
6	Male	Diploma	14	4	53	Face-to-face
8	Male	Diploma	4	4	57	Face-to-face
2	Male	Diploma	5	3	49	Face-to-face
13	Male	Diploma	5	4	56	Electronic
7	Male	Diploma/HCERT	2	2	60	Face-to-face
14	Female	Diploma/HCERT	4	12	38	Electronic
15	Male	HCERT	11	9	51	Electronic
16	Female	HCERT	13	3	26	Electronic
17	Male	HCERT	8	4	45	Electronic
18	Female	HCERT	13	13	57	Electronic
Cumulative Totals	Male – 12	Degree - 10	Years Experience - 146	Years Experience - 136	Interview minutes - 1041	Face-to-face interviews: 7
	Female - 8	Diploma - 7				Electronic interviews: 13
		HCERT - 6				

6.3. Thematic analysis

Interviews were conducted using a semi structured interview guide (Appendix 3). Thematic analysis of the interviews revealed insights into the curriculum and teaching practices for pain management, as well as contemporary pain management within the role and function of EMS , as perceived by the participants. The overarching propositions are that PEC education does not adequately meet the educational needs, and that there are unmet pain management needs within this context. Educators

[21] Years of clinical and education experience are separate.

also provided recommendations for competencies and curriculum changes, based in potential future needs. These propositions are constructed through five themes:

1. Education is not addressing pain management methodically and systematically.
2. Patients are vulnerable due to an unfulfilled primary pain management role.
3. Conflicts of interest, competing interests and limitations to capacity
4. Prehospital pain care has an unexplored potential to promote treatment equity.
5. Aspirational curriculum and content.

The following sections provide a detailed description of the emergent themes.

6.3.1 Theme 1: Education is not addressing pain management methodically and systematically

Structural pressures influence PEC programs, including pain teaching. Educators use varied methods in the classroom but believe that the PEC curriculum is overloaded and they are continuously pushed for time in the classroom.

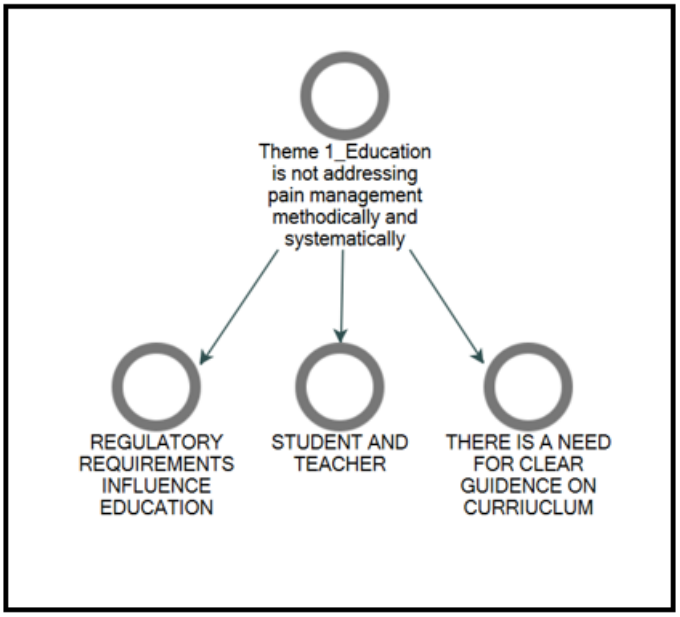


Figure 9: Thematic map for Theme 1: Education is not addressing pain management methodically and systematically.

6.3.1.1 The student and educator

Educators unanimously recognised that students assign more worth to their experiences of clinical practice. All educators recognised the importance of preceptorship, and this was considered the most powerful influence on student behaviour. Preceptorship was also considered to be erratic; in some instances, beneficial, in other instances a complex source of conflict between classroom teaching, pain management need and clinical practice. Workplace experiences may reinforce what was taught in the classroom, or cause tension between classroom learning and the student's experiences. Where classroom teaching and practice are different, students will first accept clinical practice, and the mentoring clinician's practice as the truth. Educators perceive the default position is for students to question the veracity of classroom teaching, without questioning clinical practice. These questions derive from differences in both knowledge/skill, and attitudes present amongst mentors in clinical practice.

> "…they don't question what that person has done, they question what we've taught. They go 'you've taught me this, but this is how they do it in practice'. They don't challenge the clinician they come back and they challenge their education." [Participant 10]

Educators are unable to control which preceptors will be when students arrive at an EMS for their shift. The person may not be interested in teaching or may be of higher, or lower qualification than the one the student is studying toward. Preceptors' attitudes and techniques transfer to students, including undesirable attitudes. This is mediated by many factors. Real-world pressures impact practice, and the student experiences may simply be a manifestation of those pressures, rather than limitations on the part of preceptors. Students might not be able to make sense of these pressures. Preceptors themselves may have limitations. Some may be new graduates themselves and may still be coming to terms with their own analgesic practice.

> *"So, you're just getting a grip on the basics and because you're just getting a grip on the basics you don't really have much more capacity to now focus on being empathetic towards your patient…" [Participant 13]*

Some practitioners may not be comfortable with the changes to the medicines formulary and are still practicing without the new pharmacological options. Older preceptors may be products of older teaching, and not consider non-pharmacological options, for instance. Experience was considered to be a double-edged sword; some educators were of the opinion that new PECPs hadn't yet explored their own practice. Another opinion was that older PECPs were less reflective and less caring.

> "When they are newly qualified,… you hear that the pain management is still fresh in their minds. They are just challenged because it's not available so they will be looking at things like nonpharmacological pain management, … you see them trying their way and their level best to make the patient comfortable even though they cannot offer them any pharmacological pain management. But those that have been in the industry for longer, they really don't care. They will tell the patient that they do not have any pain management and that you have pain. Unfortunately, I must treat you so, please bear with me. And they will pull, and they will twist …" [Participant 20]

This conflict sometimes extends to critique and critical reflection. One educator described using debriefing as a tool for teaching, however, preceptors felt this was unfair criticism of their practice and challenged the use of the technique and discussions of their management. This educator did say that preceptors had declined multiple invitations to come to the classroom and join in clinical discussions with students.

> "…what I found works quite well is the debriefing of students on a Monday morning when they've worked during the weekend. … I have got a bit of blowback from it which has been quite sad just because practitioners on the road don't like it that that I discuss and critique management on the road with the students on Monday … they feel intimidated by that I'm not too sure why because their names are never brought up but they got wind of it… but what I found is that that we could talk to those points um, and I could keep a finger on the pulse and then we could talk about pain management's and various other aspects and have a good solid debrief that really seemed to work. I just wish they hadn't been so much blowback." [Participant 3]

Overall, there seemed to be a disconnection between academic teaching and clinical practice. While gradate PECPs of all levels were alumni of HEIs, once in clinical practice a separation occurs, which seems to impact both practice and teaching. The incongruence between classroom instruction and practical application, along with the potential for tension, underscores the need for accountability. Practitioners should adhere to best practices in their fields, while educators should teach according to these standards. Effective communication between the practice and educational fields is essential. Isolation of one field from the other indicates a possible lack of accountability in one or both areas.

Educator and curriculum factors also impacted education. All educators had autonomy to construct their lessons, but none of them had been involved in writing, or review, of the curriculum. Most were not engaged with the whole curriculum and many were unaware of what was being taught in other subjects, or in other levels of study. When considering pain specifically, many educators were either unaware or uncertain how, or even if, pain management was addressed in subjects other than their own. Another theme was that when any pain related material often had to be repeated over time and across years of study as students did not retain learning.

Educators described varied methods, including didactic lectures, simulations and vignettes and discussions. Blending more than one teaching method was a common code, with class discussions also featuring prominently. One educator used multiple methods of teaching as they felt it allowed '…*students to ground that knowledge in their own mind…"*[Participant 13], where if they could cover a topic using a theoretical method, and then a practical method, they would have a better understanding. Without any educator articulating a teaching theory or specifying that they use a deliberate approach, most educators sought to create opportunities to apply theory in situated and authentic situations. Educators also emphasised participative approaches such as discussions and simulations, debriefing of shifts and reflective practices. The predominant teaching approach appears to be Work Integrated Learning (WIL) [383] Pain as a topic did not feature as a focal point on its own and was usually taught as an aspect of another topic. Often, pain as a topic or study unit on its own was omitted. Time constraints meant that pain was often allocated minimal class time.

A minority of lecturers did engage with other subjects, but this was mainly to form an agreement to cover aspects of pain management in a subject other than that which the curriculum document required. Pain was most often integrated into other modules and did not seem to be a unit of focus in learner guides. Three participants, who all taught on the same program were adamant that they were the only educators on the program teaching pain management, and even though their own subject outcomes did not explicitly require pain teaching.

6.3.1.2 Curriculum guidance

In part as an effort to make up time, and in part a PEC cultural influence, educators acknowledged that teaching downplayed pain. While important, pain may be allocated only a single lecture and was not a focus of teaching. Contemporary thought on the imperative for pain management[384-387] does not seem to be present in current PEC education. Pain management as a focus may be difficult to disentangle from critical and life-saving interventions, and one would not expect pain management to be prioritised over interventions, like opening airways. However, educators tended to describe a reprioritisation of pain management, even when critical interventions were not necessary or needed. Educators described a focus and emphasis of the performance of clinical skills and managing patients' visible, organic, injuries. There was a requirement to provide the procedure, or administer a medicine, and move on, without giving thought to patients' emotions. Undergraduate teaching focusses on biomedicine, downplaying the psychosocial aspects.

> "we're so focused on diagnosing those chest injuries, managing those chest injuries. If someone has fallen, broken their leg, or prevalent here in the [name of province] we so focused on ACLS training, ACS training, seizure management, Diabetics…" [Participant 6]

In the teaching, pain management has become a "…*checkbox exercise*…" [Participant 13]. The typical teaching would be that if a patient is suffering pain give your dose of morphine and move on quickly, job done. Pharmacological measures are framed is quick, easy fixes for the problem of pain to enable more important interventions, like critical interventions or transport. Educators often frame their own undergraduate student experience in negative terms. Their experiences ranged from omission of pain management teaching, to being told pain management wasn't necessary by clinicians.

> "…a lot of the pain management stuff I learned myself after I had qualified, so it wasn't really taught well … where you apply it and how you apply it, it's something that you have to figure out yourself." [Participant 5]

One participant mentioned that it is the education domain which emphasised rapid scene times and moving to hospital at the cost of patient comfort.

> "…in the past we were the ones that taught the students 'if you are on scene for longer than 7 minutes and this is a P2, what are you still doing on scene'?" [Participant 12]

The implication is that the education itself pushes students to form a biomedical perspective of pain management, one in which pharmacology, and performing procedures is the dominant mode of management.

> "I feel that often in the education that we go through, you don't really get taught about the whole the pain concept and the effects that could have, it's often just a well here's your Morphine, here's your Ketamine, here's your Fentanyl, if you give this the patient doesn't have pain. But the importance doesn't come across" [Participant 8]

There was wide recognition of extensive gaps and deficiencies in content and topics. These gaps were perceived to be present in fundamentals such as anatomy and physiology or adverse events. The degree qualifications included pharmacology as a subject, while Diploma and HC qualifications did not. Educators expressed frustration with the need to include pharmacology in the clinical subjects. Educators may have also been perceiving curriculum fragmentation to be gaps, or students not retaining and internalising knowledge, even though it may have been covered in prior education.

> "…It might be covered in A and P [anatomy and physiology] briefly but not to the extent that the paramedic would need to know…" [Participant 2]

Specialist areas were also noted as being deficient. These included topics such as paediatrics, obstetrics, pain not related to life threatening emergencies, sedation and non-pharmacological therapies. Pain therapy for intubated or intensive and specialised care patients was also considered deficient. This last deficiency is noteworthy considering the previously stated reliance on pharmacological therapy. Drug dependency was also considered by a minority of educators to be a deficiency attribute of PEC teaching; both dependence by PECPs and managing substance dependent patients and drug seeking behaviour.

6.3.1.3 Regulatory requirements influence education

A macro-level influence on education is regulatory oversight, in this instance the HPCSA. The CPG document [58] was often described in terms of a framework for teaching. Educators have begun using the CPG, and its content, to structure teaching. The regulator has also published a minimum list of performed procedures as a requirement for registration. Educators acknowledge the autonomy of the curriculum, and that the curriculum should exceed, and be broader than the CPG. However, the minimum procedures list and the approved list of capabilities and medicines formulary exert an external pressure on teaching. They are influential, as the focus shifts to the medicines described in the formulary and the required skills. This focus derived from a lack of time, and requirement to check off each procedure or medicine as having been taught or assessed. This view was especially impactful in the diploma programs, where time was of greater premium. In some programs, meeting the regulatory requirements supersede the outcomes of the curriculum.

The emphasis on meeting these requirements influences students in a negative way, in that they begin to objectify patients. Patients become a means to obtain a qualification, instead of practicing holistic pain management. The focus becomes purely on finding, and checking off, capabilities and procedures

> "…a lot of [students] see the patients as a means to getting their qualification…. when the health professionals council …allocated numbers to different skills, …, that I think was a mistake. The minute they did that, patients became targets for students to get the skills they required… students are hunting skills now and as soon as they hunting skills … it turns what you're hunting into the game and… there's the empathy gone." [Participant 3]

The framing of education, including pain education, by regulatory requirements, specifically the recently published CPG came through as a strong theme. This reliance on regulatory requirements was consonant with a desire for standardised pain management guideline. Educators felt that a standardised, regulated guideline for pain management would enable and facilitate teaching.

6.3.2 Theme 2: Patients are vulnerable due to an unfulfilled primary pain management role.

The overarching view of participants was that patients are not receiving optimal care. This was due to a combination of the limitations and shortcomings of KSAs, the manner in which PECPs viewed themselves and their role in healthcare, as well as self-perceived pressures exerted by hospital staff.

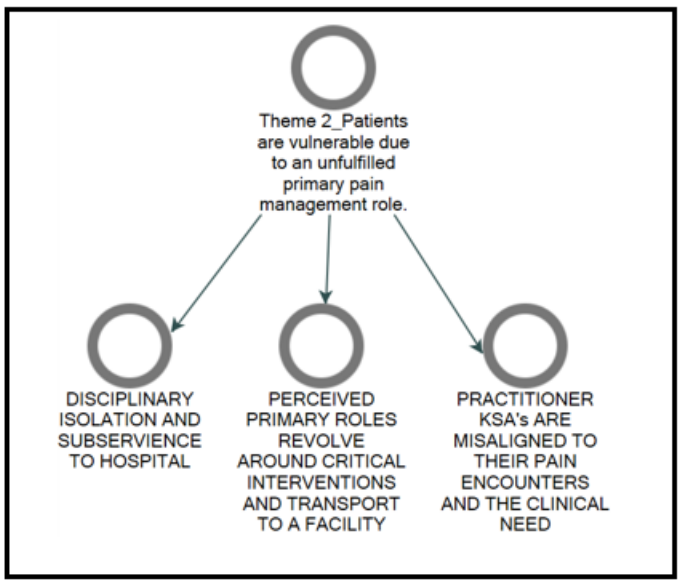


Figure 10: Thematic map for Theme 2: Patients are vulnerable due to an unfulfilled primary pain management role.

Educators agreed that pain presentations were common, and that pain management was, or should be, an emergency care imperative. This is consistent with views present in the literature. [21-24] PECPs should seek to improve the comfort and prehospital experience for patients.

> "…one of the most important functions that a member of the EMS would perform is appropriate pain management. It doesn't really matter how but I think a lot of our job is going to come down to pain management and comfort strategies." [Participant 12]

This position did not reflect in their accounts of practice and education at the level of the PECP. Educators described deficits with the provision of pain management which renders patients vulnerable to unrelieved pain. There were two categories of deficiency: a. Professional roles and medical systems thresholds mean pain management needs are unmet, and b. Practitioner KSAs are misaligned to the clinical needs inherent in pain encounters.

6.3.2.1 Perceived primary roles revolve around critical interventions and transport to a facility

The dominant perspectives foregrounded transport to and handover at a healthcare facility, and the performance of critical, life-saving interventions as the core roles and responsibilities of EMS. Pain management was viewed as important and integral, but not the prime focus.

> "So basically, the emergency side of treatment and pain management very much on that end of scope of things where we there to treat the patient provide pain management and allow them to get to hospital for further care and treatment. It's a very short space of transportation, that's where we will be providing pain management." [Participant 15]

As a meta-role, educators positioned EMS as a linkage between communities and broader healthcare, enabled by the "…*mobility function*…" [Participant 2]. This mobility is bi-directional; transporting skills and resources to the scene and transporting patients to hospital. Healthcare is transported to patients, and patients are transported to healthcare. The emergency 'life saving' role of EMS coexists with transport, to enable healthcare access. Service delivery is thus multifaceted; requiring both critical interventions and bi-directional mobility.

> "…to get patients into the health care system and get them the correct resources and if they… you know…, if we can't give them the correct resources to take them to the appropriate place…where they can get those resource." [Participant 11]

The concept of EMS as a healthcare access point is shared in the literature, raising the profile of EMS and causing it to act as a sentinel for organisational weaknesses in broader healthcare. [388] Its function can be achieved through the Anglo-American approach of rapid transport to hospital, or the Franco-German approach of initial stabilisation at the scene and then direct admission, bypassing the ED. Contemporary systems hybridise these systems.[388] Pain management is situated within these roles and acknowledged as a potential reason for the attendance of EMS. Easing suffering and

improving comfort was considered a valid role. But this was only performed once it could be established that no "lifesaving" needed to be done. Pain management is thus an imperative, without being prime. The primacy of critical interventions and transport take the focus off pain management.

6.3.2.2 Practitioner KSA's are misaligned to their pain encounters and the clinical need

Educators noted the potential for knowledge, skill and attitudinal shortcomings as a barrier to pain management amongst PECPs. This sentiment was multifaceted. Educators describe a wariness, even fearfulness amongst PECPs, to manage pain. This may stem from a fear of adverse events, especially in opioids resulting in a fear of analgesia, and this is consistent with descriptions in the literature. [44, 68]

> "…I've noticed with analgesia is people are scared of it. Whether they're scared of the adverse effects of giving an analgesia, people tend to, in my experience, 'subtherapeut' a patient." [Participant 14]

Risk aversion can be healthy, except where the risk is poorly understood or overestimated. Then the fear is irrational and may lead to paralysis of practice. This may manifest as omission of pain management or the use of sub-therapeutic doses in an effort to provide care while avoiding adverse events. A conflicting approach to pharmacological management is PECPs administering standardised doses of a medicine, and then failing to reassess, or even monitor for adverse events. One participant suggested this resulted from a sense of security that came from '*homeopathic dosing*[22]' [Participant 1]. There is prior evidence for the use of low doses [44] and lack of follow up assessment [43] amongst South African PECPs. This problem is created by the faulty application of risk-benefit in clinical decision making. Normally risk-benefit dichotomy may suffice, but it does not where the risk - benefit is misunderstood, over or under appraised. This is where the value of *sufficiency* steps in. Accounting for sufficiency will moderate clinical decisions and should be incorporated in pain praxis to bring immediate relief. Participants expressed reservations as to whether pain physiology, pain assessment and presentation was properly understood by PECPs, and whether management strategies were correct. This was not just in relation to pain types such as chronic and palliative care pain, but to acute nociceptive pain as well.

Some KSA deficits described in the literature include a belief that immature nervous systems in children mean analgesia is not necessary [68], and a belief that hospitals require a pain response to make a diagnosis. [156] South African data points to significant knowledge and attitudinal deficits amongst South African PECPs, including use of placebo outside of clinical research, ignorance of the cultural influence on pain expression, the significance of vital signs and a disregard for the subjectivity of pain. [158] PECPs may also be uncertain of the goals of pain management. [44]

Participants described diverse pain presentations as causing discomfort amongst PECPs. In their view acute pain makes up the bulk of presentations to South African EMS, but chronic pain and pain in palliative care commonly occurred. Educators also expressed that management of milder pain was important, but unfamiliar. Hitherto, acute, severe, nociceptive pain was what PECPs were familiar

[22] This is used as an informal or slang term for a subtherapeutic or very small dose of a drug.

with. Discomfort with diverse typologies played out in criticism of the CPG.[23] published by the regulator. Educators felt that the broadened medicines formulary[58] provided ample pharmacological options for situations PECPs may encounter.

> "But I do think we are currently sitting with a way better analgesic profile in the South African emergency setting, considering that we have the likes of paracetamol on board and it feels like for years we've only been sitting with this heavy agent, morphine." [Participant 8]

This positive step was tempered by a negative view of the CPG itself. The document was criticised as vague, confusing and difficult to work with. Educators were often uncertain how to use the CPG or translate the recommendations into practice and felt that this was a widespread feeling within the EMS. A major theme was a demand for an end-user document.[24] or "pain protocol" which provided clear guidance on treatment, including for pain. Some educators believed a prescriptive, standardised, comprehensive and multimodal strategy would improve effectiveness and safety. This criticism and the subsequent desire for a guideline stemmed from uncertainty in pain management strategies as well as education.

> "…as we've tried to develop the curricula, have struggled to completely interpret the document that we have. It is certainly substandard. For the level of professionalism, they're expecting us as a profession to be. My opinion is that it's a literature review document. It hasn't been published in a way that is actually legible for people to understand" [Participant 18]

A lack of guidelines has been highlighted as a barrier to pain management. [164] However, guidelines require buy-in from practitioners, without which they may disregard them [159] and improved care is not guaranteed. [69] Guidelines do not improve care on their own. [151] In this South African data, the "CPG" was viewed in this light; a document which can be useful but does not provide the instructions which educators want.

These interview data do not provide evidence of discrimination on the basis of race, sex or age. However, the potential for discrimination in the pain management of criminal suspects, and patients suspected of drug seeking behaviour did arise. This appeared to be culturally, and pedagogically embedded.

> "… because we consider ourselves to be better than that potential criminal… I've seen it too often where analgesia is just not given because this is a criminal, they don't deserve it…" [Participant 13]

[23] Clinical Practice Guideline

[24] Since these interviews, the HPCSA has published Clinical Decision Support Tools, containing a support tool for pain management.

Discrimination against crime suspects does not feature in the literature, but patients with SAS[25] does, causing much uncertainty, distrust and a conflict of professional values amongst PECPs. [68, 156, 180] Discrimination against SAS patients did arise in these interviews.

> ",… because you've been indoctrinated, this teaching, that you feel that this drug guy is only there for your drugs. So again, the empathy part where you stereotype the person and you're not empathetic to them, you don't manage the pain…" [Participant 6]

A major category was that PECPs were unprepared for interactions with diverse patient groups. The significance of these concerns cannot be overstated. Interaction with patients is dependent on communication, so-much-so that communication appears in many frameworks [60, 78, 111, 115] Poor communication is also a significant barrier to pain management. [44] Educators were of the view that PECPs often struggle to communicate and form a rapport with patients. Reasons for this included the use of the NRS pain scale being misunderstood, or misrepresented, language barriers and cultural or religious differences. One explanation was that PECPs do not view pain management as their role.

> "there's a type of… tough person culture, almost where we have a view that if a patient is not a P1 or red code patient that they're not good enough for us to manage." [Participant 1]

In children, difficulty with pain assessment is a barrier. [68, 166] Pain management in the cognitively impaired would logically also experience communication difficulties, though evidence is sparse and this appears to be a research gap. The literature also highlights differences in cultural expression making communication difficult [24], an area where PECPs are known to struggle. [158]

Educators felt that the struggle with communication and connection were magnified by differing perspectives on pain held by PECPs and patients. Priorities also differed, with each party wanting different things from the interaction, and assigning significance to different elements. These elements colluded to the point where PECPs were described as struggling with the subjectivity of pain, and either not believing patient's accounts, or making clinical decisions contrary to the patient's expectations.

> "when the old grannie is like, 'my broken toe', you say 'it will be fine, get in the ambulance, you'll be fine'. No, she won't be fine. If your toe was broken, maybe you'd be fine. But she's not fine. She's telling you, she's not fine." [Participant 19]

Cultural differences in pain expression were also offered as reasons for differences in management interpretation. There was acknowledgement that patients are influenced by culture, and expectations of their community when expressing pain. This extended to gender as well, with a common example being made of how boys would try to act tough. In other codes participants referred to examples from their experience, but in this code all examples were hypothetical.

[25] Substance Abuse Syndrome

Educators acknowledged the multidimensional nature of pain [9, 60], describing it as a spiritual experience [Participant 1]. One participant differentiated "…*emotional pain...*" as a pain type, along with "…*physical pain…*." [Participant 13] The emotional dimension was amplified by the attendance of PECPs during very emotionally charged cases, described as the "…*worst day of the patients life*." [Participant 11]. Educators felt that PECPs should be able to deal with this emotional suffering. The effect of the injury on people's lives is also seen as an aspect of pain which needs to be managed.

> "If you're badly injured physically, there's an element of emotional and mental pain that goes with that because … you start thinking ahead about the consequences" [Participant 13]

An interesting take came from participant 4, who contrasted patients in pain with patients requiring intubation. Patients in pain are conscious, and interactive, whereas patients requiring intubation are typically unconscious, with the pain patient requiring a level of interaction not required by the intubated patient.

> "for example, everybody's on RSI boat…, often not as aware about what's going on around them… whereas patients who require pain management are generally very aware about what's going on around them…" [Participant 4]

The need for empathy was a recurrent code amongst educators, as was the apparent difficulty PECPs experienced with empathy. The concept of empathy was described in terms of the subjectivity of pain, and differing interpretations of the pain experience, but not always as a human attribute and an expression of caring. Empathy was also seen in a utilitarian light, as a tool to facilitate management on scene. In this view having empathy allowed establishment of a rapport with the patient for the purposes of facilitating medical management, and not for establishing a human connection. One participant was especially blunt in their description of empathy as a tool, faking empathy to facilitate operations on scene.

> "my sympathy and empathy sometimes is faked to make the patient more compliant to say that. … if I get a patient who's trying to commit suicide my extent of caring is quite limited in reality, but I then need to realise that this person is also needing help and I need to put on that extra bit of sympathy and empathy and care for them more than what I really feel inside my heart." [Participant 15]

Perceived difficulty with empathy led to judgement of patients and their descriptions of pain, and a consequent unwillingness to treat pain. Along with the acknowledgment of the emotional component of pain, educators feel PECPs should also manage the emotions. There was also an opinion amongst educators that empathy could be eroded. Students might come into the program empathetic and caring. But, over time and after exposure to the demands and rigours of the programs, and the harsh realities of work in the EMS, become hardened, and lose empathy.

> "How many of our practitioners that have been in EMS for very long time actually become …non caring cold hearted, they just lack that empathetic quality that they once had. So… maybe it's not being unlearned, maybe we're being conditioned to lose that trait in order to protect ourselves". [Participant 14]

PECPs discomfort with communication, and the underdevelopment of empathy, may be linked to their view of their role. Whether or not PECPs intend to manage patients who require communication, connection and rapport, or whether intentions and expectations are to manage intubated, unconscious patients could not be answered by this data.

A minority of participants referred to the benefits of pain management, and pain ethics. Pain was described as an ethical imperative. It was also described as a right, though the position was that patients are unaware of their right to pain management. Patients wouldn't complain about being in pain because;

> "…they still got the assistance that they needed. Patients don't know what their rights are, rights is not the right word, but it is the right to not have pain, will be treated and not suffer from pain. But patients aren't sure that or the community is not sure of that and they're not able to provide that type of feedback."[Participant 9]

This stance posits that patients accept that pain management is separate from the roles of critical interventions and transport, an extra which we provide, if possible, but there is no guarantee. The ethical practice of pain was also influenced by the perception that some PECPs reject the subjectivity of pain. Mistrust in patient's descriptions of pain was a recurring code, with PECPs basing management on their own interpretations of a patient's description.

> "…some paramedics don't like to provide pain relief because it can't be that sore" [Participant 4]

6.3.2.3 Disciplinary isolation and subservience to ED approval

Educators often described conflict with ED staff at handover, leading to a sometimes-uneasy relationship. Clinical interactions in PEC are unique and shaped by context which may be difficult for other health disciplines to understand. The hospital staff may not understand the limitations, and requirements, of managing patients with constant noise, movement and vibration. These necessitate analgesic strategies and dosing different to hospital strategies. Other healthcare disciplines do not understand PEC qualifications, capabilities and restrictions or enablers imposed by categories of registration.

> "people don't understand what you bring to the table… So, I think a lot of the undervalue comes from not understanding the different qualifications. " [Participant 5]

Disapproval of, or conflict resulting from, PECPs' pain management led to regrettable accounts of PECPs withholding pharmacological pain management as a conflict avoidance strategy.

> "either a provider might say less morphine than what was given for instance or alternatively might not give as much analgesia as they would have normally because they're scared of the reception." [Participant 1]

They may also use smaller doses or misstate their treatment to align with EC expectations. PECPs are also concerned that reprimand by ED staff may make them appear unprofessional and incompetent to junior colleagues.

> "but also, it places the…[senior], in a difficult position where the crew might go 'Oh well the doctor said that [name of person] gave too much morphine' and that might create a different impression on how much might be enough, on you know, even my competence."[Participant 1]

Misunderstandings related to PEC qualifications, context, and disapproval of PECP pain management is recorded in the literature. [152, 165] Hospital staff and PECPs do not share perspectives on pain management. Educators further make the point, that though EMS enabled access to healthcare, in practice, patients are not entering a continuous system. They are being transported by one health system, the EMS, and then being handed off to another, the hospital system. Dissonance, or conflict, at the interface may hamper pain care. Due to the ED staff's apparent lack of understanding of PEC qualifications and PECPs' avoidance of pain management to prevent disapproval, PECPs may render lower quality pain care. PECPs defer to ED staff to avoid conflict, risking disciplinary isolation and subservience to ED staff approval.

6.3.3 Theme 3: Conflicts of interest, competing interests and limitations to capacity

A significant theme was the perception educators had of the influence and impact of context on pain management. This was mediated by context, structural limitations, and personal pressures all competing for the PECP's attention, and action. PECPs were, at times, having limited control over these limitations, and limited capacity to change them. These competing interests were at time conflicting, sometimes with each other, and the PECPs own professional and personal values. These competing interests, and conflicts, shaped the professional actions of PECPs. Structural pressures often appeared the cause of personal pressures experienced by PECPs, causing dissonance between job requirements and personal values. As these two categories appeared entwined, they are discussed together, without separating section headers.

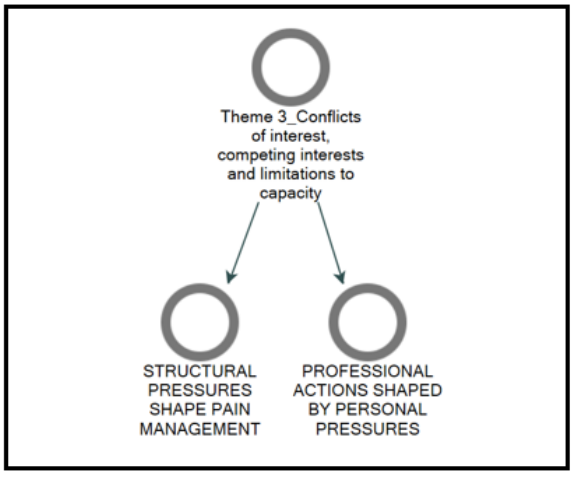


Figure 11:Thematic map of Theme 3: Conflicts of interest, competing interests and limitations to capacity

The nature of the emergency situation is that patients have limited choices in respect of who will manage them, and practitioners do not choose their cases, both beholden to availability at the time. Differing categories of registration place a systems boundary on access to therapy by limiting PECPs access to pharmacological therapies. Additionally, services do not always make all the medicines available, especially Entonox®. [152] Educators were of the opinion that the authorised capabilities and medicines formulary [58] allow for sufficient therapies, but when the dominant paradigm is that pain is managed by medicines, patients become vulnerable to insufficient management. Emergency care, and the patient's experience of it, may be dependent on which practitioner attends their emergency, and which service they work for:

> "we have nine different qualifications each with its… scope of practice and because the patients often can't choose who they get when they have an emergency that could be quite a surprise… the level of care they receive." [Participant 2]

Resources being consumed by non-emergency cases was perceived by educators to negatively impact ambulance and personnel availability for continued operations. This was perceived to hamper response times and resource allocation for true emergency cases.

> "we're not fulfilling our role completely in the essential role, because we're not only called out for non-emergencies, and many instances get abused with cases that aren't an emergency response."[Participant 18]

> "…my experiences have shown that a lot of people just want access. So, it's not necessarily that we are transporting emergency cases… I think the bulk of call purely in this country based on socioeconomic circumstances and working for the government specifically, they just need access to hospital and sometimes you the only means of transport or guidance to get the into the right facility" [Participant 7]

Participants recognised the barriers preventing patient access to healthcare, such as lack of public transport, safety concerns, financial constraints, and distance from health facilities. They understood EMS's role as a health access point and transportation provider, acknowledging how these issues hindered emergency care and strained resources. While they preferred EMS not be tied up with non-emergency cases, their frustration was directed at the situation, not the patients. Educators accepted that managing non-emergency cases was inevitable and necessary in the broader context. One suggestion was to create a separate system for planned patient transport from home, to allow people to attend their daily health needs.

> "I think there's a place for it but I still feel there needs to be differentiation between emergency cases versus people that need transport." [Participant 7]

A lack of resources, and time limits imposed by organisations impact pain management. Response times, and ambulance availability were perceived as a significant pressure for EMS. Time requirements formed a barrier to care because the clinical interaction may be rushed and

incomplete. Pain interactions which are dependent on communication, would be negatively affected. Additional pressure is placed on PECPs by this time requirement, to form a clinical rapport with patients.

> "We should be forgetting about time, organisations that demand scene times, time from scene to hospital. Why should we be loading a patient in the ambulance and rushing with him…?" ,doing whatever we need to in route to hospital to get them there as quick as possible. Whether it's operational times or whether it's you know definitive care, but I feel that that that we should be able to patient dependent, come to their level and-and form that relationship within that small space of time, to make them feel comfortable, and they don't just see a paramedic as an ambulance driver or this person that just lights and sirens for everything, that's just in a rush, but someone that comes down to that human level of the patient." [Participant 6]

The nonavailability of resources, commonly the inhaled analgesics, was perceived as a significant barrier. The reasons for the nonavailability of Entonox® specifically was explained by its expense, and abuse by PECPs. [152] This limitation is impactful in that all categories of PECPs are authorised to use inhaled analgesics, [58] and it's use should be widespread. Fentanyl was also commonly mentioned as being unavailable as were resources such as pillows. The impact on pain management is described as follows.

> "And that in itself can go a long way to support a patient with fractured ribs, or a sprained ankle, if without a pillow to rest on, it's extremely uncomfortable and not having even those basic items in your ambulances for transportation limits, even further, your non-pharmacological management options" [Participant 18]

Policies and procedures also act to hinder pain management. Organisations place restrictions on the use of some medicines, which alter the independent practice authorised by the HPCSA. In some services Fentanyl requires authorisation from a higher authority before use and practitioners may feel it is easier to forego analgesia than to try obtaining authorisation.

Participants often described the health system as dysfunctional. Reasons for this dysfunction were not explored, in keeping with the study objectives, and participants only volunteered limited information. However, the information which was spontaneously offered centred around common categories. A lack of managerial accountability was a significant barrier to pain management. Managers were portrayed as not always fulfilling their managerial function, through a lack of control, or allowing PECPs to practice without control. Basic stock control and governance systems also appear to be lacking or not implemented.

> "There was no one looking out that if you had been given a car and you had this much of the gas and you've seen so many patients, therefore, you should be around about how much at the end of the shift, there was no signing in and signing out." [Participant 20]

Participant 20 described a service where medicines, including Entonox®, *were* controlled. In this service Entonox® was accounted for, and not abused, meaning it was available for use by patients. This contributed to improved pain care. Managerial accountability had larger effects than just

availability of medicines. One perception was that a lack of oversight also seemed to engender poor attitudes, where PECPs lost empathy because they could.

> "…the moment it becomes a safe environment for the practitioner to treat the patient like… a piece of meat then they become more and more and more used to it…. You get someone, who in the beginning of their of their career work was quite empathetic and was quite caring, just developed into someone that simply isn't." [Participant 12]

In some instances, PECPs may grow tired of asking for resources which never arrive and give up. Jealous and unethical managers may deliberately withhold resources in order to punish PECPs for perceived arrogance.

> "in some services where a manager is less qualified than the people that they are managing, they will feel that they need to be 'felt' and they need to be respected so it was deliberate. …it will be just sabotaged because they think that you think you're better than them and you think you perform better. For some, it will be because there are lot of systems that are missing, that are not in place, it becomes difficult for them" [Participant 20]

Participants differentiated between private and public sector EMS. Public sector EMS was perceived to lack resources, managerial controls and accountability. Private sector EMS was perceived as foregrounding financial gain. The term "*financial medicine*" was ubiquitous in the interviews. This is the "*the delivery of a health-related service and or the performance of medical interventions where the generation of financial gain or profit is viewed as the central focus of the provider's activities and rather than the patient's wellbeing*". [389] The mechanism by which this occurs is rooted in the billing structures of private EMS, whereby billing amounts are determined by the level of care provided. The use of inhaled analgesics constitutes basic care, and the use of opioids constitute advanced care, which can be billed at far higher rates. [389] Pain management may become a conduit for "over-servicing" of patients. A variation of this is to administer a sub-therapeutic dose of an opioid and still generate the fee. In contrast, patients without medical insurance, or who cannot afford to pay for services, may be under-serviced. From time-to-time private sector EMS may manage non-paying or indigent patients and, in this case, PECPs may withhold opioids or ketamine, allowing a lower category of PECP to manage the case.

> "administer 1 milligram of morphine to a patient who has maybe abdominal pain so that they can charge an ALS fee on that patient so often the administration of 'homoeopathic doses' of analgesic medications might be in some ways seen as an incentive" [Participant 1]

Medical practice, including PEC, should be a moral enterprise, and professionals should act in the best interests of the patients. [390] The term "financial medicine" has been broadened beyond practices exploiting patients and their pain, to include multiple immoral practices. [391] The manipulation of analgesics and pain management therapies for financial gain appears to be a common practice. [152, 389, 392] Negative effects of 'financial medicine' on practitioners have been reported, where practitioners suffer moral distress and loss of professional autonomy when coerced

into these practices. This has been postulated to be one factor leading to practitioner burnout. [392] This link did not emerge in the data for this research, however, practitioner burnout did, as a reason for neglect of pain management. Practices manipulating pain therapy, leading to moral distress and burnout, which in turn leads to further pain neglect, while not proven here, is a theoretical possibility.

6.3.4 Theme 4: Prehospital pain care has an unexplored potential to promote treatment equity

This theme explores the potential, and actual changes in EMS role. These changes may be the source of uncertainty, and frustration, but also hope for the future, and an opportunity to improve the lives of patient populations and promote healthcare equity in EMS.

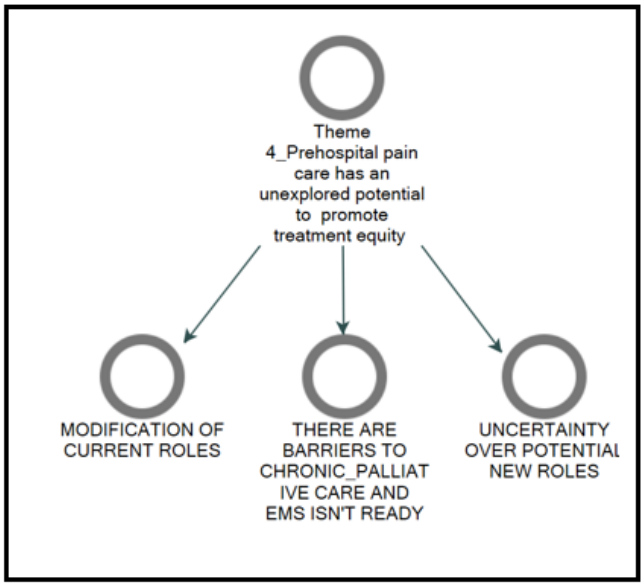


Figure 12: Thematic map of Theme 4: Prehospital pain care has an unexplored potential to promote treatment equity.

6.3.4.1 Modification of current roles

There was a consistent view that EMS roles are changing or should change, but this brought uncertainty. Dissonant views challenged role limitation to transport and critical interventions. Many educators believed EMS could and should expand pain management roles, enabled by the expanded capabilities and medicines formulary. Accepted emergency pain management roles are already being modified by necessity. PECPs are providing pain relief not only during their care but after handover, such as starting paracetamol infusions at ED handover, as patients have extended waiting times in the ED. PECPs are also fulfilling non-traditional functions, such as in EDs, or ICUs. This necessitates a slightly different pain management skill set.

This train-of-thought extends to milder pain from non-life-threatening conditions. A common example used was of patients experiencing abdominal pain late at night, when they would wait hours at an ED, and PECPs could administer analgesics which would allow the patient to be comfortable through the night, with consultation at a clinic or general practitioner the next day.

Initiating referral pathways which bypassed the ED was a common code. There was a belief that EMS could contribute more to healthcare as an integrated service, in where being first contact point, and the ability to transport could make EMS the start of a pathway to multiple sites. This might include leaving the patient at home with analgesia or transporting to clinics or general practitioners and bypass of the ED, reducing burden on the ED. Pain management was central to this broadened, non-emergency system, as pain often prompts ambulance callouts.

> "the EMS has an opportunity to be able to treat and leave at home or instead of even doing any treatment saying 'No, you don't have to go to an emergency department, you can go to here or you can go to there" and install like pathways of referrals rather than… 'we can only treat you and then we have to take you to hospital' " [Participant 10]

6.3.4.2 Uncertainty toward and barriers to new roles

There was a view that PECPs could and should contribute to primary care, community health and hospital treatment. The management of chronic pain and pain in palliative care continuously emerged, and these views were complex, but incompletely formed. The discussion was often framed in terms of inadequacy and tinged with frustration. The common scenario described was of encountering a terminally ill patient at home, or a patient with chronic pain, and not being able to help them, or only being able to offer morphine, which had already failed. A common refrain was that these patients didn't want to be transported to hospital, but that the PECP could not help them on scene. The administration of morphine was considered to create a false mandate to transport to hospital, contrary to the patient's desires. The sentiment was that the EMS could add value to the health care system by treating patients, or providing a prescription, and then leave them at home, or refer them to a general practitioner, rather than transport to a hospital.

> "… the current practices are if you treat, you have to take to hospital. The patients like that doesn't necessarily need a hospital, they just need pain relief, so it kind of limits a lot of practitioners of giving any analgesia because now we need to transport a palliative patient back to hospital which will take another bed up in the government facilities and it becomes a problem." [Participant 7]

Discharging patients at home was a contested view however, with not all participants of the opinion that the EMS was ready for this.

> "Yes. I think as soon as we start with pain management administration, or we are treating a patient it really should be our responsibility to then convey that patient to a facility where

they can take further care of that person. If we now would provide pain management to a patient and leave them at their house, what are we actually doing?" [Participant 9]

Educators were of divided opinion that EMS could contribute to chronic pain management or pain in palliative care. The recurring codes included discharging patients at home with prescriptions or non-urgent referrals or appointments.

> "I believe that chronic patients with a mild pain, we could be managing, and potentially discharging on scene with a bit of a script and that's where the team-based approach comes in. Let's have that maybe internal physician or whoever it may be on call to consult with regard to this." [Participant 17]

The theme had variations, with some educators believing PECPs would work as part of a team and others desiring autonomous practice. Yet others believed that EMS was not ready for chronic or palliative pain care and should rely on transportation to hospital.

6.3.5 Theme 5: Aspirational competency, curriculum design and content recommendations.

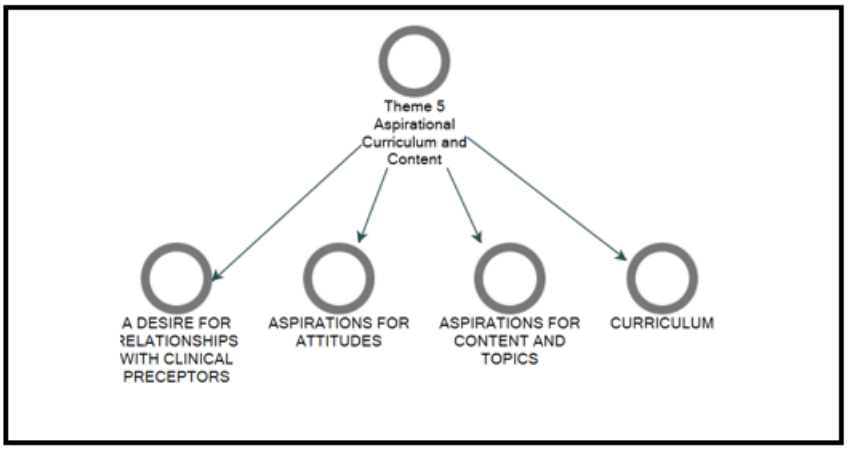


Figure 13:Thematic map of Theme 5: Aspirational Curriculum and Content

This theme unpacks participants' views on future competencies and curriculum design. Educators were not able to fully articulate specific solutions for problems of pain curriculum, but did offer some suggestions for competency and curriculum design as well as content. Educators did not offer detailed solutions to the gaps and deficiencies they encountered. None of the educators had a curriculum needs assessment, or a prioritisation process.

6.3.5.1 Cultivating relationships with preceptors

Educators considered good preceptorship to be a cornerstone of a successful program and expressed a strong desire for close and synergistic working relationships with clinical preceptors. "Community of practice" also emerged as a recurring code, with educators describing the importance of "safe spaces", and groups where practitioners and students could discuss clinical matters. Developing a value proposition for preceptors was considered necessary, some suggestions including CPD activities, library access and inviting graduates as guest lecturers, though no concrete plans emerged. An educator with international experience described mentor development programs in an overseas HEI but acknowledged the required resources to be lacking in South Africa.

> "…I think the first thing is relationship, the universities need to have a relationship with clinicians". [Participant 1]

Linking to theme 1, participants recognised the power of good preceptorship, as well as the need to develop relationships and synergism with clinical preceptors.

6.3.5.2 Knowledge, skills and attitudes

Educators also outlined specific KSAs they wished to develop. Commonly occurring codes were respect for diversity, altruism and patient centred care. Educators felt PECPs should be caring persons, who want to help. Attitudinal codes also called for self-awareness and reflection, with PECPs aware of their own experiences and biases. "Empathy" was a common attitudinal code to arise, considered by all participants to be an essential attribute of PECPs. Three perspectives on empathy exist in the literature; a cognitive perspective, viewing the world through the eyes of another, and an affective perspective which appreciates the emotional state of another. The third perspective is behavioural, and focusses in the ability to communicate this understanding to the patient. [393] The management of pain would require an integration of these three perspectives. Some participants were uncertain how empathy could be developed in students, stating that it couldn't be taught. Others felt empathy could be developed during teaching. Ultimately, educators viewed the competent PECP as being "Caring", with a respect for humanity, a setting aside of ego and a patient advocate.

> "A paramedic is someone that needs to want to care for this person, want to be there for this person, not just be there for the job, not just be there to give the drugs and be cool with all the fancy stuff. They need to be able to want to care for this person." [Participant 9]

Educators felt PECPs should be reflective, and have an awareness of their own identity, and biases. Supporting this code was the code "life-long-learning". The aggregated knowledge codes outlined by educators seemed to follow their perceived barriers to pain care. The following aggregated codes represent recommended topics to be included in pain teaching.

6.3.5.3 Recommendations for curriculum structure

Educators expressed a desire for a standardised syllabus, as well as a standardised pain guideline, to guide teaching. This stemmed from a desire to be comprehensive, and holistic in care, and ensure there were no gaps. There was an element of uncertainty about what actually was required. No participant expressed absolute certainty in expertise and all felt the need for some guidance. Participants were divided on whether there should be a dedicated pain study unit , or whether pain teaching should be integrated into other units. There was almost unanimous agreement that pain teaching should begin early in the program and not left for the senior study years. This was based on the opinion that holistic teaching, which is retained over time, requires time and reflection. Educators were also of the opinion that pain teaching should exceed the capabilities published by the HPCSA, and, and not be limited by the approved capabilities, *per se*.

> "I think possibly it needs to include more than the scope of practice that is dedicated to us by the HPCSA" [Participant 10]

Table 24: Knowledge and skills codes emerging from educators

Knowledge and skills codes emerging from educators
Anatomy and Physiology
Long term effects of pain
The nature of pain and pain theory
Pain in diverse patient groups
Pain assessment
Pharmacological therapy
Non-pharmacological therapy
Communication
Dealing with drug seeking behaviour in patients
Practitioner addiction
Psychology and providing emotional support
Clinical decision making and judgement
Contextual practice
Ethical practice
Academic literacy

Participants saw attendance of PECPs at non-emergency cases as an opportunity for professional development, and to development of caring attitudes. For those who felt empathy could be developed, the clinical environment represented the ideal opportunity, underlining preceptorship as an imperative. Medical simulations (including role play), case studies and reflective discussions were also methods put forward, not just for empathy development but for pain teaching in general. Educators themselves needed to be an example, and show empathy, for students to develop empathy.

6.4 Chapter summary

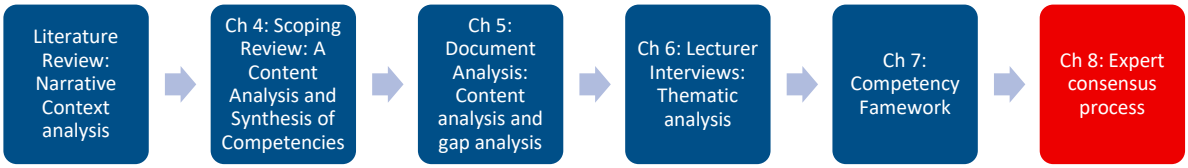
The chapter provides the results of the interviews with educators and explores their opinions and perceptions of pain curriculum and teaching. It also explores educators' opinions of contemporary pain management and it's problems as a precursor to competency development. The chapter concludes with educator recommendations for curriculum and teaching.

The findings were presented in five themes. Theme one explored how contemporary education addresses pain management in the classroom. Pain is rarely taught in a dedicated pain study unit and is often integrated into other units. Teaching approaches vary, but participants were unanimous in stating the influence and significance of clinical preceptorship on learning. HEIs do not have control of preceptor allocations and conflicts may arise surrounding placement, or regarding therapies. Educators do not necessarily have a holistic view of the curriculum and may be unfamiliar with subjects other than their own. Teaching tends to emphasise a biomedical perspective. Regulatory requirements exert significant influence over teaching, often overshadowing the curriculum.

Theme two explored clinical pain management, with the overarching findings that patients are vulnerable to sub-optimal pain management. This may result from differences in role perceptions between PECPs and the needs of practice, as well as KDSA deficits in training. The ED seems to be a major influence on pain management by PECPs, with PECPs not wanting to risk disapproval for their management, and ED staff frequently misunderstanding the PECP's capabilities and contexts. Theme three explored the influence of real-world pressures on pain management. Structural pressures such as imposed scene-time limits and limited access to resources hamper pain management. Further pressures to be navigated are organisational polices, regulatory requirements, health system dysfunction, financial requirement and a lack of managerial accountability. Theme four explores the potential for future change in PEC, including chronic and palliative care pain management. These require reimagining roles of PECPs, and EMS in general. Theme 5 provided educator recommendations for competency and curriculum development, as well as content recommendations.

This concludes the results for the educator interviews. The next chapter explores the results of the expert consensus panel, at which many of the emergent dilemmas from prior findings are put to experts for discussion and resolution.

Chapter 7: Expert Consensus Panel on Curriculum Implementation Recommendations for Pain and Nociception Competency Framework.



7.1 Introduction

The expert panel proceeded in two phases. An information pack containing a summary of the evidence and an overview of the dilemmas and ambiguities was emailed to participants prior to the panel discussion. A face-to-face panel discussion then took place, where the evidence was presented, and questions posed to the panel for discussion. The detailed methods are presented in Chapter 3.

7.2 Description of the Expert Panel

The expert panel took place on 27 March 2023 in Cape Town, South Africa. The constitution of the panel is depicted in Table 25. The face-to-face session was structured in four 90-minute sessions, separated by tea and lunch breaks. The recommendations below represent the outcomes of expert discussion and voting on the recommendations. Session one did not contain any voting rounds as this was the information and reflection session. The sessions are depicted in Table 27 below.

Table 25: Constitution of the Expert Panel

Participant nr	Expertise	Sector engaged in
1	Specialist Anaesthetist Acute Pain Physician	Public Sector Health Higher Education
2	Emergency Care Practitioner Critical Care Retrieval	Private Sector EMS
3	Emergency Medicine Consultant Palliative Care in Emergency Medicine Emergency Medicine Educator	Public Sector Health Higher Education
4	Emergency Medicine Consultant Emergency Medicine Educator	Public Sector Health Higher Education
5	Emergency Care Practitioner Emergency Care Researcher	Higher Education
6	Emergency Care Practitioner	Public Sector EMS
7	Emergency Care Practitioner Emergency Services Management Emergency Care Education	Private EMS Higher Education
8	Health Professions Education and Curriculum Development	Higher Education
9	Emergency Care Practitioner	Private Sector EMS
10	Physiotherapist Healthcare Leadership Specialist Pain Management Pain Educator Pain Research	Public Sector Health Higher Education
11	Emergency Care Practitioner Emergency Care Educator Emergency Care Research	Higher Education
12	Emergency Care Practitioner Emergency Care Educator Healthcare Regulation Emergency Care Research	Higher Education Emergency Services Regulation
13	Emergency Care Practitioner	Higher Education
14	Emergency Care Practitioner Emergency Care Management and Leadership Emergency Care Research	Public Sector Health
15	Emergency Care Practitioner Emergency Care Education	

Table 26: Structure of the Expert Panel Interaction

Presentations	Description of the problem	Question/s posed to panel
	Session 1	
Presentation 1	Background to consensus methodologies and conduct of the expert panel and voting procedures.	N/A
Presentation 2	Background to South African EMS, and emergency care education, qualification structures and regulation.	N/A
Presentation 3	Problematising pain practice (presentation of case scenarios), summary of the primary evidence from phases 1-3, presentation of the competency framework with explanation.	N/A
	Questions and clarifications. Guided reflective discussion on domains of competence and pain practice	
Session 2		
Presentation 4	**Strengthening the relationship between the clinical learning platform and HEIs.** Educator showed the power of workplace placements as learning events. These placements were also a source of conflict between the clinical platform and the classroom. Strengthening the relationship between the clinical learning platform and HEIs was considered essential by educators.	How can the educational field form, and maintain, a mutually beneficial paedogogical relationship with professional practice?
Session 3		
Presentation 5	**Structuring the pain curriculum within diverse and autonomous curricula.** The document analysis showed significant pain content gaps, and some overlap. The HEIs are autonomous and curriculum structures are diverse. Neither the literature review nor the educator interviews could resolve whether pain should be taught in standalone modules or integrated into other modules.	What is the best way to structure the pain curriculum in emergency medical care education?
Session 4		
Presentation 5	**Pain typologies and requisite KSAs** Examination of the gaps in pain practice and a projection of future EMS roles showed the potential for management of new pain typologies (other than acute nociceptive pain) and diverse patient groups. The typologies, patient groups, and the requisite KSAs were unknown and not solved by the data.	What typologies of pain should EMC curricula be preparing graduates to manage? What competencies are required for palliative care and chronic pain?
Presentation 5 continued	**Communicators or Collaborators** The evidence shows communication between PECPs and patients and other health professionals impacts management. Current EMS systems make provision for handover of care, without real collaboration between PECPs and other professionals in interdisciplinary care. Considering potential new roles, it is uncertain whether PECPs should be developed as communicators or collaborators.	Considering current and future roles, should EMC pain curricula develop graduates as *collaborators*, or communicators?

7.3 Results: Consensus Panel Recommendations

The statements (original and revised) are reported as recommendations together with summarised narratives of the discussions which gave rise to them. The aim of these summaries is to provide context and explanation to the adopted statements. Each set of statements was formulated at the same time and posed to the panel sequentially for voting.

A tabulation of the consensus statements and the initiating question are presented in Table 28. Each recommendation is accompanied by a narrative of the discussions to provide context and explanation. The discussion of session one are reported as a narrative summary. The voting results and progression to amended statements are presented in Appendix 8.

Table 27: Adopted consensus statements

Question posed to panel	Adopted statements
How can the educational field form, and maintain, a mutually beneficial paedogogical relationship with professional practice?	1. Learning outcomes should be aligned to the multidimensional nature of pain and its management.
	2. Educational institutions should facilitate or participate in platforms for engagement with clinical professionals
	3. Key stakeholders should collaborate on ongoing learning activities for pain management.
	4. Educational institutions should communicate clear learning goals to students and preceptors.
What is the best way to structure the pain curriculum in Emergency Medical Care Education?	5. Pain and nociception outcomes should be explicit throughout the curriculum
	6. Learners should participate in a foundational learning unit addressing the multidimensional nature of pain early in the program with contextually relevant learning outcomes distributed through the later learning units.
	7. Exit level learners should participate in a learning unit aimed at consolidating knowledge and attributes relating to the multidimensional nature of pain.
What typologies of pain should EMC curricula be preparing graduates to manage; specifically what competencies are required for palliative care and chronic pain?	8. Emergency care curricula should include competence in the management of acute pain in palliative care as contextually relevant to emergency services.
	9. Emergency care curricula should foster prepare graduates as collaborators in interdisciplinary pain care
Considering current and future roles, should EMC pain curricula develop graduates as *collaborators*, or communicators?	10. Emergency care curricula should prepare graduates as collaborators in interdisciplinary pain care.

7.3.1 Session 1: Panel discussion

The discussion on the context, problematisation of pain management and competency framework was congruent with key findings of Phases 1-3. It also identified potential inaccuracies and areas for improvement in the research.

One panellist commented on the similarity of the proposed competence framework with CANMEDS [111] and the use of roles, rather than atomistic lists of competencies. The comment was that these lists were difficult to work with and often experienced as burdensome by educators. The expert referred to two movements in HPE [26], where one movement atomises each role, and creates long lists of tiny competencies to show a developmental process, marked by milestones [27]. A second movement prefers identifying Entrustable Professional Activities (EPAs) [28], which are visible in professional practice and require integration of many competencies, but these are not necessarily listed. At least two panellists expressed a preference for EPAs.

In the problematisation of pain practice, another panellist noted the conflation of the concepts of pain and nociception in practice and education, positing this to be one reason for the problems in practice. A focus on nociception – "The neural process of encoding noxious stimuli." [395] – encouraged a reliance on pharmacology. Conceptualising pain and nociception separately during emergency care would allow for non-pharmacological approaches – "…*treating physiology and treating people*…". Conflation of the two - blanket labelled as pain, made treatment messy, difficult and inaccurate. For effective clinical management, and teaching, pain and nociception should be framed as separate, but related, concepts.

The panellist suggested renaming the competence framework domain from "Clinical pain practice", to "Clinical nociceptive and pain practice. The researcher was also forced to reflect, as at that time the term used in the title of the research was "pain", omitting nociception. Further reflection showed that in all the evidence, including all the evidence in both the literature review and scoping review, referred to "pain" only, and was silent on "nociception". The conflation of pain and nociception as a barrier to care arose continually in the later sessions. There was consensus that separating these concepts was an imperative for effective practice. From this perspective, it appeared that universally, contemporary teaching and practice in PEC was conceptually flawed.

[26] Health Professions Education

[27] In programs following Competency Based Medical Education, competence is described in terms of modifiers which detail at what stage in the education and in what context students are deemed competent. These points in time defining expected ability are known as "milestones". [91]

[28] An EPA is a unit of professional practice (a unit is discrete professional task or bundle of tasks, such as managing nociceptive pain) that can be entrusted, unsupervised, to someone undergoing training, once they have demonstrated the necessary competence. An EPA is a material contribution to the practice of healthcare and can only be achieved, or demonstrated, in real-world practice [394].

Panellists criticised the educational field as emphasising a biomedical model, not teaching the psychology of pain, or not emphasising human skills. Panellists recognised the influence and power of clinical practice on learning and acknowledgement of the difficulty HEIs faced with clinical placements. Universities were dependant on the operational demands of services and could not control where and with who students were placed. In the practice field, not all preceptors were interested in mentoring students. Many preceptors practiced a biomedical model of care, and did not stay up to date with best practice. Preceptors may prioritise management of nociception with pharmacology and disregard the subjectivity and human aspects of pain. Non-pharmacological aspects were indeed emphasised in classrooms, but this was swept away when the learner was exposed to clinical practice. Following this reflection, session two commenced, and the discussions are summarised next.

7.3.2 Session 2: Recommendations: Relationship between Practice and Education

The question posed to the panel was "How can the educational field form, and maintain, a mutually beneficial paedogogical relationship with professional practice?" The data presented to the panel were: a. the regulatory requirements imposed on HEIs in respect of workplace placements, b. data from the interviews of educators showing their teaching methods and their experiences of workplace learning, and c. theoretical underpinning of workplace learning. The table summarises the voting rounds and shows the progression from initial statement to the adopted statement (if applicable). Each recommendation is accompanied by explanatory paragraphs. In some instances, more than one recommendation is addressed in the same paragraph.

The panel felt it necessary that the profession first acknowledge the importance of pain and nociception in practice. The acknowledgment that pain and nociceptive management was a professional responsibility was considered an essential first step to improvement. Many issues in PEC pain and nociceptive management seem to derive from the de-emphasis of and low priority assigned to pain management, and this was evident in the literature and the primary data collected in this research. The profession also needed to define acceptable practice and the entire profession needed to "buy in" to this. The profession could then hold itself accountable for managing pain and nociception. It is an imperative that the profession engaged one-another and produced recommendations for practice.

The inherent hierarchical structure of emergency services and the biomedical approach to practice had ingrained a deference to seniority. Decisions made by PECPs with higher qualifications were never challenged as lower qualified PECPs act as assistants, not partners. Individuals practiced in isolation, not in teams, and are never forced to reflect on practice or compare with others. Practitioners did not necessarily familiarise themselves with new research and often continued to practice the way they were taught. Because of this accountability suffered. The anaesthetist drew parallels with the practice of anaesthetics and highlighted the importance of conferences and further training activities for anaesthetists to speak and compare practice and learn new skills.

Experts questioned the consistency of clinical governance and quality oversight present in services, with some practitioners holding themselves and others to account and others not. This brought to

light a risk when student deferred to clinical practice for their learning, rather than the classroom. In this environment management of pain and nociception could easily be sidelined.

A major theme to emerge from this discussion was the need for a community of practice. Further discussion addressed an apparent lack of open communication between HEIs and the workplace, especially the delineation of expectations and ILOs[29]. Preceptors and host supervisors were often left to their own opinions as to what to expose students to. This was disputed though, with testimony presented that expectations and ILOs were communicated.

The panel felt that there was an apparent confusion as to which group decided practice; academics and educators, or clinicians. In this, the panel felt there was evidence of the emergence of different groups within the profession. One classification grouped practitioners as either academics or "industry" - the clinical staff that provided services. Another prominent classification system was to group practitioners by qualification. This was inherently hierarchical. Questions on whether any particular grouping should decide on practice or making decisions, and another following instruction seemed to show barriers between practitioners. This hampered education and clinical care. One panellist, a medical practitioner, expressed surprise at the question posed, and wondered why the practice field and the education field were seen as separate entities. During the presentation, interview data described the conflict an educator experienced with a practitioner over the classroom discussion of a case; the panel questioned why the practitioner was not involved in the discussion. The discussion reflected on an apparent reluctance between the educational and practice fields to recognise the role and value of the other. The clinicians and the educators may not engage as openly as they should.

The sentiment amongst the panel was that the education and practice fields were not communicating enough on workplace placements. The practice field was not always sure what was required of them in respect of preceptorship, and not all practitioners wanted to work with students. The HEIs do not always provide enough direction on requirements, and do not provide training or guidance on mentorship and preceptorship. Universities possessed knowledge and expertise, which they did not necessarily share openly with practitioners. On the other hand, some practitioners were not willing to learn new skills or collaborate in generation of knowledge. They might become offended when student spoke of new developments or did things differently. The sentiment in the panel was that the educational field had become quite didactic, and lessons did not necessarily allow for judgement or practitioner "gestalt", which may be what students were witnessing. The two fields had placed boundaries between them, which were crossed only by students during workplace placements.

Panellists from other medical disciplines described deliberate efforts to form communities of practice within their disciplines. One mechanism was dual appointments where educators entered the practice field and vice versa, allowing expectations and outcomes to be clarified. A panellist from the field of physiotherapy concurred with the importance of community of practice, and that individuals with different identities (academic or clinician) should be able to work together. A method of collaboration, and mutual cross development, used in physiotherapy was to host CPD events. These events used a clinical problem to teach clinical skills *and* taught learning theory, developing clinicians as mentors. Panellists shared experiences of being invited into the educational

[29] Intended Learning Outcomes

spaces as being positive and felt that persons from the different fields should regularly enter the other field. Mentoring of preceptors to assist with student interactions was beneficial, though there was an acknowledgement that not all persons wanted to enter the other field.

One panellist who had worked to create communities of practice and networks in medical simulation noted the need for like-minded people to congregate and interact. However, an entity or individual needed to take responsibility for creating and running platforms, the "spaces" for engagement. In emergency care there were limited shared platforms where clinicians and educators could interact Engagement is mostly through a personal connection. The 'paramilitary' culture of EMS was also cited as a barrier, as collaboration and engagement, especially with students, was not part of the culture. The following statements were inductively formulated from the initial discussion. Each recommendation is accompanied by explanatory notes.

Statement 1: Learning outcomes should be aligned to the multidimensional nature of pain and its management

The first iteration called for learning to be driven by a unified pain practice. The panel considered this beyond their remit as they did not represent the profession. Panellists voted for an amendment to the wording. Panellists agreed that learning should be aligned to practice standards decided by the profession. Allowing for the separation of pain and nociception was essential. The term "multidimensional nature of pain" is used globally in curriculum development and encompasses pain, nociception, nociplastic and neuropathic pain, and the biopsychosocial aspects. [60, 396] The term "management" was the subject of some debate, with some panellists wondering if it limited learning to knowledge and skills, and omitted attitudes, or the "human" aspect required. The debate returned to the conceptualisation of pain management as a "unit of work", requiring integration of knowledge, skills and attitudes – in concert with the conceptualisation of EPAs. The term management was accepted to mean comprehensive assessment, care and disposition. Management as a verb was thus all inclusive. Panellists accepted the term "aligned" as a reference to the theory of constructive alignment. [397] The statement represents the responsibilities of HEIs to write accurate outcomes and objectives, which properly represent management of pain and nociception, without impinging on the field of practices' autonomy.

Statement 2: Educational institutions should facilitate or participate in platforms for engagement with clinical professionals

Statement 3: Key stakeholders should collaborate on ongoing learning activities for pain management.

Statements two and three are discussed together. Both statements reflect collaboration, and breakdown compartments and barriers by requiring collaborative communication and contact between fields. Statement two was accepted in its first iteration, however statement three was revised from "Educational institutions should facilitate CPD learning activities for pain management practice" as this statement placed the obligation on educational institutions. Panellists requested

amendment to reflect a joint responsibility of a community of practice. The term “key stakeholders” was used so as not to exclude any specific persons or groups from joining a community of practice. The term “ongoing learning activities” reflects the necessity of continuous learning post-graduation and expands learning activities beyond only CPD activities.

Statement 4: Educational institutions should communicate clear learning goals to students and preceptors.

This statement was accepted in its first iteration. The statement aims to ensure that students and preceptors alike are aware of the learning goals and expectations of the time spent in the workplace.

Statement 5: Key stakeholders in the emergency care community of practice should foreground professional cultural transformation in pain education.

The first iteration of this statement – “Educational programs should foreground cultural transformation in pain practice” - was rejected. This was on the basis that it is not the responsibility of one entity – educational institutions – to ensure transformation. The panel opined that one entity could not change the culture of another entity, in this instance the community of practice. It needed to be an inclusive, collaborative process undertaken from within. The statement uses the terms “key stakeholders” and “emergency care community” to show that diversity of membership and to be inclusive of all entities and persons with an interest in emergency care. The direct object of the sentence, professional cultural transformation in pain education, refers to the intentional and profound changes the profession needs to make to beliefs, values, norms and behaviours. This may be achieved through educational content, collaboration, implementation of policies and practices. The statement is a call to action for the profession, not just the HEIs. .

7.3.3 Session 3:Recommendations on the structure of the pain curriculum

The question posed to the panel was “What is the best way to structure the pain curriculum in Emergency Medical Care Education?” The data presented to the panel was data from phase 2 (document analysis) and phase 3(educator interviews). The data showed how contemporary curriculum was structured and how educators approached teaching and curriculum in their programs. Appendix 8 contains the voting rounds and this section summarises the discussions which lead to the statements.

At the outset of the discussion and following data on the scope and detail of curricula across programs, the panel expressed caution against over emphasising pain in curricula. The panel noted pain and nociception deserved a prominent place in curricula as it was an important professional activity, but so were many disorders. If focused curricula were to be developed for every professional activity, programs risked being overloaded. The share of time should be equitable, and allow other activities proportionate prominence. Panellists involved in curriculum development in

other health disciplines concurred that their programs constantly risked being "over credited" as new content was constantly being added, without removing existing content.

Panellists recounted their own experiences as students, and experiences of mentoring students, and were of the opinion that pain teaching was fragmented and incomplete. This forced students to fill in the gaps during workplace placement, which led to differing experiences. Panellists noted that specific topic areas did not feature at all, "falling through the cracks" of the program. Pain in palliative care, paediatrics and neonatal care and pain not related to critical events was singled out. An effort needed to be made to include these patient groups.

Panellists also had experience of silos amongst faculties, and being unsure of where specific content was taught, and how. Assumptions about curriculum coverage, and faculty not engaging each other on content, risked omissions. Another consideration was teaching a curriculum across different qualifications which resulted in differing capabilities for graduates. This resulted in a requirement for multiple endpoints for a pain curriculum. One panellist, a physiotherapist, described a 4-hour standardised course on the principles of pain which was offered to diverse healthcare disciplines. [398]This learning unit facilitated interdisciplinary pain care, as all professionals in the chain of care conceptualised pain the same way, engaged patient the same way, and used the same terminology. This single learning unit was transdisciplinary in nature and had produced excellent results. The panel recommendations in respect of these issues follow in the next sections.

Statement 6: Pain and nociception outcomes should be explicit throughout the curriculum

On the face of it this statement should be common sense and good curriculum practice. Data from the document analysis found that it was not the case in contemporary curricula. The panel used this statement as an anchoring statement. Reference to pain and nociception reinforces statement 1 on the multidimensional nature of pain and gives impetus to statement 4 (clear learning goals). An explicit curriculum document provides clear guidance to educators, students and preceptors in respect of learning goals. The statement also addresses the finding in the document analysis that many outcomes were *implicit* and may or may not be interpreted to include pain and nociception.

Statement 7: Learners should participate in a foundational learning unit addressing the multidimensional nature of pain early in the program with contextually relevant learning outcomes distributed through the later learning units.

This statement is a direct recommendation on structuring pain curricula. Students should participate in a foundational learning unit early in the program, which addresses fundamentals such as anatomy and physiology, as well as the multi-dimensional nature of pain. This statement elaborates on statement 6. Foundational principles are revisited in a spiral of learning that becomes deeper and more complex with each visit. and contextualises pain and nociception to new patient populations and disorders as and when those populations and disorders are addressed in the curriculum. The intent is that a spiral curriculum [399] is applied. The statement requires that pan and nociception outcomes are not confined to a single learning unit, or year of study, but are continuously addressed and reinforced throughout the program. This prevents students, and lecturers, from

compartmentalising and confining the learning to that learning unit. This is an imperative, in that pain is ubiquitous, and diverse, and affects diverse populations.

This statement was a refinement of the first iteration: “Learners should participate in a foundational learning unit addressing pain and nociception education early in the program with contextually relevant learning outcomes distributed through the later learning units”. The term “pain and nociception” was replaced with “multi-dimensional nature of pain”, which is more universally used and is intended to include both pain and nociception as dimensions.

Statement 8: Educational programs should use milestones to track the attainment of pain learning outcomes at set points in the program.

This statement provided a method of reliably implementing statement 7. Milestones should be used throughout the program to ensure comprehensive coverage of content.

Statement 9: Exit level learners should participate in a learning unit aimed at consolidating knowledge and attributes relating to the multidimensional nature of pain.

This statement has multiple purposes. The interview data showed the student experience in workplace placements was inconsistent and may entrench harmful attitudes and the panellists testified to congruent experiences. Data from the document analysis also showed fragmentation and inconsistencies in the structure of pain teaching. The competence framework’s prime purpose is to prevent this, but with the inconsistency in workplace placements, to ensure uniform learning and attitude formation panellists felt a final learning unit was necessary. This would also scan for gaps, and address, any outcomes, or patient groups which had “fallen through the cracks” during the program. This final learning unit should be reflective in nature, to address their experiences in the workplace, and ensure proper attitude formation. The term “exit level learners” designates the participating students.

This statement was the second iteration, the first being: “Senior learners should participate in a pain management capstone learning unit. The term “senior learners” was considered too non-specific. In a one-year program such as the Higher certificate, who would be classified as a senior learner? Similarly, in a 4-year program such as the bachelor’s degrees, would “senior” be in the third year or fourth year. The term “exit level” was preferred for clarity. The term “capstone” was replaced as the panel felt milestones should be formative assessments, not summative, and a “capstone” learning unit risk being just another milestone. The term “multidimensional nature of pain” was inserted to describe the comprehensive nature of the learning unit.

7.3.4 Recommendations on the content and attributes of curriculum

In this session the panel was presented with the data from the initial data collection phases. The scoping review showed the pain typologies and available management therapies. The document analysis of curricula showed contemporary South African education focused on acute nociceptive pain. The educator interviews and the literature review articulated unmet needs, such as chronic pain. Diverse contexts, such as palliative care were emphasised in data as both a contemporary and future imperative but were absent in curricula. The question was, *should* they be represented? Are diverse pain types and contexts the responsibility of EMS to manage, and EMS education to prepare for? Another uncertainty related to interdisciplinary contact. Data from educator interviews suggested that EMS operates in a silo, with minimal interdisciplinary and transdisciplinary contact. Patients are handed over, following which EMS withdraws from further care. Expanding EMS roles to include pain in palliative care and chronic pain care might necessitate new competencies. The two questions posed to the panellists were *"What typologies of pain should EMC curricula be preparing graduates to manage; specifically what competencies are required for palliative care and chronic pain?"* as well as " *Considering current and future roles, should EMC pain curricula develop graduates as collaborators, or communicators?"* The following sections narrate panel deliberations.

As a rule, patients experiencing acute pain in palliative care will be transported to hospital, even if they prefer to remain at home and this was also expressed in the educator interviews. Leaving patients at home after treatment was considered "breaking rules". The panel discussed the pressure and anxiety experienced by PECPs on these cases. Any call reaching a dispatch centre is treated as an emergency until an in-person assessment can be made by a PECP. The PECP will be present in person, and may feel obliged to "do something", even if the presentation is not acutely life threatening. Training programs do not prepare PECPs for these encounters, nor to discharge on scene. Customary referral pathways are to take the patients to the ED, which are also not necessarily equipped to manage these cases. Speaking to the patients' physicians is not always possible.

Treating and discharging on scene may leave PECPs uncomfortable, a result of the rule breaking theme, as they may not feel supported if something goes wrong. Transport to hospital is an expectation, and also hands responsibility over, which treatment and on scene discharge does not. As in the educator interviews, money arose as a complex factor in treatment decisions. Panellists mentioned that private hospitals rely on PECPs transporting patients to hospital. However, one panellist described a model where patients are admitted to their own home under the care of the hospital and are visited by nurses twice per day. They are charged in-patient fees during this period. Ambulance services, and PECPs, can be called to these "home admissions".

A panellist with experience and expertise in healthcare regulation commented that the scope of practice of the profession does not allow patients to be treated and discharged at home. PECPs must either transport or provide no services and leave the patient at home. Secondly, allied health professions must apply to SAHPRA to have specific disorders and contexts added to authority to use a medicine and cannot use medicines for purposes outside that which has been authorised, even if it is an indication for that medicine. PECPs using medicines approved for acute pain, for palliative care, is a regulatory grey area. Role change is more complex than just developing the KSAs and may

require lobbying for regulatory change. Curricula do need to be forward looking though, and educators should probably start preparing students for this eventuality, with the caveat that these KSAs cannot be used till regulatory approval is granted.

The panel raised a concern that EMS still operates in isolation. Palliative medicine manages pain in an interdisciplinary team. A panellist commented that this was essential, as despite being a specialist pain physician she herself was sometimes unsure if patients were indeed in palliative care. Expertise from multiple disciplines was often needed to effectively treat patients. The EMS did not necessarily have access to this interdisciplinary expertise. Panellists agreed that a PECP providing care in palliative care should not do so independently, but within a system of care. If patients were not transported, it is essential that they are discharged into a referral system with a treatment plan. A system change was required, not merely development of KSAs.

Statement 10: Emergency care curricula should include competence in the management of acute pain in palliative care as contextually relevant to emergency services.

This statement specifically addresses acute pain, which can occur in palliative care. The statement neither requires on-scene discharge, nor transport. Management is foregrounded, ensuring that the statement remains about patient welfare. There is also an acknowledgement that PECPs may work in different systems, and that some may indeed work in a system which allows collaboration, consultation and referral to destinations other than an ED. The focus remains palliative care and allows the profession to decide on the content of practice.

Sentiment was different for chronic pain: PECPs should understand the fundamentals of chronic pain and its management; diagnostic criteria and typologies (primary chronic pain and nociplastic pain). PECPs should understand that acute and chronic pain could occur together and should focus on the management of acute-on-chronic pain. Knowledge of referral pathways was essential. The panel felt that making additional recommendations for chronic pain would unnecessarily complicate matters. Chronic pain was contained within the term “multidimensional nature of pain” and the statements already made were sufficient. The statement *“Emergency care curricula should develop an understanding of the multidimensional nature of chronic pain”* was thus redundant.

Aside from addressing acute pain in palliative care the panel was reluctant to be too prescriptive in specification of pain types. The panel feared that some types may be missed, and that recommendations would be treated as prescriptions. The panel’s stance was that the profession should deliberate further on this, and that typology specifications should be allowed to evolve in the specific learning outcomes.

Statement 11: Emergency care curricula should enable graduates as collaborators in interdisciplinary pain care.

Interdisciplinary collaboration was considered an essential competency. Implementing many of the statements above are dependent on collaboration, and this is a necessary, context free and

transferable skill. In broader pain care, treatment is interdisciplinary, and there is potential for PECPs to join these teams. Limiting pain and nociception care in emergency care to communication does not serve the broader aims and ideals. This also enabled potential future roles for PECPs in interdisciplinary pain care.

The original statement used the word “foster” instead of “enable”, which one of the panellists asked to be amended, as she felt the word placed too much responsibility on the curriculum. Curricula should create opportunity for learning but cannot guarantee it. The word enable was proposed, and the panel agreed to this amendment without the necessity of a re-vote.

7.4 Chapter Summary

The expert panel made recommendations on the integration of the competency framework into existing curricula. These recommendations can also be used to guide the writing of ILOs[30]. The discussions were congruent with many of the findings of the preceding stages of research. These were the use of roles instead of atomistic competencies, separation between the practice and educational fields and the fragmentation of and gaps in contemporary curricula.

The conflation of pain and nociception in the literature and the data was an important inaccuracy in the conceptual framework found in both the literature and the data. This conflation also enabled a biomedical view of practice, which could be changed by reframing the philosophy in terms of the multidimensional nature of pain.

The discussions highlighted multiple points, positive and negative. Significant points were the need for a community of practice to take ownership of the profession, and for this community to hold itself accountable. Educational and practice fields should recognise what the other has to offer and view themselves as part of this community. Management of pain and nociception was also not an isolated procedure, and if especially future roles are to advance, a systems thinking approach is necessary.

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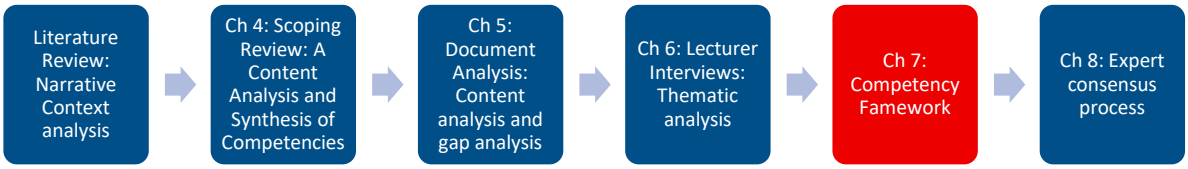
Chapter 8: Competency Framework and curriculum recommendations



8.1 Introduction

This chapter synthesises the competency framework, which is a main study output. The chapter begins with provisional frameworks, which were induced from the scoping review, and interviews with educators. These provisional frameworks are essentially a summary of the unmet needs and persistent problems of both teaching and practice of prehospital pain management, and a precis of their solutions.

8.2 Provisional Domains: Scoping Review

Table 28 shows the set of provisional competency domains induced from the scoping review, together with their definitions. The underlying codes for each domain are displayed in separate tables, followed by an explanation of their derivation. Underlying codes were ether direct, or indirect. Direct codes are explicit in the data and derived directly from text without interpretation. Indirect codes are not explicit in the data but are induced or inferred. They required interpretation and capture meanings and nuance which was not immediately obvious.

Table 28: Provisional Competency Domains Induced from the Scoping Review

No.	Provisional Competency Domains	Description
1	Assessment of Pain	Evaluation of the intensity, nature and location of a patient's pain using an appropriate assessment tool or process.
2	Application of Therapies	Selection and application of appropriate therapies to alleviate pain.
3	Effective Communication	Engaging in clear, dialogue with patients, other healthcare professionals or appropriate partners to ensure effective management of a patient's pain.
4	Contextual practice	Applying or adapting pain management therapies to the specific clinical, cultural, situational or environmental context of each patient.
5	Foundational Sciences	The sciences underpinning clinical pain management. These include anatomy, physiology and pharmacology.
6	Occupational and Practitioner Safety	The protocols, procedures or protective equipment which ensure physical safety and prevention of harm to practitioners.
7	Patient Safety	The protocols, procedures, practices and equipment which minimise risks to patients and prevent iatrogenic harm while providing effective pain management.

8.2.1 Provisional Domain 1: Assessment of pain

Table 29: Provisional Domain 1: Assessment of Pain

	Axial Codes	Description
K	1. Knowledge of multiple pain assessment scales	Describe the structure application of objective and behavioural pain assessment scales.
S	2. Apply multiple pain assessment scales	Use objective and subjective pain scales appropriately in context.
A	3. Acceptance of the subjectivity of Pain	Accept the personalised and individual experience of pain, and it's multidimensional nature.
	4. Empathy	Understanding the feelings of another.

Key: K: Knowledge; S: Skill; A: Attitude

Table 19 in Chapter 4 shows a range of behavioural/observational and objective tools. Cognitive[31] and psychomotor[32] access to multiple pain assessment tools allows for pain assessment in diverse patient populations and multiple pain typologies. Knowledge alone is not sufficient to perform clinical management [74] and attitudinal[33] codes are essential. The PECP should accept the results of the pain assessment in accordance with the multidimensional nature of pain [9], and display empathy during patient interactions. Empathy is essential for trust and confidence building. This is particularly true for behavioural/observational scales where patient behaviour is interpreted in a structured manner. Not all patients who experience pain will be able to self-report pain or use scales such as the NRS if they are innumerate. While PECP observation as a technique has risk of bias, in some situations it will be necessary to evaluate pain behavioural/observational tools. PECPs should develop empathetic awareness to be aware of pain subjectivity and their own cognitive biases.[34] This suggests that educational design incorporate opportunities for development of empathy *and* preservation of empathy during workplace practice.

8.2.2 Provisional Domain 2: Application of Therapies

Knowledge of therapies and patient conditions (K) is essential to make informed selections and apply pain strategies in diverse populations and contexts. [236, 239] Psychomotor skills are also necessary perform therapies and manipulate equipment. Pain management can be applied in strategies (S). Examples are; bridging analgesia [304, 357, 360], and multimodal analgesia [288, 289, 312, 352, 359], facilitate patient handling [258, 400], and in different dosing ranges (analgesic vs anaesthetic) [304, 347], Procedural Sedation and Analgesia (PSA). [346] Use of devices such as PCA[35] pumps [263, 310] require a technological capability (S). These were all direct codes.

[31] Represented by Knowledge (K)

[32] Represented by Skill (S)

[33] Represented by Attitude (A)

[34] Empathy mediates the appreciation of subjectivity, however, empathetic practitioners also require a pluralistic worldview i.e. they need to recognise and value multiple perspectives at a philosophical level.

[35] Patient Controlled Analgesia

Table 30: Provisional Domain: Application of Therapies

	Axial Codes	Description
K	1. Evaluation and Selection of Therapies	Matching therapies and their characteristics to pain management needs in context.
	2. Pain in diverse populations	Knowledge of the needs of diverse populations
	3. Therapy characteristics	The pharmacokinetics, pharmacodynamics, therapeutics of medicines and the characteristics of non-pharmacological therapies.
	4. Ethical frameworks	Structured approaches to decision making which balance benefit and harm, respect, patient autonomy, justice, ensure accountability and transparency and are culturally sensitive.
S	1. Procedure of therapy application	Key steps in applying a therapy that ensure safety and effectiveness.
	2. Pain Management Strategies	Formulate and execute a pain management plan.
	3. Patient engagement	Communicate and engage with patients about their healthcare.
	4. Technological capability	Integrate technology and devices into pain management.
	5. Obtaining consent	Fully informing patients about therapies and obtaining permission to manage pain.
A	1. Compassionate commitment	Consistently initiating and providing care, which is empathetic, respectful and supportive physically, emotionally, socially and spiritually.
	2. Empathy as a practice prerequisite	Understanding the feelings of another.
	3. Respect for patient autonomy.	Respect for the patients right to make fundamental decisions about their own healthcare.
	4. Commitment to integrity	Consistently adhering to moral and ethical principles.

Key: K: Knowledge; S: Skill; A: Attitude

Compassionate commitment (A) requires PECPs to consistently initiate therapy to a high standard. Ethical practice requires integration of all three code types. Knowledge of ethical frameworks (K) will be required for pain management. This is linked to respect for autonomy (A) and obtaining consent (S). Involvement of patients in their healthcare showed some direct evidence in the scoping review.[279] Empathy, again featured as an essential code which cannot be limited to one domain. The emergency situation may place PECPs in a position of disproportionate power, where their decisions are not questioned, meaning a commitment to professional integrity (A) is essential. Attitudinal codes were indirect.

8.2.3 Provisional Domain 3: Effective Communication

The scoping review generated the direct code “patient communication” (S) and the indirect code “interprofessional communication” (S) codes. Pain assessment is an exercise in communication, verbal for objective scales and non-verbal for behavioural scales, and links to Domain 2. The application of therapies also requires explanation of the technique. Patients value communication, and effective communication with patients and family members relieves anxiety and facilitates procedures.[278] This may take the form of calm, reassuring explanations, gentle speech, and addressing patient concerns.[279]

Table 31: Provisional Domain 3: Communication

	Codes	Description
K	No codes	-
S	Communicating with patients	Strategies and practices to effectively convey information, listen to concerns and build trusting relationships with patients.
	Interprofessional Communication	Interactions and information exchange between different healthcare professionals
A	No codes	-

Key: K: Knowledge; S: Skill; A: Attitude

Interprofessional communication can be a barrier[154] or enabler [164] Telemedicine inherently involves technology-mediated communication with consultants, usually physicians. [247, 290] In some jurisdictions, consultations with a medical authority are required before administering medicines, especially opioids. [243] The data did show some evidence of the necessity for effective handover in the ED. [271] There were no codes for knowledge and attitude.

8.2.4 Provisional Domain 4: Contextual Practice

Regulatory and legal considerations (K) and work in a physical context (S) were direct codes. The regulatory framework appeared to be the ultimate determinant of therapy in PEC. Regulating authorities authorise therapies and the control procedures to follow. Study therapies were restricted to those carrying regulatory approval (K), with the exception of FICB studies[275, 278, 279, 286, 293], and non-pharmacological therapies. [238, 287, 289 234, 240, 242, 255, 288] (excluding splinting [328]) Further regulatory requirements were completion of clinical documentation [309, 313, 346, 354, 364] including consent for procedures. [230, 275, 279] An important regulatory consideration was the requirement for medical authorisation in some jurisdictions. [235, 236, 243, 245, 247, 251, 258, 290, 338, 339]

Table 32 :Provisional Domain 4: Contextual Practice

	Codes	Description
K	1. Regulatory and legal considerations	The laws, rules and regulations governing practice in a jurisdiction and which make practice different to other jurisdictions.
S	1. Work in a physical context	The mode and context of operations (primary response, interfacility transfer, ground or air ambulance, urban or wilderness, civilian or military)
	2. Clinical Decision making and judgement	Evaluating and choosing the best course of action in pain management.
A	1. Cultural competence	Delivering effective, respectful and responsive pain management to patients from diverse cultural backgrounds.

Key: K: Knowledge; S: Skill; A: Attitude

Physical context codes (S) displayed generic and unique codes. Specific capabilities were often required in some modes and contexts. These were more pronounced in the unique wilderness and military environments. Military evidence showed changes to the use of NSAIDs based on bleeding risk [355] and the selection analgesics based on soldiers' need to continue fighting or rescue themselves.[269] Another contextual change was the selection of OTFC [36], a fentanyl preparation not requiring an IV line that can be

[36] Oral Transmucosal Fentanyl Citrate

used in combat environments. [266, 267, 269] Evidence from wilderness environments showed selection of route of administration to be crucial for practical application. The researchers regarded Entonox® preparations to be cumbersome , hampering operations, and more compact preparations methoxyflurane were preferred.[309] Adverse effects may also be pronounced, or risks amplified, in diverse environments. These codes show overlap with codes in application of therapies and selection and application of varied therapies in diverse environments is a function of Clinical Decision making and judgement (S), as an indirect code.

The need for cultural competence (A) was a direct code in the evidence for acupressure [238, 287, 289, 311], which is rooted in TCM[37], an Eastern knowledge tradition. All these authors attempted to explain acupressure in terms of western biomedicine, reconceptualising established eastern knowledge traditions to fit western (particularly North American) thought. This is a possible misappropriation of indigenous Chinese knowledge. Per definition, cultural competence is also inherent in pain expression, and links to pain assessment and the multidimensional nature of pain.

8.2.5 Provisional Domain 5: Foundational Sciences

Fundamental Sciences emerged as a key competency domain with essential direct and indirect codes. Fundamental sciences are axiomatic for any healthcare discipline. These sciences include Anatomy, Physiology, Pharmacology, and Pathology/Pathophysiology, each with numerous sub-codes. Some therapies required procedure specific anatomical knowledge; TENS [234, 240, 255, 288, 315, 319, 363], FICB[53, 239, 275, 278, 279, 310, 345],acupressure. [238, 287, 289 311, 314, 315, 363] and digital nerve block [298] as direct codes.

[37] Traditional Chinese Medicine

Table 33 : Provisional Domain 5: Fundamental Sciences

	Codes	Description
K	1. Foundational Anatomy a. Anatomical terms and positions b. Neuroanatomy and pain pathways. c. Great vessels d. Autonomic nervous system	Basic and essential knowledge of the structures of the human body and the relationships between them.
	2. Procedure specific anatomy.	Detailed and specialised knowledge of defined structures that enables the performance of medical procedures.
	3. Pharmacology a. Pharmacodynamics b. Pharmacokinetics c. Therapeutics	Knowledge of medicines and their effects on the body.
	4. Physiology	Normal functions of living organisms
	5. Pathology a. Pain pathology b. Specific disorders	The mechanisms and processes of disease.
	6. Multidimensional nature of pain	Pain involves sensory, physical, emotional, cognitive and social aspects.
S	7. Practical application of anatomy a. FICB b. TENS c. Digital block	The use of anatomical knowledge in the performance of a therapy.
	8. Clinical Pharmacology	The application of pharmacological principles in a clinical setting.
A	No codes	-

Key: K: Knowledge; S: Skill; A: Attitude.

Pharmacology generated the direct codes pharmacokinetics (K), pharmacodynamics (K) and therapeutics(K). Toxicology did not present as a code within the data, though much of the evidence recorded adverse events. Pharmacokinetics linked directly with the skills associated with the different routes of administration (cross referenced with contextual practice). This may also link with competencies linked to patient safety.

8.2.6 Provisional Domain 6: Occupational and Practitioner Safety

Codes related to practitioner safety emerged in some of the methoxyflurane evidence, which discusses safe use of the medicine in confined spaces. [313, 357] Safe occupational exposure for Methoxyflurane has not been established, but regular use of the vapouriser without supplemental oxygen appears safe. [241]Risk mitigation involves correct application of the vapouriser and coaching of patients in proper use, which cross references communication.

Table 34: Provisional domain: Occupational and Practitioner Safety

	Codes	Description
K	1. Knowledge of Work health and safety policy	Understanding guidelines and procedures which ensure a safe and healthy working environment.
	2. Risk of Abuse of medicines by PECPs	The risk of misuse or abuse of pain management therapies by PECPs.
S	1. Occupational Health and Safety procedures	Performing and adhering to guidelines and procedures which ensure a safe and healthy working environment.
	2. Risk assessment and mitigation	Recognising potential hazards which could harm practitioners and implementing strategies to minimise their impact.
A	Colleague supportiveness	Being helpful, encouraging and non-judgemental to other PECPs.

Key: K: Knowledge; S: Skill; A: Attitude

A theoretical risk to emerge, and thus an indirect code, was the potential for abuse of medicines by PECPs. [235, 246, 303] The scoping review did not explicitly look for evidence related to PECP abuse and addiction, and therefore the realised risk cannot be excluded on the basis of this review.

8.2.7: Provisional Domain 7: Patient Safety

Table 35: Provisional Domain 7: Patient Safety

	Codes	Description
K	1. Adverse events	Undesirable effects or experiences resulting from the use of medicines or medical devices.
S	1. Managing patient addiction, abuse, and drug tolerance	Recognising substance use issues, implementing appropriate pain management therapies, and providing ongoing support and monitoring.
	2. Managing adverse events	Responding effectively to undesirable effects or experiences resulting from the use of medicines or medical devices.
	3. Risk assessment and mitigation	Recognising potential hazards which could harm patients and implementing strategies to minimise their impact.
A	1. Responsible attitudes to medicines	Commitment to using medicines safely, effectively and ethically.
	2. Emotional effects of pain	Respond appropriately to the emotional responses patients have to pain.
	3. Non-judgemental outlook	Maintaining an impartial and accepting mindset without labelling patients.

Key: K: Knowledge; S: Skill; A: Attitude

Patient safety emerged as direct codes, in that safety was an objective of some of the studies and reported as ana outcome. [243, 249, 260, 269, 281, 299, 309, 310, 325, 332, 359, 360, 364] Risk assessment and mitigation features in indirect evidence, and a number of authors used physiological risk scoring systems and sedation monitoring systems to augment their application of pain therapies. These include the Ramsay Sedation Scale[333] , the Physiologic Severity Score (PSS)[291], Injury Severity Score (ISS) [272, 299], and Altered Mental Status Scale. [352, 358]

Risks, as indirect codes, included opioid tolerance [267], bleeding risks [312, 321], serotonin syndrome[321] , shock [307], excited delirium [351] and breast milk transfer of medicines. [364] The literature on Methoxyflurane contains references to nephrotoxicity in anaesthetic doses. [364]

Methoxyflurane has been offered as an alternative to opioids due to opioids' potential for abuse [346], though sparse evidence of abuse of methoxyflurane does exist. [304]The USA, from which the bulk of evidence emanated, has a persistent opioid abuse problem amongst the population [272], which may require the use of alternate therapies. [308] Aside from limited indirect evidence, pain management in patients who abuse substances, or who are tolerant to analgesics are not addressed in the evidence and represents a knowledge gap.

8.3 Provisional competency domains derived from educator interviews

Following interviews with educators, the six provisional competency domains (themes) emerged. The underlying code book is described next.

Table 36:Provisional competency codes induced from the educator interviews

	Provisional Competency Domains	Description
1	Practitioner Wellness	Maintain physical and mental health to ensure optimal performance and resilience in high stress environments.
2	Clinical Pain Practice	Implement techniques and practices to effectively manage and alleviate pain.
3	Foundational Sciences	The sciences underpinning clinical pain management. These include anatomy, physiology and pharmacology.
4	Duty of Care and Predisposition for Caring	Demonstrate a commitment to patient welfare, ethical practices, and a propensity to act on pain management need.
5	Managing Dilemmas	Navigate complex clinical, legislative and contextual challenges using judgement.
6	Professional Practice	Uphold accepted standards of practice, professional and moral integrity and a commitment to life-long learning in clinical pain management.

8.3.1 Provisional Domain 1: Clinical Pain Practice

The problem identification in Chapter 6 found malalignment between KSAs and the clinical need. Both enablers, and gaps in practice emerged during the interviews, and are displayed as codes below. Educators recognised unmet needs, as a category of KSAs which supported potential future roles for EMS, and these are included in the codes.

Educators recognised the need for multiple therapies (pharmacological and non-pharmacological) and strategies (multimodal therapy, procedural sedation and analgesia). Equipment preparation and manipulation as psychomotor skills emerged as enablers and barriers. PECPs appear comfortable managing acute nociceptive pain in adults, but struggle with children, unconscious patients, pain in labour and pain in a variety of modes, such as urgent care and critical care. A significant code was provision of emotional support to patients in pain. Pain management needed to be responsibly prioritised so as not to hamper more urgent interventions or place the patient at risk. As an attitude, PECPs must develop a predisposition to act, using the skills and equipment at hand. This predisposition needs to embrace community needs and preferences, in all their diversity, without imposing the practitioners own values and perspectives.

Table 37: Provisional Domain: Clinical Pain Practice

	Codes	Description
K	No codes	-
	1. Use comprehensive therapies and strategies a. Multimodal strategies b. Procedural Analgesia and sedation c. Non-pharmacological therapy. d. Pharmacological therapy	Effective application and integration of a variety of therapies into a pain management strategy.
	1. Assess pain in diverse situations a. Unconscious patients b. Substance abuse patients c. Paediatrics d. Obstetrics e. Pain in urgent care f. Critical Care Retrieval g. Mild Pain	Evaluate pain across different age, sex and/or gender, cultural, ethnic and demographic groups as well as modes of operations.
	2. Perform psychomotor skills	The ability to execute physical tasks requiring both cognitive and motor functions.
	3. Manage diverse pain presentations a. Manage mild and severe pain b. Unconscious patients c. Substance abuse patients d. Paediatrics e. Obstetrics f. Pain in urgent care g. Critical Care Retrieval h. Multiple pain typologies i. Mild pain	The ability to manage a range of pain types and severities.
	4. Judgement in prioritisation of therapies	Evaluate and rank therapy options based on their appropriateness and effectiveness for the patient's condition in context.
A	1. Predisposition to Act	The PECPs willingness to respond to a patient's pain.
	2. Acceptance of community needs	Recognition and respect for the diverse healthcare needs and cultural values of the community served.

Key: K: Knowledge; S: Skill; A: Attitude

The codes in this domain arose from response to the environment in which PECPs work. Practicing safely as a code stemmed from risk of violence PECPs may face in the community, especially as they carry medicines with recreational and street value. Managing community needs as a code stemmed from the frequent exposure of PECPs to non-emergency cases, who may be experiencing pain and discomfort without a medical emergency. This caused frustration amongst the educators as it often detracted from emergency work, however, transport to hospital and access to healthcare is a real need in South Africa as many do not have private transport. Acceptance of this need reduces

frustration and prevents the blurred role from hindering care. This attitudinal code links to the skill of managing mild pain and minor discomfort during these non-emergency calls.

8.3.2 Provisional Domain 2: Practitioner Wellness

Table 38: Provisional Domain: Practitioner Wellness

	Codes	Description
K	1. Recognising burnout and desensitisation	Understand the signs and symptoms of burnout and desensitisation.
	2. Recognising practitioner addiction	Describe the signs and symptoms of substance misuse and abuse by PECPs.
S	3. Accessing counselling	Identify when mental health support is needed and know how to seek counselling services.
A	No codes	-

Key: K: Knowledge; S: Skill; A: Attitude

The need for practitioner wellness as a competency domain stemmed from the perceived influence the "unwell practitioner" has on pain management. "Burnout"[38] and "Desensitisation" were commonly occurring codes. Educators were of the view that burnout and desensitisation to patient suffering impacted pain management in South Arica. This affected empathy and willingness to act. Some reasons were offered, including overwork and the relentless nature of the job, a perpetual lack of resources, unmanaged PTSD and a lack of managerial accountability leading to despair. Participant 18 mentioned societal desensitisation to human pain and suffering, brought on by social media, violent video games and the high level of inter-personal conflict in the country as a cause of desensitisation in PECPs. The effect on care is of a lack of empathy which leads to withholding analgesia. This was also perceived as unmanaged, with "the system" not seeing PECPs as humans with emotions, "*…who can hurt…"*, and a lack of access to emotional counselling or platforms to "*…off-load…"*. Practitioner addiction arose as a code, with educators describing substance abuse by PECPs, including abuse of authorised medicines such as Entonox, midazolam and morphine.

Prevalence of burnout amongst PECPs is estimated to be between 16% and 56% [401], and between 23% and 53% in South African PECPs.[402] Both of these studies showed a wide range of prevalence. The systematic review by Reardon et al [401] showed heterogeneity in burnout measurement and populations while the South African study measured different categories of burnout, each at a different prevalence. Burnout remains a complex, and multilayered phenomenon. Additional to

[38] Burnout is classified in the International Classification of Diseases 11th edition (ICD-11) as ".. *a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed"* and is characterised by feelings of energy depletion, job related negativism or cynicism and reduced professional efficacy. It is an occupational phenomenon, not a medical condition, and is related to an occupational context only.

World Health Organisation. 2019. Burn-out an "occupational phenomenon": International Classification of Diseases [Online]. Available: https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases [Accessed 02 December 2024].

those described by participants, contributary factors include uncontrolled environments, irregular and unpredictable hours, physical fatigue, risk of injury [401] and threats of violence. [403]

8.3.3 Provisional Domain 3: Foundational Sciences

Table 39:Provisional Domains: Foundational Sciences

	Codes	Description
K	1. Pain Anatomy	Basic and essential knowledge of the structures of the human body pertaining to the pain experience, and the relationships between them.
	2. Pain Physiology	Normal functions of the pain response.
	3. Multidimensional Nature of Pain	Pain involves sensory, physical, emotional, cognitive and social aspects.
	4. Psychology	Describe the fundamental principles of human behaviour and mental processes.
	5. Pharmacology	Knowledge of medicines and their effects on the body.
S	No codes	-
A	No codes	-

Key: K: Knowledge; S: Skill; A: Attitude

Foundational sciences are axiomatic to clinical pain management and produced primarily knowledge codes. Educators explicitly described the necessity for an understanding of anatomy, physiology, and pharmacology. Psychology emerged as a minor code and described as a gap in the curriculum as the subject was present in early PECP education but not in HEQSF align qualifications. Pharmacology also emerged as a minor code, contrasting the degree and diploma qualifications. The degree qualifications included pharmacology as a subject, and diploma qualifications did not. Educators expressed frustration with addressing pharmacology in the clinical subjects and would prefer having the subject in Diplomas. No skills (S) or attitudinal (A) codes were present.

8.3.4 Provisional Domain 4: Duty of Care and Predisposition for Caring.

The codes in this domain were implicit, but universal amongst participants. Almost all educators considered empathetic and holistic care essential to sufficient pain management. Empathy allows practitioners to understand the feelings and experiences of the patient (or at least accept them). Holistic care as a code arose as educators recognised pain expression as subjective and influenced by patients' lives which extended beyond the incident. Patients have physical, emotional and social needs, including a need for social support systems. Educators recognised that this was not enough on its own – that PECPs also needed to act on these attitudes – and the code 'caring' emerged from this. Emotional support may be seen as a caring, but is included as its own skills code, as data from all phases, including the literature review, indicates PECPs have a predisposition for being disconnected.

Table 40: Provisional Domain: Duty of Care and Predisportion for Caring

	Codes	Description
K	-	-
S	1. Caring	The behaviours and interventions undertaken to enact the attitudes of empathy and holistic care.
	2. Providing Emotional Support	The ability to offer empathy, understanding and reassurance to patients.
A	3. Pain management as a moral responsibility	Acceptance of the ethical obligation to alleviate pain and suffering.
	4. Empathy	Understand the feelings of another.
	5. Holistic care.	Consider the physical, emotional and social needs of the patient during pain management.

Key: K: Knowledge; S: Skill; A: Attitude

The code 'moral responsibility' emerged from the educators perception that PECPs often did not believe pain management was always their responsibility. Another perception was that PECPs acted as gatekeepers, deciding which pain would be treated and which not, based on their own beliefs and biases. A perception was that only the most severe pain would be treated, with an opioid, and the rest left alone. Categories of PECP who could not access opioids might defer pain management to those that did or not provide care at all. Once PECPs accept that pain management is their responsibility as a moral endeavour, and have epistemological access to therapies not requiring opioids, they can "do something", using these skills. There were no knowledge (K) codes present.

8.3.5 Provisional Domain 5: Managing Dilemmas

This domain arose as a solution to the educators' perceptions of the problems in pain management. Over and above the micro level factors present in the clinical interaction, meso and macro factors influenced pain management.

Practitioners and their education may solve many of the micro-level issues directly, however, legislative and policy barriers, or health systems barriers can only be coped with, not directly altered. Educators spoke of extensive systems dysfunction which hampered care, an overarching, multifaceted dysfunction in logistics and management which colluded together to form barriers. Resource constraints may arise from these barriers, or simply be inherent in the environment, and PECPs need resilience, innovation and creative thinking skills to overcome these limitations.

Table 41: Provisional Domain: Ethical and dilemma management

	Codes	Description
K	-	
S	1. Providing care in resource constrained environments	Navigating the operational and ethical challenges of delivering pain management with limited resources.
	2. Providing care in a restrictive policy environment.	Navigating the challenges posed by regulations, policies or procedures which may restrict pain management.
A	3. Resilience in systemic dysfunction	The maintenance of a positive and adaptive mindset despite challenges and insufficiencies
	4. Ethical practice	A commitment to integrity, honesty and fairness, and a predisposition to act ethically.

Key: K: Knowledge; S: Skill; A: Attitude

Policy restrictions may also require adaptions to therapies, and the use of alternate therapies to manage pain and nociception. The attitudinal codes arose from the moral need to maintain ethical care in an environment which does not necessarily enable it. Educators described PECPs who have *"...lost hope…"* in the face of systemic dysfunction, and their care deteriorates, or themselves may become part of the problem. Attributes of resilience, and a belief in ethical practice may cause PECPs to always act in the best interests of patients. No knowledge (K) codes were present.

8.3.6 Provisional Domain 6 Professional Practice

Table 42: Provisional Domain: Professional Practice

	Codes	Description
K	No codes	-
S	1. Scholarly practice	The integration of theory, scientific evidence and practice-based knowledge to manage pain.
	2. Interprofessional communication	Interactions and information exchange between different healthcare professionals
	3. Communication with patients	Strategies and practices to effectively convey information, listen to concerns and build trusting relationships with patients.
A	4. Life-long Learning	A commitment to continuous personal and professional development.

Key: K: Knowledge; S: Skill; A: Attitude

This domain underpins all professional practice by PECPs. These codes were formed in response to the challenges experienced in pain management. Scholarly practice as a code stemmed from either the lack of appropriate guidelines, or misunderstandings in guidelines. Educators recognised that PEC was in transition as a profession, and that much scientific evidence not from the PEC context, requiring interpretation. Evidence-based practice thus requires scholarship and a predisposition for life-long learning, as evidence, and guidelines changed.

Communication arose in two codes: patient communication and interprofessional communication. Communication with patients is essential for assessment, and management of pain. Interprofessional communication refers to both collaboration with other professionals, and education of professionals about PEC and qualification structures, as communication was showed to be a barrier to pain management. No knowledge codes were present.

8.4 The Competency Framework

This framework does not describe an entire profession, only one aspect of it, and should not inadvertently restrict or preclude other aspects of the practice of PEC. Secondly, the framework is generic, intended to provide guidance for multiple different programs, offered by autonomous institutions. The framework offers curriculum designers the freedom to adapt and rearrange the domain elements to fit their programs. Competencies are not intended as learning outcomes to be cut and paste into curricula, but as statements of practice performance, to guide outcome writing. Curriculum designers still need to do due diligence in respect of content and hold the discussions and debates necessary to design a curriculum.

Each domain[39] is divided into sub-domains containing enabling competencies which integrate knowledge, skills and attitudes. As far as possible, enabling competencies maintain thematic consistency with the sub-domain and domain. Domains are interdependent, and following from the conception of competence described in Chapter 1, some domain overlap is visible in the enabling competencies.

The framework is displayed in Figure *14* and Table 43 shows the descriptions of each domain. The following sections elaborate on each domain and show the enabling competencies. The representative diagram, with the domain Clinical Pain Praxis at the centre, to show the domains centrality, level of integration with the other domains, and primacy. The supporting domains are arranged as a "roundtable", to show their influence on Clinical Pain Praxis, and their equality with the other domains.

[39] These domains are presented for transparency and accountability for the framework development process. This may be of value in building confidence in the rigour of the synthesis.

Figure 14: Competency Framework for the management of pain and nociception by PECPs

Table 43: Descriptions of Framework Domains

Domain	Description
1. Clinical Nociceptive and Pain Praxis	Implementing evidence-based techniques and moral practices to manage nociception and alleviate pain safely and effectively, ensuring patient comfort and optimising clinical outcomes.
2. Foundational Knowledge	The sciences underpinning clinical pain management. These include anatomy, physiology and pharmacology.
3. Practitioner safety and Wellness	Maintaining physical and mental health to ensure optimal performance and resilience in high stress environments and the protocols, procedures or protective equipment which ensure physical safety and prevention of harm to practitioners.
4. Communication and Collaboration	The skills and abilities required to effectively interact with patients, their families, and other healthcare professionals to ensure effective management of a patient's pain.
5. Ethical Pain Practice	A commitment to integrity, honesty and fairness, and a predisposition to act ethically in the management of pain.
6. Duty of Care and Predisposition for Caring	Demonstrating a commitment to patient welfare, ethical practices, and a propensity to act on pain management need.
7. Professional Development and Evidence-Based Practice.	The continuous pursuit of knowledge, integration of the latest research into clinical practice, and fostering a culture of respectful critique and community to ensure ongoing professional growth and excellence in patient care.

8.4.1 Domain 1: Clinical Nociceptive and Pain Praxis

Clinical Nociceptive and Pain Praxis is the central domain of the framework and directly integrates the pain management and assessment domains from the two provisional frameworks. Positioning clinical nociceptive and pain praxis at the centre of Figure *14* underscores the primacy of this domain and emphasises the framework's patient-oriented focus. This domain is the most integrative of the domains and enabling competencies overlap with other domains to enable patient-centred pain care.

The use of the term "nociceptive" stems from recommendations of the expert panel. The conflation between the concepts of pain and nociception was considered a barrier to effective care and education. Experts opined that conflating the two concepts results in a real-world foregrounding of nociception, to the neglect of pain, even though the label assigned is 'pain management'. Nociception is the "… neural process of encoding noxious stimuli." [395], which can be managed using pharmacology (such as local anaesthetics). As previously mentioned, PEC predominantly manages nociceptive pain. This potentially has led to conflation of the two concepts under the label of "pain". The problem is that labelling pain and nociception under a single term risk restricting management to nociceptive pain and a reliance on pharmacology. The literature described in Chapter 2 and the data collected in Chapters 4-6 give credence to this. PECPs seem to have difficulty with the emotions resulting from the conscious perception of nociception i.e. pain, as well as with non-nociceptive pain. Thus, the recommendation that the separateness is made explicit.

Table 44: Sub-domains and Enabling Competencies for Clinical Nociceptive and Pain Practice

Clinical Nociceptive and Pain Praxis	
Sub-domain	Enabling competencies
Assessment of pain	• Accept the personalised and individual experience of pain, and its multidimensional nature • Utilise a variety of validated pain assessment tools to evaluate patients' pain. • Gather detailed patient history and perform physical examinations to differentiate pain typologies and inform treatment and disposition plans.
Application of nociception and pain therapies	• Integrate therapies, technologies and devices into pain and nociception management strategies. • Devise and implement therapy strategies for managing pain and nociception in the PEC context, including monomodal and multimodal strategies, procedural and bridging analgesia. • Perform therapeutic procedures using proper technique and ensuring patient safety. • Tailor pain and nociception management strategies to the specific needs and preferences of diverse individuals, different typologies and levels of pain severity. • Administer pain medicines safely and effectively, adhering to guidelines and protocols to minimise risks and optimise patient outcomes.
Compassionate patient care.	• Accept and serve patient and community needs. • Demonstrate predisposition to act, in the best interests of those in care. • Manage the emotional effects of pain, displaying empathy and adopting a non-judgmental attitude during patient care. • Demonstrate empathetic communication skills, actively listening to patients' concerns and providing emotional support throughout the pain and nociception management process. • Advocate for patients' needs and preferences.
Contextual practice	• Explain the impact of cultural, legal, and regulatory factors on the assessment and management of pain and nociception. • Adhere to legal and regulatory frameworks during the management of pain and nociception. • Provide sufficient and safe care within the physical context of operations, adapting pain management practices to suit diverse clinical settings and patient populations • Adapt pain management practices to suit diverse clinical settings and patient populations, ensuring effective care delivery in various contexts. • Respect the cultural backgrounds and beliefs of patients display cultural competence during patient care. • Adhere to standards and procedures of occupational safety during the application of therapy.
Providing care in resource-constrained environments.	• Demonstrate resourcefulness and adaptability in managing pain and nociception in environments with limited resources. • Prioritise patient needs and make informed decisions to optimise care delivery in resource-constrained settings. • Employ problem-solving strategies to overcome challenges and barriers to effective pain and nociception management in resource-limited environments
Patient Safety	• Display a responsible attitude to medicines and control medicines according to laws, regulations and policies. • Apply validated risk assessment and monitoring tools. • Identify potential medicine related hazards and implement strategies to mitigate patient risks. • Adapt management strategies in consideration of patient addiction, substance abuse and tolerance. • Adhere to established safety protocols and guidelines to prevent adverse events and ensure safe delivery of pain management care.
Clinical Decision making and Judgement.	• Utilise critical thinking and problem-solving skills to make informed clinical decisions when managing pain and nociception. • Demonstrate ethical decision-making in all aspects of pain and nociception management, ensuring actions align with professional standards and patient welfare.

The term “praxis” replaced the original term “practice”. What was required of PECPs was a deeper and more holistic integration of KSAs, not merely performing procedures, such as in practice, but also being reflexive. Praxis refers to action and “doing” – the exercise of skill or science in the real world. Praxis is the bridge between theoretical constructs learned on campuses and that which professionals do every day. [404] It is action informed by skill and knowledge. Praxis allows “…acting wisely and prudently…”[405] in indeterminate and unknown situations. Praxis links to intentions and values, as well as the KSAs of a profession, with the aim of producing “…morally committed action…”, for the betterment of humankind. [405]. There is an interrogation of past experiences, and critical reflection, and a search for alternatives. Praxis embodies a practical wisdom, and requires contextual integration of knowledge, skills and attitudes, in a moral and ethical manner, which ultimately exceeds the individual KSAs. [405]

The performance of real-world services through the attribute of praxis ultimately makes people’s (patient’s) lives better. Praxis is demonstrated during action, thus it is bound by context. Praxis dovetails directly with the conception of competence described in Chapter 2. Praxis is appropriate in the domain name, to denote the requirement for PECPs to integrate KSAs in a moral, ethical and compassionate manner, to benefit patients.

8.4.2 Domain 2: Foundational Sciences

This domain is axiomatic to healthcare and an essential component of the framework. The domain encompasses essential scientific knowledge underpinning pain management practice. The domain equips PECPs with the scientific foundation necessary to understand, assess and manage pain and nociception comprehensively and compassionately.

Table 45: Sub-domains and Enabling Competencies for Foundational Sciences

Foundational Sciences. This domain contains the science underpinning pain practice	
Sub-domain	Enabling competencies
Anatomy	• Apply knowledge of human anatomical structures relevant to pain and nociception, including the nervous system, musculoskeletal system, and major organs, to clinical practice. • Explain how the body's homeostatic mechanisms are affected by pain and nociception and how they influence management strategies.
Physiology	• Apply a thorough understanding of the physiological mechanisms underlying pain and nociception, including, pain pathways, and the body's response to pain • Apply pain theories and models to the management of pain and nociception. • Discuss the complex, multidimensional nature of pain, including its sensory, emotional, cognitive, and social components. • Use scientific terminology for discussing pain and nociception

Table 45: Sub-domains and *E*nabling *C*ompetencies for Foundational Sciences (continued)

Foundational Sciences continued	
Pathophysiology	• Differentiate the mechanisms of acute and chronic pain. • Explain the pathophysiology of nociceptive, nociplastic and neuropathic pain presentations. • Explain how major disease processes contribute to pain and how they influence pain management approaches
Pharmacology	• Differentiate the major classes of analgesic medicines • Explain analgesic pharmacokinetics and pharmacodynamics, including mechanisms of action, side effects, and interactions. • Differentiate the routes of administration of analgesic medicines.
Psychology	• Recognise the psychological aspects of pain, including the impact of stress, anxiety, and depression on pain perception and management

8.4.4 Domain 3: Practitioner Wellness and Safety

This domain is not located directly in the therapeutic pathway, but the data shows it appear to have a significant effect on real-world care provided by PECPs. The data also showed exposure to occupational hazards, which this domain addresses. The enabling competencies available in this domain are transferable beyond pain and nociception management. They are included here because of the effect on pain care, and they appear imperative to competence in managing pain and nociception.

Table 46: Sub-domains and enabling competencies forPractitioner Wellness and Safety

Practitioner wellness and safety	
Sub-domain	Enabling competencies
Occupational and practitioner safety	• Identify occupational hazards in respect of pain management therapies • Explain the proper and safe application of analgesic gases. • Adhere to Occupational Health and Safety policies pertinent to prehospital practice.
Burnout and desensitisation	• Recognise the signs of occupational burnout in self and others and their impact on personal wellbeing and patient care. • Reflect on professional experiences and emotional responses. • Articulate the available resources, support systems and procedures for accessing counselling for burnout. • Maintain professional boundaries, ensuring confidentiality and professional ethics when supporting colleagues. • Collaborate in a team environment to promote mutual well-being and resilience against burnout.
Practitioner Addiction	• Identify signs of addiction in oneself and others • Demonstrate support and empathy for work colleagues suffering drug addiction and encourage them to seek professional help. • Adhere to organisational policies and procedures in respect of addiction. • Articulate the available resources and support systems for addiction and procedures for accessing counselling.

8.4.5 Domain 4: Communication and Collaboration

Like Practitioner Wellness and Safety, this domain extends beyond pain management. It emerged from the essential communication in pain assessment and patient interaction, highlighting issues in patient and interprofessional communication. Data showed that poor communication hampers pain care and negatively impacts overall service delivery. Effective communication is crucial for managing pain and nociception and is essential for competence.

Table 47: Sub-domains and Enabling Competencies for Communication and Collaboration

Communication and Collaboration	
Sub-domain	Enabling competencies
Communication with patients	• Communicate respectfully and effectively with patients from diverse cultural, linguistic and socioeconomic backgrounds. • Adapt communication strategies to patients' age, developmental and cognitively levels. • Use non-verbal communication techniques such as body language, eye contact and facial expressions to enhance patient interactions • Effectively communicate with parents and significant others, providing reassurance, information, and support regarding the patient's pain management. • Seek and incorporate feedback from patients and colleagues to continuously improve communication skills and patient care practices. • Promotes a patient-centred approach by involving patients and their families in the communication and collaboration process.
Interprofessional communication and collaboration	• Communicates respectfully, clearly and accurately with direct colleagues, superiors, subordinates, and colleagues from related professions. • Work collaboratively within a multidisciplinary team, contributing to shared goals and patient care plans. • Value diverse perspectives and expertise within the healthcare team. • Manage and resolve conflicts within the team constructively. • Provide and receive feedback in a manner that promotes personal and professional growth. • Ensure accurate and thorough documentation and handover of patient information to facilitate continuity of care and team communication. • Participate in interprofessional education and training opportunities to enhance communication skills and understanding of other professions' roles. • Demonstrate leadership and mentorship abilities to guide and support colleagues in their professional development and practice. • Adhere to ethical standards and maintain confidentiality in interprofessional communications. • Adapt communication styles and approaches to suit varied professional contexts and team dynamics. • Engages in collaborative decision-making processes to ensure comprehensive patient care. • Fosters a culture of mutual respect and trust within the team to enhance collaboration. • Utilises technology and digital tools effectively to support interprofessional communication and collaboration.

The term 'collaboration' was not in the original iteration of the framework, as collaboration did not clearly emerge as a necessity in the empirical data. Educators participating in the interviews showed an aspiration for closer collaboration with other healthcare providers, and greater participation in the healthcare system beyond mere unidirectional transport to an ED. However, there was no clear definition of the structure nor extent of this participation. Educators were also uncertain as to the nature of future roles, and to what extent any inter-professional collaboration would take place, if at all.

Pain management in broader healthcare shows a trend toward inter-disciplinary management[123], and the IASP has designed curricula to enable collaboration.[122, 124] The potential need for collaboration as a competency was presented to the expert panel for discussion (Chapter 7). The expert panel affirmed the need for collaboration as a competency, not just between PEC and other professions, but to enable community of practice, professional development and enhanced patient care *within* the PEC profession. Based on input from the expert panel, collaboration was added to the domain of communication, together with enabling competencies.

8.4.6 Domain 5: Duty of Care and Predisposition for Caring

Domain 5 is primarily attitudinal. The data showed that PECPs may struggle with enabling attitudes, and that on occasion, even if they possess the knowledge and skill, may still sub-optimally, or even omit, pain and nociception management. Negatively influencing factors may include mis-prioritisation of patient care, misconceptions of patient needs, organisation or professional culture, subjectivity of the pain experience and beliefs of professional role. Like domains three and four, this domain is transferable to other professional tasks.

Table 48: Sub-domains and enabling competencies for Duty of Care and Predisposition for Caring

Duty of Care and Predisposition for Caring	
Sub-domain	Enabling competencies
Altruism	• Prioritise patient needs and well-being above personal or organisational interests.
Caring	• Respect and respond to individual patient needs and values. • Respond to patients' physical and emotional needs.
Compassionate Commitment	• Offer emotional support to patients and their families. • Show compassion for the patient's experience. • Show commitment to excellence and continuous learning and improvement. • Provide emotional support to patients experiencing pain, using effective communication and empathy.
Empathy and holistic care	• Use active listening to communicate and gain understanding of the patient's emotions and perspectives.
Moral Responsibility	• Make ethical decisions and align actions to professional standards and accepted moral principles. • Advocate for patient rights and autonomy. • Uphold integrity and accountability in professional practice.

8.4.7 Domain 6: Ethical Practice

Another transferable domain, Ethical practice underpins most actions in healthcare, and pain and nociception management. The enabling competencies extend beyond theoretical knowledge of ethical principles. Domains 5 and 6 are related, but where Domain 5 positions pain and nociception management as a professional obligation, Domain 6 positions it as a moral obligation. It is an obligation in both theory and practice, and Domain 6 doesn't only require knowledge of ethics, but the practice of ethical conduct in building resilience and agency against some of the barriers to practice emerging in the data. These include unethical conduct by practitioners and managers, negative influences of material profit and the challenges resulting from resource constrained environments.

Table 49: Sub-domains and enabling competencies for Ethical Pain Practice

Ethical Pain Practice	
Sub-domain	Enabling competencies
Ethical Practice Adherence	• Apply ethical the ethical principles of beneficence, non-maleficence, autonomy, and justice in clinical practice • Adhere to professional ethical standards and guidelines. • Utilise ethical decision-making frameworks to resolve complex clinical and ethical dilemmas.
Patient Autonomy	• Respect and uphold patients' rights to make informed decisions about their care, providing all necessary information and support. • Ensure patients provide informed consent for all treatments and interventions, explaining risks, benefits, and alternatives clearly and comprehensively. • Advocate for patients' preferences and choices, ensuring their voices are heard and respected in the decision-making process
Resilience in Systemic Dysfunction	• Demonstrate resilience and adaptability when working within systems experiencing dysfunction and maintain high standards of care despite challenges. • Identify and address systemic issues that impact patient care, working collaboratively to find solutions and improve system functionality. • Maintain professionalism and ethical behaviour in the face of systemic dysfunction to prioritise patient care. • Advocate for systemic changes that enhance patient care and professional practice, participating in initiatives and discussions aimed at improving healthcare systems

8.4.8 Domain 7: Professional Development and Evidence-Based Practice

This domain involves the continuous pursuit of knowledge and evidence-based practice. This domain emphasises the importance of staying current with the latest research and integrating new findings into clinical practice. The data showed that not all PECPs maintain their KSAs, and doing so improves

practice. Some PECPs may have experienced difficulty interpreting and applying guidelines or contextualising recommendations. Professional Development and Evidence-Based Practice also encompasses debate and respectful critique of practice and fostering a community of practice. Given the power of mentorship and the relationships with clinicians, this is essential. While not the intent of this framework, it also means contributing to the body of knowledge through research. Putting all these elements together, the aim of the domain is for professionals to continuously develop, extending beyond the minimum competence they displayed on graduation. This domain is also transferable to other aspects of practice.

Table 50: Sub-domains and enabling competencies for Professional Development and Evidence-based Practice.

Professional Practice	
Evidence-based practice	• Describe research methodologies and appropriately appraise scientific literature or guidelines to inform clinical practice. • Apply the best available evidence to clinical decision-making, ensuring that patient care is based on current and relevant research findings. • Integrate clinical expertise with patient values and preferences to provide individualised pain and nociception management plans. • Apply evidence-based pain and nociception management techniques and therapies
Life-long learning	• Demonstrate a commitment to continuous professional development by engaging in ongoing education and training related to pain management. • Engage in reflective practice to evaluate personal performance and identify areas for improvement and growth. • Keep up to date with advances in pain management techniques, technologies, and best practices through regular review of professional literature and participation in relevant professional activities. • Participate in professional organisations and networks to stay informed about the latest developments in the field.
Community of Practice	• Engage in respectful debate and critique of practice to foster a culture of continuous improvement. • Contribute to a community of practice by sharing knowledge, experiences, and best practices with colleagues. • Participate in peer review processes to ensure the quality and relevance of clinical practice. • Promote a culture of inquiry and innovation within the healthcare team. • Encourage and support colleagues in their professional development and evidence-based practice efforts

8.5 Ecological pain and nociception management

A significant attribute of the competence framework is the distribution of the competencies across the ecological levels described by Bronfenbrenner [149]. The development of the framework shows that effectively managing pain and nociception is influenced by complex interactions between the patient, PECP and environment. [103] Competence beyond the micro-level clinical interaction is required and the framework makes allowance for that.

Patient assessment and management occurs at the microsystem, but even within this, influences such as the relationship between the PECP, patients and their families are significant. Mesosystems include how PECPs enact policies or respond to systemic constraints are addressed as well as the relationship between the EMS and ED staff. Exosystem influences include EMS systems constraints (or enablers), and the effect of policy on management, such as the requirement to transport patients to hospital, or obtaining authorisation for some therapies. Macrosystem influences include regulatory authorisation for categories of PECP to use specific therapies.

The Domain Clinical Pain Practice mostly occupies the micro-level of PECP-patient interaction, however the need for community orientated attitudes occupy the exo-system. Foundational Sciences occupy the microsystem, however, the psychological competencies providing emotional support may require insight into matters occupying a higher system, if these are causing the patient distress. Practitioner Wellness and safety require KSAs spanning the exosystem and macrosystem if policies and legislation are to be understood and applied. The causes of burnout and desensitisation may result from micro, meso and exosystem stressors, and accessing counselling is an exosystem spill. While the Communication domain is primarily a microsystem competency, managing meso and exosystem stressors, such as ED staff not understanding the legislation and policies which govern PECP's capabilities, may go some way in improving communication. The Domains Duty of Care and Predisposition for Caring and Ethical Practice may also be primarily microsystem competency domains, however, ethical guidelines and frameworks are themselves exo or macrosystem entities, and building resilience may involve insight into and demonstrating agency in exosystem and macrosystem problems. The domain scholarly practice is primarily a microsystem domain, which was developed in partial response to difficulty interpreting a regulatory practice guideline, a macrosystem document.

As patient care and clinical practice should be holistic, so should the competencies , and the enabling curricula. Competencies and curricula which focus too narrowly on clinical medicine and the resulting practitioner-patient interaction risk being incomplete, and contributing to the problems described in Chapters 1 and 2. This framework attempts to redress that, following the criticality of the previous chapters.

8.6 Chapter Summary

This chapter developed and articulated the competency framework, which is a one of the major outputs of the research. The framework is a synthesis of provisional frameworks derived from the

scoping review and interviews with educators. The framework consists of seven domains of competence;

1. Clinical Nociceptive and Pain Praxis
2. Foundational Sciences
3. Practitioner Wellness and Safety
4. Communication
5. Duty of Care and Predisposition for Caring
6. Ethical Practice, and,
7. Scholarly Practice

These domains are composed of thematic sub-domains and enabling competencies, which view competence, and the underpinning KSAs ecologically. In so doing they enable holistic description of competence and allow for comprehensive practice and curriculum design.

Chapter 9: Discussion, Limitations and Future Research

9.1 Introduction

This thesis aimed to develop a competency framework for designing contextually relevant pain management curricula in South African Prehospital Emergency Care (PEC) education. These competencies could be used for stand-alone pain management courses to bridge graduate practice, however, the primary goal was to integrate them into existing PEC programs. This poses implementation challenges, as pain management is not the sole focus of PEC curricula, and these competencies would need to coexist with others. Additionally, integrating these competencies into diverse curricula offered by autonomous HEIs would require a specific plan or recommendations for independent curriculum designers, all of which remains their prerogative and exceeds the scope of this study. The value proposition of this study for pain management stakeholders is derived from its objectives:

1. To explore and map the evidence for pain management therapies applied by prehospital emergency care providers, as a basis for identifying competencies.
2. To explore the contemporaneous curricula and approach to PEC pain management education in South Africa.
3. To describe the competencies required for comprehensive, appropriate, and sufficient pain management practice.
4. To make recommendations for the teaching of pain and nociception management competencies into prehospital emergency care curricula.

A four-phase research process was undertaken in pursuit of these objectives. Following a narrative literature review of pain management discourse, an extensive scoping review of therapies mapped the evidence base for the application of pain management therapies by PECPs. This described the tasks and summarised contexts of practice beyond local contexts to infer global best practices and knowledge gaps. The scoping review sketched a broad picture of therapy application. By catalysing the usual scoping review methodologies [197, 198], through a reflexive thematic analysis [201] of its findings, the knowledge, skills and attitudes necessary for the application of the therapies were induced. These were presented as provisional competencies.

The research was originally undertaken to develop competencies in South African PECPs and improve South African education. The medicines formulary and procedures list authorised for use in South Africa[58] overlaps some of the therapies found in the scoping review; i.e. splinting/traction splinting, ice, methoxyflurane, Entonox™, paracetamol, ibuprofen, ketamine, morphine and fentanyl. The scoping review found many more therapies to be in use worldwide than these. It is important to evaluate these additional therapies, and include relevant KSAs in the competency framework to avoid a parochial outlook on curriculum. It may not be appropriate to limit professional capabilities and education to narrow regulatory prescript. It was thus appropriate to explore beyond regulatory

prescript, and include competencies which would broaden professional capabilities beyond local context.

The second phase used Content Analysis [205] to evaluate the key content and concepts in contemporary South African PEC curricula, and to explore the relationships between phenomena. Curriculum mapping was used to show the contemporaneous extent and structure of pain learning and teaching. This description of the content, structure, gaps and omissions of the explicit curriculum added to the problem analysis of pain management practice in South Africa and informed the formulation of curriculum implementation recommendations for the emergency care and related professions.

In phase three, interviews with educators had a threefold purpose: explore educators' perceptions of practice and it's problems; explore the barriers and enablers to pain management education in PEC, and to obtain knowledge broker views on requisite current and future Knowledge, Skills and Attitudes (KSAs). Inductive thematic analysis [201] of this data was used to synthesise another set of provisional competencies.

In phase four, the two sets of provisional competencies were consolidated to form a draft framework (without avoidable redundancy). This draft framework and emerging dilemmas (from insufficient evidence) was presented to an expert panel for individual critique, group discussion and input. The second task of the expert panel discussion was to make expert consensus recommendations for the implementation of the competency framework in PEC curricula. To comment on the framework the expert panel considered summary information from the literature review and relevant primary data from the scoping review and interviews. To make curriculum implementation recommendations, the experts drew on primary data from the document analysis. The expert panel discussion was chosen over the Delphi method as it allowed debate and dialogue between experts from a variety of disciplines, producing rich data in an area where little is known. [221] In the Delphi method, participants never meet, and do not produce discussion. The expert panel allowed thematic analysis in addition to the generation of statements, which would not have been possible with the Delphi method, and resulted in richer research. This research was also not limited by logistics, and there was no need for the expedience of a Delphi method, as all participants were able to meet face-to-face. [223] The expert panel was also chosen over Nominal Group Technique (NGT), as NGT requires participants to independently generate ideas in response to questions. [223] In this instance, they would not have had the benefit of novel findings generated from the prior research phases. The very 'richness' stemming from the multidisciplinary nature of the panel may have been negated, as these experts may not have had personal experience of the findings presented. Limiting the panel to experts likely to have personal experience of the findings, i.e. PEC educators, would again negate the rich discussion as they may not bring the external insights afforded by experts from other health professions.

The following sections summarise and discuss the aggregated findings of the research and offer a self-critique of the competence framework. The discussion follows the chronological sequence of the data collection, beginning with the narrative literature review and ending with the expert panel.

9.2 Disproportionality in Evidence Typology, Context and Coverage

The narrative literature review (Chapter 2) highlighted several gaps and attributes in the literature which align to findings in the data. The PEC literature documents errors and deficits of practice, such as failure to assess pain[42, 43, 150], or manage pain. These may stem from knowledge[151, 158] , skills [154 44] or attitudinal[68] gaps. Beliefs and perceptions[68 68, 156, 158] - both rational and irrational - of PECPs in respect of pain management play a pivotal role in application of therapies. Disproportionality appears to be a feature of the body of literature; more severe pain is more often managed than milder pain [160] and pain from trauma receives greater emphasis in practice[150]. A major area of disproportionality is amongst patient groupings, with pain in younger adults being managed, and researched, more often than pain in diverse groupings, such as paediatrics and infants[153, 164 68], older adults[160, 168] and females. [163, 166] Race appears to play a role in pain management decisions, though this literature is primarily from the USA and the rest of the world is underrepresented. [169, 176, 177] Awkward relationships between PECPs and EMS authorities[165], and Emergency Departments, in respect of professional qualifications, operational expectations and interprofessional relations have an inappropriate effect on care. [159] It is in the field of education that the evidence of disproportionate research is greatest. Other healthcare disciplines have researched and interrogated their own pain education[129-133], but this interrogation is lacking in PEC. It is against this backdrop that the data collection and analysis took place, with an apparent continuance of disproportionality in the primary data.

Within the body of evidence examined in the scoping review, the observation of disproportionality is manifest in terms of the strength and contextual applicability of the pain management evidence[40]. Primary research was predominantly descriptive and observational [406], though some experimental work was published (25 experimental studies). According to GRADE (Grading Quality of Evidence and Strength of Recommendations) [407] criteria, the body of evidence is of lower strength. Pain as a phenomenon is portrayed as present in between 27.7% [21, 22] and 55% [24] of cases, yet a relatively small number of primary research studies were found (ninety-eight), across the fifty two year timespan. One would expect a greater number of primary research studies. The challenges of conducting research in the prehospital setting is well known[408], and may be financially, operationally and ethically prohibitive. Perhaps this is indicative of a practice-research gap exacerbated by limited research capacity in PEC and ethical limitations.

In terms of contextual applicability, evidence originated primarily in high income countries, with North America and Europe dominating. Disproportionality was not only evident by region; there was a preponderance of evidence for primary response in ground ambulance, with aeromedical and Critical Care Retrieval contexts relatively underrepresented. Evidence focused almost exclusively on acute nociceptive pain, usually of traumatic origin, with non-nociceptive, chronic pain, and pain in palliative care being conspicuously absent. This was relevant considering the potential for changing roles [32-38], and the aspiration for role change expressed by interview participants. Application of pain therapies in paediatrics and older adults was present, but not to the same extent of younger adults,

[40] Evaluating the research quality and strength of evidence was not the aim of the study, but the pattern of disproportionality seemed so consistent it would be remiss not to mention it as a secondary finding.

suggestive of a practice bias.[41]. Specifically, pain management in obstetrics, gynaecological disorders, SAS and neonates was almost completely absent, showing curriculum inequality that may systemically prejudice some of the most vulnerable patient groups. Surprising for a profession concentrating on critical interventions in emergencies, pain therapy application in shocked and unconscious patients was not researched. Lastly, there was a major difference between the amount of primary pharmacological research (n=91), and nonpharmacological research (n=8). The implications for curriculum design, learning and teaching, and practice, is the need to extrapolate research findings, and recontextualise evidence from other disciplines and contexts, to make decisions for PEC. PECPs risk being trained, and practising, amidst a research void. This begs the question: How then, might pain management graduate attributes be consistently assured?

In respect of the document analysis of the curricula, pain-related curricula appeared arbitrary and capricious. Institutional differences in curriculum design were found, which was expected, as HEIs are autonomous in terms of curriculum design. This, on its own is not problematic; it is even desirable, as this would allow for tailoring and adaptation of learning and teaching to local contexts and institutional conditions and strengths. What was problematic, is that overall, it did not appear as if pain learning and teaching was guided by a discernible framework or guiding schema. Curricula were found to be fragmented and incomplete in respect of pain learning and teaching. Pain ILOs lacked learning integration, both within programs and between programs. Alignment between theoretical, practical and workplace learning was often not present. Omission of microsystem level techne.[42] was frequent – such as risk assessment and monitoring tools, and important non-pharmacological therapies.

A major finding was the de-emphasis of the affective learning domain [88] in curriculum, and a focus on biomedical processes, skills and procedures for therapy. Considering pain's nature as an individual *experience*, and the absolute requirement for acceptance of subjectivity in pain expression [9], the practitioner focus on biomedical constructs and to neglect the emotional dynamism is problematic. Contemporary curricula do not make explicit and comprehensive provision for pain management. Rather, it is the management of nociception which is foregrounded and then padded and termed as 'pain management'. This matter arose during the expert panel discussion where it was duly noted that the conflation of pain and nociception is a barrier to learning and causes practice to focus on pharmacology to the neglect of non-pharmacological options, including emotional support. The literature in the scoping review was selected for the evaluation of therapy application and so was unintentionally biomedical in emphasis. The deemphasis of the affective domain in curricula cannot be linked to the evidence in the scoping review, as this was not the aim of the scoping review. However, the curricula showed similar characteristics in terms of patient groupings, pain typologies and EMS contexts, to the disproportionality of evidence in the scoping review.

[41] It would make for interesting future research to determine if such practice bias results in inequitable pain management across the lifespan.
[42] art, craft, technique, or skill

9.3 Research Gaps, Curriculum Bias and Educator Agency

The document analysis (of curricula) show a similar pattern to the scoping review, in terms of conceptual emphasis and omissions. These include a lack of explicit emphasis on diversity in patient groups, pain typologies other than acute nociceptive pain, and omission of contexts such as CCR, palliative care and lower acuity cases[43]. A definite focus on acute, nociceptive pain was present, with a focus on trauma aetiology. Unlike the scoping review evidence, the curriculum content analysis did not deliberately exclude these groups. There were many outcomes which addressed pain management in general terms, without being explicit about patient groupings, contexts or typologies. The specifics of the learning and teaching would be left to the discretion of whoever enacted the curriculum, creating a reliance on educator and practitioner agency. It is unclear which topics the enacting educators would choose to include in their classes. Without a precise curriculum they may default to their own experiences and/or perspectives, regulatory requirements, or research evidence. This represented an educational risk, as contemporary regulatory standards and documents [55-58, 67] made little provision for diversity in patient groups, pain presentations or contexts. Similarly, research evidence also appears to focus on acute, nociceptive pain in adults, deemphasising diversity in pain exposure, experience, care and outcomes.

This study aimed to describe contemporary education and curriculum. It was noted that literature (narrative literature review and scoping review) and curricula both show similar patterns in respect of patient groups, pain typologies and context. The literature was selected for the emphasis on pain therapy, although analysis of the therapies shows an emphasis on pharmacology, acute nociceptive pain in trauma and primary response in ground ambulance. None of the educators interviewed had been involved in curriculum writing or review and so could not provide insight into the reasons for curriculum structure or content. There was no obvious reason in the data for the insufficient and arbitrary nature of the curricula. Possible reasons may include a lack of curriculum writing capacity in the profession, poor coordination between the regulator and HEIs, rapid changes of PECP programs from vocational to higher education offerings, a lack of quality and safety standards for pain management (at the time), or simple oversight, and not providing pain management with a 'home'.

Educator interviews also revealed several key insights into pain teaching and curriculum in PEC education. Educators' perceptions were that a primary pain management role was not being fulfilled, due in part to PECPs not viewing pain management as their role. The educators had a sense that PECPs did not possess appropriate KSAs to fulfil this primary role, a perception consonant with the findings of the document analysis and the literature review in Chapter 2. Educators also expressed contrasting opinions in terms of role development and change. The obligation on EMS to relieve suffering, however it was encountered, was consistent amongst educators. In so doing EMS should take on new roles, such as providing pain management in palliative care, or viewing mild pain and non-urgent cases as "their job". In so doing, EMS could promote treatment equity. What was not consistent were opinions on how to do this, or whether EMS, and PECPs were ready and able to expand roles beyond the provision of critical interventions, pain relief in acute nociceptive pain, and transport to hospital. The analysis of the literature, and the curricula, suggest that extensive

[43] Lower acuity cases may represent mild or moderate pain presentations

research and curriculum development would be necessary to provide the evidence, and develop the competencies necessary for a role change.

9.4 Community of (pain management) practice

A dissonant finding was that even though transport to a hospital, usually an ED, was considered a major function, there existed conflict with ED staff which hampered pain management. This may stem from misunderstanding of qualifications, capabilities and roles or a lack of value for interprofessional practice. Investigation of the causes, and implications of this apparent conflict was beyond the scope of the research. The educator interviews revealed the crucial role of workplace learning and the high level of credibility that students attribute to their preceptors. This sometimes conflicted with classroom teaching, leading students to often default to their field learning. Unfortunately, placements and preceptorships were perceived as erratic and uncontrolled, the implication being that while good habits and practices were transferred to students, so were unhealthy ones. The perceived reasons for this were many and varied, sometimes helpful and sometimes conflicting. A general sense of disconnection between academics and clinical practitioners emerged, resulting in an awkward relationship. The importance of a community of practice and shared goals became evident, with a sense that pain education could not advance without a whole of health approach.

Encouragingly, educators did express a desire for deeper engagement with clinical practitioners and the formation of a community of practice. Additionally, deliberate development of pain management education, competencies and curricula, was recommended by all participants. There was also recognition of the need and desire to develop proper attitudes and 'soft skills' amongst PECPs. Based on the findings here, this will take a considerable amount of research and development. There is fertile ground, and opportunity, for implementation of the expert recommendations for curriculum implementation[44].

[44] Expert recommendations for curriculum implementation:

1. Learning outcomes should be aligned to the multidimensional nature of pain and its management
2. Educational institutions should facilitate or participate in platforms for engagement with clinical professionals
3. Key stakeholders should collaborate on ongoing learning activities for pain management.
4. Educational institutions should communicate clear learning goals to students and preceptors.
5. Key stakeholders in the emergency care community of practice should foreground professional cultural transformation in pain education.
6. Pain and nociception outcomes should be explicit throughout the curriculum.
7. Learners should participate in a foundational learning unit addressing the multidimensional nature of pain early in the program with contextually relevant learning outcomes distributed through the later learning units.
8. Educational programs should use milestones to track the attainment of pain learning outcomes at set points in the program.
9. Exit level learners should participate in a learning unit aimed at consolidating knowledge and attributes relating to the multidimensional nature of pain.
10. Emergency care curricula should include competence in the management of acute pain in palliative care as contextually relevant to emergency services.

These recommendations addressed the issues highlighted in phases one to three and can be arranged in three sets. The first set are recommendations aimed at deliberately cultivating relationships between the custodians of the curriculum – the HEIs, and the field of practice (recommendations 1-5). Platforms of engagement should value pluriversal perspectives and engender mutual respect. Importantly, the PEC *community* needed to agree on the way forward for pain practice in PEC, not only HEIs or curriculum designers. The second set make recommendations on the structure of the pain curriculum (recommendations 6-9), and the third set makes specific recommendations for content. Chapter 7 provides a comprehensive analysis of each recommendation and detailed discussion will not be reiterated here. In light of the findings from phases one to three, certain aspects will be highlighted. When all data is considered, professional education needs to serve professional practice and cannot be sustained without collaboration and buy-in from practitioners.

Recommendations six to nine address consistency, curriculum fragmentation and systematic learning. Overall, the recommendations advocate for comprehensive ILOs which are explicit, and not generic. Important is the emphasis on pain's multidimensional nature (which can be read to include nociception) [9, 60] and the biopsychosocial aspects of both pain and nociception. Taken together, this set of recommendations gives pain learning and teaching a systematic program, embedded in curricula. Essentially, the recommendations give pain learning and teaching the "home" it has been lacking. There is a caveat though, made explicit in both the primary data and the expert panel discussion. Pain outcomes need to be properly considered and responsibly integrated. Pain management is important, but it is not the only task of PECPs, and other important tasks and roles should not be overshadowed. The curriculum should not become fuller than it already is. Pain management deserves equal value with other topics, but not hegemony.

The theme of equality of pain care continues in the final set of recommendations (recommendations 10 and 11). The panel was not prescriptive in naming topics for inclusion in curricula, this is the preserve of the community of practice and should not be dictated by a single panel of experts. The recommendations do give guidance though, in respect of roles which the literature [32-36], the data, and expert opinion, show to be growing issues. A role for PEC in management of emergency pain in palliative care was foreseen by the panel and made recommendations in this respect. The need to work collaboratively was also foreseen by the panel, given more legitimacy as the panel was multidisciplinary in nature. Collaborating with, rather than merely communicating with other health disciplines was seen as not only improving pain care, but also provides PEC, as a profession, with an opportunity to have an equal presence amongst healthcare professions. Collaboration will not only improve patient care but elevate the standing of PECPs as well. The following section will critique the competency framework, against both the findings of the research, and potential expectations of practice.

11. Emergency care curricula should enable graduates as collaborators in interdisciplinary pain care.

9.5 Reflections on the implications of the framework for the world-of-work.

Competency frameworks fill the gap between practice and education informing curriculum and education. [75] As a link, they are required to describe the complexities of practice such that sufficient curriculum can be designed. [103] Adequate health outcomes often rely on the relationship between multiple forces [409] and competence frameworks which ignore these interrelated forces risk not meeting the needs of society. [103] Contemporary frameworks need to encompass technology[410], and a focus on patient and provider wellbeing[411]. A reliance on objective knowledge and skills without developing subjective attributes and non-technical skills has been criticised. [103] Competency frameworks should not be reductionist and should represent professional practice. What this means, is competency frameworks are not only "downstream looking" – informing education but are intended to be reflections of "upstream processes" – professional practice. [103]

Employers use competency frameworks (competency models) to describe the collection of "knowledge, skills, abilities, and other characteristics (KSAOs)"[83] needed to effectively perform a job. Competency models inform hiring, employee management and promotion and performance management.[83] These models also link to business objectives and service delivery. [83] Businesses – or healthcare services – may develop niche areas or "competencies" which distinguish the business or service from competitors and provide a competitive advantage. [412] Employees' KSAOs will need to matched to these competencies to be effective in the business or service. [412]

Competency Frameworks are combinations of competencies which have been organised in some way, and may consist of competencies, hierarchies or categories of competencies, with links to learning resources or assessments. [413] Competency frameworks may be used to guide education, assessment, credentialling or workforce development.[413]. Given that they can be used by educators for education, and organisations for human resource management, different structures for frameworks have arisen. Competencies can be denoted as individual or organisational, be grouped by theme, or job role, occupation or sector. [413]

This framework was originally developed to help fill perceived gaps in education, and in so doing improve practice. The research, and the ensuing framework, is "downstream" facing. The researcher used descriptions of practice to guide *education* for pain management practice, with service delivery secondary. The framework is decidedly *denotative* for education, however, due to the linkage with clinical practice the framework provides, there should be *connotations* for the world-of-work.

It is not the intention of this framework to guide the credentialing, registration or hiring of individuals. In fact, the framework can't do this as it does not denote competencies for a whole profession, rather, one (crucial) task within the profession. Proficiency in these competencies does not mean proficiency as a PECP, although, the research posits (in the interest of patient safety) there should be no proficiency as a PECP without proficiency in the denoted competencies. For the task of

pain management, the framework attempts to 'adjust' for the disproportionate representations[45] evident in the data, by taking on an inclusive approach to competency development.

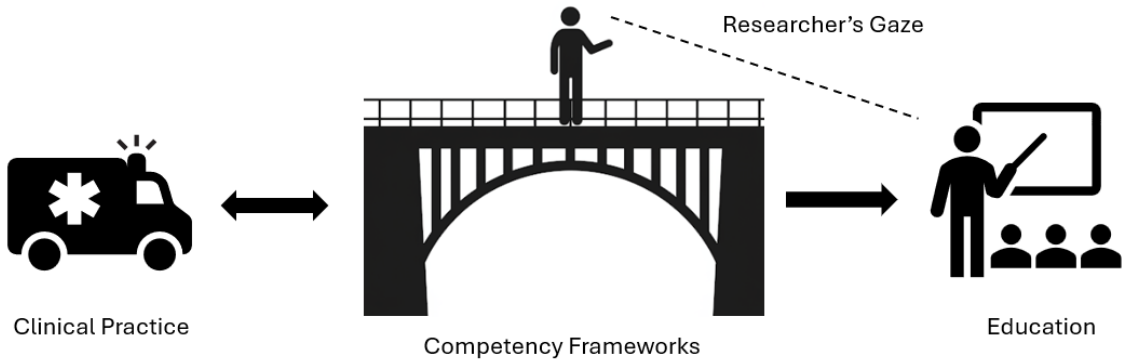


Figure 15: Researcher Perspective of the framework

Adapted From: Batt AM, Williams B, Brydges M, Leyenaar M, Tavares W. New ways of seeing: supplementing existing competency framework development guidelines with systems thinking. Advances in Health Sciences Education. 2021;26(4):1355-71.

The framework itself is denotative of the evidence, from an educational perspective. But proficiency in these competencies imply obligations by employer organisations. These include (and are not limited to) the provision of adequate clinical equipment and the adoption of enabling policies and procedures. They further include allowing access to counselling following vicarious or direct trauma associated with pain expression; setting job descriptions, job requirements, performance targets; and adopting management practices that are patient centred and practitioner oriented. Patient and practitioner safety influence pain care, and employers are bound by law to provide safety equipment and policies that are protective. Failure in these obligations detracts and undermines the competence of the practitioner. Ultimately, while these competencies are intended as individual competencies on the part of the PECP, they also position pain management as a service delivery competence of organisations. Implementation of this framework in education will place a duty on organisations to recognise that PECPs have these competencies, and to enable them, without prejudice.

9.5 Trustworthiness and Rigour

The rigour and trustworthiness of the research was examined in terms of the evaluative criteria developed by Lincoln and Guba[414], which addresses credibility, transferability, dependability, and confirmability.

[45] Such disproportionate representations foster inequitable research outcomes as they skew research agendas, bias funding priorities and limits the pain management discourse and practice unduly. Eventually, the issue of disproportionality is one of equity and fairness, patient safety and practitioner choice.

9.5.1 Credibility

Credibility was addressed by using well developed methods and procedures. The scoping review used the JBI methodology. [198] The method was comprehensively described and transparently implemented, with stoic adherence. The protocol for the scoping review was published on the Open Science Framework (link in Chapter 3). Both document content analysis and interviews were preceded by extensive and systematic synthesis of the literature, which not only informed the analytical and conceptual framework, but enabled between-method triangulation. The confidential and individual nature of the interview elicited authentic views predicated on lived experiences and clarification was obtained for any poorly understood issues. Peer review by supervising staff added to credibility as did a 'thick description' of context and circumstances. Credibility of the consensus panel findings were ensured by the iterative, prolonged engagement with the panel and persistent observation [414] The structured and facilitated nature of the interaction allowed personal biases to be managed and made known. [221]

9.5.2 Transferability

In reporting all phases a thick description of methods and findings allow evaluation for transferability. The scoping review drew evidence from international sources, elevating the findings across contexts. The purpose of the research is a contextually relevant and suitable output to guide education. As such, it is not intended that it be transferable to other contexts. However, applicability to the target context is ensured though the rigour of selection and synthesis of suitable evidence as well as the diverse representation of key stakeholders in the expert panel. The expert panel was representative of the diverse nature of the EMS, which added to transferability.

9.5.3 Dependability and Confirmability

To show dependability, a comprehensive and detailed description of the research design, operational data gathering, and reflective appraisal is provided in the report. Detailed description of the data leading to findings and conscientious description of the analysis process in an 'audit trail' support confirmability (Shenton, 2004). The content analysis (Phase 2) and thematic analysis (Phase 3) were conducted using well established and validated techniques[201, 205]. Coding for both phases was conducted using NVIVO 12 Pro (Lumivero, Denver, CO), which allowed for direct linking of data to themes, and categories. This contributes to stability of the data over time, and potential recoding or replication in future. This also formed the basis for an audit trail, whilst averting undue influence of researcher bias. In the reporting direct quotes were linked to findings to privilege participant voices. Member checking was employed for the interviews. The expert panel was conducted according to a documented methods[218] and an open, transparent voting process. Dissenting views were captured and reported. Audio recordings and transcripts were coded in NVIVO 12 Pro (Lumivero, Denver, CO), which allows for audit and confirmability of the findings. The panel occurred at the end of detailed and rigorous data collection, and this data is available for scrutiny in the

preceding chapters. The co-chairs were attuned to the risk of coercion and ensured proportional engagement.

9.6 Study Limitations

The research did contain some limitations, and these are discussed in this section. These were a grouped as known limitations of the methods, as well as specific limitations of the data collection and analysis. The limitations of the scoping review included an emphasis on breadth, not depth of evidence, and the fact that a risk of bias assessment was not carried out. This was an acceptable omission, both in the application of the study and of the method [198]. Scoping reviews area intended as a screen, to answer broad questions, not to make narrow decisions, and so this suited the aims and objectives of this research.

A further limitation is that evidence was limited to the English language [46], omitting evidence which may have stemmed from non-English areas of the world. The scoping review only included evidence in which PECPs applied the therapies, omitting application by physicians. Once again, this was appropriate (for precision) because the aim was not to describe all practice, only practice by PECPs. Another limitation, and potential area of critique, was that research evidence in the scoping review and primary data in the educator interviews were used as proxy indicators for actual pain management practice. One may argue that research amongst PECPs had not advanced as fast as practice had, and that this evidence did not reflect practice. In most regions of the world, including South Africa, practice is regulated, and therapies are authorised by a regulator or medical authority. The findings of the scoping review aligned with regulated practice in the jurisdictions in which the original data was collected, as required by the constituent study methods.

One may also argue that the data should have included practitioner observation or interviews. In respect of these potential criticisms, practitioner interviews [152] and a Knowledge, Attitudes, and Practices (KAP) survey [158] were conducted amongst South African PECPs, with similar needs, gaps, and omissions being found. The educators participating in the interviews had almost as much operational and clinical experience as they had educational experience and so could legitimately comment on practice. Also, research included practitioner voices and data.

Qualitative content analysis may be criticised for over-interpretation and undue subjectivity. This is a criticism of qualitative research in general [188]. In respect of the method, sufficient quality measures were in place to mitigate this, including the use of software for coding, an awareness of undue subjectivity, and cross-referencing with study supervisors, independently of each other. The data itself contained some limitations, notably the fact that some foundational science subject learner guides were not submitted and as such there was missing data. This was a minority of data. Another limitation was inherent in the data type. Curriculum documents did not guarantee that the ILOs were taught, nor that classroom teaching was not embellished with additional content. As the blueprint for education, the documents mapped the intention of the education, and gaps or

[46] English is the language of the researcher.

deficiencies in these documents showed gaps and deficiencies in education as a possibility. The documents did not necessarily indicate what actually happened in the classroom. This was mitigated by interviewing the enacting educators and collecting their testimony. The coding schemas also only looked at explicit pain ILOs. Considering the large number of nonspecific pain learning outcomes present, what were identified as gaps in the documents may not equate to deficient learning and teaching in the classroom. Broader attributes such as communication, while not explicitly linked to pain in the curriculum document, may have been taught in other modules. The findings showed gaps in the curriculum documents and potential gaps in learning and teaching.

The expert panel was multidisciplinary in nature, with varied expertise, experience and representative of stakeholders. The composition of the panel is described in Chapter 3. The consensus panel also resulted in some limitations, notably that it was not possible to objectively measure the validity of the expert judgments at the time they were made[221]. It was also not possible to measure the effects of any decisions or recommendations in this research, as competencies and curricula would take years to implement. It was a process that rested on judgment which was difficult to evaluate before the delivery of the program. The expert panel was preferred to decision-making by a single designer or a committee. The expert panel was guided by method, was transparent, and subject to instantaneous member checking by the other panel members. It offered enhanced decision-making and provided an additional layer of evaluation and trustworthiness for the curriculum implementation recommendations.

A closing comment on limitations is the critique that the framework and implementation recommendations are theoretical and have not yet been tested in the field. Testing a framework was beyond the ethics and study scope and was therefore not feasible. Because the purpose of the framework was to integrate into existing curricula, integrating and testing the competencies would take as long as the delivery of the programs themselves, which could be up to four years in the case of the degree program. Obtaining cooperation from the different HEIs would also add to the time needed for testing. In mitigating this, rigorous methods were applied in the development of the framework. There was also some theoretical consonance with other work. If we consider Donabedian's conceptual model for quality in health care which considers structure, process, and outcome [415], there is constructive alignment. Foundational Knowledge, Communication and Duty of Care, and Predisposition for Caring aligned with structures. Communication and Collaboration, Ethical Pain Practice, and Professional Development and Evidence-Based Practice aligned with processes, and Practitioner Safety and Practice and Clinical Pain Praxis aligned with study outcomes.

9.7 Summary

Owing to the nature of the study design and sequential nature of the framework development process, some discussion, relevant to the methods applied, appears in previous chapters. The following discussion is intended to complete that reflection and to privilege the researcher voice with regard to overarching perspectives. The disproportionality in evidence typology, context and coverage is raised as self-critique. Research gaps, curriculum bias and educator agency is another topic for discussion as practitioner paralysis is a likely outcome if capacity is not nurtured. The

curriculum bias may be a function of missing evidence and it is plausible that the research gaps are a function of a lack of research capacity as post-graduate paramedicine study is a recent phenomenon. On a positive note, stakeholders valued a community of (pain management) practice to avert disparate clinical practice and to make pain care a whole of health concern.

This chapter defends the claim to trustworthiness and rigour. The detail for methodological rigour is found in the methods chapter and is referred to throughout. As an educator and clinician, I offered my reflections on the implications of the framework for the world-of-work. Lastly, study limitations are provided, counterbalanced with delimitations. The next and final sections present recommendations for future research and concluding remarks.

9.8 Recommendations for Future Research

The thesis suggests a number of future research opportunities. Implementation of the framework in curricula represents a major opportunity for research and development in PEC curriculum and pain management education. Aligned to the recommendations for formation of a community of practice and eliciting 'buy in' from practitioners for clinical pain praxis, a similar approach is foreseen as necessary for implementation. There is fertile ground for implementation, as all the educators participating in the research indicated the need for guidance in pain education, and practice, and expressed enthusiasm for this project. Implementation science is the "the scientific study of methods to promote the systematic uptake of research findings and other EBPs into routine practice, and, hence, to improve the quality and effectiveness of health services." [416] The field of implementation science offers guidance for the adaptation and implementation of curricula, [416-418] and implementation projects would be best served by structured projects which include the HEIs offering the educational programs. Inherent is the opportunity for research collaboration.

The scoping review highlighted several opportunities of further research, in line with the purpose of scoping reviews.[197] The gaps and omissions in evidence for pain management in diverse populations and diverse pain presentations are numerous, and both clinical practice and education could benefit from exploration and development. These include paediatrics – especially infants and neonates – older adults, gynaecological and obstetric pain, SAS, as well as unconscious and critically ill patients. Other significant, and especially pertinent research gaps include the management of mild pain in PEC, how pain is addressed during aeromedical transfer or CCR, or the wilderness and medical rescue environments. The geographical disproportion in research evidence also offers boundless opportunities. What we know of practice in one country or population may not hold in another, and this allows for research to be repeated – even if it is altered to suit context – to better understand local needs or problems.

The possibility of role change, or redefinition of exiting roles emerged in all aspects of this thesis, and especially the PECP's place in palliative care is becoming a focus of research. With the recognition of potential came uncertainty; uncertainty over clinical care (what should PECPs *do* during these encounters), and uncertainty over how EMS in general fits in. Both clinical care and health systems questions arose. Ethical practice, and ethics education were shown to be a gap. Considering the structure of South Africa's health system, the inequality present, and the unique and under-research ed PEC environment, there is a need for both abstract, philosophical work and

practical ethics application research. Pain management may act as a quality indicator [419] and this opens another avenue of research in terms of quality management for pain care.

The potential directions indicted above may be divergent in perspective; each topic area may be approached as a categorical problem of clinical medicine, biomedical science, health systems or social sciences. Additionally, each of these topics, in each of the categories may address theory (the abstract), praxis (integration) or practice (the concrete). These multiple perspectives of the topic areas may make conceptualisation of future research difficult and risk projects from being isolated from each other. One project may not support another in terms of knowledge generation, and this risks fragmentation of research. Naidoo[420] suggests the use of a conceptual tool to guide the formulation of research questions and determine research gaps, biases and opportunities.

The tool allows conceptualisation and location of research and allow it to be tracked and mapped over time. Research bias, gaps and opportunities can be observed. In so doing this will support the development of a research agenda. Another advantage is to assist novice researchers to conceptualise and frame their own research. This is useful in a field such as PEC, which is still developing a cohort of researchers. This concludes the recommendations for research. The following section will conclude the thesis as a whole.

Figure 16: Research Compass

From: NAIDOO, N. 2017. *Gender-based Violence: Strengthening the role and scope of Prehospital Emergency Care by promoting theory, policy and clinical praxis.* PhD, University of Cape Town. Used with permission.

9.9 Conclusion

This thesis set out to develop a novel competency framework and make enabling curriculum implementation recommendations to shape and guide the design of contextually relevant pain management curricula in South African Prehospital Emergency Care education. While the direct aim was development of a competence framework, the broader vision was improved patient safety, patient comfort and confidence, and better health outcomes. The research explored both contemporary PEC education and practice for pain management. The aim was achieved, and several new findings were made during the discrete phases of the data collection, in addition to the development of the framework and recommendations. When considering all the findings, the research demonstrates that competence in clinical pain management relies on holistic education and contextually appropriate practice, which adopts an ecological perspective on healthcare issues. For the PEC profession to achieve proficient pain management, it is essential to foster a community of practice that embraces a shared vision of patient care. The framework, and implementation recommendations, enable the realisation of these conclusions, in relation to unmet educational and practice needs insofar as pain management is concerned.

The phase specific findings in brief; the scoping review sketched the landscape for therapy application by PECPs and highlighted several omissions and gaps in research evidence. I feel compelled at this final stage, to remind the reader that not all the findings of the scoping review were negative[47].. The scoping review also revealed an inventory of effective and safe therapies and assessment tools. The document analysis showed expected institutional autonomy, but also a lack of a guiding framework to structure pain management learning and teaching. Collectively, the national curriculum showed gaps and omissions in ILOs. However, the educator interviews revealed that the curriculum enacted in the classroom may compensate for the explicit curriculum in the documents. Educator interviews provided new insight into pain management practice in South Africa. The need for holistic and ecological education became apparent during the interviews. The framework was presented to a multi-disciplinary panel of experts, representative of both practice and education, for input. The panel also made recommendations for curriculum implementation.

Implementing this competency framework for pain management in emergency care education has significant implications for both education and practice. Enhanced clinical skills and standardised training will lead to improved patient outcomes and consistency in care. The framework promotes a higher standard of professionalism, increased confidence, and better decision-making among paramedics. It also encourages interdisciplinary collaboration, fostering a team-based approach to pain management. The emphasis on holistic education and contextually appropriate practice, adopting an ecological perspective on healthcare issues, ensures that paramedics provide comprehensive patient care. Additionally, the framework supports accountability, and evaluation, ensuring PECPs remain current with best practices and new developments. The framework was intended for undergraduate programs, however adaptation to continuous professional development programs or micro-credentialing holds vast potential for ongoing professional development. These implications collectively contribute to a more competent, confident, and effective paramedic workforce, ultimately enhancing the quality of care provided to patients. The proposed framework

[47] The scoping review critique may have taken on a deficits approach inadvertently, as developing lines of inquiry are needed for comprehensivity.

and implementation recommendations reinforce these conclusions, highlighting the importance of a community of practice that embraces a shared vision of patient care.

The research did contain some limitations, which were grouped as known limitations of the methods and specific limitations of the data collection and analysis. The scoping review emphasised breadth over depth and did not include a risk of bias assessment, which was appropriate for the study's aims. Additionally, the review was limited to English-language evidence and focused on practices by PECPs, not physicians. Lastly, qualitative content analysis may be criticised for subjectivity, but sufficient quality measures were in place to mitigate this. While there may have been gaps in the data, this does not mean the research itself is deficient. Rigorous methods, research procedures and proper use of interpretive methodologies means the findings in this study represents the best available evidence on which to base decisions.

The specific contributions of the research include a comprehensive description of therapies and practice, a comprehensive analysis of the problem of pain management in PEC and PEC education, as well as an implementable means of addressing these. The research also opens exciting avenues for further development in pain management education and practice, as well as PEC as a whole. With the pain management problem space now defined, this does not represent the end, but rather the beginning!

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List of Appendices

Appendix 1: Search Strategy: Pilot Search

Search terms were developed in conjunction with a university librarian. Records from the pilot search were imported in Rayyan (n=394) and 129 duplicates removed using the functionality in Rayyan. Two reviewers blinded to each other's work screened titles and abstracts of 50 records from the remaining records using the eligibility criteria. Records were marked as ether 'included excluded' or 'maybe'. The blind was removed, and the two reviewers discussed the records marked 'maybe' and any conflicts. The full texts for 25 articles were then read and evaluated independently against the eligibility using the same process and functionality in Rayyaan platform. Once the blind was again removed conflicts were resolved through discussion. The two reviewers then applied the charting tool to the 25 full text articles to test and calibrate the data charting instrument. Once completed the results of the data charting were compared and discussed and any differences in understanding settled. The data charting tool was also refined, and additional data was extracted.

Appendix 2: Data Extraction Tool and Explanations

Data Extraction Tool

Item	Field	Description
Section 1: Identification and tracking of record		
1	Name of Charter	Person completing the charting
2	Record number (individual identifier)	Unique number assigned to each article
Section 2: Description of the study		
3	First Author Name	Surname of first author
4	Year of publication	Year of publication contained on the article
5	Title of the article	Title
6	Aim and Objective of the Study	Used to determine eligibility
7	Type of research	The author's description of study type
8	Type of research: Coded	Research team classification in accordance with the framework discussed in Appendix
9	Study therapy or therapies	Listing the therapy under study
	Category	Pharmacological or non-pharmacological
	EMS Mode	This has changed from "role" to "mode" (road/aeromedical/interfacility etc
	Pain typology	Acute Trauma Pain Acute non-trauma pain Cardiac Pain Back Pain Chronic Pain Obstetric pain
	Age of study population	Was the study done in persons older or younger than 18, or in neonates?
	Country of origin of data (study site)	In which country was data collected. Charting of secondary evidence omitted this criterion.
	Inclusion Criteria	Inclusion criteria for variables, or in the case of secondary evidence, the inclusion of primary studies.
	Exclusion Criteria	Exclusion criteria for variables, or in the case of secondary evidence, the exclusion of primary studies.
	Specific injuries or pathologies	Was the study conducted in a patient group with a specific injury. E.g. pain management in hip fracture.
Section 3: Therapy Findings For all the sections below use 'not reported' if the data isn't present.		
	Population size	N=
	Sample size	n= (for qualitative include how many respondents)
	Pain assessment system	The pain scales or tools that the system used.

	Dosages or applications	Which doses of medicine or how many applications of a procedure were captured in the study.
	Effectiveness	Describes the effectiveness of the therapy.
	Adverse events and safety	Which adverse events were recorded.
	Acceptability Findings	Were any findings related to acceptability of the therapy recorded or studied?
	Feasibility	Was the therapy found to be feasible?
	Limitations of the study	What study limitations were recorded?
Section 4: Curriculum Findings		
	Barriers to therapy	What barriers to therapy were recorded?
	Enablers to therapy	What enablers to therapy were recorded?

Appendix 3: Typology of studies used in data extraction tool.

Studies are classified according to framework discussed by The University of Oxford's Centre for Evidence-Based Medicine. [406] The framework makes three distinctions between studies. 1. Does the study describe a quantitative relationship between variables (Analytic studies), or does it only describe a picture of what is happening, without quantifying a relationship (Descriptive study). Descriptive studies can be Cross-Sectional or Qualitative.

The next distinction occurs in analytical studies only. If a researcher manipulates or alters a variable (exposure) it is an experimental design. If the variables under study are naturally occurring and not intervened on by the researcher, but relationships are still studied, it is an observational study.

The third level of distinction occurs in observational studies and is determined by when the outcomes are measured. If the outcome is determined after exposure/intervention it is labelled a cohort study, and if at the same time as exposure/intervention it will be labelled a cross-sectional study. If the outcome was determined before the exposure, it will be labelled case control study.

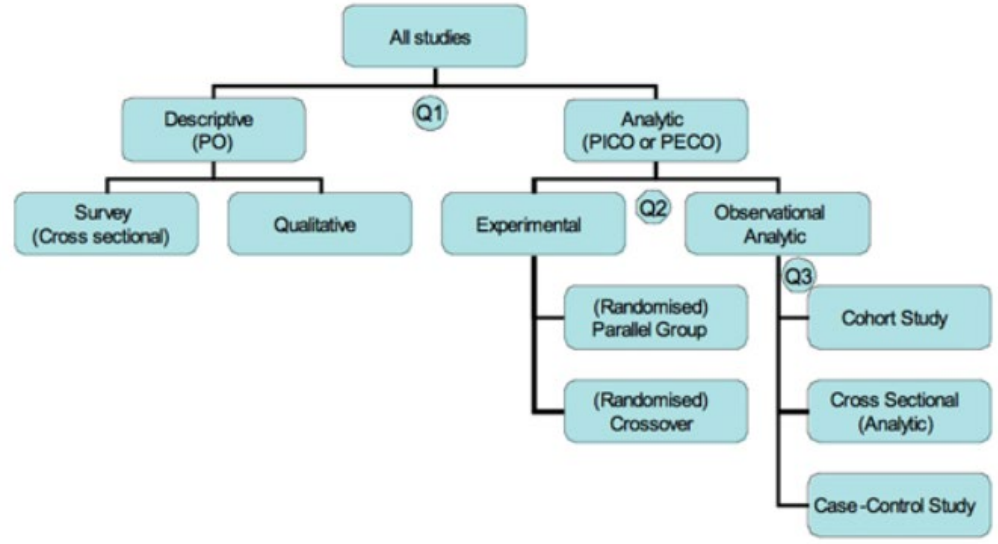

Figure from: CENTRE FOR EVIDENCE-BASED MEDICINE. 2023. *Study Designs* [Online]. Oxford: University of Oxford. Available: https://www.cebm.ox.ac.uk/resources/ebm-tools/study-designs [Accessed 11 July 2023].

Appendix 4: Information Sheet and Consent Forms: Individuals

INTERVIEW

Title: Shaping the undergraduate pain management curriculum in prehospital emergency care education: toward a curriculum and competency framework.

Part 1: Participant Information sheet: Interview

Thank you for agreeing to participate in this interview research. You have been requested to participate as you have been identified as a key informant on prehospital education. As an educator you may have specific insights into pain related education. This research is part of a larger study in fulfilment of a Doctoral of Philosophy (PhD) in Emergency Medicine at the University of Cape Town (UCT). The researcher, Ryan Matthews, is an emergency care educator currently employed as a lecturer at the Cape Peninsula University of Technology and holds a BTech in Emergency Medical care and an MPhil in Emergency Medicine.

The purpose of the research is to understand the educational approach to pain management education as well as the prominence and importance pain management occupies within education. The research also explores how education affects practice and which educational needs may still be present with respect to clinical pain management practice. The research will also explore any barriers or other influences there are for pain education.

This is not an audit of education, nor are you being evaluated in any way, nor is your institution being evaluated. The data will be collected via a one-on-one interview which will take approximately 1-2 hours. The interview will be audio recorded to allow me to engage in conversation without being distracted by writing of notes. The audio recordings will be transcribed to text and both artifacts kept confidential, anonymous and stored on a password protected electronic platform.

Participation is voluntary and you may withdraw at any time and without providing a reason. There is no risk to you, but should you feel uncomfortable at any time please inform the interviewer. **You have the option of participating in the interview face-to-face or over an electronic platform.** Should you have already contributed data at the time of your decision please inform the interviewer, Mr Ryan Matthews, that he can remove your contribution from the data set and/or engage you on any remedial measures necessary. Should you have any concerns or questions you may contact the Interviewer, the principal investigator or the Human Research Ethics Committee (UCT), contact details below. This research has been approved by the Human Research Ethics Committee (UCT) and the ethics clearance number is **[HREC 614/2020].**

Refreshments are provided, which you may consume before or after the interview. There is no direct benefit to you. I value your input and hope to learn from the insights your unique position within emergency care education offers and your input will be used to determine the educational need for pain management. It is our intention that

the results of the research will be published in a peer reviewed journal, adding to our understanding of pain management education in South Africa. Ultimately, the research will be used to construct a curriculum framework to guide curriculum design and improve education. There thus may be indirect benefit, through improved understanding of pain management education and construction of tools to guide curriculum design.

All responses, insights and data you may offer will be held confidential and only used for the purposes of the research. Your name will never be used in any reporting nor will it be disclosed to anybody or any institution, nor will your contribution be linked to you or your institution. You will remain completely anonymous. Further, you may contact Mr Matthews should you require additional information.

Our contact details are as follows:

- Research Student:
    - Name: Ryan Matthews
    - E-mail: ryan.matthews2@gmail.com Tel: 0832877083
- Principle Investigator and Internal Supervisor (UCT):
    - Name: A/Prof Peter Hodkinson
    - E-mail: peter.hodkinson@uct.ac.za Tel 021 440 7601
- Chair of UCT Human Research Ethics Committee (HREC):
    - Name: Prof Marc Blockman
    - E-mail: marc.blockman@uct.ac.za Tel 021 406 6626

Part 2a: Certification of Consent: Interview

To be completed by the interviewee

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked to have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Declaration by participant

By signing below, I _____ agree to take part in a research study entitled 'Shaping the undergraduate pain management curriculum in prehospital emergency care education: toward a curriculum and competency framework'.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been answered to my satisfaction.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may not disclose the identity of other participants I may know of or content from discussions out of respect for confidentiality.
- I consent to the interview being audio recorded and transcribed.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- **I have chosen to participate in a face-to-face/ electronic interview process (please circle 1)**
- **I consent to be interviewed in English.**

Signed at (place):_____ on Date: _____ 20 _____

Signature of participant

_____

Declaration by investigator

I (name) _____ declare that:

- I explained the information in this document to _____
- I encouraged the participant to ask questions and took adequate time to answer them.
- I confirm that the participant was not coerced into giving consent, and that consent was given freely and voluntarily.
- I have explained the data collection procedure, that the interview will be audio recorded and transcribed for analysis.
- I am satisfied that they understand all aspects of the research, as discussed above including the non-disclosure agreement.

Person taking consent: Ryan Matthews

Signed at (place) _____ on (date) _____ 20 . __

Signature of investigator

_____

Appendix 5: Information Sheet and Consent Form: Departments

Title: Shaping the undergraduate pain management curriculum in prehospital emergency care education: toward a curriculum and competency framework.

Part 1b: Participant Information sheet: Curriculum documents

Thank you for agreeing to participate in this research. Your department has been requested to participate as it is a key site in respect of prehospital education. This research is part of a larger study in fulfilment of a Doctoral of Philosophy (PhD) in Emergency Medicine at the University of Cape Town (UCT). The researcher, Ryan Matthews, is an emergency care educator currently employed as a lecturer at the Cape Peninsula University of Technology and holds a BTech in Emergency Medical care and an MPhil in Emergency Medicine.

The purpose of the research is to understand current pain management curricula present in pain management education. The research explores the content and approach to pain management education documented on formal curricula.

The request is for specific sections of the curriculum documents of your HEQSF aligned Emergency Care programs to be made available for analysis. The specific sections I am requesting are those dealing with pain assessment and management, pain anatomy, physiology, pharmacology and ethics in the subjects Emergency Medical Care (level of study as applicable), Pharmacology, Medical Rescue (if applicable) and Foundations of Practice, or equivalent subjects. If any other subjects contain subject matter related to pain, I would be appreciative if that documentation could also be forwarded. This is not an audit of curricula nor is your department being evaluated or benchmarked.

Participation is voluntary and you may withdraw your documentation at any time. Should you have already contributed data at the time of your decision please inform the researcher, Mr Ryan Matthews, that he can remove your contribution from the data set and/or engage you on any remedial measures necessary. As stated in the proposal your department's documentation will be kept confidential and anonymous and your department will not be linked to any data. Should you have any concerns or questions you may contact the Interviewer, the principal investigator or the Human Research Ethics Committee (UCT), contact details below. This research has been approved by the Human Research Ethics Committee (UCT) and the ethics clearance number is **[HREC 614/2020].**

It is our intention that the results of the research will be published in a peer reviewed journal, adding to our understanding of pain management education in South Africa. Ultimately, the research will be

used to construct a curriculum framework to guide curriculum design and improve education. There thus may be indirect benefit, through improved understanding of pain management education and construction of tools to guide curriculum design.

All insights and data you may offer will only be used for the purposes of the research. Your name will never be used in any reporting nor will it be disclosed to anybody or any institution, nor will your contribution be linked to you or your institution. You will remain completely anonymous. Further, you may contact Mr Matthews should you require additional information.

Our contact details are as follows:

- Research Student:
    - Name: Ryan Matthews
    - E-mail: ryan.matthews2@gmail.com Tel: 0832877083
- Principle Investigator and Internal Supervisor (UCT):
    - Name: A/Prof Peter Hodkinson
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- Chair of UCT Human Research Ethics Committee (HREC):
    - Name: Prof Marc Blockman
    - E-mail: marc.blockman@uct.ac.za Tel 021 406 6626

Part 2b: Certification of Consent: Curriculum Documents

To be completed by the Head of Department

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked to have been answered to my satisfaction. I consent voluntarily curriculum documentation from my department being included in this research.

Declaration by HOD

By signing below, I _____ agree to curriculum documentation being submitted for analysis in a research study entitled 'Shaping the undergraduate pain management curriculum in prehospital emergency care education: toward a curriculum and competency framework'.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been answered to my satisfaction.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may not disclose the identity of other participants or departments I may know of or content from documentation out of respect for confidentiality.
- I may choose to withdraw my department's data from the study at any time and will not be penalised or prejudiced in any way.

Signed at (place) _____ on (date) _____ 20__

Signature of HOD

_____-

Declaration by investigator

I (name) _____ declare that:

- I explained the information in this document to _____
- I encouraged the HOD to ask questions and took adequate time to answer them.
- I confirm that the HOD was not coerced into giving consent, and that consent was given freely and voluntarily.
- I have explained the data collection procedure.

- I am satisfied that they understand all aspects of the research, as discussed above including the non-disclosure agreement.

Person taking consent: Ryan Matthews

Signed at (place) _____ on (date) _____ 20 . __ __

Signature of investigator

Appendix 6: Semi Structured Interview Guide

- All interviews will be conducted by the student, Ryan Matthews
- Interviews will be audio recorded
- Time allotted is 1-2 hours.
- Interview times will be pre-scheduled, at the convenience of the participant.
- The participant will be supplied with the consent form, containing the information sheet, prior to the interview, and the signed copy must be handed to the interviewer prior to the interview commencing. The participant will be asked to confirm verbally that they have read and understood the information and consent form.
- *(interview questions may be adjusted following the findings of studies 1 and 2)*
- ***Participants will be provided with refreshments before or after the interview.***

Commencement

- Introduction.
- Confirmation of interview process and withdrawal options.
- Invite questions or clarifications.
- Confirmation of consent and that the information form has been read and consent form has been completed.

Demographic Information

- Lecturing experience
- Subject lectured
- Confirmation that lecturer teaches pain topics

Interview Guide

Questions are divided into domains. Exact questions may change pending outcomes of prior studies.

Domain 1: Importance of pain management and pain interventions

Q1: In your view, how does pain management fit into the scope of work of Emergency Medical Services?

Q2: How do you believe EMS practitioners approach pain management? Is it comprehensively addressed? Do you have any observations or comments on pain management by EMS?

Q3: How do you feel about the published HPCSA practice guideline? Is it sufficient? Do you feel it is implementable?

Q4: How do you feel about the range of pain management options available to or used by South African EMS? In your view, are the current options sufficient?

Domain 2: Pain curriculum

Q5: Where and how in your program is pain management taught?

Q6: How was your pain curriculum developed? Why is it structured in this way? Does it follow a specific guiding framework?

Q7: How do you personally feel about your pain curriculum? Would you like to see changes or do you believe it is sufficient as is?

Q8: How closely is the curriculum followed? How much freedom do you have in your teaching?

Domain 3: Teaching

Q9: Please could you tell me a bit about the subject you lecture?

Q10: How prominent is pain management in your teaching? How much time is devoted to it?

Q11: How do you approach the teaching of pain topics? Do you believe pain should have a specific, or different approach to other topics?

Q12: Is there anything that either helps or hinders the teaching of pain in emergency care programs?

Appendix 7: Curriculum Maps and Window Elements

Structure of pain teaching (Window 1)

Dedicated Units

In Bachelor's programs 20 of the 63 subjects contained pain ILOs. Dedicated pain units of study (pain sections) were present in 14 subjects. In the 2 Diploma programs, 7 of 19 subjects contained pain ILOs, of which none had dedicated pain units of study. Of the 17 subjects in the 3 HC programs, 5 contained pain ILOs, with 1 containing a pain unit of study.

Subject Structure: Cognitive/Theoretical, Psychomotor/Practical and Workplace learning

Bachelor's programs

In the first 3 years of study Bachelor's programs taught emergency medical care in a complementary suite of three subjects: a theoretical/cognitive subject (classroom based), a psychomotor/practical subject (simulation laboratory based) and an experiential/workplace learning subject.

This subject structure diverged in the fourth (final) year of study. Two programs maintained cognitive/theoretical, psychomotor/skills and experiential/workplace subjects in the fourth year. Another two organised emergency care subjects according to patient group and context, i.e. paediatric and neonatal emergency care, and Critical Care Retrieval (CCR) with integrated theoretical and practical learning. The subject structures are displayed below.[48]

Table A4-1: The two models of Bachelor's programs (Model A and B) which differentiate in the fourth year of study

Subject structure for the first three years for all programs. **(Years 1-3)**	Clinical Theoretical Subject	Clinical Practical Subject	Workplace learning subject	Anatomy (year 1)	Physiology (year 1 and 2)	Pathology- (year 3)	Pharmacology (year 3)
Model A Final year subject structure for two programs **(Year 4)**	Clinical Theoretical Subject		Clinical Practical Subject		Workplace learning subject		
Model B Final year subject structure for another two programs **(Year 4)**	Paediatric specific subject (theoretical and practical)		Critical Care Retrieval (theoretical and practical)		Workplace learning subject		

[48] *These do not represent **all** the subjects present in these programs. All programs also contain non-clinical or non-fundamental science subjects which are not represented in the models.*

Diploma Programs

Diploma program five offered theoretical subject streams based on context, i.e. trauma emergencies and medical (non-trauma) emergencies and offered CCR as a standalone theoretical subject. Program 5 also had a standalone practical subject. Program six organised subjects as theoretical/cognitive, practical, and work-place learning, embedding CCR in the main theoretical subject.

Table A4-2: Two models of Diploma programs (Model A and B) which differentiate in both years of study.

Model A	**Year 1**	Medical (Non-trauma) emergencies – theoretical	Trauma emergencies – theoretical	Practical subject	Workplace learning subject	Physiology - theoretical	Anatomy – theoretical
	Year 2	Medical (Non-trauma) emergencies - theoretical	Trauma emergencies - theoretical	Practical subject	Workplace learning subject	Critical Care Retrieval - theoretical	
Model B	**Year 1**	Clinical Theoretical Subject	Clinical Practical Subject	Workplace learning subject	Anatomy – theoretical	Physiology-theoretical	
	Year 2	Clinical Theoretical Subject		Clinical Practical Subject		Workplace learning subject	

Higher Certificate

Two HC programs organised the clinical subjects as theoretical and practical subjects. The third maintained a practical subject throughout the year but a purely theoretical subject in semester one, and a second semester subject which integrated theoretical and practical learning. All three programs offered workplace learning as a subject.

Table A4-3: Two models of HC programs (Model E and F)

Model A	Theory subject - theoretical		Practical subject - Practical	Workplace Learning	Physiology - theoretical	Anatomy – theoretical
	Theory subject - theoretical		Practical subject - Practical	Workplace Learning	Physiology - theoretical	Anatomy – theoretical
Model B	Emergency Care – theory (semester 1)	Emergency Care – practical and theory (semester 2)	Practical subject	Workplace Learning	Physiology - theoretical	Anatomy – theoretical

Tables A4-4, A4-5 and A4-6 show the locations of units of study dedicated to pain, and the location of pain ILOs within programs. Dedicated units of study for pain are not found in all subject types, or across programs.

Table A4-4: Map of Bachelor's programs showing location of pain outcomes

	Program	Emergency Care Theory	Emergency Care Practical	Work-place learning	Physiology 1	Anatomy 1
Year 1	1	Dedicated pain study unit	Embedded in other units	Dedicated pain study unit	No explicit pain outcomes	No explicit pain outcomes
	2	Embedded in other units	No explicit pain outcomes	No explicit pain outcomes	No response	No response
	3	Embedded in other units	No explicit pain outcomes	No explicit pain outcomes	No response	No response
	4	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes
	Program	Theoretical ILOs	Emergency Care Practical	Work-place learning	Physiology 2	
Year 2	1	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	Dedicated pain study unit	
	2	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No response	
	3	Dedicated pain study unit	No explicit pain outcomes	No explicit pain outcomes	No response	
	4	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	Dedicated pain study unit	
	Program	Theoretical ILOs	Emergency Care Practical	Work-place learning	Pharmacology	Pathology
Year 3	1	Dedicated pain study unit	Dedicated pain study unit	Embedded in other units	Dedicated pain study unit	Embedded in other units
	2	Dedicated pain study unit	Dedicated pain study unit	No explicit pain outcomes	Dedicated pain study unit	No response
	3	Embedded in other units	No explicit pain outcomes	No explicit pain outcomes	No response	No response
	4	Embedded in other units	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes
	Program	**EMC Theory**	**EMC Practical**	**Work-place learning**		
Year 4	1	no explicit outcomes	no explicit outcomes	No explicit pain outcomes		
	2	Dedicated pain unit	No explicit pain outcomes	No explicit pain outcomes		
		Paediatric subject (theory and practical)	**Critical care retrieval (theory and practical)**	**Work-place learning**		
	3	Dedicated pain study unit	No explicit pain outcomes	No explicit pain outcomes		
	4	Dedicated pain study unit	No explicit pain outcomes	No explicit pain outcomes		

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Table A4-5: Map of Diploma programs showing location of pain outcomes

	Program	Emergency Care Medical	Emergency Care Trauma	Practical	Work-place learning	Physiology 1	Anatomy 1
Year 1	5	Embedded in other subjects	Embedded in other subjects	Embedded in other subjects	No explicit outcomes	No explicit outcomes	No explicit outcomes
		Emergency Care Theory		Emergency Care Practical	Work-place learning	Physiology 1	Anatomy 1
	6	No explicit outcomes		No explicit outcomes	No explicit outcomes	No explicit outcomes	No explicit outcomes

	Program	Emergency Care Medical	Emergency Care Trauma	Practical	Work-place learning	Critical Care Transport
Year 2	5	Embedded in other subjects	Embedded in other subjects	No explicit outcomes	No explicit outcomes	Embedded in other subjects
		Emergency Care Theory		Emergency Care Practical	Work-place learning	
	6	Embedded in other subjects		No explicit outcomes	No explicit outcomes	

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Table A4-6: Map of Higher Certificate programs showing location of pain teaching

	program	Theory subject (Semester 1)	Integrated theory and practical subject (Semester 2)	Practical Subject	Workplace subject	Physiology 1	Anatomy 1
Year 1	9	Embedded in other subjects	Dedicated pain study unit	Embedded in other subjects	No explicit outcomes	No explicit outcomes	No explicit outcomes
		Emergency Care Theory		**Emergency Care Practical**	**Clinical Practice**	**Physiology 1**	**Anatomy 1**
	8	Embedded in other subjects		No explicit outcomes	No explicit outcomes	No explicit outcomes	No explicit outcomes
	7	Embedded in other subjects		No explicit outcomes	No explicit outcomes	No explicit outcomes	No explicit outcomes

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Description of contexts and patient groups (Window 2)

Hierarchy charts generated by NVIVO 12 Pro showing the emphasis on context and patient groups found in the SLGs (charts Figure 7 and Figure 8) This observation, verified through NVivo, finds that pain contexts or typologies and patient grouping by age or sex are disproportionately differentiated. The implication is a lack of sensitivity for particular age and sex groups and teaching of content without adequate context. This raises concern for educational efficacy and patient safety downstream..

Figure A4-1 shows that the greatest number of SLGs contained undifferentiated pain ILOs. The similar shading of the areas show that the SLGs contained similar numbers of ILOs per context. Figure 8 shows the ILOs per patient grouping. The greatest number of SLGs do not specify a patient group when considering ILOs.

Figure A4-1: Hierarchy chart of patient groups: The number of SLGs contributing codes are depicted by the area of the fields. The number of aggregated codes extracted from those SLGs by colour shade. The greater the area of a category field, the more SLGs contained codes for that category. The larger the total number of codes in that category, the darker the colour will be. Child codes are shown nested within the parent code.

Figure A4-2: Hierarchy chart of contexts. The number of SLGs contributing codes are depicted by the area of the fields. The number of aggregated codes extracted from those SLGs by colour shade. The greater the area of a category field, the more SLGs contained codes for that category. The larger the total number of codes in that category, the darker the colour will be. Child codes are shown nested within the parent code.

Figure A4-2 shows that the greater number of SLGs contained contextually undifferentiated ILOs for pain. Contextual ILOs, those specifying trauma or CCR were present in a minority of SLGs.

Description of Domains of Learning (Window 3)

The ILOs were coded according to Bloom's Domains of Learning. The cognitive domains refer to skills related to mental processes, acquisition of knowledge, task accomplishment and problem solving. Learners remember or reproduce something, solve an intellectual problem or reorder or combine previously learned work to produce new outputs. The affective domain refers to attitudes, feelings, and emotions, the acceptance or rejection of an idea, and the development of character traits. [88] The Psychomotor Domain empathises muscular and motor skills and manipulation of material requiring neuromuscular coordination. [88]

Most ILOs were evaluated to be cognitive in nature, emphasising content knowledge task accomplishment, problem solving or reproduction. Fewer ILOs were evaluated as intentionally biasing psychomotor skills. The ILOs coded as affective in nature were scarce across the aggregated SLGs. Of interest, only 3 SLGs were evaluated to contain a single affective pain ILO each. These affective domain outcomes are displayed in Table 3.

Table A4-7: Affective Intended learning outcomes per subject learner guide for paediatrics, trauma and undifferentiated groups and contexts

Reference learner guide	Intended learning outcome
1_B_3_EMCT	• Display tolerance for culture, race and gender as influencers of pain expression.
5_D_1_PHE	• Use a structured format to communicate with distressed patients while remaining sensitive to their age, values, culture, religion, gender and socioeconomic and personal circumstances.
9_HC_1_ECP	• Display tolerance for culture, race and gender as influencers of pain expression.

Specific description of topics (Window 4)

Category: Pharmacology

Bachelors programs accentuated pharmacological pain management, enabled by the pharmacology subject. Pharmacological ILOs in bachelors programs were comprehensive in respect of analgesic medicines. ILOs relating to concepts such as pharmacokinetics and pharmacodynamics were general in some SLGs, and not specifically relating to analgesics. [2_B_3_Ph]. The ILOs covered the classes of medicines in the authorised formulary [58] and some exceeded the formulary, including ILOs addressing medicines such as pentazocine and buprenorphine, propoxyphene and codeine [1_B_3_Ph] and Sufentanil, alfentanil, remifentanil, Methadone and Meperidine. [4_B_3_Ph]. Bachelor's programs also covered NSAIDS, including Ibuprofen, Aspirin, Diclofenac [4_B_3_Ph] [1_B_3_Ph] and paracetamol. [1_B_3_Ph] Local anaesthetics were mentioned as a class, without being specific. These outcomes were not systematic or present in all the programs equally.

This relative breath in content was not carried through to the Diploma and HC programs, none of which displayed comprehensive pharmacology ILOs, despite graduates having an extensive authorised medicines formulary. [58] Only program 5 contained ILOs relating to pharmacokinetics and pharmacodynamics but specific mention of analgesics was omitted. Any mention of pharmacology was confined to ILOs relating to use and application of a medicine in general pain management. Explicit pharmacology ILOs were not present in HC programs (pharmacology ILOs are shown in Appendix 5). Bachelor's programs 1 and 2 contained ILOs relating to receptor tolerance, drug misuse and dependence in their opioid sections, but did not address how pain should be managed in the substance-dependant patient.

5.6.3 Category: Pain Assessment

Pain assessment as a topic was variable and inconsistently situated. Bachelor's programs 1 and 2 addressed pain assessment in year 1, while program 4 addressed it in year 3, with only program 1 detailing the pain scales in the SLG. Programs 2, 3 and 4 addressed paediatric pain assessment in year 4. In the Diploma programs, program 5 omitted pain assessment as a topic, with program 6 situating it in the theory subject only, of year 2. In the HC programs, program 9 contains pain assessment ILOs in the theoretical and practical subjects, with detailed descriptions of the pain scales. Programs 7 and 8 contain no ILOs related to pain assessment. There are no ILOs in any programs dealing with the subjective nature of pain or the experience of pain from a patient's point of view.

5.6.4 Category: Pain as a symptom

A number of ILOs referred to pain as a symptom in discussing the pathophysiology of a disorder or to aid diagnosis, without categorising pain management. The aetiologies were gastrointestinal/abdominal pain (programs 1, 3, 5 and 9), cardiac pain (programs 1,3,5, and 9), gynaecological pain (program 1) and spinal tenderness (program 5). All ILOs were evaluated to be in

the cognitive domain, and mostly referred to non-traumatic pain, including abdominal and chest pain.

5.6.5 Category: Pain Management

Most management ILOs were general, with little specificity in respect of context or disorders. All programs emphasised the use of pharmacological therapies in acute traumatic pain. Non-pharmacological therapy is only explicitly documented in year 1 of Bachelor's program 1 and in the HC program 9. A single, duplicate ILO pertaining to risk management was present in the theoretical and practical subject of Bachelor's program 2, in the third year of study. However, the ILO did not require the use of risk assessment tools.

Pain management of potential procedures were limited to intubation (programs 2 and 3), electrical cardioversion (program 6) and pain management during labour (programs 5 and 9). Diploma program 5 contained general outcomes related to procedural pain and sedation (PSA) in trauma.

Table A4-8: Map of curriculum organisation, location of dedicated units of study and location of pain topics: Bachelor's degrees.

	Program	Emergency Care Theory	Emergency Care Practical	Work-place learning	Physiology 1	Anatomy 1
Year 1	1	• Pain management general • Pain assessment • Application of pharmacological therapies (ENTONOX, Methoxyflurane) • Application of non-pharmacological therapies (Splint, Ice, Elevation) • Communication	• Pain management general • Pain management (musculoskeletal trauma & burns) • Pain assessment • Application of pharmacological therapies • Application of non-pharmacological therapies • Communication	• Pain management (general) • Application of pharmacological therapy • Application of non-pharmacological therapy • Pain assessment (tools and scales) • Communication	No explicit pain outcomes	No explicit pain outcomes
	2	• Pain assessment (general) • Pain management (musculoskeletal trauma and burns)	No explicit pain outcomes	No explicit pain outcomes	No response	No response
	3	• Pain as a symptom (abdominal)	No explicit pain outcomes	No explicit pain outcomes	No response	No response
	4	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Emergency Care Theory	Emergency Care Practical	Work-place learning	Physiology 2
No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	• Nociceptors • Conduction • Stimuli • Central processing • Modulation • Purpose of pain • Categories of pain • Pathology & pathophysiology (headaches)
No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	No response
• Pain as a symptom (cardiac) • Pharmacokinetics • Pharmacodynamics • Pain management in trauma • Application of pharmacological therapy	No explicit pain outcomes	No explicit pain outcomes	No response
No explicit pain outcomes	No explicit pain outcomes	No explicit pain outcomes	• Nociceptors • Conduction • Stimuli • Central processing • Modulation • Purpose of pain • Categories of pain • Pathology & pathophysiology (headaches)

	Program	Emergency Care Theory	Emergency Care Practical	Work-place learning	Pharmacology	Pathology
Year 3	1	• Assessment (Patient Factors) • Provider as a person • Cultural, racial and gender competence • Patient rights • Pain assessment(tools and scales) (VAS, NRS, FLACC, Wong-Baker, Adjectives) •Pain management general • Application of pharmacological therapy (Ketamine, Morphine, Fentanyl, Paracetamol, Anti-inflammatories)	• Pain assessment tools and scales • Application of pharmacological therapies • Pain management general	• Pain Assessment	• Pharmacokinetics and Pharmacodynamics of opioids and mixed opioid agonists/antagonists/Anaesthetics Local anaesthetics • Pharmacokinetics and Pharmacodynamics of inhaled analgesics	• Pain as a symptom (abdominal)(Cardiac)(gynaecologic)
	2	• Risk Assessment • Clinical decision making • Pain Assessment • Procedural pain management (intubation) • Application of pharmacological therapies	• Risk assessment • Clinical decision making • Application of pharmacological therapy • Pain management (general)	No explicit pain outcomes	• Misuse, dependence and addiction Pharmacokinetics and pharmacodynamics Local anaesthetics NSAIDS Opioids	No response
	3	• Application of pharmacological Therapy • Procedural pain management (intubation)	No explicit pain outcomes	No explicit pain outcomes	No response	No response
	4	• Pain assessment • Pain management general • Application of pharmacological therapy	No explicit pain outcomes	No explicit pain outcomes	• Medicine classes (anaesthetics)(Entonox, Methoxyflurane, Ketamine, Local Anaesthetics) • Analgesics classes (opioids) (Morphine, Codeine, Fentanyl, Sufentanil, Alfentanil,) Remifentanil, Methadone, Meperidine,) • Medicine classes (NSAIDs/Paracetamol)	• Pathology and pathophysiology of pain

	Program	Emergency Care Theory	Emergency Care Practical	Work-place learning
Year 4	1	no explicit outcomes	no explicit outcomes	No explicit pain outcomes
	2	• Pains assessment (Paediatric) • Pain Management (Paediatric) • Application of pharmacological therapy (Opioids)	No explicit pain outcomes	No explicit pain outcomes
		Paediatric subject (theory and practical)	**Critical care retrieval (theory and practical)**	**Workplace Learning**
	3	• Pains assessment (Paediatric) • Pain Management (Paediatric) • Application of pharmacological therapy (Paediatric)(Opioids)	No explicit pain outcomes	No explicit pain outcomes
	4	• Pains assessment (Paediatric) • Pain Management (Paediatric) • Application of pharmacological therapy (Paediatric)(Opioids)	No explicit pain outcomes	No explicit pain outcomes

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Table A4-9: Map of curriculum organisation, location of dedicated units of study and location of pain topics: Diplomas.

Year 1	**Program**	**Emergency Care Medical**	**Emergency Care Trauma**	**Practical**	**Work-place learning**	**Physiology 1**	**Anatomy 1**
	5	• Application of pharmacological therapy (Labour) • Pain as a Symptom (Cardiac)(Abdominal) • Pharmacokinetics • Pharmacodynamics	Application of pharmacological therapy Pain as a symptom (spinal tenderness)	• Application of pharmacological therapy (Labour)	No explicit outcomes	No explicit outcomes	No explicit outcomes
		Emergency Care Theory	**Emergency Care Practical**		**Work-place learning**	**Physiology 1**	**Anatomy 1**
	6	No explicit outcomes	No explicit outcomes		No explicit outcomes	No explicit outcomes	No explicit outcomes
Year 2	**Program**	**Emergency Care Medical**	**Emergency Care Trauma**	**Practical**	**Clinical Practice**	**Critical Care Transport**	
	5	Pain management (Labour) • Pharmacological therapy Pain as a symptom (Abdominal/Chest pain) Pharmacokinetics Pharmacodynamics	• Pain management (paediatric trauma) PSA (trauma)	No explicit outcomes	No explicit outcomes	Application of pharmacological therapy	
		Emergency Care Theory	**Emergency Care Practical**		**Clinical Practice**		
	6	• Pathophysiology of pain • Pain assessment (paediatric pain scales) • Pain management (paediatric) • Pain management (general) •Procedural (cardioversion) • Application of pharmacological therapy	No explicit outcomes		No explicit outcomes		

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Table A4-10: Map of curriculum organisation, location of dedicated units of study and location of pain topics: Higher Certificates.

Program	Emergency Care Theory		Emergency Care Practical	Clinical Practice	Physiology 1	Anatomy 1
7	• Pathology and pathophysiology • Nociceptors • Categories of pain		No explicit outcomes	No explicit outcomes	No explicit outcomes	No explicit outcomes
8	• Pathology and pathophysiology • Nociceptors • Categories of pain • Referral to higher care		No explicit outcomes	No explicit outcomes	No explicit outcomes	No explicit outcomes
Program	**PEC**	**ECP**	**Skills**	**Clinical Practice**	**Physiology 1**	**Anatomy 1**
9	• Pain as a symptom (cardiac)	• Patient factors • Cultural, Racial and Gender Competence • Patient rights • Pain as a symptom (abdominal & cardiac) • Application of non-pharmacological therapy • Pathology and pathophysiology • nociceptors • Categories of pain • Decision making • Pain Assessment (tools and scales) (VAS, NRS, FLACC, Wong-Baker, Adjectives) • Pain management musculoskeletal trauma and burns	• Pain assessment (paediatrics) • Pain Management (general) • Application of non-pharmacological therapy (Ice, Splint, Distraction, Reassurance)	No explicit outcomes	No explicit outcomes	No explicit outcomes

Legend

Green: Dedicated Pain Unit of Study	**Yellow**: Pain ILOs embedded in other Units of Study	**Red:** No explicit pain outcomes

Minority Categories: Ethics, Provider characteristics, Decision Making and Referral to Higher Care

The hierarchy chart below displays the emphasis of pain management ILOs in the aggregated SLGs. Undifferentiated pain management ILOs (prescribing neither medicines, nor non-pharmacological methods) and explicitly non-pharmacological methods are present in the smallest number of SLGs. The least emphasised ILOs are those involving ethics, drug dependence and cultural, racial and gender competence, being found in the fewest SLGs and producing the fewest codes.

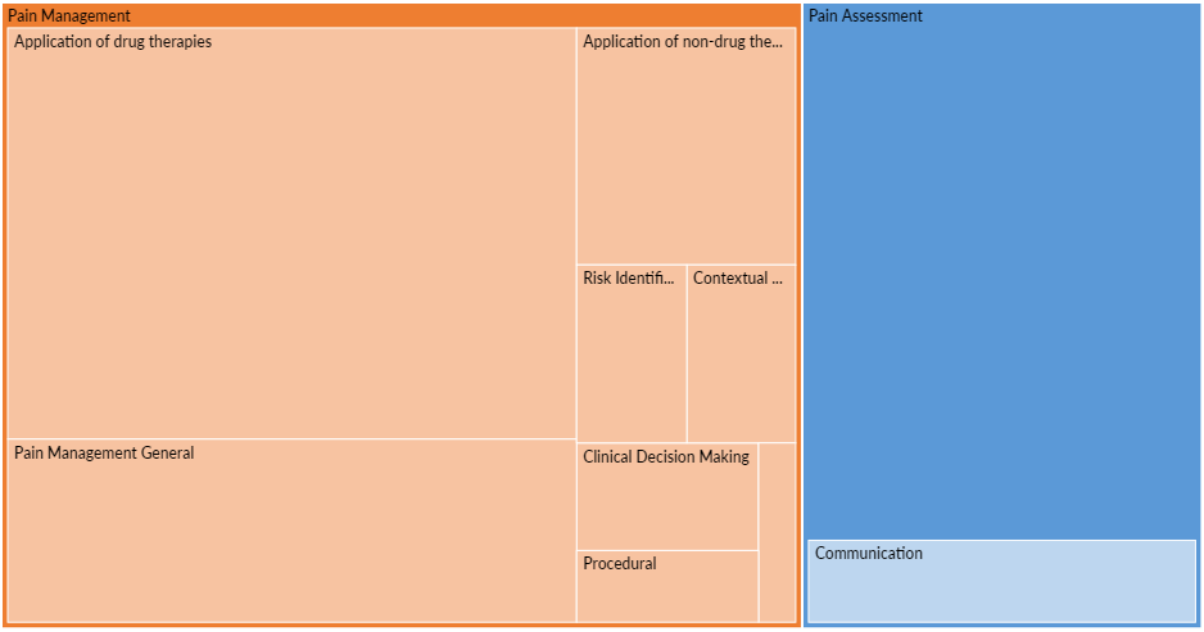

Figure A4-6: Content: Pain management and assessment by topic: The number of SLGs contributing codes are depicted by the area of the fields. The number of aggregated codes extracted from those SLGs by colour shade. The greater the area of a category field, the more SLGs contained codes for that category. The larger the total number of codes in that category, the darker the colour will be. Child codes are shown nested within the parent code. This chart denotes pain management codes and categories in orange, and pain assessment codes and categories in blue.

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Appendix 8: Aggregated Intended Learning Outcomes for Pain

Cognitive Intended learning outcomes per for paediatrics, trauma and undifferentiated groups and contexts

Reference SLG		Intended learning outcome			
	Paediatric Pain assessment ILOs	**Paediatric Pain Management ILOs**	**Trauma**	**Contextually undifferentiated pain assessment ILOs**	**Contextually undifferentiated pain management ILOs**
1_B_1_EMCT	nil	nil	• Discuss the management of fractures in the prehospital setting including; ○ pain management and the principles of procedural pain relief for fracture stabilization ○ the use of wire / box splints ○ traction splints ○ pneumatic splints	• Use a validated pain assessment tool appropriate to a context. • Comprehensively discuss the importance of establishing a rapport with patients during the emergency situation.	• Describe and discuss in detail the characteristics and usage of the following pharmacological and non-pharmacological pain management measures: ○ Splinting Ice ○ Elevation ○ Reassurance ○ Entonox ○ Methoxyflurane (Penthrox)
1_B_1_EMCP	nil	nil	• Demonstrate assessment and care of the trauma patient with regards to: ○ Pain assessment and management	• Efficiently integrate pain management therapies into the management of emergency conditions	
1_B_1_CP	nil	nil	• Demonstrate assessment and care of the trauma patient with regards to: ○ Pain assessment and management	• Use validated pain assessment tool appropriate to a context	• Apply the fundamentals of pain management contextually in a clinical situation ○
1_B_3_EMCP				• Apply pain assessment tools and methods that are appropriate for context.	

				○ Morphine ○ Ketamine ○ Fentanyl ○ Paracetamol ○ Anti-inflammatories	
1_B_3_EMCT	• Describe the use of the following pain scales: ○ Numeric Rating Scale ○ Visual Analogue Scale ○ Adjective Rating Scale ○ Wong-Baker Scale ○ FLACC	nil	○	• Describe the assessment of pain	• Integrate pain management principles and techniques into the management of painful injuries and disorders. • Describe the use of pharmacological agents in pain management. • Comprehensively describe the characteristics and use of the following analgesics: ○ Morphine ○ Fentanyl ○ Ketamine ○ Paracetamol ○ Anti-inflammatories
2_B_1_EMCT	nil	nil	nil	• Identifying pain and the management options	nil
2_B_3_EMCP	nil	nil	nil	•	• Identify the indications for analgesia in the pre-hospital environment. • When presented with a comprehensive clinical scenario, determine the appropriateness of

					analgesia administration and decide on the best treatment regimen. • Select the dosage and demonstrate the general approach for post-intubation sedation, analgesia and paralysis using: o Midazolam o Morphine o Ketamine o Rocuronium o Vecuronium o Neostigmine
2_B_3_EMCT	nil	nil	nil	• Select with justification an appropriate method(s) for assessing pain severity using evidence that validates such method(s) • Compare the drugs in common usage for analgesia.	• When presented with a comprehensive clinical case study, determine the appropriateness of analgesia administration and decide on the best treatment regimen.
2_B_4_EMCT	• Discuss the challenges associated with identifying and quantifying pain, particularly in younger children. • Name the clinical features associated with the behavioural response to pain in	• Discuss and demonstrate the management of pain in different paediatric age groups and specifically the administration of opioid analgesics. [Refer to HPCSA PBEC CPGs].	nil	nil	nil

	different paediatric age groups.				
3_B_2_EMCT	nil	nil	• Discuss the Pre-hospital recommendations for analgesia in trauma patients.	nil	• Give the dosage and general approach for post-intubation sedation, analgesia and paralysis using midazolam, morphine, rocuronium and vecuronium.
1_B_3_EMCP	nil	nil	nil	• Apply pain assessment tools and methods that are appropriate for context.	
3_B_4_PNC	• Discuss the challenges associated with identifying and quantifying pain, particularly in younger children. • Name the clinical features associated with the behavioural response to pain in different paediatric age groups.	• Discuss the management of pain in different paediatric age groups and specifically the administration of opioid analgesics. [Refer to HPCSA ALS protocols]	nil	nil	nil
4_B_3_EMCT	nil	nil	nil	• Explain how to assess for, identify and manage pain.	Give the dosage and general approach for post-intubation sedation, analgesia and paralysis using midazolam, morphine, rocuronium and vecuronium.
4_B_4_PNEC	• The challenges associated with	• The management of pain in different	nil	nil	nil

	identifying and quantifying pain are discussed, particularly in younger children. • The clinical features associated with the behavioural response to pain in different paediatric age groups are named.	paediatric age groups is discussed, and specifically the administration of opioid analgesics (within the confines of the HPCSA ALS protocols)			
5_D_1_M	nil	nil	nil	nil	nil
5_D_1_T	nil	nil	• Discuss pain management in the trauma patient according to defined protocols: o Methoxyflurane o Nitrous Oxide • Briefly discuss the various factors that should be taken into consideration to determine whether spinal immobilization should be instituted, under the following headings: o Spinal pain or tenderness	nil	nil
5_D_2_T	nil	• Discuss pain management in paediatric trauma.	• Discuss pain management of the patient with a musculoskeletal injury.	• Discuss the scheduling, mechanism of action, indications, contraindications, adverse events, precautions, dosage	nil

			• Discuss procedural sedation and analgesia (PSA) of the trauma patient in the prehospital emergency care setting according to a defined protocol.	and administration of the following drugs: ○ Fentanyl ○ Ketamine - Intramuscular ○ Lignocaine hydrochloride (Local Anaesthetic) ○ Morphine Sulphate ○ Paracetamol (Intravenous)	
5_D_2_PHE	nil	nil	nil	nil	• Initiation of pharmacological analgesia
6_D_2_EMCT	• The use of an age-appropriate pain scale method to assess pain severity. • Discuss the differences in the process of pain assessment and management in the paediatric patient.	nil	• Integrate pain management principles and techniques into the management of musculoskeletal disorders and injuries.	nil	• Indications and contraindications to the use of various pain management agents in the pre-hospital setting • Advantages and disadvantages (limitations) with the use of analgesia in prehospital settings • The use of the various agents for pain management in the pre-hospital setting.
7_HC_1_EMCT	nil	nil	nil	• Explain pain under the following headings: ○ Physiology ○ Receptors ○ Types ○ Assessment ○ Appropriate management	nil
8_HC_1_EMCT	nil	nil	nil	• Describe pain and the principle of pain management in the prehospital setting	• Physiology, receptors, types, assessment of pain are correctly explained leading to appropriate

					management and correct identification for a need of referral to a higher level of clinical competency
9_HC_1_ECS	• Adapt pain assessment methods to be appropriate for children.	nil	nil	nil	nil
9_HC_1_ECP	• Describe the assessment of pain. • Describe the use of the following pain scales: ○ Numeric Rating Scale ○ Visual Analogue Scale ○ Adjective Rating Scale ○ Wong-Baker Scale ○ FLACC	nil	nil	nil	• Integrate pain management principles and techniques into the management of musculoskeletal disorders and injuries. • Describe the use of pharmacological agents in pain management. • Comprehensively describe the characteristics and use of the following analgesics: ○ Methoxyflurane ○ Nitrous Oxide • Comprehensively describe the use of the following techniques for pain management: ○ Ice ○ Splinting ○ Distraction ○ Reassurance

Psychomotor Intended learning outcomes per for paediatrics, trauma and undifferentiated groups and contexts

Reference SLG	Intended learning outcome				
	Paediatric Pain assessment ILOs	**Paediatric Pain Management ILOs**	**Trauma**	**Contextually undifferentiated pain assessment ILOs**	**Contextually undifferentiated pain management ILOs**
1_B_1_EMCT	nil	nil	nil	• Demonstrate the principles of pain assessment and communicating with patients in pain.	nil
1_B_1_EMCP	nil	nil	nil	• Demonstrate the principles of pain assessment and communicating with patients in pain.	• Demonstrate and show the appropriate use of the following pharmacological and non-pharmacological pain management measures: ○ Splinting ○ Ice ○ Elevation ○ Reassurance ○ Entonox ○ Methoxyflurane
1_B_1_CP	nil	nil	nil	nil	• Demonstrate and show the appropriate use of the following pharmacological and nonpharmacological pain management measures: ○ Splinting ○ Ice ○ Elevation ○ Reassurance ○ Entonox Penthroxyflurane

1_B_3_EMCT	nil	nil	• Demonstrate assessment and care of the trauma patient with regards to: ○ Pain assessment and management	nil	nil
2_B_3_EMCP	nil	nil	nil	Demonstrate an appropriate method(s) for assessing pain severity based on evidence that validates such method(s).	• Demonstrate the use of the drugs in common usage for analgesia.
1_B_3_EMCP	nil	nil	nil	nil	• Correctly assemble and manipulate equipment for the provision of pain management drugs and interventions.

Intended learning outcomes: Critical Care Retrieval

Reference SLG	Intended learning outcome
5_D_2_CCTd	Discuss the use of sedation and analgesia during critical care transfer, in both mechanically ventilated and spontaneously breathing patients.

Intended learning outcomes: Physiology

Reference SLG	Intended learning outcome
1_B_2_P	• Describe and discuss 3 types of stimuli (chemical, mechanical and thermal) • Explain the non-adaptive nature of pain receptors • Explain the relationship between the rate of tissue damage and intensity of pain • Explain the effect on bradykinin • Explain how tissue Ischemia causes pain • Describe how muscle spasms cause pain • Understand the concept of “double pain sensation” • Describe receptors for pain and describe the spinothalamic tract for pain and temperature • Briefly describe and distinguish between the neospinothalamic and paleospinothalamic pathways • Describe receptors for pain • Describe structure and localization of pain receptors • Describe the body pain suppression mechanism • Distinguish between fast and slow pain • Explain the relationship between pain stimuli and arousal of the reticular activation system
4_B_2_P	• Describe the functioning of pain receptors and list the types of painful stimuli • State the functional purpose of pain. • Describe the functioning of pain receptors and list the types of painful stimuli • Discuss analgesia and describe the major components of the analgesic system. • Trace the dual transmission of pain into the central nervous system. • Distinguish between the two major categories of pain • Describe the physiological mechanisms underlying referred and visceral pain. • Describe the role of endorphins and enkephalins in the analgesic system. • Describe the gate control theory of pain modulation.

4_B_2_GP	• Describe the pathophysiology of pain in detail.
6_D_2_EMCT	• Discuss the provision of analgesia under the following headings: o Overview of pain
9_HC_1_PEC	• Describe the pathophysiology and clinical presentation of selected cardiovascular disorders.
7_HC_1_EMCT	• Explain pain under the following headings: o Physiology o Receptors o Types
8_HC_1_EMCT	• Physiology, receptors, types, assessment of pain are correctly explained leading to appropriate management and correct identification for a need of referral to a higher level of clinical competency
9_HC_1_ECP	• Briefly describe the sensory perception of pain. • Accurately list the neurotransmitters involved in pain transmission. • Briefly describe the neural pathways involved in sensory transmission of pain

Intended learning outcomes: Pharmacology

Reference	Intended learning outcomes
1_B_3_Ph	• Discuss the role of opioid receptors and their distribution within the body. • Explain the mechanism of action, actions, therapeutic uses, pharmacokinetics, adverse effects, tolerance and physical dependence and drug interactions of opioid agonists. • Explain the mechanism of action, actions, therapeutic uses, pharmacokinetics and adverse effects of partial opioid agonists and mixed agonist-antagonists. • Explain the mechanism of action, actions, therapeutic uses, pharmacokinetics and adverse effects of opioid antagonists. • Briefly describe the use of fentanyl in anaesthesia. • Be able to provide brief notes on the moderate agonist's propoxyphene and codeine. • Be able to provide brief notes on the mixed analgesic agonist-antagonists pentazocine and buprenorphine. • Discuss how Naloxone and naltrexone act as opioid antagonists • Discuss the selection of drugs that provide a safe and efficient anaesthetic regimen based on the nature of the surgical procedure as well as the patient's physiologic and pharmacologic state.

	• Discuss the staged progression of anaesthesia from induction through to recovery. • Explain how inhalation anaesthetics maintain anaesthesia after the administration of an intravenous agent with regards common features of inhaled anaesthetics, potency, uptake and distribution and mechanism of action. • Describe the effects of nitrous oxide. • Describe the different types of intravenous anaesthetics (barbiturates, benzodiazepines, opioids, neurolept anaesthesia, ketamine and propofol) that are used to rapidly induce anaesthesia. • Be able to explain the use of intravenous anaesthetics with regards to rapid sequence induction. • Explain the mechanism of action and adverse effects of local anaesthetics.
2_B_3_Ph	• Describe the mechanism, effects of local anaesthetics and methods of administration. • Explain the function of pain receptors and describe the pharmacological action of opioid analgesics. • Describe the pharmacological actions of nonsteroidal anti-inflammatory drugs.

4_B_3_Ph	• Discuss the:
	  ○ Stages of anesthesia
	  ○ Depth of anesthesia
	• Discuss the mechanism of action and pharmacokinetics of the following groups of medications:
	  ○ Inhalation anaesthetics in general
	  ○ Nitrous oxide
	  ○ Methoxyflurane
	  ○ Intravenous anaesthetics, specifically
	  ○ Propofol
	  ○ Benzodiazepines
	  ○ Etomidate
	  ○ Ketamine
	  ○ Local anaesthetics
	  ○ Morphine
	  ○ Codeine
	  ○ Fentanyl
	  ○ Sufentanil
	  ○ Alfentanil
	  ○ Remifentanil
	  ○ Methadone
	  ○ Meperidine
	  ○ Partial agonists and mixed agonist-antagonist medications

	○ Non-Narcotic analgesic agents ○ Paracetamol ○ Ibuprofen ○ Diclofenac ○ Acetyl Salicylic Acid
5_D_1_M	• Discuss the scheduling, mechanism of action, indications, contraindications, adverse events, precautions, dosage and administration of the following drugs: ○ Acetyl Salicylic Acid ○ Nitrous oxide
5_D_2_M	• Discuss the scheduling, mechanism of action, indications, contraindications, adverse events, precautions, dosage and administration of the following drugs: ○ Paracetamol (Intravenous and Oral)

Intended learning outcomes: Drug Misuse, Tolerance and Dependence.

Reference SLG	Intended Learning Outcome
[1_B_3_Ph]	• Explain the mechanism of action, actions, therapeutic uses, pharmacokinetics, adverse effects, tolerance and physical dependence and drug interactions of opioid agonists.
[2_B_3_Ph]	• Discuss the deleterious effects of drug misuse and dependence.

Intended learning outcomes: Pain as a Symptom

Reference SLG	**Intended learning outcome**
9_HC_1_PEC	• List the causes of chest pain
9_HC_1_ECP	• Appropriately assess abdominal pain.
5_D_1_M	• Differentiate the typology of chest pain. • Evaluate the severity of chest pain.

	• Interpret the 3-Lead ECG tracing in a patient with cardiac chest pain. • Describe the ST segment and T-wave rhythm changes that can occur on the ECG in the presence of chest pain. • Describe the location and type of abdominal pain, with particular reference to visceral, somatic and referred pain
5_D_2_M	• Discuss the focused history to be obtained from the patient with abdominal pain. • Explain the mechanism of pain with specific reference to abdominal pain and referred pain.
1_B_3_GP	• Discuss the following as a cause of abdominal or chest pain: o Gastritis o Oesophagitis/Reflux oesophagitis • Discuss the most common abnormalities of the Endometrium and Myometrium as causes of pain and bleeding: o Ovarian Cysts o Endometriosis o Inflammation of the Fallopian tubes
2_B_2_EMCT	• Differentiate the characteristics of the pain/discomfort occurring in angina pectoris and acute myocardial infarction.
3_B_1_EMCT	• Outline the prehospital assessment and treatment of a patient complaining of abdominal pain and distinguish between pain characteristics.
3_B_2_EMCT	• Differentiate the characteristics of the pain/discomfort occurring in angina pectoris and acute myocardial infarction.

Intended learning outcomes: Risk Assessment

Reference SLG	Intended learning outcome

2_B_3_EMCP and 2_B_3_EMCT	• Identify the possible risks associated with the administration of analgesia in the pre-hospital environment.

Intended learning outcomes: Procedural Analgesia

Reference SLG	Intended learning outcome
5_D_2_T	• Discuss procedural sedation and analgesia (PSA) of the trauma patient in the prehospital emergency care setting according to a defined protocol
6_D_2_EMCT	• The use of sedation and analgesia in/for synchronized cardioversion
2_B_3_EMCP	• Select the dosage and demonstrate the general approach for post-intubation sedation, analgesia and paralysis using: ○ Midazolam ○ Morphine ○ Ketamine ○ Rocuronium ○ Vecuronium ○ Neostigmine
9_HC_1_ECP	• Effectively integrate fracture management into a comprehensive management plan.
3_B_2_EMCT	• Describe and explain optimum prehospital management regarding Procedural sedation using knowledge of pathophysiology and evidence for best practice. • Identify and discuss the emergency drugs used in the procedural prehospital sedation under the following headings: ○ Mechanism of action ○ Side effects ○ Other indications ○ Contra-indications ○ Packaging ○ Dose, repeat dose and dose intervals. ○ Routes and method of administration

Intended learning outcomes: Pain during Labour

Reference SLG	Intended learning outcome
5_D_1_M	• Discuss the use of Nitrous Oxide as an analgesic for the patient in labour
5_D_2_M	• Discuss pain management for the patient in labour.
9_HC_1_ECP	• Describe the management of pain during delivery using Nitrous Oxide

Intended learning outcomes: Critical Care Retrieval Ethics

Reference SLG	Intended Learning Outcome
1_B_3_EMCT	• Discuss patient rights in the context of pain management.
9_HC_1_ECP	• Discuss patient rights in the context of pain management.

Appendix 9: Voting Progression of Consensus Statements.

Key:

Threshold reached	Threshold not reached – discuss and re-vote	Statement redundant and discarded.

Table 7A-1: Voting progression of session two.

Question	Nr	Statement	Voting round 1	Outcome	Amended statement 1	Voting round 2	Outcome
How can the educational field form, and maintain, a mutually beneficial paedogogical relationship with professional practice?	1	Learning should be driven by a unified pain practice	Agree -10 (67%) Disagree – 0 Amendment – 5 (33%)	Threshold not reached – discuss and re-vote	Learning outcomes should be aligned to the multidimensional nature of pain and its management.	Agree -13 (87%) Disagree – 0 Amendment – 2 (13%)	Threshold reached and statement adopted.
	2	Educational institutions should facilitate or participate in platforms for engagement with clinical professionals	Agree – 15 (100%) Disagree – 0(0%) Amendment 0 (0%)	Threshold reached and statement adopted.			
	3	Educational institutions should facilitate CPD learning activities for pain management practice.	Agree – 10 (71%) Disagree – 1 (7%) Amend 3(22%)	Threshold not reached – discuss and re-vote	Key stakeholders should collaborate on ongoing learning activities for pain management.	Agree 14 (93%) Disagree 0 (0%) Amend 1 (7%)	Threshold reached and statement adopted.
	4	Educational institutions should communicate clear learning goals to students and preceptors.	Agree 13 (93%) Disagree 0 (0%) Amend 1 (1%)	Threshold reached and statement adopted.			
	5	Educational programs should foreground cultural transformation in pain practice	Agree 6 (40%) Disagree 4 (27%) Amend 5 (33%)	Threshold not reached – discuss and re-vote	Key stakeholders in the emergency care community of practice should foreground professional cultural transformation in pain education	Agree 13 (87%) Disagree 0 (0%) Amend 2 (13%)	Threshold reached and statement adopted.

Table 7A-2: Voting progression of session three.

Question	Nr	Statement	Voting round 1	Outcome	Amended statement 1	Voting round 2	Outcome
What is the best way to structure the pain curriculum in Emergency Medical Care Education?	6	Pain and nociception outcomes should be explicit throughout the curriculum	Agree 12 (80%) Disagree 1 (7%) Amend 2 (13%)	Threshold reached and statement adopted.			
	7	Learners should participate in a foundational learning unit addressing pain and nociception education early in the program with contextually relevant learning outcomes distributed through the later learning units.	Agree 10 (67%) Disagree 1 (7%) Amend 5 (33%)	Threshold not reached – discuss and re-vote	Learners should participate in a foundational learning unit addressing the multidimensional nature of pain early in the program with contextually relevant learning outcomes distributed through the later learning units.	Agree 13 (87%) Disagree 0 (0%) Amend 2 (13%)	Threshold reached and statement adopted.
	8	Educational programs should use milestones to track the attainment of pain learning outcomes at set points in the program.	Agree 12 (80%) Disagree 0 (0%) Amend 3 (20%)	Threshold reached and statement adopted.			
	9	Senior learners should participate in a pain management capstone learning unit.	Agree 11 (73%) Disagree 1 (7%) Amend 3 (20%)	Threshold not reached – discuss and re-vote	Exit level learners should participate in a learning unit aimed at consolidating knowledge and attributes relating to the multidimensional nature of pain.	Agree 13 (86%) Disagree 1 (7%) Amend 1 (7%)	Threshold reached and statement adopted.

Table 7A-3: Voting progression of session four.

Question	Nr	Statement	Voting round 1	Outcome
What typologies of pain should EMC curricula be preparing graduates to manage, specifically what competencies are required for palliative care and chronic pain?	10	Emergency care curricula should include competence in the management of acute pain in palliative care as contextually relevant to emergency services.	Agree 12 (80%) Disagree 0 (0%) Amend 3 (20%)	Threshold reached and statement adopted.
		Emergency care curricula should develop an understanding of the multidimensional nature of chronic pain.	Agree 7 (47%) Disagree 0 (0%) Amend 8 (53%)	Statement redundant and discarded.
Considering current and future roles, should EMC pain curricula develop graduates as *collaborators*, or communicators?	11	Emergency care curricula should enable graduates as collaborators in interdisciplinary pain care.	Agree 13 (87%) Disagree 0 (0%) Amend 2 (13%)	Threshold reached and statement adopted as an amended statement after voting

Appendix 10: Ethical Clearances

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

Room 650- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

12 November 2020

HREC REF: 614/2020

A/Prof P Hodkinson
Division of Emergency Medicine
F-51 OMB
Email: peter.hodkinson@uct.ac.za
Student: ryan.matthews2@gmail.com

Dear A/Prof Hodkinson

PROJECT TITLE: SHAPING THE UNDERGRADUATE PAIN MANAGEMENT CURRICULUM IN PREHOSPITAL EMERGENCY CARE EDUCATION: TOWARD A CURRICULUM AND COMPETENCY FRAMEWORK FOR SOUTH AFRICA -PHD CANDIDATE MR RYAN MATTHEWS

Thank you for your response letter, addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020 & 06 July 2020.

Approval is granted for one year until the 30 November 2021.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

We acknowledge that the student: Mr Ryan Matthews will also be involved in this study.

Please quote the HREC REF in all your correspondence.

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

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

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

HREC/REF 614/2020sa

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938) This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30.01.2026
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee		Date Signed	28/1/2025

Note: Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.

Please use the latest form found on our website:
http://www.health.uct.ac.za/fhs/research/humanethics/forms

HUMAN RESEARCH ETHICS COMMITTEE
28 JAN 2025
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

Comments to PI from the HREC
Thank you for the deviation document

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)			
HREC REF Number	6 4/2020	Current Ethics Approval was granted until	30.11.2024
Protocol title	Shaping the undergraduate pain management curriculum in prehospital emergency care education: toward a curriculum and competency framework for South Africa.		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?		☐ Yes	x☐ No
If yes, could you please provide the HREC Reference number for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	A/Prof Peter Hodkinson		