Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice

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Declaration

"I, Scott Ian Stewart, declare that the PhD thesis entitled *Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice* is no more than 80,000 words in length, including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work."

"I have conducted my research in alignment with the Australian Code for the Responsible Conduct of Research and Victoria University's Higher Degree by Research Policy and Procedures."

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ABSTRACT

Evidence-based practice (EBP) is a core skill of all health professionals and a professional registration requirement for paramedics in Australia, NZ, and the UK. Paramedic Academics (PAs) have a key role in teaching EBP to paramedic undergraduates. However, only limited literature exists to assess the preparedness of PAs to do so.

The current research is conducted under the paradigm of constructivism using the mixed methods of a phenomenological guided multiple repeated individual case studies using sequential semi-structured interviews incorporating vignettes and a positivist-based survey. The Evidence-Based Practice Profile-Paramedic (EBP^2-P) survey assesses the domains of relevance, terminology, practice, confidence, and sympathy to EBP. Demographic data was also collected. Data analysis was Cronbach's alpha coefficient, descriptive statistics, Welch's unequal variances *t*-test and Factorial AVOVA.

A total of 106 PAs from Australia (61), NZ (20) and the UK (25) responded to the survey. Most respondents had a paramedic background (89%) and >10 years clinical experience (68%). Only 11% held a PhD while 12% held a Master's by Research and 30% a Master's by coursework. Under half of respondents had any EBP education (48%) or published an academic paper or presented at a conference (43%). Mean academic experience was four years with 22% reporting less than one year. EBP^2-P scores for the PAs were statistically significantly superior ($p < .05$) to other allied health professional academics in the domains of practice and sympathy and not significantly different in relevance, terminology, and confidence.

The themes of variable EBP training levels, academic, and clinical use, inexperienced PAs, lack of higher degrees, resistance to students practicing EBP from clinical supervisors were detected in the qualitative phase. Student paramedics' attitudes to EBP were influenced

strongly by early clinical placements and they disliked being taught by non-paramedic staff that did not understand the paramedic environment and used irrelevant examples.

The pattern of the EBP^2-P scores demonstrated that the PA cohort is at least as capable as the Allied Health Academics regarding the EBP characteristics evaluated. Differences between Australian PAs and their UK and NZ counterparts may be due to variation in years professional registration programs began. Some academics, in-service educators, and clinical managers require EBP education. Further support is needed for PAs to publish, present, and remain in academia. Paramedic EBP education should be themed through each unit of an undergraduate course with an explicit teaching of the five steps early, integrated into practical clinical situations and featuring prominently in a capstone project.

Key recommendations for practice include retaining and developing paramedic academics with appropriate mentors; facilitating research and training opportunities; and monitor wages to align with ambulance industry. Furthermore, recommendations for higher education delivery focus on ensuring EBP is integrated into all units in the paramedic undergraduate curricula and implementing a EBP education program for clinical supervisors.

Recommendations for further research involve conducting a EBP^2-P study of paramedic students transiting into the workforce, development, and evaluation of assessing EBP competency using OSCEs in undergraduate paramedicine and developing a paramedic signature pedagogy consensus statement based on a systematic review and Delphi survey.

This work has provided insights regarding the key role paramedic academics have in teaching EBP to paramedic undergraduates. Findings from the current study reinforce that progression has been made in developing the professional culture to support the integration of EBP as a critical component of paramedicine education and practice.

ACKNOWLEDGMENTS

Firstly, I want to acknowledge my wife Kerrie, who has gone above and beyond to support and put up with me writing this thesis. Also to Alice, Christopher, Mum, and Dad with who I can spend more time with, thank you.

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To the case study participants and survey respondents thank you for your time, I hope I have accurately depicted your words and thoughts. Hopefully this work will make the profession a little bit better. To Professor Carl Heneghan of The Centre for Evidence Based Medicine in Oxford, thanks for your time and advice.

Thanks to the great educators and the public science communicators that inspired my love of science and science-based medicine. The Carl Sagan's, Karl Kruszelnicki's and Ben Goldacre's your work is amazing.

To Harvey and Oberon who have kept me company and my feet warm under my desk on long nights – good boys.

The challenge of COVID19 has demonstrated the power of EBP but also the distance we need to go to ensure everyone has an understanding.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AHPRA	Australian Health Practitioner Regulation Agency
CPG	Clinical Practice Guideline
CREATE	Classification Rubric for EBP Assessment Tools in Education
EBM	Evidence Based Medicine
EBP	Evidence Based Practice
EBP^2	Evidence Based Practice Profile
EBP^2-P	Evidence Based Practice Profile - Paramedic
HCPC	Health and Care Professions Council
OSCE	Objective Structured Clinical Examination
PA	Paramedic Academic
PPEd	Paramedic Practice Educator
RLTM	Roper-Logan-Tierney Model

1 INTRODUCTION

"*The practice of medicine is an art, based on science. Medicine is a science of uncertainty and an art of probability*." – William Osler, circa 1900 (Silverman et al., 2008). The uncertainty that Osler described at the turn of last century continues to be a challenge despite significant advances in medical knowledge that have occurred since then. Even when the pathophysiological basis of a disease process is thought to be well understood the actual result of medical intervention may cause increased morbidity and mortality to the patient. An example of this is the once common practice of providing supplemental oxygen to an otherwise well oxygenated patient suffering an acute myocardial infarction (commonly known as a heart attack). The logic behind this treatment was to increase the oxygen supply to the area of heart muscle that was dying due to lack of blood flow, but paradoxically the extra oxygen caused the blood vessels to contract resulting in less oxygen being deliver and an increase in the area of the muscle death (Cabello et al., 2016). As a result of this new understanding, guidelines now require the oxygen levels in a patient's blood to be measured before administering supplement oxygen in patients with suspected acute myocardial infarctions (Wyckoff et al., 2021). This example reinforces the need to incorporate the best available evidence in medical care provision, including paramedicine, to improve professional practices that foster quality patient outcomes.

Current perspectives within many societies include the expectation that if you are seriously ill or injured, a call to the emergency number will quickly result in having a paramedic attend and provide a high quality, professional service. Individuals expect to be assessed, treated, and transported to hospital as required. This social contract has been in place since the commencement of ambulance services around the turn of last century (Ebben et al., 2017; Williams et al., 2009). While the education and skill levels of paramedics are not familiar to the public in the way that those of nurses or doctors are, most people expect

paramedics to perform at the high-quality level of other medical professionals (Flanagan et al., 2019). Specifically, patients want paramedics to reassure them, explain their diagnosis, provide treatment, and present a prognosis (Eaton et al., 2021; Halter & Ellison, 2008). Timely, safe, and effective treatment, particularly pain relief, and choice of hospital are also important to meeting the expectations of patients treated by paramedics (Togher et al., 2015). The expectations of paramedics by the community have become more sophisticated over time (Andrew et al., 2020; Grantham, 2004). In the first half of last century ambulance *drivers,* as they were commonly known, had little training beyond a first aid certificate. The education of paramedics has evolved in response to increasing skills and treatment options (Givati et al., 2018). Australia, New Zealand and the United Kingdom have led the world in moving towards a university education as the entry level standard for paramedics (O'Brien et al., 2014; O'Meara et al., 2017). Increasingly stakeholders such as governments and professional bodies require that paramedics deliver healthcare in a cost and clinically effective manner (Health & Care Professions Council, 2021; Turner et al., 2015). An element in achieving these outcomes within the health professions is the implementation of Evidence Based Practice (EBP), a method aimed at informing decision making by integrating the best available evidence with the practitioner's clinical judgment and patient values (S. E. Straus et al., 2011). There are a number of other definitions of EBP but most involve the five steps of formulating an answerable clinical question, accruing evidence, evaluating that evidence, applying the evidence and finally assessing performance (Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls, & Osborne, 2005). There is growing data that the heath care delivered in an EBP manner is more likely to be effective and efficient in terms of patient outcomes, cost, and satisfaction (e.g. Emparanza et al., 2015; B.M. Melnyk et al., 2018; Wu et al., 2018). It is now the gold standard that all healthcare professions be educated in and utilise EBP (Albarqouni, Hoffmann, Straus, et al., 2018). For paramedicine

the obligation to practice EBP is embedded in the professional registration requirements (Australian Health Practitioner Regulation Agency, 2019; Health and Care Professions Council, 2014; Paramedic Council of New Zealand, 2020). However, the best methods for teaching health care professionals the steps of EBP, are still evolving with few studies using high-quality instruments to measure all aspects of EBP (Albarqouni, Hoffmann, & Glasziou, 2018; Ilic et al., 2015).

EBP education for paramedic undergraduates demands a university system that can effectively support students acquiring EBP competencies and healthcare organisations that encourage integration of EBP into clinical practice by students (Lehane et al., 2019). To achieve these aims paramedic bachelor's degree courses must have curricula that targets the core EBP competencies defined by Albarqouni, Hoffmann, Straus, et al. (2018). EBP principles need to be integrated throughout all elements of the curricula and linked to accreditation (Paramedicine Board of Australia, 2020). The successful education of paramedic undergraduates in EBP requires the Paramedic Academic (PA) to demonstrate skills in several domains. Firstly, PAs need to be able to access, understand, and appraise the paramedical research (Cochran-Smith & Lytle, 1999). Secondly, they need a positive attitude to EBP, and role model its use as these have been shown to have a significant effect on the uptake by students (Gonzalez et al., 2021; McEvoy et al., 2018) . Thirdly they require the ability to teach a suitable pedagogy that considers students background knowledge, environment and learning outcomes. Finally, they require pedagogical content knowledge, represented by knowing the best practice examples, explanations, and teaching of a particular topic to a particular student (Shulman, 1986).

Despite paramedicine education being delivered in universities since the mid-1990s (Brooks et al., 2016; Brooks et al., 2018; Lord, 2003) a survey of paramedics that had entered academic teaching roles in Australia and New Zealand reported that most were

underqualified, with few higher degrees and little research or academic publication experience (Munro et al., 2016a). Later qualitative research found that these PAs struggled while working in higher education to achieve university expectations around teaching, research, publication, and obtaining a PhD (Munro et al., 2019). The ability of the PA cohort to meet the unique needs of the profession has been questioned (O'Meara & Maguire, 2018).

This project aimed to investigate if "*Australasian and United Kingdom Paramedic Academics are adequately prepared to teach Evidence Based Practice*". To explore this aim a mixed methods approach was used due to the complex nature of teaching EBP to undergraduate paramedic students, a single approach, either qualitative or quantitative would not provide a comprehensive answer to the research question (Morse & Niehaus, 2009). The dearth of literature in this field means studies for direct comparison are lacking. The mixed method approach enabled methodological triangulation through comparison and corroboration of data collected through different methods (Padgett, 2012). This research will provide an overview of the current state of the ability of the PA cohort in Australia, New Zealand, and the United Kingdom to teach Evidence Based Practice to paramedic undergraduates. It also identifies gaps in this critical ability and provides some possible solutions.

Chapter two will explore the wider field of medicine, how it has evolved to be evidence based, and the evolution of the EBP concept. It will then consider the origins of the Ambulance services in the United Kingdom, Australia, and New Zealand. Next it examines the current framework of the paramedical profession including the increasing size of ambulance services, professionalisation, registration workload changes, changing staff demographics, and evolution of education of paramedics in response to the increasing sophistication of care . The literature around PA teaching at university will be explored along with paramedic pedagogy, curricula, and the search for a paramedic signature pedagogy. The

research examining teaching EBP in the health professions will be considered before focusing on the teaching of EBP to Paramedics. Finally, there is a statement of the research question.

Chapter three will detail the study design and the rationale and purpose of the study. It will describe the mixed methods used to capture both quantitative and qualitative data to provide a triangulated approach. A diagram will be used to graphically demonstrate how each phase of the research links to the sub-aims and overall research question.

In chapter four the development of the EBP^2-P will be discussed, methods of recruitment, ethics, data collection, management and analysis will be reported. The results of internal consistency, exploratory factor analysis of the EBP domains and non-domain items as well as the domain scores for the three countries will be produced. The domain scores will be compared to other academics and the three countries compared. The PA domain scores for the EBP^2-P will be compared to other groups and analysed. The effect of time teaching at university, higher degree qualifications, publishing, and research experience, and EBP knowledge will be examined.

The qualitative aspect will be considered in Chapter five. The case study research design and methodology will be discussed. Each of the eight case study participants will have a vignette of their experiences and education described. From the thematic analysis of the case study participant data the themes emerged of EBP definition, importance, facilitators and barriers, pedagogy, achievement of outcome goals for graduates and PA preparedness to teach EBP.

Chapters six will bring the two phases of the research together to address the overall research question and sub-aims. In this chapter the two phases of the research and their findings will be examined in relation to the overarching research aim. This chapter will also provide for recommendations for further theoretical research and practice. Limitations will be explored and considered in light of the research aims and design.

2 REVIEW OF THE LITERATURE

2.1 Introduction

This chapter will conduct a review of the literature supporting the investigation of the preparedness of Paramedic Academics (PA) in UK, Australia, and New Zealand to teach Evidence-Based Practice (EBP). The emergence of EBP, its underpinning theory and criticism will be examined. The origins of paramedicine, its development in UK, Australia and New Zealand, and the current status will be explored. The definition of PA used in this thesis will be defined. The literature regarding PA with and without a paramedic background will be surveyed. Teaching theories, pedagogical content knowledge, the unique education needs of professionals, the paramedicine pedagogy, and the pursuit of a paramedic signature pedagogy will be reviewed. The issues regarding educating health undergraduates specifically educating paramedic students will be considered. Finally, a statement of the research question will be presented.

2.2 Evidence Based Medicine

2.2.1 Origins

Disease and death are universal human experiences. Since prehistoric times humans have attempted to heal the sick and injured. Early concepts of the cause of the diseases involved evil spirits or transgression of a taboo and treatments involved rituals, chanting, or sacrifice (Turner, 2021). Early attempts to use cures that didn't solely rely on mystical cures can be found. Central Australian aboriginals, with a culture dating back ca. 45000 BCE, have traditional healers known as *Ngangkari* that used a blend of physical, botanical, and supernatural therapies to treat physical, mental, emotional, and spiritual spheres of human malaise (Maria, 2018; Panzironi, 2013). Prehistory Europeans also used medications with active properties. *Ötzi*, a well preserved Italian mummy dated to ca. 3300 BCE, was found

with birch fungus known to have antibacterial properties (Pleszczyńska et al., 2017). The first record of an attempt to provide a rational scientific approach to medical treatment is an Egyptian text dated to ca.1600 BCE documents treatment of trauma such as fractures and wounds. More commonly the surviving papyrus documents invoked a supernatural explanation of disease (Wilkins, 1992).

Hippocrates of Kos (ca. 460 – 370 BCE), a Greek physician, is credited with establishing medicine as a distinct profession in its own right, delineating it from the associated fields of *philosophy* and *theurgy* (the practice of rituals performed with the intention of invoking action from one or more gods) (Yapijakis, 2009). His belief that disease was a product of environmental factors, diet, and living habits not punishment from gods was revolutionary (Serageldin, 2013). Although his knowledge of the underpinning physiology was inconsistent with a modern understanding, this science based concept still drives the philosophy of medicine today (Gullace et al., 2019; Mountokalakis, 2006).

Hippocrates of Kos advised his contemporary physicians to "*rely on actual evidence rather than on conclusions resulting solely from reasoning, because arguments in the form of idle words are erroneous and can be easily refuted*" (Schiefsky, 2018, p. 48). Since the early days of medicine, there has been a need for evidence-based inquiries that enable a physician to ascertain and apply the best treatment strategy for each patient. Even during the early era of medicine, physicians understood the importance of using evidence to guide treatment protocols. The first published randomised controlled trial was conducted by Lind (1757) a Naval surgeon who conducted research to prevent scurvy on long voyages. Florence Nightingale operated in an evidence-based way with careful data collection and analysis in a study on finding factors related to increased perinatal maternal deaths (McDonald, 2001; Nightingale, 1863).

Archie Cochrane, a Scottish doctor championed the significance of accurately testing the effectiveness of health care treatments in his book *Effectiveness and Efficiency: Random Reflections on Health Services Cochrane* (Cochrane, 1972). His experiences as member of the British Ambulance Unit during the Spanish Civil War and as a Medical officer in a German prisoner of war camp were influential on his conviction that much of medicine did not have sufficient evidence to justify its use (Cochrane, 1984; Cochrane & Blythe, 1989). Cochrane suggested that, because resources are always limited, they should be used to provide equitably those forms of health care which had been shown in properly designed evaluations to be effective (Cochrane, 1984). He particularly favoured health interventions supported by evidence from randomised controlled trials as he believed they were more reliable than other sources of evidence (Cochrane, 1972). Cochrane is seen as visionary who helped lay down much of the foundation for EBP (McMenamin et al., 2019; Shah & Chung, 2009).

2.2.2 Development of EBP model

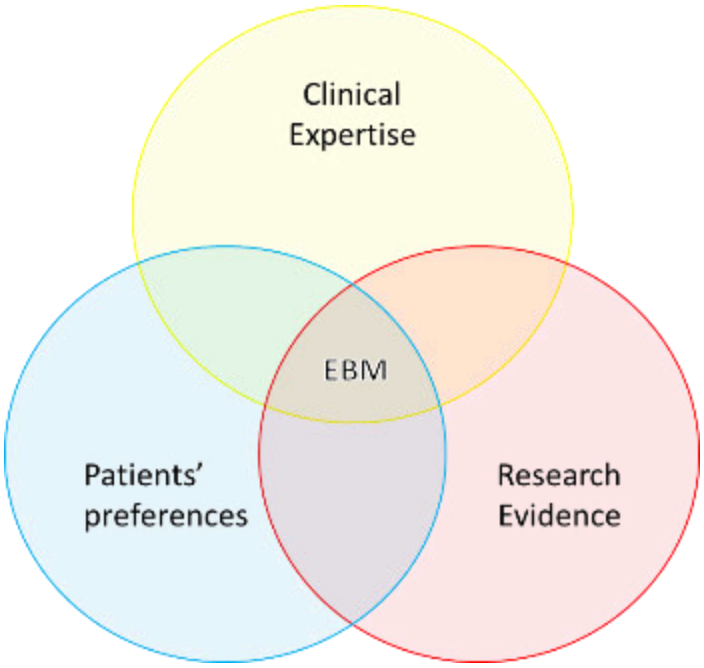
The term and concept of Evidence Based Medicine (EBM) was formally presented in a paper by the Evidence Based Medicine Working Group (1992). In a paradigm shift in medical thinking, evidence from research was given equal weight as clinical experience and biological reasoning, leading to substantial levels of debate within the literature (e.g. Falzer, 2021; Fox, 1993; Hersh, 1994).

Sackett, Rosenberg, et al. (1996, p. 71) defined EBM as the "conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integration of individual clinical expertise with the best available clinical evidence from systematic research". They clarified that individual expertise was the judgment that clinicians gain from experience and practice including the patients' preferences, rights, and circumstances. The best available evidence

was defined as clinically relevant, and ideally, patient centred but basic science was acceptable. See Figure 1.

Figure 1:

Evidence Based Medicine

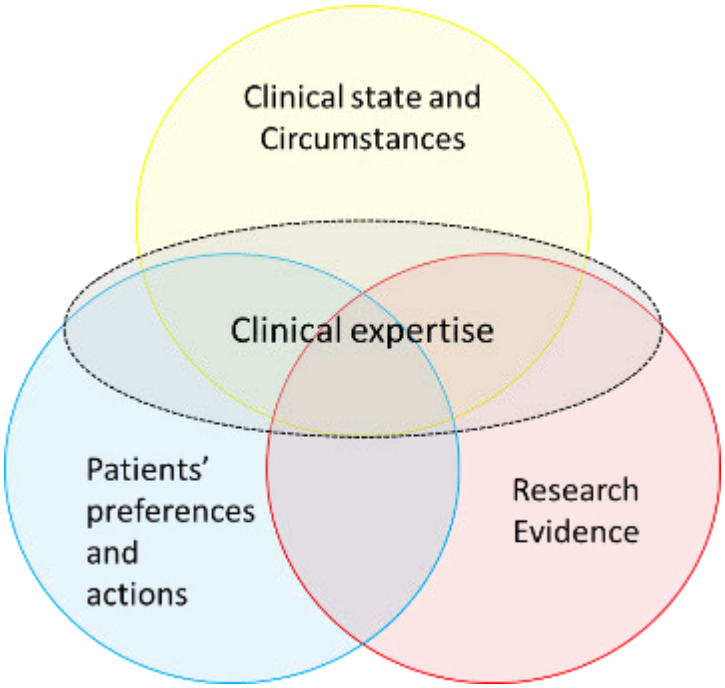


Note: Adapted from "Evidence based medicine: what it is and what it isn't," by D. L. Sackett et al., 1996, British Medical Journal, 312(7023), 71-2, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2349778/pdf/bmj00524-0009.pdf. Copyright 1996 by British Medical Journal.

The original three circle model of EBM is appealingly simple but lacks guidance on how the sources of data are to be integrated. Haynes et al. (2002) presented an updated three-circle model of EBM to address criticisms of "cookbook medicine". They assert that "clinical state and circumstances" better encapsulates variability of patient compliance with treatment. The positioning of "clinical expertise" represents the expanded role of interpreting and integrating the other three factors to achieve a successful result. See Figure 2.

Figure 2.

Evidence-Based Medicine after 2002

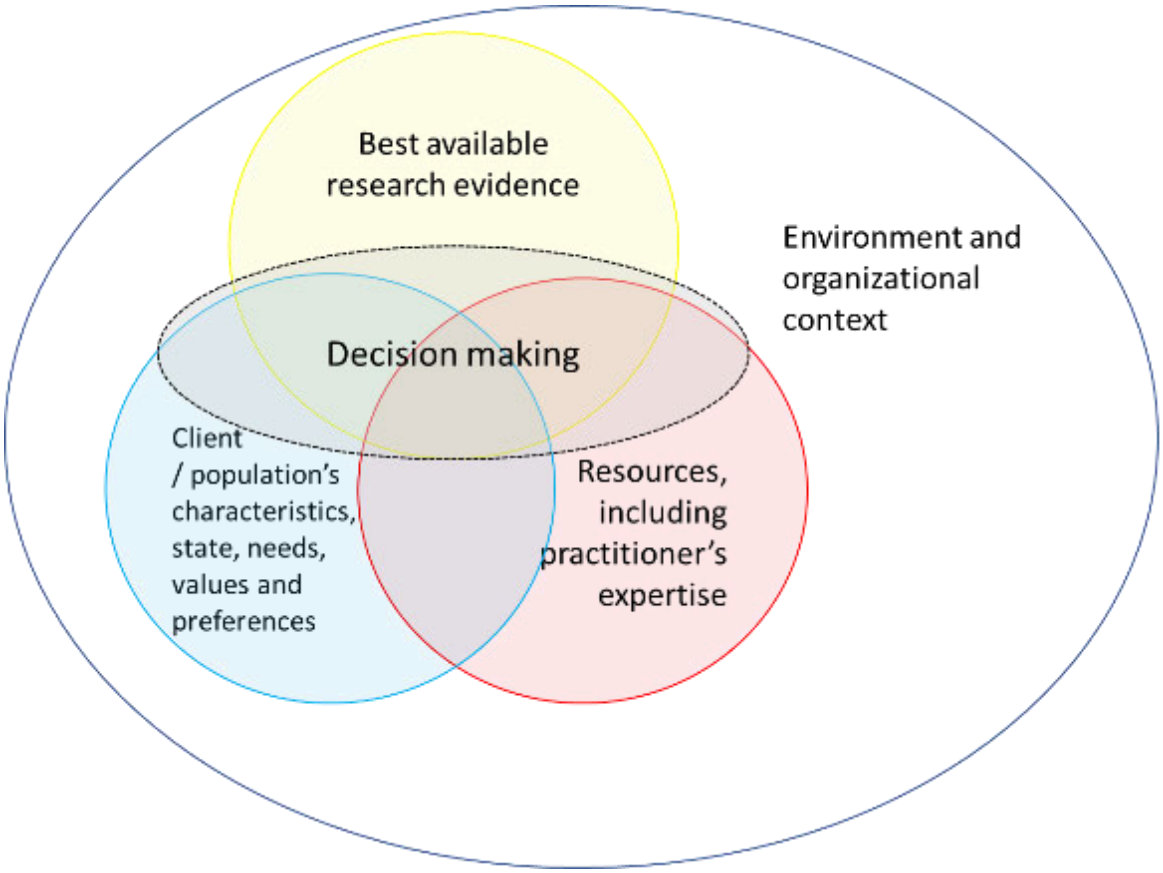


Note: Adapted from "Clinical expertise in the era of evidence-based medicine and patient choice" by R. B. Haynes et al., 2002, BMJ Evidence-Based Medicine, 7(2), 36-8 http://dx.doi.org/10.1136/ebm.7.2.36. Copyright 1996 by British Medical Journal.

Satterfield et al. (2009) proposed a new transdisciplinary EBP model. Building on the Haynes et al. (2002) model, Satterfield et al. ground their model in an ecological framework. The terminology of "client" is broader than 'patient', so to align with terminology in areas such as social work and the ability of EBP to operate at a population level the construct was extended. The model also emphasises the importance of shared decision making (McCormack & Elwyn, 2018). See Figure 3.

Figure 3.

Revised Evidence-Based Medicine Model



Note: Adapted from "Toward a Transdisciplinary Model of Evidence-Based Practice" by J. M. Satterfield, 2009, The Milbank Quarterly, 87(2), 368-90, 10.1111/j.1468-0009.2009.00561.x, Copyright 2009 by Blackwell Publishing Inc.

2.2.3 EBM to EBP

Since the beginnings in medicine the EBM concept spread initially to other health professions (Hoffmann et al., 2017b) then more widely to disciplines such as teaching (Petty, 2009), policing (Sherman, 1998) and management (Pfeffer & Sutton, 2006). As such it became the more inclusive Evidence Based *Practice* (EBP), however medical based authors often still refer to EBM. Some authors argue that *Evidence-Informed Practice* is a more correct term as the association between evidence and practice cannot be that of providing a

basis rather that practice is *informed* by evidence and theory (Kumah et al., 2019; Isaac Nevo & Vered Slonim-Nevo, 2011).

2.2.4 Criticisms of EBP

The early focus on critical appraisal triggered a debate around the unrealistic expectation that all five steps of the EBM/EBP be conducted for all knowledge gaps (McAlister et al., 1999). Attempts to rapidly perform clinical appraisal led to the realisation that issues with the source articles such as inadequate randomisation or methodical problems could cause an overestimate the benefit of medical interventions (Pildal et al., 2007). Defining what qualifies as evidence in EBP has caused recurring debate (Jennings & Loan, 2001; Pallett, 2020; Phillips, 2019). Critics illuminate the elevated status of randomized controlled trials compared to qualitative research (Miles et al., 2004; Morse, 2005) and its lack of applicability to an individual patient (Ferreira et al., 2022).

Ioannidis (2016) contended that EBP had been hijacked by the pharmaceutical industry. He argued that the randomized controlled trials were performed well but were deliberately set up to ask the wrong questions often using surrogate outcomes. Trials with findings that were not supportive of new drugs were often not published thus skewing the literature (Goldacre, 2015). In spite of regulations to register and report results of all trials in jurisdictions such as the EU, a study by Goldacre et al. (2018) found that only half did so.

Despite EBP's critics and challenges, it is a core component into the curriculum of health professional programs worldwide (Frenk et al., 2010) and a requirement of many national registration bodies (Accreditation Council for Graduate Medical Education, 2022; Australian Health Practitioner Regulation Agency, 2019; Health & Care Professions Council, 2018).

2.3 Paramedicine

2.3.1 Ambulance origins

The first documented paramedic-like roles, involving treatment and transport, were performed by aging Centurions who were no longer able to fight for Imperial Rome around c. 300 BCE. They organised the transport of wounded from the battlefield and performed some procedures such as suturing and amputations (Davies, 1989). The *Order of the Knights of Saint John of Jerusalem* founded around 1023 CE performed a similar function during the Crusades in the 11th to 13th centuries. The movement was later revived in Britain as the *Venerable Order of St. John of Jerusalem* that was later to become seminal for many of the current civilian ambulance services (Bernard, 2011).

Injury and illness from military conflict continued to be the driver for paramedic service development. The term "ambulance" is thought to originate from the 1487 CE when under King Ferdinand of Spain, specialised medical tents– called *Ambulancias* were introduced for troops fighting the Moors (Barkley, 1990). However, transport to the tents was not commenced until the battle had concluded resulting in some troops dying from wounds that were otherwise salvageable.

Later during the Napoleonic wars around 1793 CE the Surgeon-in-Chief of the French Grand Army, Baron Dominique Larrey introduced the transport of wounded by horse drawn wagons to mobile hospitals during the battle thus reducing the time to reach treatment (Greaves et al., 2011). These two wheeled horse drawn carts were dubbed *Ambulance Volante* or "flying ambulances" due to their relative speed of transport (Oritz, 1998). This early intervention resulted in a reduction in morbidity, infection, suffering and death (Welling et al., 2010). Larry also increased mobility and organisation of military units he referred to as *Ambulance* with the function of providing first aid and transport to the first line of hospitals (Nestor, 2003). The military origins and particularly the innovations by Larrey of triage, rapid

transport, specialised equipment, and training continues to influence civilian ambulance services (Brewer, 1986; Howard, 1994; Welling et al., 2010). His fight against medical, military, and political bureaucracy to get the best outcomes for patients foreshadowed later similar battles by paramedic leaders and organisations.

The use of new technology and weapons in the bloody American Civil war of 1861 – 1865 CE provided much work for medical services. Medicine was still in a primitive state with little understanding of infection or hygiene. It was also a low point in history for paramedicine. Contemporary commentators declared; *"…the ambulance systems were the least satisfactory part of the medical department, which itself was the least satisfactory part of the military…*." (Longmore, 1869, p. 36). The poor performance of the ambulance may have contributed to the high casualty toll of the American Civil war (Reilly, 2016).

Hospital-based ambulance services began in Cincinnati, USA in 1865 CE and other services soon followed (Barkley, 1990). In 1869 CE Edward Dalton, a former Union army surgeon used his war experience to shape the Bellevue Hospital ambulance service. By contemporary standards the Bellevue ambulances were well equipped with splints, a stomach pump, morphine, and brandy. Dalton realised response time was important to his patients and organised a mechanism where the harness for the horses was lowered from the celling of the barn readying the ambulance to respond in 30 seconds.

2.3.2 Ambulance services

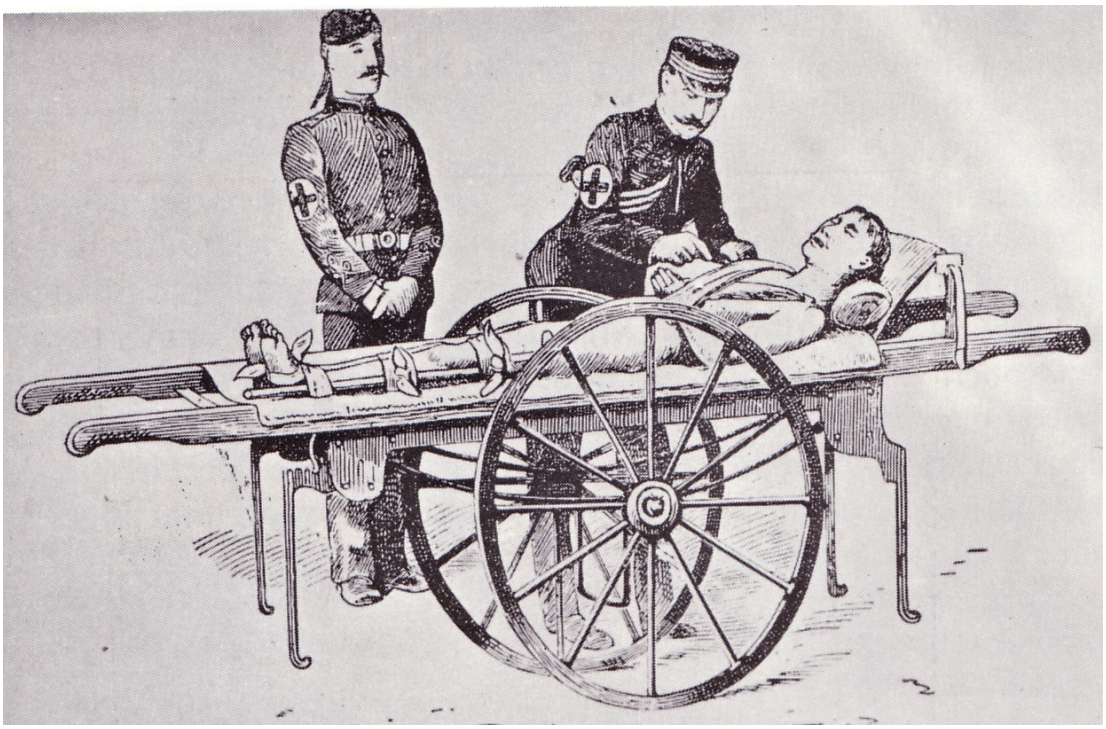
2.3.2.1 United Kingdom history

The industrial revolution of the 19th century with its increased mechanisation brought with it a rise in the rate of injuries and deaths from accidents in the United Kingdom (Blackie & Turner, 2018). The disenfranchised workers had little access to physicians on site and transport by bystanders in carts and makeshift stretchers aggravated injuries (Pollock, 2013). Bristowe (1862) suggested that hospitals should supply an ambulance transport system for the

UK civilian public. Howard (1882), proposed using a network of ambulances based at police stations dispatched by telephone, inspired by his experiences with American hospital based services such as Bellevue (Haller, 1990). After lobbying in parliament and medical journals the *Order of St John* established the first UK ambulance service in 1889 (Greaves et al., 2011). Human powered carts such as the Ashford Litter were used that carried splints, bandages, smelling salts, and camel hair brushes (Hunt, 2009). See Figure 4.

Figure 4.

"St John" Ashford litter



Note: From "First to Care: 125 Years of the Order of St John New Zealand, 1885-2010," by H. Graeme, 2009, Oratia Media Ltd. Copyright 2009 by Oratia Media Ltd.

In a theme that is constant to all three countries considered in this thesis, under funding was an issue (Pollock, 2015). The London County Council Ambulance was staffed entirely by women by 1916 due to men volunteering to fight in World War I (Marwick, 1977). Training in the moving and handling of the sick and injured for all drivers and

attendants was made mandatory in 1925 but it was often delayed or not completed (The County Hospital Services, 1931). During World War II, due to the shortage of men the London Auxiliary Ambulance Service was operated by over 10,000 volunteers, mainly women and older men. This contrasted to the male dominated ambulance services in the inter-war and post-war periods. see Figure 5.

Figure 5.

World War II UK Ambulance recruiting posters

Note: “Men Over Thirty!” and “Women Wanted as Ambulance Drivers.” Copyright ca. 1940 by H.M. Stationery Office, UK.

The National Health Act (1948), saw responsibilities for provision of ambulance services allocated to county councils. The service was described as “scoop and run” (Caple, 2004) with paramedics possessing only a first-aid certificate and a clean driving license certificate (Kilner, 2004b). A number of large disasters led to a realisation of failings in terms of training and equipment (Caple, 2004) as a result the UK government commissioned the

influential Millar report into the equipment and training of in NHS ambulance staff (Millar et al., 1966).

Millar et al. (1966) realised education facilities were inadequate, first aid training of insufficient depth and not covering the range of medical challenges faced by the officers. They proposed "para-medical" education stating, "…*there is much apart from first aid that a man must learn if he is to become an efficient member of the ambulance service*", (Millar et al., 1966, p. 7). Acknowledging the casual sexism common at the time, the Millar review considered what could be done for a patient before seeing a doctor and also under medical instruction. Millar et al. (1966) termed this *Ambulance nursing* but emphasised that it was not a shortened version of nursing training. The resulting Ambulance Services Proficiency Certificate consisted of eight weeks of medical, nursing and hygiene followed by one week in an Accident and Emergency department undertaking clinical placement before entering service. After a year working, a final oral and practical test concluded the process (Millar et al., 1966). A national residential training school with a class size of 20 with 2 instructors was also introduced. Millar et al. (1966) recognised the role quality of education and prescribed a three week course on teaching techniques, casualty simulation and methods of testing competence for would be instructors who needed 5 years' experience as well as the Ambulance Services Proficiency Certificate.

The Ambulance Services Proficiency Certificate evolved into the Institute of Health and Care Development (IHCD) ambulance technician programme that, until recently, was the basic qualification for front line staff in the UK. The IHCD contained 6 weeks clinical and 3 weeks driving with the final award obtained after 12 months clinical practice. Pantridge and Geddes (1967) pioneered giving ambulance staff advanced training and equipment including a defibrillator. Soon the model of a second tier of ambulance service response skills was replicated in other places including 1972 in Melbourne, Australia (Ambulance Victoria,

2015) and in 1973 in Brighton UK (Briggs et al., 1976). These experiences showed that with appropriate education paramedics could go beyond scoop and run.

The Wright report (1984), recommended a program based on the skills needed for Partridge's model that includes clinical resuscitation skills and Advanced Life Support (Kilner, 2004b). This lead to the IHCD paramedic programme which included 6 weeks of theory and 4 weeks hospital placement (Institute of Health and Care Development, 2000). While the IHCD course provided increased skills and drugs focused on the management of time critical patients, they still didn't match the work load which mostly consisted of low acuity patients (Lendrum et al., 2000). Other skills thought desirable by, and present in other health profession such as self-awareness, culture, and ethnicity, evidenced based practice, research, mentoring and supervision, clinical governance, teaching, and presentation skills were absent in the training (Kilner, 2004a; Morgan, 2001). In response to this gap the Universities of Hertfordshire and Coventry started pre-employment paramedic degrees in conjunction with their local ambulances services in the late 1990's which addressed these requirements and those of upcoming professional registration (Carney, 1999; College of Paramedics UK, 2014).

The registration of Paramedics in the UK in 1999 brought a number of changes to the UK paramedic environment (Health Professions Council, 2007). The standards of proficiency, conduct, performance, ethics knowledge, understanding and skills paramedics needed to reach were now prescribed by an independent body, the Health Professions Council, rather than the employers. The professional body the British Paramedic Association (BPA) was formed in 2000 and worked with the HPC, the Ambulance Services Association (ASA) and Joint Royal Colleges Ambulance Liaison Committee (JRCALC) to develop standards, clinical guidelines and curriculum guidance documents (Joint Royal Colleges Ambulance Liaison Committee, 2006).

JRCALC under the leadership of Douglas Chamberlain created a Practitioner in Emergency Care (PEC) role in 2000 (Health & Care Professions Council, 2021). This was to better cater for the patient case mix which was increasingly dominated by non-time critical patients with less serious 'undifferentiated' primary care type cases. The post graduate level PEC training equipped these paramedics with the additional skill set needed to safely assess, diagnose, and treat these patient types. Crucially they often did not need to transport to a hospital; increasing patient satisfaction and reducing the cost to the health system (Halter & Ellison, 2008; Woollard, 2006). The *Transforming NHS ambulance services* report (Committee of Public Accounts, 2011) identified that Ambulance services has a critical role in the performance of the whole entire urgent and emergency care system. Making full use of ECP skills was identified as part of the change suggested in this review into the cost effectiveness of the Ambulance Services in the UK. The report also noted that if the best practices already used by at least one of the NHS trusts were used by all the trusts £165 million a year could be saved.

Independent prescribing for Advanced paramedics educated to Masters level began in 2012 and expanded in scope in 2018 (Stenner et al., 2021). The title of the PEC evolved to the emergency care practitioner (ECP) role, then advanced paramedic practitioner. ACPs currently operate across the UK in various situations including as part of a General Practitioner's medical practice (Spencer, 2016). ACP's, both in ambulance services and working in multidiscipline teams such as GP clinics, increase the capacity of the UK health system to treat low complexity patients in primary care (Eaton et al., 2021; Eaton et al., 2020; Edwards et al., 2022).

2.3.2.2 Australian history

In the first 50 years of European settlement in Australia medical care was supplied by ex-military surgeons employed by the Crown (Lewis, 2014). Melbourne university opened the first Australian medical school in 1862 CE. By the mid 1880's the majority of Victorian doctors were university graduates (Dyason, 1988).

The UK Order of St John delivered their Ambulance syllabus to a group of Sydney railway workers in 1881 producing the first of a number of industry focused community ambulance services (Howie-Willis, 1983). In the same year the first organised ambulance service in Australia began in the colony of Victoria formed from army medical troops trained with a rudimentary St John inspired curriculum (Howie-Willis, 1983). In 1916 the St John Ambulance Brigade partitioned off the transport function which was renamed Victorian Civil Ambulance Service (VCAS). Soon after VCAS became insolvent and survived only due to council donations. The State Government refused to subsidise the VCAS, as it did not consider it a Victoria-wide service in the same way as the police and fire brigade. The 1918 Spanish flu pandemic, in which four VCAS staff died from influenza, drove an increase in funding, staff and equipment ("A Brief History of Ambulance Education in Victoria," 2006)

As late as 1960 there was no formalised training with "on-road" exposure and textbooks dating from the previous century (Wilde, 1999). Some workers started in the morning and after getting fitted for uniform were treating patients by the afternoon (Bouvier, 2011). A dedicated ambulance officers training centre (AOTC) was established in 1961 with a mix of ambulance, nursing and medical teaching staff moving to the Mayfield Centre in Melbourne 1963. The status of paramedic training at the time can be inferred from the other courses delivered contemporaneously at Mayfield which included flower arranging and aged care (Bouvier, 2011).

In response to experiences in the Vietnam war and the growing Australian road collision deaths, the Royal Australasian College of Surgeons in 1969 called for more training of ambulance officers, improved status of ambulance officers, and the recognition and value of ambulance officer skills by the medical profession (Wilde, 1999). By the early 1970s the community were calling paramedics increasingly for medical emergencies as well as the traditional trauma. Ambulance education in Victoria began teaching a TAFE accredited *Certificate of Applied Science (Ambulance Officer)* course in 1978. This move to a Further Education level of education was in response to perception that training of the ambulance paramedics was not adequate to satisfy the expectations of the community (Monash University, 2007). By 1987, further pressure to improve standards was answered by the introduction the *Associate Diploma of Health Science (Ambulance Officer)*. The course was of 1230 hrs was delivered in 6 stages of varying lengths over 3 years interposed with working second officer, initially with a Clinical Instructor and later with any qualified officer.

In what would be repeated later, older paramedics felt threatened by the newer, better educated graduates of the TAFE system and dubbed them “Bionics”. The mistrust of the new would be repeated with the introduction of Bachelor level paramedic degrees in the 1990’s and is akin to hospital trained nurses transitioning to the pre-employment university model during the 1980s (Russell, 2005).

In 1991 the peak body for ambulance services in Australia, the Council of Ambulance Authorities (CAA), called for the education of paramedics to be conducted by universities partially on cost shifting grounds. In 1994, Charles Sturt University became the first in the world to offer a paramedic degree with Victoria University following a few months later (Lord, 2003). The initial Victoria University Bachelor of Health Science extended the depth of knowledge in areas such as physiology and pharmacology and added areas such as research and ethics that didn’t appear in the Associate Diploma in Health Science curriculum.

Critically for EBP, the bachelor degrees added skills in analysing research and applying it to ambulance practice. Flinders University in South Australian began offering pre-employment paramedic bachelor degrees in 1998 (Brooks et al., 2018). Monash University began delivery of the Diploma of Ambulance Paramedic studies for Ambulance Victoria staff in 1999 for Ambulance Victoria staff and in 2001 the Bachelor of Paramedic Studies (Monash University, 2002, 2021a). Both Monash and Flinders Bachelor level courses included discrete, EBP focused units (Monash University, 2002; Pointon, 2004). Monash University continues to be among the world leaders in paramedic education and research, producing 16 PhD graduates and over 1000 peer reviewed journal articles up to 2020 (Monash University, 2021a).

In 2005 Ambulance Victoria changed to a pre-employment bachelor's degree requirement for all new operational staff with other Australian states except for NSW following soon after.

2.3.2.3 New Zealand history

In 1885 the first branch of St John Ambulance was started in Christchurch, New Zealand. By 1905, nearly half of the St John divisions outside the United Kingdom were in New Zealand ("St John Ambulance Association," 1885). *Wellington Free Ambulance* (WFA) began in 1927, after the mayor, Sir Charles Norwood witnessed an injured man lying on the road, and no hospital ambulance being available (Wellington Free Ambulance, 2015).

The NZ Ambulance Transport Advisory Board who regulated the paramedic industry in 1963 required that all paramedics pass the Order of St John administered national examination board (Dare, 1977). A mobile intensive care ambulance was introduced in Auckland in 1970. Training focused on first aid, CPR and defibrillation but also covered analgesia by Nitrous Oxide administration and blood pressure measurement (Rice, 1994).

A review into the NZ Ambulances Services by Dare (1977) expressed great concern over the training of staff. The level was felt to be inadequate and the training, which was conducted locally, erratic. A centralised training school, fulltime training officers, and regional continual training was recommended. Dare also realised the importance of following up patients in hospital to give the paramedic a learning opportunity to get feedback on their care and working diagnosis but also to develop good interprofessional communications. Furthermore he suggested clinical placements in the hospitals and multiple day long seminars within hospitals (Dare, 1977). The NZ National Ambulance Officers Training School (NAOTS) was established soon after and delivered three levels of certification. Initial training was Basic aid with six weeks full-time and 400 hours of service. This was followed by Intermediate Aid with six pre-course correspondence assignments, a two-week block course and two weeks in-hospital experience. After three years' service paramedics could do the Advanced aid 14 weeks in total to work as intensive care (Dare, 1977).

A review of the NAOTS (Offenberger & Walton, 1984) resulted in the affiliation with the Auckland Institute of Technology and awards recognised by the Authority for Advanced Vocational Awards (AAVA). In 1996 the NATOS certification formally became a vocational qualification of higher learning when was brought under the National Qualification network as part of a range of reforms.

The NZ Ambulance Education Council urged a return to regional service-led training believing this to be the best solution (Costa-Scorse, 2008). Upskilling of Intermediate level paramedics subsequently commenced in Auckland in 1999 and spread across the county, bringing high quality analgesia to more patients. The early 2000's saw the change from the title ambulance officer to paramedic in line with public expectation (Costa-Scorse, 2008).

The void left by departure of NAOTS was filled by two entities offering tertiary Paramedic degrees. NAOTS's partner the Auckland Institute of Technology became the

Auckland University of Technology and offered a Bachelor of Health Science (Paramedic) degree. Victoria University in Melbourne combined with Wellington Free Ambulance to offer a Bachelor of Health Science (Paramedic) delivered through Whitireia Community Polytechnic. By the mid 2000's both St John and Wellington Free Ambulance service began requiring various staff to complete a tertiary degree.

By the mid 2000's a number of issues were impacting on the NZ paramedic industry. The increasing number of staff with tertiary degrees created a perceived double standard compared to the vocationally focused certificate level staff (Kedgley, 2008; Werner, 2011). Additionally many of the Australian services that the NZ organisations could benchmark with had moved to a graduate only policy for new staff (Costa-Scorse, 2008). A developing recognition within the profession existed highlighting that the patient workload was increasingly that of chronic illness rather than acute trauma. Furthermore, the public had moved beyond perceiving paramedics as merely a transport service and expected medical assessment and treatment. Meeting this expectations of safe appropriate diagnosis, referral and or treatment required further education.

In 2007 the Health Select Committee acknowledged a need for consistency in ambulance education, scope of practice and clinical competency (Kedgley, 2008). The National Diploma in Ambulance Practice replaced the NAOTAS Certificate as the minimum standard for Ambulance officers in NZ in 2008. The diploma was a blended learning program of 1,300 hours of online and in-class learning plus on-road clinical experiences.

A Bachelor's degree in Paramedicine become the standard for entry to the profession for New Zealand in 2014 and current staff are encouraged to upgrade to this level. The AUT BHSc degree in paramedicine is a course delivered over three years that consists of 3,600 hours of learning, including 1,100 clinical hours of clinical placement in ambulance services,

hospitals, and community or primary health centres (Auckland University of Technology, 2015).

2.3.2.4 Ambulance service trends

From origins in single cities and towns there has been a tendency for small services to amalgamate to a single large service. This concludes when the service is at state level in Australia, multiple counties in the UK, and almost the whole country in NZ resulting in a catchment area of around 3 – 9 million people. Another trend is the ambulance services professional community coming together to share ideas and facilitate quality service delivery. The Council of Ambulance Authorities (CAA) was established in 1962 from all eight Australian states and territories, New Zealand, and Papa New Guinea. The stated aim of the CAA is to develop a body of knowledge through research, exchange of information, monitoring and reporting (The Council of Ambulance Authorities, 2016). The Association of Ambulance Chief Executives, which has a similar goal of providing UK ambulance services with an organisation that can support, coordinate and implement nationally agreed policy (Association of Ambulance Chief Executives, 2016).

2.3.3 Current framework of paramedical profession

Following structured review of the literature regarding the history of the history of Australasian and United Kingdom ambulance services several topics can be discerned. They relate to the formation of professional bodies, registration, and increasing, changing workload, changing staff demographics, and, increasing education levels all link to the broader theme of increasing professionalisation of paramedicine.

2.3.3.1 Professional bodies

Paramedics have formed professional groups to share and facilitate progression. In Australian the Institute of Ambulances Officers (IAO) was formed in 1973 out of the

industrial turmoil of the 1960s and 1970s. Reflecting the change of nomenclature to paramedic and modelling itself off the medical colleges such as The *Royal Australasian College of Surgeons*, IAO evolved into the Australian College of Ambulance Professionals (ACAP) in 2000 (Marr, 2003). ACAP started the open access, peer-reviewed, *Journal of Emergency Primary Health Care*. In 2010 ACAP changed its name to Paramedics Australia (PA) to better represent both the geographic region and occupation of its members rather than their iconic vehicle (Paramedics Australasia, 2014). A NSW led faction broke away to form the Australian and New Zealand College of Paramedicine in 2011 but merged in 2020 to form the Australasian College of Paramedicine (ACP). ACP is the peak professional association and represents its members on standards of education, training, and continuing professional development. It also conducts scientific conferences, symposia, and other professional workshops. The British Paramedic Association (BPA) formed in 2001 in response to a need for a professional body to represent paramedics to the Health Professions Council. In 2009 it changed its name to the College of Paramedics (CoP). CoP performs a similar role to ACP as a professional body to represent ambulance professionals in all matters affecting their clinical practice. CoP has interests in Paramedic curriculum guidance, Paramedic post-registration education and career framework (College of Paramedics, 2015).

2.3.3.2 Professional registration

Paramedicine has been described as an emerging profession (Reed et al., 2019). The definition of profession varies but usually includes a unique body of knowledge, authority to practice, community lead sanctions, ethical codes, and a unique culture (Eaton et al., 2021). UK paramedics became registered health professionals in 2000 (Givati et al., 2018) while Australia only received professional registration in 2018 (Paramedicine Board of Australia, 2019b) and NZ in 2021 (Te Kaunihera Manapou Paramedic Council, 2021). The question regarding whether paramedicine met the criteria for being a profession produced much

academic debate (e.g. First et al., 2012; Murcot et al., 2014; Tavares et al., 2021; Williams et al., 2015; Williams et al., 2009, 2010; Woollard, 2009). The struggle for paramedics to be recognised as a profession mirrors other occupations including nursing and teaching (Sachs, 2003; Sutton & Arbon, 1994).

2.3.3.3 Workload changes

Initially setup to attend and transport the critically ill, increasingly paramedics are now more commonly caring for less acute patients often with multiple chronic problems (Association of Ambulance Chief Executives, 2011). There is also a trend of the patient workload increasing faster than would be predicted by population increase alone (Andrew et al., 2020; Lowthian et al., 2011). These factors together with an increasing expectation of the public for paramedics to do more than just transport (Bogomolova et al., 2016; Halter et al., 2006; Stewart, 2001) has led to a need to increase in the required skill set and underpinning knowledge of the paramedics. This as well as calls from paramedics for improved education, has led from first aid certificates to university degrees (Batt et al., 2019). Additionally, there has been a development of specialised roles of intensive care for the critically ill, aeromedical, extended care for the complex chronically ill patient and community paramedics (Eaton et al., 2021; Tavares et al., 2016; Wilkinson-Stokes et al., 2021).

2.3.3.4 Changing staff demographics

While the UK has a long history of employing female paramedics, particularly during the World Wars, for some Australian ambulance services this did not happen until the 1980's. (Department of Health, 2021). Paramedics that identify as female in the Australian workforce had increased from 26% in 2006 to 47% in 2021 (Paramedicine Board of Australia, 2022). This is set to further increase with women making up the majority of students in Australia

paramedic undergraduate degrees (Laing et al., 2014). This gender ratio is approximately mirrored in the authorship of published paramedic journal articles (Lucent & Stewart, 2017).

2.3.3.5 Education status of paramedics

Currently there are there are 53 UK, 23 Australian and 2 NZ paramedic degree courses (Australian Health Practitioner Regulation Agency, 2020; NHS, 2021). Most are three-year Bachelor level degrees with some double degrees combining nursing lasting four years. While many Australian universities offer an honours year as a research focused one year degree with a Bachelor qualification as an entry requirement, some such as Latrobe University offer a 4 year bachelor of Paramedic Practice with Honours integral to the program (Latrobe University, 2022). Keele University in the UK takes this theme further with a five-year Paramedic Science with Integrated Masters with a stated aim of preparing its graduates to engage with evidence-based practice and enhanced clinical practice, research, education or leadership opportunities (Keele University, 2022). These examples illustrate the trend for paramedicine to have increasing standards of education.

2.4 Paramedic Academics

2.4.1 Definition

In this thesis the operational definition used for a Paramedic Academic (PA) is those who teach into a paramedic degree. While primarily aimed at professionally registered paramedics who are fulltime lecturers, the definition includes the academics that have a non-paramedic background as well as paramedics working mostly clinical that teach sessional into the paramedic degrees. A wider definition for PA was chosen for the study as all faculty that influence an undergraduate paramedic student's academic engagement and learning need to be considered (Hayat et al., 2020; Perkmann et al., 2021; Plett et al., 2014). This is particularly true of EBP as it is a complex capability that needs an array of academic skills,

knowledge, and understanding blended with clinical judgment, ideally with repeated practice in a clinical setting (Horntvedt et al., 2018; Larsen et al., 2019; Patelarou et al., 2020).

2.4.2 PA with a Paramedic Background

In this section I am considering the PAs who have a paramedic background and are teaching at a university in any capacity. The issues of transition to academia, maintaining currency, skillset required, and professional identity will be covered. Despite paramedic degree courses existing for over 25 years in Australia, New Zealand, and the United Kingdom, limited relevant literature exists.

The challenged faced by paramedics transitioning to the academy was first reported by Peter O'Meara (2006). He declared that paramedics should be the main educators of undergraduate paramedics. He recognised that many of the experienced, but otherwise suitable paramedics of the time, had little or no tertiary qualifications. Often the move from a senior paramedic role to that of a new lecturer was accompanied with a pay drop. A further issue noted was promotion to senior academic levels that would mediate the wage gap required a PhD and a strong record of research and publishing. However, this was challenging as the emerging discipline of paramedicine had few areas to apply for funding and few focused peer reviewed journals. Nine years later the situation had improved slightly with O'Meara, Maguire, et al. (2015) estimating the number of paramedics in Australasia with a PhD to be more 20 with another 20 doctoral candidates and 40% of the workforce had at least a Bachelor’s degree.

The experiences of sessional educators within an Australian undergraduate paramedic degree were investigated by Williams and Beovich (2017) using qualitative methodology and thematic analysis. The sessional educators purposively sampled with semi-structured interviews were primarily paramedic clinicians delivering tutorial and practical

sessions. Williams and Beovich detected the themes of, lack of formal processes, preparation for teaching, connection and support, program inconsistencies, and educator benefits. Of concern was the reported lack of feedback and professional development although most participants expressed interest in receiving both. Positives reported were enjoyment of teaching and staying current with the profession. Williams and Beovich questioned quality assurance in the sessional-teacher workforce but regarded their findings as comparable with another studies in sessional tutors in other disciplines (Bevan-Smith et al., 2013).

The issue of the qualifications of industry-based paramedics who transition to Academica was investigated in a series of articles by Munro et al. (2016a, 2016b). They found that only 10% of paramedics recruited by universities to academic positions possessed doctoral qualifications, and 37% had been published. The respondents were however experienced paramedics with a mean of 8 years and experienced mentors with most having previous training experience such as a clinical mentor or sessional instructor in a tertiary programme. Munro et al. (2016a, pp. 6-7) observed that a "*large majority of paramedic academics beginning academic roles in paramedicine programs in Australian and New Zealand universities did not have the requisite skills required to permit them to start meeting performance expectations within the first year of their employment*." This finding is concerning given the commencing PA would be expected to teach undergraduates soon after starting. A possible solution was provided by Munro et al. (2016a) focussed on having a core group of suitably qualified and experienced PAs continue the required research and teaching, while mentoring the new PAs.

As an outcome of investigating professional identity in qualitative study of industry paramedics transitioning to academia, Munro et al. (2018) noted many participants did not consider themselves to be paramedics. The PA participants shared that they were no longer treating patients so were not paramedics and did not have a PhD so were not academics.

Munro et al. (2018, p. 33) dubbed this phenomena, "*The No Man's Land of Professional Identity*". This lack of professional identity has been also found in nurses transitioning to Academia (Findlow, 2011; Kristoffersen et al., 2020). UK research (Andrew, 2012) found similar challenges with the evolution of nursing identity, the main problem was the need to find the optimum balance between scholarly research activity and practice engagement. The twin concepts of academic and vocational orientation continue to challenge the role development of health professionals training for Academia. Rather than being seen as an integrated process, the "*dualistic concept of vocationalists and professionalists*" (Andrew & Robb, 2011, p. 430) continues to fuel debate around the legitimacy of nursing as a valid discipline within higher education and not a practice-based institution. This debate has been ongoing since Florence Nightingale opposed attempts by Ethel Bedford Fenwick to establish state registration of nurses in 1887 (Helmstadter, 2007).

Trautwein (2018) reported that the activities of research, teaching and administration contributed to the development of an Academic professional identity. However many universities value research higher than teaching (Coate et al., 2001{Hancock, 2019 #235)}(Coate et al., 2001; Hancock et al., 2019). The shortfalls in new PAs identified by Munro et al. (2016a) predictably resulted in the failure to identify as an academic reported in Munro et al. (2018).

The concept of Communities of Practice (CoPs) as a method of forging collective identity in industry was proposed by Wenger (1998). In this conceptualisation the novice is initially categorised as a legitimate peripheral participant and over time moves to the centre of the CoP. The concept of CoP was further developed by Andrew and Ferguson (2008) into COP as a portal for constructing professional identity. The experienced paramedics studied by Munro et al. (2018) had difficulties transferring the capital they had established in the paramedic CoP to the academic CoP. In a subsequent paper, Munro et al. (2019) discussed

juggling the triple demands of research, teaching and clinical currency for the novice PA and identified that other professions such as nursing have similar issues. They suggest the quality of the mentor/mentee relationship is critical to successful transition. They further recommend that both these paramedic and academic COPs need to engage more effectively in the preparation and development of these new PAs.

2.4.3 PA with a Non-Paramedic Background

While PAs without paramedic backgrounds play an important role in paramedic undergraduate courses, the literature dealing with their challenges is scant (Beovich, Gosling, et al., 2021; Hazelwood, 2015; Lim et al., 2016; Sinnayah et al., 2019; Tangalakis et al., 2014; Whyte et al., 2011). The available literature mainly concerns student engagement issues with non-clinical units.

Whyte et al. (2011) reported that paramedic students were consistently poor performers in bioscience classes. Despite the vital importance of bioscience, a "love-hate" relationship was identified. They found success rates in bioscience were similar to that of nursing and nursing/paramedic double degree student and correlated with success in clinical subjects. The best reported predictors were Mature age entry and a high year 12 score.

The effects of a short intervention on academics teaching first year bioscience units to health undergraduates was studied by Tangalakis et al. (2014) who noted that the subjects were usually taught by sessional staff that had little or no pedagogical education. They reported that after a short workshop on teaching strategies 78% of the staff believed that had improved as teachers and 90% of staff thought the students were engaged.

A survey of students (N = 736) studying a multidisciplinary allied health communication skills unit at an Australian university by Hazelwood (2015) revealed that nursing/paramedic students reported a significant decrease in student engagement while other students did not. Paramedics and nursing students reported lower satisfaction with the unit

than psychology students. The reason provided for this included the students perceived that the unit was not sufficiently tailored to their needs and therefore not relevant to their future working requirements. The unit was modified to include more multidisciplinary case scenarios, role playing scenarios and videos of past students demonstrating the relevance of the course. Hazelwood was at a loss to explain the differences as all health professionals need similar general communication skills but speculated at a lack of professional identity among nursing/paramedic students.

The pedagogical challenges associated with teaching epidemiology in a EBP unit to undergraduate paramedic students were described by Lim et al. (2016). They found many paramedic students did not engage with the topic as they didn't want to be a researcher and felt it is irrelevant given, they believe they would operate under strict guidelines when employed. Lim et al. related this to a lack of clinical knowledge, maturity, and professional identity to appreciate the need for epidemiology and EBP. In response to this lack of academic connection and to better cater for their principally generation Z cohort, they changed their teaching to operate under a connectivist paradigm with some resulting improvement in satisfaction scores of the students. Statistical analysis of the change in student satisfaction scores was not provided.

The redesign and evaluation of two first-year paramedics bioscience units was reported by Sinnayah et al. (2019). The changes involved moving away from traditional lectures and tutorials to inquiry-based learning incorporating applied clinical scenarios. The two fulltime lecturers and 5 sessional instructors reported that teaching in a nondidactic fashion was challenging. Sinnayah et al. found active learning significantly improved students' grades, satisfaction scores, and reduced failure rate in the unit.

The Lecture attendance among university paramedic students was investigated through sequential mixed methods by Beovich, Gosling, et al. (2021). They found units such

as Foundations and Research and Evidence, had a decreasing attendance over time while clinically focused subjects such Advanced Life Support, Cardiac Conditions, and Emergency Management had an increase. This correlated with the students perceived value of these subjects.

The trend in the literature is for paramedic students to focus on the clinical and practical units that they perceive to be the most relevant to their future needs as professionals while neglecting the underpinning EBP, bioscience, law, ethics, and sociology subjects. Research in this area has revealed however a continuing focus on non-clinical science and social science units within paramedic courses. Challenges remain evident in regard to extending the connection of paramedic students to the academic content presented by non-paramedic academics in particular sessional academics.

2.5 Paramedicine Pedagogy and curriculum

2.5.1 Teaching theories

Teaching theories are important as each can provide a unique framework to understand how individuals and groups learn but also a method to describe, explain, analyse, and predict learning. Those teaching theories relevant for this thesis will be briefly addressed in approximately chronological order however as the field is overlapping and densely interconnected this is challenging. An endeavour will be made to contextualise the theories within a paramedicine higher education framework with a focus on EBP.

Pedagogy originally meant a place of instruction but in modern usage can be defined as “The art, occupation, or practice of teaching. Also: the theory or principles of education; a method of teaching based on such a theory” (Oxford English Dictionary, 2020). Another obsolete meaning is meaning is ‘to lead the child’ which was often a role perfumed by slaves in ancient Greece (Shah & Campus, 2021).

Socrates (469 BCE – 399BCE) is associated with the eponymous Socratic method of teaching (Delić & Bećirović, 2016). The basic technique is to encourage the learner to process a given problem by their own intellectual labour, with minimal guidance from the teacher and without access to literature. The canonical form of Socratic teaching has drawbacks and is less restricted in modern usage (Birnbache, 1999). The method does encourage students to use critical thinking to question the orthodoxy and in this sense is consistent with EBP. The Socratic method is used in health professional education for pharmacology (Hope et al., 2017; Oyler & Romanelli, 2014), psychology (Clark & Egan, 2015; Van Seggelen-Damen et al., 2017), and biomedical science students (Burder et al., 2014).

John Dewey, an influential polymath presented many theories (e.g. Dewey, 1897, 1898, 1900, 1903, 1923; Dewey & Dewey, 1915). He argued that education was not just about content knowledge but also to develop the student to their full potential for the good of society (Dewey, 1897). Dewey (1903, p. 18) was an early proponent of constructivism when he asserted that for education to be most effective, "*content must be presented in a way that allows the student to relate the information to prior experiences thus deepening the connection with the new knowledge*". The extensively used Problem Based Learning (PBL) has its roots in Dewey's ideas (Ültanir, 2012). He also was a supporter of hands on learning and reasoned that "*if knowledge comes from the impressions made upon us by natural objects, it is impossible to procure knowledge without the use of objects which impress the mind*" (Dewey, 1916, p. 217). PBL is a student centred pedagogy which allows students to learn by experiencing the process of solving an open-ended problem when presented with trigger material (Dolmans et al., 1997). When implemented within education in the health professions this is typically framed around a health problem scenario. This may be text based or simulated via physical or virtual means. PBL has been used in paramedic education via

immersive virtual worlds in Australia (Mitchell et al., 2019), the UK (Beaumont et al., 2014; Jivram et al., 2021), and NZ (Cochrane et al., 2016). The application of PBL to EBP is somewhat synergist as both processes share similar steps of identifying the problem, searching for information, assessing the information, synthesising a new understanding from old and new knowledge, and applying the new understanding. PBL is considered a constructivist pedagogy because it emphasizes collaborative and self-directed learning while being facilitated by tutors (Jivram et al., 2021; Seibert, 2021).

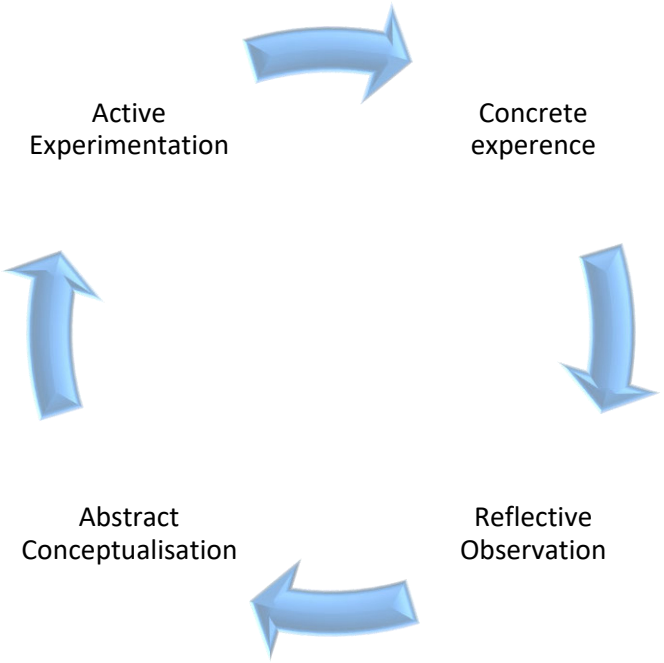
Jean Piaget (1896 – 1980), a Swiss psychologist, developed a theory of cognitive development (Piaget, 1952; Piaget, 1976). *Piaget's theory of cognitive development* is a broad theory regarding the nature of knowledge and development of human intelligence. It proposes that intelligence changes as children grow and go through four stages of development, sensorimotor, preoperational, concrete operational, and formal operational stage. A central tenant of the Piaget's theory is that a child's cognitive development is not solely about gaining knowledge, but also the child has to construct a mental model of the world (Huitt & Hummel, 2003). The theory has had considerable influence in the understanding of cognitive development (Arnon et al., 2014), constructivism (Drescher, 1991; Waite-Stupiansky, 2017) and problem based learning (Qayumi, 2001). The theory has also received criticism, for example, the stages of development have been seen as a continuous process by some (Babakr et al., 2019; Vygotsky, 1978) and for being biased in relation to social and cultural differences (Cohen, 2017). Some investigations have indicated not all individuals progress to the formal operational stage (Demetriou & Spanoudis, 2018) with Dasen (1994) stating that only 1/3 of adults reached the stage. More specifically for EBP teaching requiring critical thinking, 50% of college students fail to reach the formal (Keating, 1979) suggesting this neural heterogeneity may influence learning behaviours (Demidenko et al., 2022).

Andragogy refers to methods and principles used in adult education (Oxford English Dictionary, 2017). Originally coined by German educator Alexander Kapp (1799–1869) (Kapp, 1833; Loeng, 2017), and popularised by Malcolm Knowles (1913 – 1997), andragogy is the art and science of adult learning, thus andragogy refers to any form of adult learning (Knowles, 1984). Knowles makes five distinctions about teaching adults compared to children. He asserts that adults are self-directed, self-motivated, have experiences that can be compared to new learnings, their readiness to learn is related to their required skills and knowledge, and prefer immediacy in the application of knowledge.

David D. A. Kolb (1984) attempted to model the whole field of learning with one concept. See Fig 6. Kolb's learning cycle. Although he took inspiration from Piaget, Dewey, and Lewin, his main point of difference was that Kolb believed all learning was experimental. He stated that effective learning happens when the learner progresses around the cycle of; a concrete experience, that is the basis for reflective observation, then abstract conceptualisation occurs which provides ideas for active experimentation. The results of the active experimentation in turn becomes a new concrete experience for the next cycle. Each of the four stages of the cycle is associated with a different learning style, thus while learning style is a contested concept (Furey, 2020; Willingham et al., 2015; Wininger et al., 2019), the variation in approach to considering a problem may assist in the understanding (Taylor, 2017). The Kolb learning cycle is used extensively in paramedicine (Hilliard et al., 2017; Naidoo, 2021; Williams, Brown, et al., 2013) and EBP education (e.g. Murray, 2021; Song & Park, 2021; Walker & Hirsch, 2020). See Figure 6.

Figure 6.

Kolb's learning cycle.



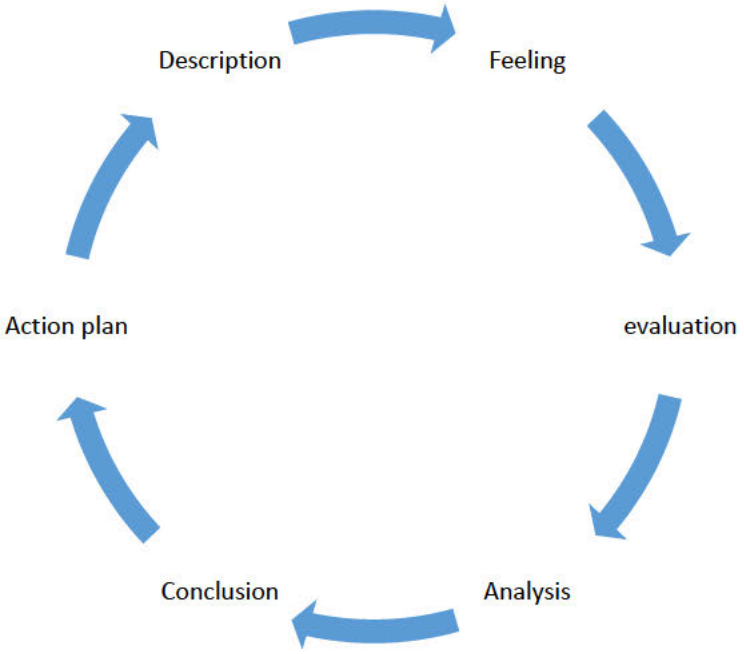
Note: From "Experiential learning: experience as the source of learning and development" D. A. Kolb, p. 33. Copyright 1984 by Prentice Hall

Reflective Practice is the process of retrospectively considering ones actions in a critical way as part of a continuum of learning and adaptation. (Leitch & Day, 2000). The rationale for this is that experience alone does not inevitably lead to learning, but deliberate reflection is needed (McBrien, 2007; Norrie et al., 2012). Many models of reflective practice have been proposed. An early proponent (Borton, 1970) presented a cycle inspired by Gestalt theory required the practitioner to ask "What, So what, and Now what?". Graham Gibbs (1988) adapted Kolb's experiential learning cycle with structured debriefing to facilitate reflection. He advises to; describe what happened; note the feelings and reactions; evaluate the experience; attempt to analyse the situation; make some conclusions; and make a personal action plan about responding to this situation now and for the future. Gibbs Reflective cycle is commonly used in paramedic education particularly in clinical placement phases (Hilliard

et al., 2017; Kirk, 2019; Snowdon, 2021) but has also been used to write EBP focused reflections on practice (Wade, 2010). See Figure 7.

Figure 7.

Gibb's Reflective cycle.



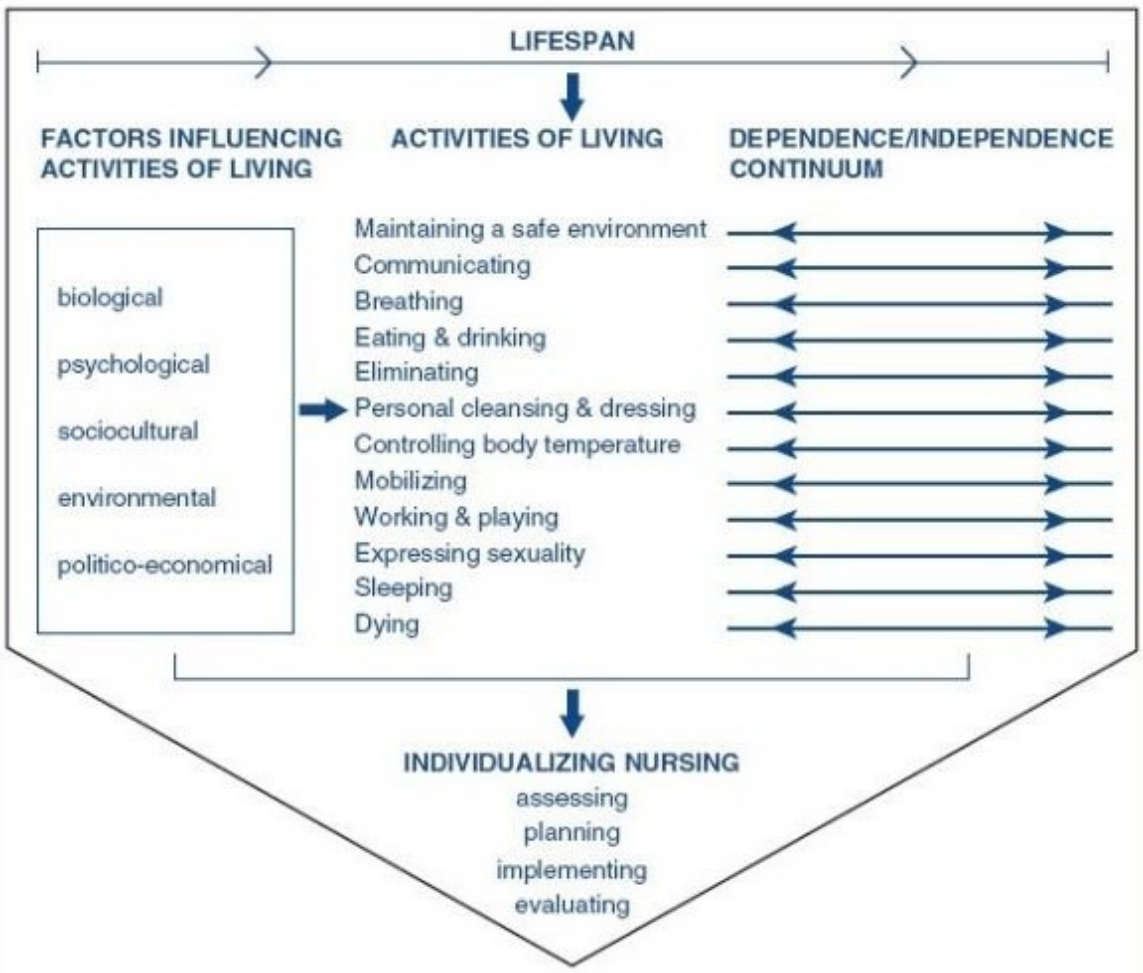
Note: By G. Gibbs, 1988, "Learning by Doing: A Guide to Teaching and Learning Methods." Oxford Polytechnic. Copyright 1988 by Oxford Polytechnic

The Roper-Logan-Tierney Model (RLTM) (Roper et al., 2000) identifies the main features of human existence using the multiple biological, psychological, sociocultural, environmental, and politico-economic lenses. They operationalise these into 12 activities of daily living such as communicating, beathing, eating, sleeping, and dying. The RLT was an attempt to capture a single, unified model of nursing (Tierney, 1998) by UK nurse educator Nancy Roper with refinement by colleagues Winifred Logan and Alison Tierney. The RLTM has been criticised for oversimplification and many other models of nursing exist (Mudd et al., 2020) but none are universally accepted within the profession (Vieira et al., 2021). The

RLTM has been used in a number of academic and clinical settings (de Moura et al., 2015; Kara, 2007; Williams, 2015) including neonatal transport setting (Healy & Timmins, 2003), however, no published literature was found to support its used in paramedicine . See Figure 8.

Figure 8.

The Roper Logan Tierney Model



Note: From “The Roper-Logan-Tierney model of nursing: based on activities of living,” by N. Roper et al., 2000, Copyright 2000 by Name Elsevier Health Sciences.

Constructivism theory holds that learning occurs when learners are actively involved in a process of meaning and knowledge construction in contrast to passively receiving information. Meaning is not transmitted from the teacher but is created by the students’ learning activities. Learners are the makers of meaning and knowledge (Biggs, 1999).

Constructivism attempts to develop critical thinking, inquiry and collaboration (Driscoll, 2005) all core skills of EBP (Rolloff, 2010). The constructivist model first introduces basic concepts which the students master and builds on these to grapple with more complex topics in a scaffolded approach (Alexander & Murphy, 1998). The spiral health care curriculum. adopted by many medical education institutions (Masters & Gibbs, 2007) uses a constructivist approach to build core competencies such as EBP, interdisciplinary teamwork. Developed by Bruner (Bruner, 1960) the spiral curriculum is an iterative re-examination of topics throughout a course. Each successive encounter builds on the one before to construct a deeper understanding. The iterative nature of Spiral curriculums has been shown to improve EBP education outcomes of surgeons (Elçin et al., 2014). Spiral learning emphasises the mastery of skills, knowledge and cognition which are key to implementing EBP (Al Ketbi, 2018).

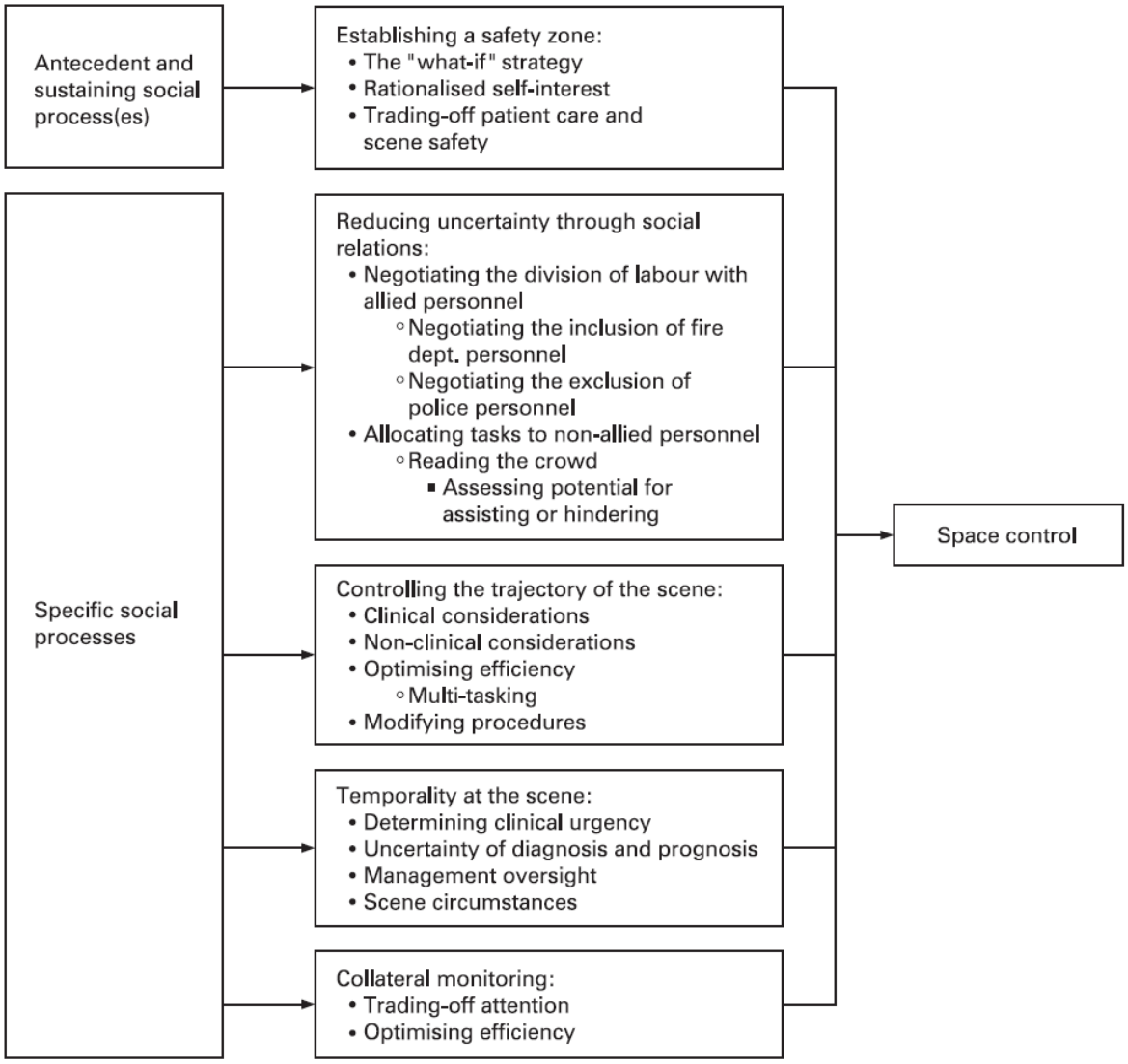
Siemens (2004) proposed Connectivism as a theoretical framework for understanding learning in a digital age. Connectivism puts emphasis on internet technologies that contribute to new avenues of communication and knowledge formation (Siemens, 2005). He considered the existing epistemological traditions of objectivism, interpretivism, and pragmatism to be limited as they only considered the intrapersonal view of learning and failed to address the impact technology made in learning in knowledge-rich environments. Furthermore, Siemens considers that what sets connectivism apart from theories such as constructivism is the position that learning does not simply happen within an individual, but can happen across peer networks (Goldie, 2016). While the digital native (Helsper & Eynon, 2010) stereotype of the Z generation that make up many of the students in paramedic undergraduate (Lim et al., 2016) classes is not universal, building digital literacy into the pedagogy at the theory level is now vital (Poncette et al., 2020; Smith et al., 2020). There is support from medical educators that connectivism provides a lens that better understands and manages digital technologies in

the explicit, implicit, and hidden curriculums (D'souza et al., 2021; Flynn et al., 2015; Messman et al., 2020).

A Theory-of-Practice for paramedics was presented by Campeau (2008) developed using the social-psychological perspective of Symbolic Interactionism and Grounded Theory Methodology on data obtained from semi-structured interviews of paramedics. He postulates that what sets paramedics apart from other healthcare personnel is the setting of their clinical practice. In Campeau's theory, paramedics adapt to the scene by taking control of the activities that take place in the space around the patient and themselves. The Theory-of-Practice has ramifications in the contextualisation of education for paramedics. See Figure 9.

Figure 9.

The space control theory of paramedic scene management.



Note: From "Why Paramedics Require "Theories-of-Practice" by A. Campeau, 2000, Journal of Emergency Primary Health Care, 6(2), 1-7. In the public domain.

The learning theories presented come from multiple disciplines, philosophies, and epistemologies with overlapping definitions. All have been utilised at least in part to guide the education of paramedics and EBP. Despite existing support constructivism, connectivism, and Campeau's space theory, a definitive paramedic underpinning educational theory has not yet become clear.

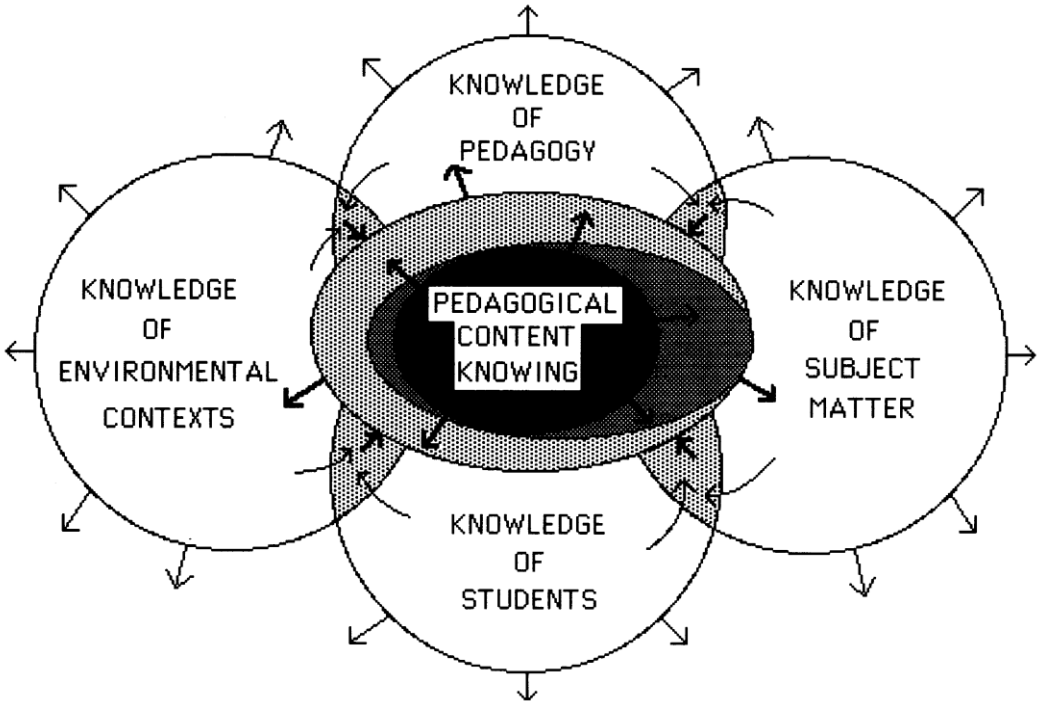
2.5.2 Pedagogical Content Knowledge

In a review of the shift in prominence from content knowledge to pedagogical method within teacher education in the 1970's and 80's, the influential author Lee S. Shulman (1986) proposed the much cited construct of *Pedagogical Content Knowledge* (p. 9). He envisaged this to the dimension of subject matter knowledge that embodies the elements that most enhances its teachability. He explained that these were, "*the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations*" (p. 9) that support the comprehensibility of the topic for the student.

The Shulman model of Pedagogical Content Knowledge (PCK) was interpreted through a constructivist lens by Cochran et al. (1993). Their model of PCK comprised four components, subject matter knowledge, pedagogical knowledge, teachers' knowledge of students' attitude, capabilities, and optimal learning strategies, and understanding of the cultural, political, social, and physical environments. In the developmental model of Pedagogical Content Knowing the expanding circles overlap and represent the growth and integration of the four areas of knowledge over time until they become one body of knowledge. Cochran et al. (1993) describes the process as *synthesis* and *integration* drawing a distinction from the *transformation* referred to by Shulman (1986, 1987). They suggested that the construction of PCK results over time from episodes of teaching, watching teaching and refection on teaching. See Fig PCK1 A Developmental model of Pedagogical Content Knowing. See Figure 10.

Figure 10.

A Developmental model of Pedagogical Content Knowing



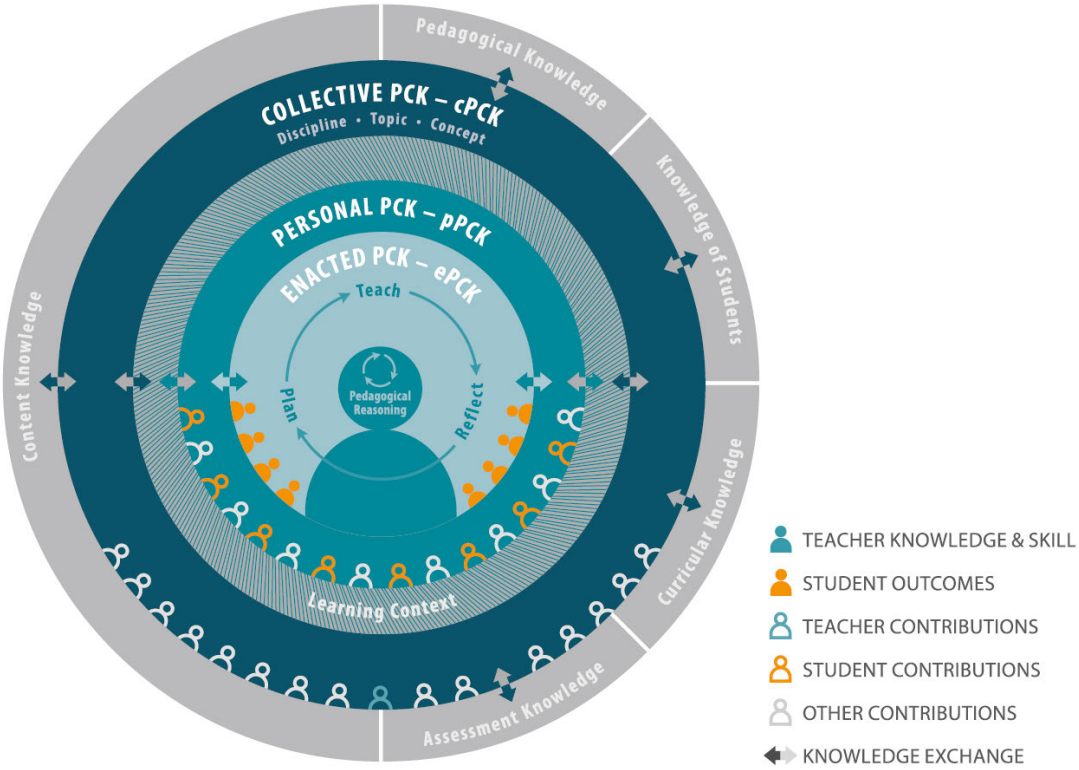
Note: From "Pedagogical content knowing: An integrative model for teacher preparation" by K. F. Cochran, 1993, Journal of Teacher Education, 44(4), 263-72, Doi 10.1177/0022487193044004004 . Copyright 1993 by Journal of Teacher Education.

Pedagogical Content Knowledge (PCK) was also defined by Carlson et al. (2019, p. 2) as, "*the knowledge of, reasoning behind, and planning for teaching a particular topic in a particular way for a particular purpose to particular students for enhanced student outcomes*". After finding a previous model suboptimal, they produced the Refined Consensus Model (RCM) of PCK. They declared PCK to have three separate domains of collective, personal, and enacted. Enacted PCK (ePCK) was seen as the specific knowledge, skills and examples that a particular teacher uses to teach a particular concept, in a certain setting with an individual or group of students. Personal PCK (pPCK) is the cumulative pedagogical content knowledge and skills of an individual teacher that is the synergist sum of a teacher's own experiences including all students and other teachers. Collective PCK (cPCK) is

conceptualised as a community level domain that combines multiple teachers' contributions as understood and documented by multiple people. The context in which the learning takes place also has an influence. This included the student attributes, learning environment, and wider educational situation such as policies and requirements. The RCM of PCK as described by Carlson et al. (2019) is centred around the practice of science teaching but has obvious implications for teaching EBP to health professionals. See Figure 11.

Figure 11.

The Refined Consensus Model of Pedagogical Content Knowledge



Note: From "The Refined Consensus Model of Pedagogical Content Knowledge in Science Education" by J. Carlson et al., 2019, in Repositioning Pedagogical Content Knowledge in Teachers' Knowledge for Teaching Science, 77-94., 10.1007/978-981-13-5898-2_2. Copyright 2019 by Springer.

2.5.3 Educating the professions

The education of professionals in tertiary intuitions began with medicine, the clergy and law nearly a millennia ago (University of Bologna, 2022). Over time new professions have transitioned to higher education with paramedicine among the most recent in leading the evolution in Australia, New Zealand, and the UK (Brooks et al., 2016; Brooks et al., 2018).

The inspirational Lee S. Shulman (1998) proposed six characteristics of professional education as, service to others, understanding of body of knowledge, skilled practice, judgment under unavoidable uncertainty, learning from experience as theory and practice interact, and a professional community to mentor and share knowledge. He indicates these attributes influence the pedagogies that have been crafted to ease entry into relevant professions such as medical residencies for graduate doctors. Shulman suggests the conservative university is the source of radical ideas, and the applied field reorientates the professional within the parameters of the industry. He observes that professions have an inherent tension between theory and practice that requires the student to negotiate. He offers an example of graduates devaluing theoretical preparation once they reach the field, "*the chief of clinical services at the hospital admonish them to forget all the nonsense they were taught at university because now will learn the way it is really done"* (p. 519). A scenario that is echoed in many papers reviewing paramedics students' clinical placement experiences (e.g. Bourke-Matas et al., 2020; Devenish, 2014; Lazarsfeld-Jensen, 2014).

The influential report of the Global Commission on Education of Health Professionals for the 21st Century, (Frenk et al., 2010) called for a new era of professional education. They identified that health professionals are the intermediaries of knowledge between those who produce it and those that required it. They further recognised health professions education had not kept up with the changes in the health system. Frenk et al. (2010, p. 1951) called for, "*all health professionals in all countries should be educated to mobilise knowledge and to*

engage in critical reasoning and ethical conduct". Other recommendations included the adoption of responsive competency-based curricular rather than static course work, integration of training with clinical delivery, interprofessional education, breaking down of siloed professions, strengthening of educational resources, and exploitation of the power of IT for learning and knowledge brokerage. They also advocated the transformation in education focus from memorising facts to critical reasoning skills that can facilitate the core EBP skills of, "*search, analyse, assess, and synthesise information for decision making*" (p. 1952). The report illustrates the need for paramedics to be educated and proficient in EBP as well as engaging in critical reasoning, ethical conduct and interprofessional working.

The definition of a profession often includes a requirement for the individual to possess special knowledge and skills in a body of learning derived from research, education, and training at a tertiary level. The professional also needs to operate ethically and for the service of others. (Cruess et al., 2004). Saks (2012) criticized this taxonomic approach viewing a profession as a socially negotiated label based on occupational ideologies in relation to the knowledge and skills involved. Arguably paramedicine meets Cruess et al.'s criteria but perhaps not Saks's, a fuller discussion is conducted in 2.5.5 and 5.4.2.1.

2.5.4 Paramedicine pedagogy

Historically paramedic curricular was focused on technical, psychomotor skills (First et al., 2012) and competencies (Bowen & Williams, 2020). In an editorial Grantham (2004) commenting on the transition from ambulance service based education to tertiary education providers was positive about coming external accreditation of paramedic degrees by the Council of Ambulance Authorities (CAA) drawing parallels with medicine and nursing. He saw it as an enabler bringing benefits to all stakeholders including paramedics, patients, and academics. Industry continued to put emphasis on producing "road-ready" graduates that were able to work independently soon after course completion however (O'Meara, Williams,

et al., 2015). O'Brien et al. (2014) argued that the increasing complexity of the paramedic workplace and the diverse expectations of the key stake holders placed substantial stress on the graduates. They advocated a four-year bachelor model with an intern year, given the independent and increasing scope of practice of paramedicine. A qualitative systematic review by Hanna et al. (2021) reinforced the need for paramedic students and graduates to have effective clinical preceptors. They found that while there was a knowledge practice gap with some skills and knowledge the most common was lack of effective communication with patients, families, and other professionals. Non-traditional clinical placements have been advocated to improve communication skills in paramedic students(Ross et al., 2015; Ross et al., 2018; Simpson et al., 2016).

In a series of articles Williams (2004, 2005a, 2005b) examined the inclusion of case-based learning (CBL) for the paramedic pedagogy. He found the paradigm, based on grand theories placed context and situated the student so to promoted authentic learning. It also allowed hypothesis generation and consolidation and integration of other knowledge and skills. He reported that CBL was distinguished from Problem Based Learning (PBL) in that CBL requires students to have some prior knowledge to assist them. The CBL methodology seems to be synergistically compatible with EBP education.

Simulation plays a major role in paramedic education, bringing together theory and physical skills in a safe realistic environment (McKenna et al., 2015; Morrison et al., 2017). It also allows students to experience and become competent in rare, high-stakes conditions such as paediatric cardiac arrest, child birth complications or major disasters (Lammers et al., 2021). Simulation allows students to practice and be assessed in procedures, decision-making and critical thinking in real-time (Hunter et al., 2021). Despite its widespread use the evidence for efficacy in paramedicine is lacking (Bischof et al., 2016). Promisingly

simulation has been shown to be valid and reliable for EBP competency assessments in medical undergraduates (Kumaravel et al., 2021).

2.5.5 Signature pedagogy

The concept of '*signature pedagogies*' was presented by Shulman (2005b) after a 10 year study into educating and preparing for practice, professions such as medicine, law, nursing and teaching. These he described as modes of teaching that have become inseparable from preparing individuals for particular professions. He suggested that a history lecturer wants their students to develop an understanding of history. By comparison a lecturer in a profession wants their student, "*to understand in order to act, to act in order to make a difference in the minds and lives of others-- to act in order to serve others responsibly and with integrity*" (p. 3). He went on to detail that signature pedagogies have routine learning situations where the rules of engagement are clear and consistent, so the learning opportunities become clear. These learning routines are distinctive for the profession and pervasive in the curriculum. Lastly the signature pedagogues become imbedded in the general pedagogy of the whole profession.

In a large Australian Learning and Teaching Council funded review on Australian paramedic education, *Paramedic education: developing depth through networks and evidence-based research*, Willis et al. (2009b) identified the need for a signature paramedic pedagogy. They used the example of nursing that had developed two signature pedagogies, a focus on care and a theory focused on reflective practice and evidence-based practice. They shared that three strands existed in paramedic Clinical education, skills acquisition, apprenticeship, and decision making in the published literature. The fourth stand of moral and ethical preparation was discovered in the grey literature of university course descriptions. They concluded with the concept that the emerging paramedic academic cohort would further develop the signature pedagogy.

In a follow up editorial Willis (2009) again recognised that paramedicine had a uniqueness due to the *practice in an environment of uncertainty* and *autonomy.* She acknowledged that barriers to developing a signature pedagogy were due to structural and government issues. An intriguing observation was that student paramedics embraced the technical skills but were reluctant to study other topics. She linked this rejection of academia to the challenges paramedic academics had developing a signature pedagogy but pondered that the practical lens may be the key.

As an outcome of membership of the larger research group that supported the *Paramedic education: developing depth through networks and evidence-based research,* Lazarsfeld-Jensen (2010), proposed that the signature pedagogy of paramedics was the mentored *on-road* (clinical placement) experience. This clinical placement is traditionally performed by the student as a third crew member working on an ambulance, performing the clinical role of a paramedic but with a qualified paramedic directly mentoring and ensuring safety. This insight was provided after interviews and focus groups with senior paramedics, academics, and students. She also revealed that paramedic graduates had a learning gap in interpersonal, ethical, and professional skills that future curricula needed to address. The explanation provided for this included generational changes involving risk tolerance and technology enabled social distancing. Lazarsfeld-Jensen concluded that, "*The signature pedagogy of paramedics found in this project was a profoundly interpersonal extended apprenticeship in which theoretical knowledge and clinical skills had to be consummated in the on-road event*" (p. 372). She pointed out that this would be a challenging role for the mentors who would be mainly from a different generation and with little understanding of the graduates' skill set.

As the paramedic profession in Australia matured and most preemployment education had transitioned to universities, Acker and Johnston (2015) revoiced the call for a signature

pedagogy. They saw this as a needed component for paramedic education to evolve. Further they called for underpinning educational theory and philosophy suitable for the unique needs of the profession. Unfortunately, they did not offer any contenders for these needs.

A discourse analysis by Weber, Lawson and Williams (2021) examining the frameworks that guide curriculum design of paramedic courses commented that 12 years had passed since the Willis et al. (2009b) report and despite the changes in Australian and New Zealand paramedicine, the original employer generated competencies were still in place. Weber, Lawson and Williams (2021) argued that paramedic education could be differentiated from other health education models with the development of a conceptual framework underpinned by a signature pedagogy. They posited the Dreyfus model of skills competency (Dreyfus, 2016) and Critical theory (Matthews, 2014) as contenders for a suitable conceptual framework for paramedic signature curriculum .

The development of a paramedic signature pedagogy continues with scenarios and clinically integrated learning being promising elements with the Dreyfus model and Critical theory considered as promising candidates. The full transition to a signature pedagogy for the paramedic profession may have to wait until competencies used for registration and course validation catch up with current practice.

2.6 Research Examining Teaching EBP in the Health Professions

Many authors point to early experiments in medicine as the birth of EBP. Nursing scholars however point to Nightingale and her innovative use of data visualisation to improve health. Whatever the origins, competency in EBP is a skill needed by all health professionals (Albarqouni, Hoffmann, Straus, et al., 2018). Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls and Osborne (2005) published the seminal consensus paper *Sicily statement on Evidence Based Practice* laying out a defined core set of knowledge and skills need to educate and practice EBP for health care professionals. Since then, there has

been considerable academic interest in the topic (Barends & Briner, 2014) with 192 articles being published between 2010 and 2018 concerning undergraduate health students (Larsen et al., 2019).

2.6.1 Content / Core Competencies

Generally, EBP competencies are linked to key EBP principles and steps that are universal across the health professions. Sackett, Rosenberg, et al. (1996) wrote the seminal editorial "*Evidence based medicine: what it is and what it isn't*" in an attempt to define what was included in the increasingly popular Evidence Based Medicine (EBM) movement. Their definition of EBM as has been cited 19569 times as of January 2022:

> *Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.* (p. 71)

Sackett, Rosenberg, et al. (1996) further emphasised that EBM was not impossible to practice and suitable for general medicine. They also stated it was not cookbook medicine but required individual clinical expertise and patients' choice to maximise the quality and quantity of life. Finally, they pointed out that EBM was not simply randomised trials and meta-analyses but that the best available evidence could come from basic sciences although they did not mention qualitative research.

The heavily cited, *Sicily Statement of Evidence-Based Practice* arising from the 2003 Conference of Evidence-Based Health Care Teachers and Developers clarified the scope and definition of EBP. Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls and Osborne (2005) produced a consensus statement on behalf of the multinational, multi-profession group that defined what Evidence-Based Practice (EBP) meant, designated

the skills required to practise in an evidence-based manner, and outlined a curriculum that meets the requirements for training health professionals in EBP. Their definition of EBP was similar to that of EBM by Sackett, Rosenberg, et al. (1996) but broader to include entire health care teams and a reference to available resources. Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls and Osborne (2005) stated that:

> *Evidence-Based Practice (EBP) requires that decisions about health care are based on the best available, current, valid, and relevant evidence. These decisions should be made by those receiving care, informed by the tacit and explicit knowledge of those providing care, within the context of available resources.* (p. 4)

Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls and Osborne (2005) further described the five steps of EBP, now supported by evidence of teaching effectiveness, as translation of uncertainty in to an answerable question, systematic accessing of the best evidence available, critical appraisal of the evidence for validity, clinical relevance, and applicability, application of results to practice, and evaluation of performance. They also outlined EBP education requirements as equipping graduates with skill enabling them to complete the five steps of EBP. Finally, they called for assessment tools for each of the stapes to be developed and distributed freely.

Australians (Leung et al., 2016) using survey methodology, sampled 42 academics and educators in one state, designed a competency framework for measuring EBP knowledge and skills in nursing based on the five-step EBP model. Participants rated the framework structure and relevance highly but disagreed about the levels of EBP competence required for nurses. While nursing focused this paper provides valuable information for similar work in the paramedic domain.

A consensus set of core competencies for health professionals in EBP was generated by the international team of Albarqouni, Hoffmann, Straus, et al. (2018). They built on a previous systematic review (Albarqouni, Glasziou, et al., 2018) and used modified Delphi methodology to interrogate 234 participants representing a range of health professions from 36 countries to develop 68 EBP core competencies. Albarqouni, Hoffmann, Straus, et al. (2018) defined EBP core competencies as "*the essential minimal set of a combination of, attributes, such as applied knowledge, skills, and attitudes, that enable an individual to perform a set of tasks to an appropriate standard efficiently and effectively*." (p. 2) They stated that a lack of EBP skills and knowledge was commonly reported as a barrier to EBP use and linked this to inconsistency in the content and quality of EBP education. Hence the imperative to develop a standardised set of EBP core competencies. These were broader in focus being international and multidiscipline unlike the earlier USA based, nursing-centric by Melnyk et al. (2014). The 68 core competences were grouped into six domains representing the five steps of EBP and an introductory group comprising background processes. The development of the international multidiscipline EBP core competencies is an important step in creating a common reference point for all EBP discussion.

The views on EBP education by international experts were synthesised using qualitative content analysis by (Lehane et al., 2019) supported by a cross-sectional national survey and literature review in a wholistic Irish paper. Motivated by poor uptake of EBP resources and irregular application at point of patient contact, they focused on curriculum, teaching, and stakeholder engagement. They found a very strong message of the need to integrate EBP though all elements of curricula lest students "*perceive a dichotomy between EBP and actual clinical care*" (p. 104). Furthermore, graduates must be able to access, understand and integrate the research into their practice but with no expectation that they will go do primary research. As well as the five-steps of EBP, the ability to be competent in

shared decision making was seen as important. Using relevant, interesting, clinical scenarios to teach EBP was viewed as critical to success. EBP role models that championed EBP in clinical decision making and contextualised the process in a specific workplace was proposed as a target for all healthcare organisations. The provision of training in EBP for clinical educators to achieve a critical mass in an organisation was also recommended. The engagement of stakeholders such as national policymakers, professional organisations, patients was identified as having significant potential to facilitate uptake and consistency of EBP. Limitations of the study included lack of input from allied health professions such as paramedicine. Overall, this pragmatic paper brings clarity to what is known about EBP education and implementation while identifying many avenues for investigations in andragogical approaches and organisational change implementation.

Core EBP competencies for nurses produced Dolezel et al. (2021) using Delphi methodology added step 0 before the accepted five steps of EBP and step 6 after. Step 0 is titled *Cultivate a spirit of inquiry within an EBP culture and environment* and concerns behaviour such as mentoring, questioning clinical practice, and implementing strategies to establish and maintain EBP culture. Step 6 Disseminate the outcomes of the EBP decision or change and encompasses communication of best evidence to stakeholders, generating external evidence and formulating evidence-based policies

2.6.2 Pedagogy

Instructional practices used for evidence-based practice with pre-registration allied health students were reviewed in an Australian paper by Hitch and Nicola-Richmond (2017) which found 17 relevant articles. They observed that EBP could be challenging, the application step in clinical practice could be particularly so, "*The challenges inherent in translating a classroom acquired understanding of evidence based practice into real life are well recognised*." The findings included the need for social negotiation and collaboration

skills to practice EBP post-graduation, with journal clubs, group assignments, and small group case discussion being used to promote this. The need for Collaborative, relevant and authentic learning experiences was also clear in the paper. The induction of EBP skills to students early in a degree then scaffolding the learning with EBP embedded in all the curriculum and assessment had strong support in the paper.

A systematic review of 85 studies that investigated the effect of EBP educational interventions that utilised a control group was presented by Albarqouni, Hoffmann and Glasziou (2018). Only 10% of the included studies taught all five steps of EBP with step three, critical appraisal, being the most commonly assessed occurring in 74% of papers. EBP skills and knowledge were frequently assessed with attitudes, behaviours, and self-efficacy, less common. Ironically less than half of the studies measuring EBP teaching utilised high quality, validated instruments to measure the outcomes of interventions.

A large scoping review of EBP teaching methods by Larsen et al. (2019) mapped literature on teaching methods across the five steps of EBP as defined by the Sicily Statement. Approximately half of the included 81 studies were USA based with a qualitative and nursing bias. Of the seven key methods for teaching EBP identified by the paper, research courses, workshops, collaboration with clinical practice, and IT technology were most frequently reported while journal clubs and embedded librarians were least. EBP Steps two – acquire evidence, three – appraisal of evidence and four – integrating evidence with practice, were the most commonly examined. The paper illuminates the richness of the EBP teaching literature while spotlighting the areas of paucity such as EBP steps one and five. This study excluded medical education to focus on nursing and allied health degrees with a common paradigm as such it may provide more relevant finding for paramedic-based education.

2.6.3 Curriculum

Chaboyer et al. (2004) were among the first Australian nursing academics to publish their work developing an integrated EBP curriculum. After a benchmarking with another university, they implemented a spiral curriculum and a capstone research project into their degree. They identified a need for infrastructure and process changes in their new curriculum. The infrastructure involved a dedicated EBP unit and EBP champions. The processes that changed were, integrating a research tread through the degree, an introduction to EBP in semester one, and sharing their changes with the local health services that accepted students on clinical placements. Chaboyer et al. (2004) while advocating for research to be taught early in a bachelor's degree did not discuss the challenges of engaging and demonstrating relevance to the students before meaningful clinical experience.

To assist academics developing EBP curriculum Khan and Coomarasamy (2006) created a hierarchy of effective teaching and learning activities rated by their ability to increase competence in evidenced-based medicine. From their review of empirical and theoretical evidence they ranked interactive and clinically integrated activities as Level 1 (highest), interactive but classroom-based activities as Level 2(a), didactic but clinically integrated activities Level 2(b), and didactic, classroom or standalone teaching at Level 3 (lowest). The Khan and Coomarasamy (2006) paper was based on scant data with large heterogeneity in student populations, assessment tools and outcome definitions but has been widely cited and used for systemic reviews of EBP (e.g. Horntvedt et al., 2018; Maggio et al., 2013; Young et al., 2014)

A systematic review of strategies for teaching EBP in nursing education was published by Horntvedt et al. (2018). They detected that there were four main themes in the literature, Interactive teaching strategies, Interactive and clinically integrated teaching strategies, learning outcomes, and barriers to EBP. Their conclusion was that while most

included studies used lectures and interactive teaching strategies, collaboration with clinical practice was poorly addressed. The Horntvedt et al. review was based on just seven articles a fact recognised by the authors but still limiting its reliability.

A recent systematic review on the effects of teaching EBP at different levels of health professionals' education was conducted by Bala et al. (2021). They concluded that all levels of student, undergraduate and postgraduate improved EBP knowledge and skills after a EBP educational intervention. Improvements in attitude towards EBP was inconsistent after EBP teaching. Little evidence was found on long term improvements in patient care.

The curriculum documents of an UK undergraduate nursing course were analysed to detect EBP and evidence informed practice in the units by Kumah et al. (2021). While they found EBP components imbedded in four of the nursing units they were not present in the other subjects. This suggests that sub optimal EBP teaching is still occurring in undergraduate health professional courses due to not being wholistic delivered.

2.6.4 Role Modelling

A qualitative case study investigating strategic and functional behaviours to facilitate the uptake of EBP by institutions was offered by Stetler et al. (2014). They deconstructed the frequently stated but abstract notion that leaders should support EBP into a hierarchical array the macrolevel themes of strategic, functional, and crosscutting, and 10 interrelated midlevel themes. The strategic leadership behaviours were focused on integrating EBP into the vision, planning and day-to-day running of the origination. Functional behaviours included inspiring and inducing EBP behaviours, developing, role modelling EBP, and monitoring EBP projects. Behaviours that were crosscutting included incorporating EBP in strategic thinking, referencing EBP in communications, and sustaining an EBP culture. The themes in the report are almost certainly valid for other health organisations wanting to support EBP.

A large study by Farahnak et al. (2020) with 565 participants considered the influence of leadership on subordinates attitudes to, and implementation success of, EBP. They reported a positive correlation between transformational leadership and staff attitudes toward EBP. Staff attitudes toward EBP was also noted to be related to implementation success of EBP.

2.6.5 Assessment instruments

A validated, practical assessment instrument constructively aligned with the curriculum and appropriate to the context of assessment is critical to quality education as it provides high quality information on what, and how well the students learned, but also where they struggled. As such, the evidence it provides informs and guides the learning and teaching. Hatala and Guyatt (2002) commenting on the lack of evidence in EBP teaching observed that "*ironically, if one were to develop guidelines for how to teach based on these results, they would be based on the lowest level of evidence*" (p. 1110). Perhaps because the EBP movement originated from medicine rather than education, only one early publication (Parkes et al., 2001) on EBP educational interventions included a detailed analysis of evaluation instruments (Coomarasamy & Khan, 2004; Green, 1999; Taylor et al., 2000).

The *Berlin* assessment tool was developed to measure medical professionals' EBP skills and knowledge (L. Fritsche et al., 2002). Dubbed '*Berlin'* after city the validation took place in, the tool is applied before and after an education intervention and consists of two sets of 15 test questions. Each set consists of a clinical scenario with questions related to the steps taken to solve it in an attempt to assess deep learning. One flaw with the *Berlin* tool is the lack of assessment for the other steps in EBP such as formulation of an answerable question. The other limitation is that is only validated for physicians not all health professionals.

The *Fresno* test was developed by Ramos et al. (2003) in California as a validated instrument to measure the effect of instruction in evidence based medicine. Improvements

over the *Berlin* tool is that it uses open ended question rather than multiple choice to assess higher order thinking and investigates answerable question design resulting in a broader assessment of skills. Both the *Berlin* and Fresno tests are aimed at medical staff therefore both may lack validity for assessing EBP competency across different health disciplines.

Following the call for assessment tools by Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls and Osborne (2005) in the *Sicily Statement of Evidence-Based Practice,* Shaneyfelt et al. (2006) conducted a systematic review on quantitative instruments for evaluating education in EBP. Most of the 104 instruments identified were developed for medical students and post graduate medical trainees and aimed at the acquiring evidence and apprising evidence steps of EBP. By now the field had matured somewhat and 53% of the instrument had a least one type of validity evidence with 10% having more than three. Shaneyfelt et al. found high quality instruments available for assessing individuals and curricula but not for EBP attitudes, and behaviours.

The challenge to find an instrument that assesses EBP skills all five steps and is valid across health care professionals was attempted by Ilic (2009). He was unable to find a suitable tool and proposed using the Objective Structured Clinical Exam (OSCE) as a flexible method for evaluating EBP competency, combining assessment of cognitive skills including knowledge, reasoning, and communication. While he identified several papers that assessed OSCEs (Bradley & Humphris, 1999; Burrows & Tylman, 1999; Fliegel et al., 2002; Frohna et al., 2006; Tudiver et al., 2009) but all were validated on medical students limiting their generalisability to nursing and allied health professionals.

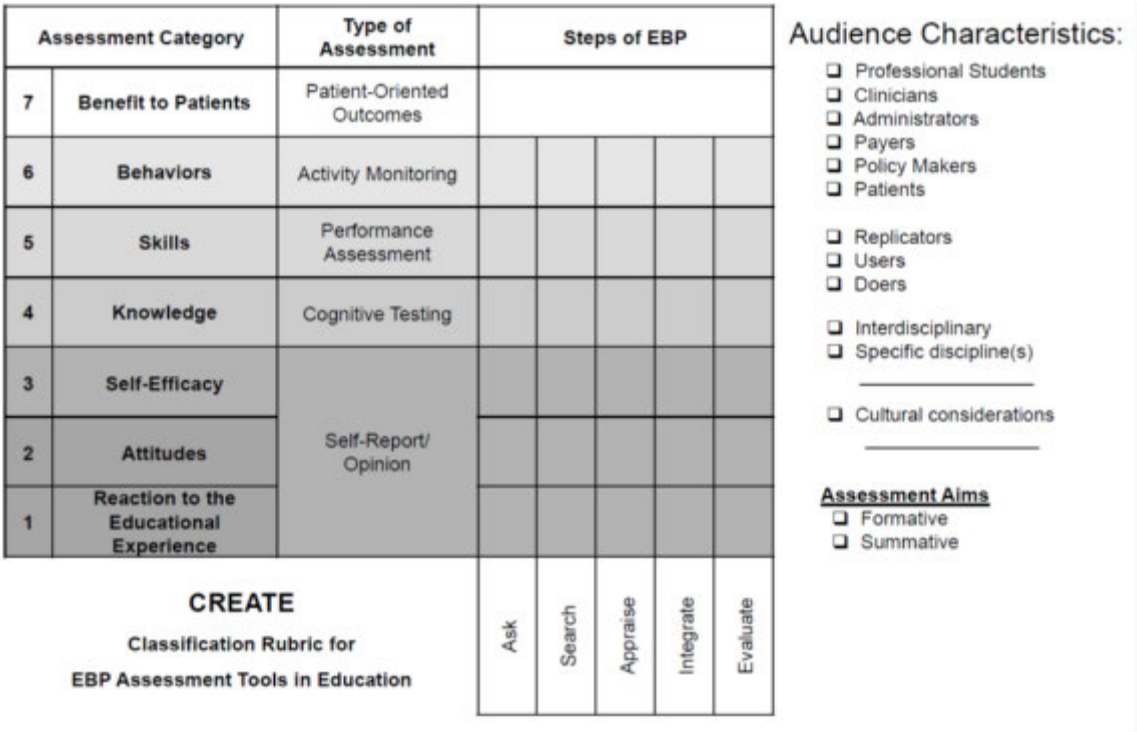
A trans-professional EBP practice profile questionnaire was validated by McEvoy et al. (2010a) in Australian cohorts. They validated their instrument the Evidence-based Practice profile (EBP^2) on 700 allied health undergraduates and academics from six professions at one university. In a subsequent paper McEvoy et al. (2010b) applied the EBP^2 to cohorts of five

allied health professions of Physiotherapy, Podiatry, Occupational Therapy, Medical Radiation, and Human Movement. The authors reported that relevance, confidence, terminology, sympathy, and practice increased with exposure to EBP training. McEvoy et al. (2010b) also detected significant differences in the score for these domains between the professions and gave possible explanations of different EBP programs in the courses, and professional socialisation during clinical placement. This was investigated in a later study in which McEvoy et al. (2011) examined changes in the EBP domains using the EBP^2 as physiotherapy students transitioned from university to the workforce. They found self-reported increases in confidence and knowledge and a transitory decline practice and sense of relevance of EBP in the first 2 years after graduation. The EBP^2 has proved to be flexible; it was modified by Snibsøer, Ciliska, et al. (2018) to produce the EBP^2-N for use in evaluating Norwegian Allied health students, and by Hu et al. (2020) the EBP^{2}Q-C, for applicability to assess Chinese practicing nurses. The measure provided the basis for the EBP^2-P used in the current thesis.

The *Sicily statement on classification and development of evidence-based practice learning assessment tools*, was created by Tilson et al. (2011) at the productive *International Conference of Evidence-Based Health Care Teachers and Developers* conference. They identified that limited tools existed with psychometrics validation to measure EBP educational interventions. As well as calling for further research they produced the Classification Rubric for EBP Assessment Tools in Education (CREATE) framework as a common taxonomy for classifying such EBP education assessment tools. See Figure 12.

Figure 12.

The CREATE Framework



Note: From "Sicily statement on classification and development of evidence-based practice learning assessment tools" by J. K. Tilson et al., 2011, BMC Medical Education, 11, 78 (10.1186/1472-6920-11-78). Copyright 2011 by Springer.

The *Guideline for Reporting Evidence-based practice Educational interventions and Teaching* (GREET) was developed by Phillips et al. (2016) after a Delphi process involving 36 EBP focused international researchers, educators and journal editors. This was to combat an observed trend for papers to lack information describing study interventions. The GREET checklist consists of 17 items which are recommended for reporting EBP educational interventions. They include, the name of the intervention, educational theory, learning objectives, content, materials, educational strategies, incentives, instructors, delivery, environment, schedule, hours, planned changes, unplanned changes, attendance, deviation from planed educational strategies and deviation from planed timetable. Adherence to the GREET checklist by primary researchers would assist academics applying research to their

own teaching, it also provides a framework to inform which areas need to be discussed in this thesis.

A discussion paper by Saunders and Vehvilainen-Julkunen (2018) posited that while there were many tools to measure EBP competencies, the majority available were based on self-assessments. They provided evidence that while logistically less demanding, self-assessments had poor accuracy in measuring evidence-based practice knowledge and skills. Lastly, they called for accurate, validated instruments that assess all the domains of EBP to be performance based.

In a systematic review and taxonomy of assessment tools for EBM Kumaravel et al. (2019) claimed that "*at present there is no taxonomy of existing tools to aid EBM educators*" despite the CREATE framework (Tilson et al., 2011) being developed eight years earlier. Kumaravel et al. (2019) regarded the assessment tools; *educational prescriptions* (*EP*) and *ACE* as addressing at least three of the EBP domains while *Fresno*, *Berlin*, *EBM test* and *OSCE* assessed two. They were unable to find any tools that assessed EBP skills in real world situations.

A partial solution to this lack of real world assessment was provided by Kumaravel et al. (2021). The researchers developed a spiral model of assessing EBM competency using OSCEs. Now aware of the CREATE framework, they used it and core competencies developed by Albarqouni, Hoffmann, Straus, et al. (2018) mapped over six different OSCE stations across the four years of the undergraduate medical degree to assess EBP competency. They mirrored the spiral curriculum of increasing depth of understanding with a spiral model of OSCEs with rising difficulty. Although this was validated in undergraduate medical students, the authors believe it has external validity for other health professions.

This survey of the available literature indicates that ideally an assessment instrument for assessing EBP teaching of paramedic undergraduates would assess all aspects of the

CREATE framework. Due to the nature of some paramedic workplaces this may be logistically prohibitive. Assessment of EBP competencies via suitably constructed OSCEs as described by Kumaravel et al. (2021) spiralled though a paramedicine degree may be an achievable gold standard.

2.7 Research examining teaching EBP to Paramedics

The literature base related to the examination of the teaching of EBP to paramedic undergraduates is small. As such I will consider all papers that consider paramedics and their use of EBP. The papers will be reviewed in chronological order.

An early paper on EBP terminology was presented by De Smedt et al. (2006) who used an electronic survey of 112 medical doctors, 158 nurses and 121 paramedics in Belgium to self-rate their knowledge of EBP terms. The paramedics were tested on a simplified list of terms as the group comprised medical emergency technicians, firemen and medical volunteers with varying educational backgrounds. Two multiple choice questions objectively tested the participants EBP terminology knowledge. All three professional groups lacked adequate EBP terminology and overestimated their knowledge of EBP, with nurses being the most inaccurate.

The understanding of research methods is an important EBP skill. Callaghan et al. (2011) investigated video resources for teaching research concepts to a focus group of 27 UK students in paramedicine, midwifery, and physiotherapy. Motivation for the study was that students felt that research was "*both difficult and irrelevant to their training and practice*" (p. 378). The students' feedback did support the use of video resources that broke the information down into manageable sections and explained the concepts in multiple ways. The perception by students that research and EBP is complicated and extraneous to their training and practice is a theme through much of the paramedic EBP literature.

The first Australian study on the beliefs of paramedics towards EBP and research was conducted by Simpson et al. (2012). The large online survey of 892 paramedics employed in NSW, examined expectations regarding EBP's impact on their ability to provide patient care. Some of the population surveyed were current or past undergraduates but many had progressed through a vocational training course. Simpson et al. (2012) found 97% considered research as important but those with a tertiary background rated it significantly higher. Years of service and clinical level of the paramedic were both negatively correlated with perceived research importance. Almost all respondents reported that they would change their practice based on prehospital evidence with tertiary background positively correlated with increased likelihood while years of service and clinical level were not significant. The authors indicate that tertiary education is a factor in shaping the attitudes and perceptions of paramedics towards EBP.

Classification of the traits relating to knowledge translation was a key focus of the Williams, Jennings, et al. (2013) study of 266 mostly young and female undergraduate enrolled in a paramedicine degree or nursing and paramedicine double degree at one Australian university using the Practice Style Inventory (PSI). Knowledge translation relates to the uptake of evidence-based research into clinical practice and is broader in application than EBP due to increased number of stakeholders. They found that students found EBP confusing and not practical in guiding patient care. The PSI score indicates the paramedic student cohort were far more inclined to rely on experience rather than evidence.

The ability of paramedic undergraduates to influence EBP was described by (Strong & Thompson, 2016) using examples from NZ, UK, and Australia. Assessment tools that require a '*submission-ready journal article*' (p. 22) as a capstone assessment and targeted mentoring programs have produced student research that has changed clinical practice. While the courses provided excellent support only a few of the students achieved external success.

The consistent factor identified in the students was that of curiosity. The paper shows the value of aligning assessment with the professional skill of changing practice, it also shows the importance of kindling the passion in the talented questioning student.

Lim et al. (2016) wrote of their experience teaching epidemiology within an evidence-based practice unit to undergraduate paramedic students in one Australian university. They used the connectivist pedagogy, and approach they believe to be effective for the young 83% under 25 years, student cohort they were teaching. They supported this contention with improved before – after student satisfaction survey results although they did not report on the statistical significance of this change. Lim et al. (2016) suggested that paramedic students felt isolated from EBP due to their perceived need to follow Clinical Practice Guidelines and hence had a lack of clinical experience and professional identity to appreciate the need for EBP. Examples of learning activities were provided but lacked clarity on the differing paramedic student needs compared to that of other health undergraduates.

Barriers to the utilization of research findings for paramedics in Saudi Arabia was researched by Samarkandi et al. (2018) using a scale validated in the USA for assessing nurses' perception of barriers to EBP. Participants were mostly Saudi (96%) with only 10% having Bachelor qualifications. The highest rated barriers to EBP were, unclear implications of EBP and lack of single site for relevant literature. The authors note this is different to the published literature that focuses on nurses in western countries and proposed that the differences in culture and health care may be causes. The delivery of the survey in a second language, the culturally specific items, inadequately powered survey, and the questionable generalisability constitute limitations to this study.

Givati et al. (2018) examined changes in education and training approaches for paramedics in the UK using narrative-based qualitative research methodology to examine the move to the university-based model. They drew on data from interviews and a focus group

involving undergraduate paramedic students, registered paramedics, and paramedic lecturers. Givati et al. (2018) reported that some paramedic undergraduates felt that *purely intellectual* subjects such as EBP were over emphasised and *stole* time from practical, hands-on subjects. This was in the setting of a larger theme of academic framing of paramedic expert knowledge and the transition away from in-house training to university-based education.

Eaton (2019) used naturalistic enquiry focus groups and a review of diary entries of 5 UK paramedic academics and 37 paramedic undergraduates to investigate their shared decision making, a critical part of EBP. Students described that they would emulate the behaviours and attitudes of their clinical placement supervisors. Values were seen as a purely academic activity divorced from clinical practice by students. Eaton (2019) reported that both groups believed that students placed greater emphasis on the developing physical clinical skills on clinical placement than on practicing "soft" skills such as shared decision making. The role of values in the shared decision-making element of EBP is currently under-appreciated by both paramedic students and their educators and needs to be more explicit in the undergraduate curriculum.

An Australian based investigation was completed by Ramis, Chang and Nissen (2019). They surveyed a convenience sample of undergraduate nursing and paramedicine students from one university in Australia due to their reported intention to use EBP following graduation. Utilising structural equation modelling of results with an underpinning of Bandura's self-efficacy theory, they found belief in the benefit of the evidence-based practice process directly and significantly influenced student intention to use EBP while self-efficacy also had a significant but indirect effect. These two factors explained 25% of the variance in the model. This paper added to the understanding of use of EBP after graduation but also illuminated the need for further research into other factors.

Larger scale quantitative research by Murphy et al. (2019) surveyed 584 health care students at an Australian university of which 10.4 % were paramedic undergraduates. They investigated health undergraduates' perception of EBP and if this differed across profession and year level. The online qualitative study was primarily based on content analysis of the students' responses to the question: "*What does evidence-based practice mean to you?*" The most common answer reported was that EBP involves *research evidence* (35.8%), followed closely by no answer (35.4%), the next most common was *decision making or reasoning* (6.8%) and *incorporates professional/clinical experience* (5.0%). The element *client input* was mentioned in only 3.8% of responses and *critically appraising evidence* in 1.4%. The elements *searching for or acquiring evidence*, *reflecting on decisions,* or *evaluating outcomes and sharing your learning or influencing others* all occurred in less than 1% of responses. Students from higher year levels were marginally more likely to respond to the question. Differences between the courses were also small. An identified concern was that few students in any group had an adequate understanding of the five steps of EBP or its place in professional practice. The authors advise improving this by exposing students to all five steps of EBP frequently and especially in real world circumstances such as clinical placements.

Bourke-Matas et al. (2020) surveyed 185 students enrolled in paramedicine or double degree of nursing and paramedicine at one university in Australia after paramedic clinical placement. They investigated multiple aspects of the conversation students had with their supervisor about EBP while on placement. Most (82%) of students understood what a conversation about EBP entailed but disappointingly only 23% reported having one during placement with their supervisor. Worryingly a third felt there would be negative repercussion as of a result of engaging in an EBP conversation with their supervisor. Students reporting wanting more opportunities to practice discussing EBP before placement.

Sequential mixed-methods was used by Barr et al. (2020) to investigate the development of information literacy, a critical component of EBP, in a paramedic undergraduate degree. Specifically, they utilised Delphi methodology to iteratively interrogate members of the Network of Australasian Paramedic Academics on their perception of the importance of information literacy education. The participants generally agreed with Australian and New Zealand Information Literacy framework and rated them highly important. There was consensus that the Information Literacy skills of finding, describing, storing, and managing information should be at the beginning of a degree to scaffold the higher order skills of analysis, critique, evaluation, and synthesis. Barr et al. (2020) also used a pre-validated online questionnaire to investigate the self-perception of student paramedics own information literacies. The 77 students that replied (16% response rate), reported good scholarly habits but varying understanding of common EBP terms such as *p* value or levels of evidence. The research adds to the evidence base around the timing of EBP topics within a curriculum and the need for more effective literature skills and basic terminology education.

Factors affecting learning about EBP was investigated by Wilson et al. (2021) who conducted a qualitative study of learning journals recorded by 101 of 121 students in a final year unit of one Australian paramedicine degree. Using phenomenographic approaches they identified variation in students' learning and the factors affecting that variation. They found some students had negative attitudes as a result of engaging with the complexity of medical research. They also reported a correlation between student learning outcomes with student's epistemological stance, and opportunities for peer interactions and self-reflection. The paper provides deeper understanding of the factors affecting students EBP learning outcomes.

The body of knowledge around paramedics and EBP is small but growing exponentially. Although most papers have studied single cohort of a university or ambulance

service and relied on self-reported surveys, while others have utilised more diverse methodologies. However, the themes in the literature are consistent. EBP terms and application are poorly understood which is consistent with research on other health care students. However more experienced and senior paramedics are less sympathetic to EBP. When supervising students, mentors are not consistently engaging students in EBP conversations. This can lead to some students being tentative to discuss the topic of EBP. Paramedic undergraduates appear to not yet fully appreciate the need for EBP and prefer to concentrate on clinical skills. Basic EBP skills such as information literacy need to be at start of a degree course, but the optimal paramedic EBP curriculum is unclear.

2.8 Summary

The practice of humans attempting to provide effective medical cures guided by the best available scientific evidence dates back to antiquity. The concept of EBM gathered pace in the 1980's and became adopted by other health professions to become EBP. Despite criticism and challenges, EBP has become a dominant paradigm in health care.

From military origins, paramedics and paramedicine have evolved from a male dominated, transport service to a registered health profession. The education of paramedics also evolved to higher education and the introduction of Paramedic Academics (PA). PA face the challenges of lack of supervisor, reduced income and the perils of The No Man's Land of Professional Identity. While PA are competent paramedics many lack the experience or qualifications expected of other academics.

Many overlapping teaching theories exist with imprecise terminology. Constructivism and more recently connectivism appear to have most influence on paramedic education despite a focused paramedic model being proposed. The education of the professions presents a multidimensional champagne of content, skills and pedagogy. The search for a paramedic signature pedagogy has produced some potential contenders.

The health professional-based literature produced good consensus on issues of core competencies and the need to integrate EBP teaching into all units. The critical role of industry and clinical placement into the engagement with EBP of paramedic students is clear.

2.9 Statement of the research aim

This thesis aims to investigate whether: "Australasian and UK Paramedic Academics are adequately prepared to teach EBP". Subthemes that will be investigated to achieve this aim include: The paramedic academics' EBP profile including relevance, terminology, practice, confidence, and sympathy. Their knowledge of, and attitudes towards, pedagogy, pedagogical content knowledge and experience of the paramedic industry. A comparative analysis of the factors: Country of Institution (Australia, UK, and NZ) and paramedic academic professional background will also be used to achieve the primary aim. Academic background will consider academic experience, time in higher education, possession of a higher degree, research capability, operational paramedic history and paramedic specific degree or diploma.

3 RESEARCH DESIGN AND METHODOLOGY

3.1 Research Paradigm

The research paradigm is the shared world view of a discipline and guides how problems are considered and answered (Schwandt, 2014). The current study is framed within the area of medical education research whereby it considers the disciplines of education and medicine. Monrouxe and Rees (2015) argue that medical education research is a social science and should use its traditional philosophical approach to engage critically with the aims of the investigation. Most medical research, quantitative or qualitative, does not disclose its underlying epistemological assumptions or research paradigms (Bordage, 2009) however, those that do commonly cite a positivist paradigm (Bunniss & Kelly, 2010). It is notable that the nursing profession which has a different world view than medicine, has embraced a greater diversity of paradigms in their literature (Ataro, 2020). Lingard (2007) argues that the epistemological stance matters more than methodological does because it influences the way the research question is posed.

The choice of methodology for this research is driven by the epistemological nature of the problem (Hanson et al., 2011). The current research question concerns the preparedness of paramedic academics to teach evidence-based practice to paramedic undergraduates. The framework under investigation guides the choice of theoretical approaches by the complexly and definition of the task (Ertmer & Newby, 2013). The *preparedness to teach EBP* element of the primary aim has components of *how* and *why* questions. These are best answered with case study methodology as such questions, "*deal with operational links needing to be traced over time, rather than mere frequencies or incidence*" (Yin, 2009, p. 9). The *Australian, New Zealand and United Kingdom* component of the primary aim implies asking *who, what, where, how many,* and *how much* question for which surveys are more appropriate (Dane,

2011). The current research is conducted under the paradigm of constructivism using the mixed methods of a phenomenological guided multiple repeated individual case studies and a positivist-based survey. In an attempt to best capture reality, multiple sources of information were gathered through case studies, vignettes, and questionnaire in a concurrent triangulation design (Ramírez-Montoya & Lugo-Ocando, 2020). The quantitative and qualitative phases occurred contemporaneously, and both the methods were given equal weighting (Creswell & Clark, 2018). This triangulation technique adds texture, depth, and varied insights to an analysis but also validity and credibility to the results (Denscombe, 2007; Johnson & Christensen, 2019; Ramírez-Montoya & Lugo-Ocando, 2020). The blending of qualitative and quantitative methods also overcomes the false dichotomy of positivist and non-positivists philosophies (Doyle et al., 2009).

The qualitative data was thematically analysed via a phenomenological lens (van Manen, 1990) to examine and clarify human situations, events, meanings, and experiences as they spontaneously occur in the course of daily life (von Eckartsberg, 1998). Qualitative case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources (Baxter & Jack, 2008). In this study, data will be sourced from case studies using sequential semi-structured interviews and questionnaire results. This multi-faceted exploration allows for the complex phenomenon to be revealed and understood (Yin, 2018). As constructivism underpins much of paramedic undergraduate education (M. Boyle et al., 2007) and medical EBP education (Rolloff, 2010) it is appropriate that it was used as framework to interpret the data.

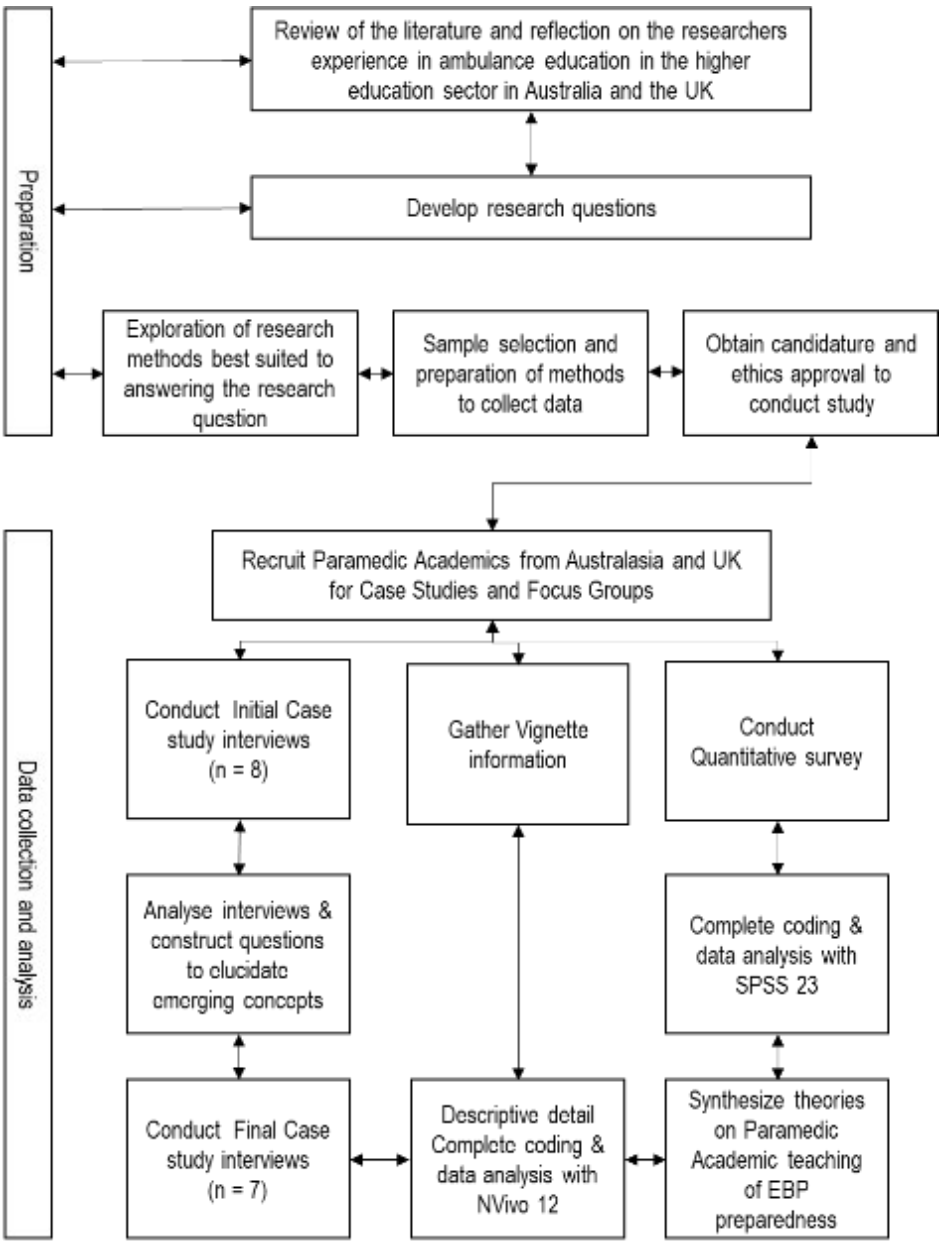
3.2 Methodological approaches

The study adopted three methodological approaches to data collection. A case study approach incorporating vignettes, utilising a qualitative methodology and a quantitative framework incorporating survey methodology. By combining methods and theories through

triangulation, biases in any one of these is reduced (Noble & Heale, 2019) and data richness is increased (Lambert & Loiselle, 2008). A model of the implementation of the current methodology is provided in Figure 13.

Figure 13

Model of the implementation of the current methodology



3.2.1 Case Studies

Case study methodology has been demonstrated to be suitable for research of an exploratory nature such as the current work where there is little specific literature to guide procedures (Johansson, 2007). A variety of case study designs have been used with the two most common situated in the social constructivist paradigm (Merriam & Tisdell, 2015) or the post-positivist viewpoint. (Clark, 1998; Young & Ryan, 2020). Although case study methodology is widely used, due to its complexity and contradictory epistemological hypotheses, the scientific validity can be difficult to prove (Baskarada, 2014). Case studies are the method of choice when considering intricate social phenomena such as teaching andthe capability to build extensive and in-depth descriptions of the occurrence and circumstances (Baskarada, 2014). Utilising case study methodology permits the researcher to take a multifaceted and wide-ranging topic such as *Preparedness to teach EBP to paramedic students* and break it down to manageable research questions. In particular, the multiple case study methodology allows a better understanding of a phenomenon than a single case study. It does this by combining of data from similar complex situations but having unique variations. The cases are grouped and considered as one entity dubbed a *quintain* (Stake, 2006; Walton et al., 2022). The quintan concept acknowledges that the individual cases have their own messages, but the overall phenomenon exhibited by the multiple cases grouped together is also informative (Hays & McKibben, 2021; Sahlin, 2022). The differences in the individual subjects in the case studies are contrasted and compared to better understand the quintain (Heale & Twycross, 2018). In this research the quintain is a PA teaching into a paramedic undergraduate degree. This in combination with the quantitative data from study 1 and the Focus group data in study 3 allows triangulation (Noble & Heale, 2019) which helps increase the reliability and credibility of the findings (Korstjens & Moser, 2018).

While independent statistical generalisation is not possible with case studies alone, when two or more cases are found to support the same theory an analytical generalisation can be made (Yin, 2009). The multiple case study approach provides the researcher with the ability to analyse the data both within each situation and across situations to clarify the important influences (Yin, 2018). Baxter and Jack (2008) found that evidence created from a multiple-case study is measured, strong, and reliable although this is offset by the extra time and cost required (Baskarada, 2014). Case study methodologies, using various qualitative methods, have a long and diverse history in health care (Keen & Packwood, 1995). Despite some leading medical journals being accused of an anti-qualitative bias (Greenhalgh et al., 2016) some of the most influential papers utilised a case study approach. (e.g. Hak et al., 2000). Case study methodology can provide crucial evidence about the context of an intervention to assist in solving questions of internal and external validity in public health and health services evaluation (Paparini et al., 2020).

3.2.2 Vignettes

Vignettes are often used in research as way of framing a topic especially when they are complex or sensitive (Budd & Kandemir, 2018). They are usually used to precisely provide descriptive components regarding the research topic to frame the characteristics of the participants in a consistent and structured manner (Jenkins et al., 2010). Tremblay et al. (2022) found that vignettes seemed to deepen understanding of complicated circumstances experienced by healthcare professionals. In the current research they are a way of presenting the pertinent experiences, skills, and comments of the participants to better provide a rich understanding of their professional journey (Skilling & Stylianides, 2020).

3.2.3 Quantitative

Survey methodology provides data with which to make statistical inferences about the population being studied. As such it is sited in the ontology of the positivist paradigm aligned with the hypothetico-deductive model of science (Park et al., 2020).. Survey methodology is widely used in the medical field to uncover knowledge-practice gaps. (Gendy et al., 2019). Psychometric principles are used in self-reported instruments to investigate the characteristics of the human as a measuring instrument (McDowell, 2006) First used in 1838 (Gault, 1907) the questionnaire has advantages of cost, speed and effort on the part of the researcher particularly when deployed via electronics means (Fanning & McAuley, 2014; Griffis et al., 2003) although some groups prefer paper. The standardised responses of questionnaires may frustrate participants when provided options do not match their desired response (Dillman & Bowker, 2001). This disconnectedness is an example of measurement errors and can impact on the reliability and validity of results (Gideon, 2012). Other sources of error include sampling error where the sample analysed does not accurately represent the characteristics of the population (Anderson & Gerbing, 1984). Questionnaires are widely used in healthcare professional education (e.g. Bridgeman et al., 2018; Kaur et al., 2020; Ooi et al., 2021) including paramedic education (e.g. Malcolm Boyle et al., 2007; Brown et al., 2011; Decullier et al., 2020; Munro et al., 2016a; Munro et al., 2019).

3.2.4 Researcher positionality

Researchers shape and are shaped by the research process and outputs. It is impossible to remain independent of a study topic when conducting qualitative research (Palaganas et al., 2017). The creditability of findings and depth of researchers understanding of their work is improved when a researcher clearly defines the contextual intersecting relationships between the participants and themselves (Dodgson, 2019). Reflexivity is this continual process of connecting with and communicating the position of the researcher and context of the

research. (Barrett et al., 2020). The cultural and social paradigms that the research occurs within need to be described and examined. Tong et al. (2007) recommend that qualitative researchers, due to the nature of the research process, should declare their personal characteristics and relationship with participants.

I identify as male and hold a Bachelor of Science, Diploma of Education, and Masters of Business by research. I started with Metropolitan Ambulance Service, Melbourne in 1992 gaining my Diploma of Health Science (Ambulance) in 1995. I gained Clinical Instructor status in 1997 and did Mobile Intensive Care Ambulance training in 2001. I am a Registered paramedic that have been teaching paramedics and other health care students at universities in Australian and the UK since 2000. I currently hold a Senior Lecturer role with an Australian University.

Hence, I am insider into the process of EBP PA teaching of. I declare that my background is rooted in empirical quantitative science but have come to appreciate and embrace qualitative research. This PhD research was sparked in part by the observation that other PAs were using non-evidence based health care which caused me to ponder the paradox.

Two of the participants were colleagues at the time of interview, the other six were employed at other universities. The small, close-knit nature of the PA population means that five of the participants were known to me before with interviews.

3.3 Sub aims

The methodological approach detailed to examine the main aim of whether "*Australasian and United Kingdom paramedic Academics adequately prepared to teach Evidence Based Practice*" will also involve the exploration of three sub aims;

1. To conduct a thematic examination of paramedic Academics' knowledge of and attitudes towards pedagogy, EBP knowledge, pedagogical content knowledge and awareness of paramedic industry.
2. To carry out a comparative analysis of the demographic factors: Country of Institution (Australia, NZ, and UK) and paramedic academic professional background.
3. Quantify the Academic background characteristic of, academic experience, time in higher education, possession of a higher degree, research capability, operational paramedic history and paramedic specific degree or diploma.

4 THE EBP^2–P: A QUANTITATIVE SELF-REPORTED QUESTIONNAIRE

4.1 Introduction

Study 1 aimed to develop and assess a valid and reliable tool to measure preparedness to teach Evidence-Based Practice (EBP) within a sample of the paramedic academic (PA) population of Australasia and the United Kingdom. To achieve this a self-reported questionnaire to measure the major domains of EBP that included Relevance, Terminology, Confidence, Practice and Sympathy was used. Secondly it gathered demographic information on the PA population in Australasia and the UK regarding qualifications, EBP training, clinical, teaching and research experience, age, and gender. Taken together these two measures enabled a quantitative measure of the preparedness to teach EBP of the PA population of Australasia and the United Kingdom.

4.1.1 Background to Evidence Based Practice Assessment tools

Evidence based medicine had become integrated into many medical degrees and some health disciplines as EBP by the early 2000's (Coomarasamy & Khan, 2004). Straus and Jones (2004) observed that the evidence on the most effective methods of teaching evidence-based practice was lacking despite much evidence for the effectiveness of using EBP. Dawes and colleagues (2005) in the seminal "*Sicily Statement on Evidence Based Practice"* made recommendations on the skills needed to perform the five steps of EBP: the construction of an answerable question, systematically acquiring the best available evidence, critical appraisal of evidence, application of results to the practice and evaluation of result. They also advocated that these be part of any health education and identified the need for freely available, validated assessment tools to measure the teaching of the five EBP steps.

Not all health care activities need all five EBP steps. Straus et al. (2006) advocated that EBP practitioners can operate in three modes; Replicator, User and Doer. When dealing with common presentations with few time constraints they, used the first four steps, omitting Evaluation. When under time constraints or with rare conditions they operated as an EBP User, accessed pre-appraised resources and omitted the third Appraisal step, Finally when they used the recommendations of EBP experts, usually in the form of EBP based guidelines, they were practicing in Replicator mode. Straus et al. (2006) proposed that the outcome levels of Replicator, User and Doer should be a dimension of the conceptual framework of EBP education Assessment tools.

Paramedics, like all health care professionals, need to be able to perform all stages of EBP. Frenk et al. (2010, p. 2) in the influential *Education for Health Professionals for the 21st Century* report identified one of the fundamental shifts that needed to happen is the transition from "*fact memorisation to critical reasoning that can guide the capacity to search, analyse, assess and synthesize information for decision-making*." It is acknowledged that due to time and resources constraints that the majority of paramedic EBP practice would be in the *Replicator* and *User* modes. A tool to measure the EBP dimensions relevant to paramedics would include all five domains.

Work by Tilson and colleagues (2011) offered a taxonomy for EBP assessment tools. They acknowledged the complexity of judging the quality of EBP by a clinician and in response developed the Classification Rubric for EBP Assessment Tools in Education (CREATE) framework to categorize the instruments. One axis of the CREATE grid is based on the effect of the educational intervention and ranges from the student's reaction, attitude change, knowledge, skills, behaviours and finally benefit to patients. The other axis is the 5 steps which they rename Ask, Search, Appraise, Integrate and Evaluate. The five steps are intersected with the effect of the educational intervention to form a grid of 25 points (Tilson

et al., 2011). Tools such as the Knowledge, Attitudes, Access, and Confidence Evaluation instrument (KACE) (Hendricson et al., 2011), the Fresno Test (Ramos et al., 2003) and the Evidence-Based Practice Beliefs and Implementation Scale (Melnyk, Fineout-Overholt, & Mays, 2008) achieve some of the objectives but not all.

McEvoy et al. (2010a) evaluated 10 of the most cited allied health EBP questionnaires and found that none of them measured all domains of EBP. The measures also lacked validity across all health disciplines. To evaluate the EBP profile across multiple disciplines and experience levels McEvoy et al. (2010a) developed the *Evidence-Based Practice Profile questionnaire* (EBP^2). The EBP^2 has satisfactory test–retest reliability and excellent internal consistency (Cronbach's alpha = 0.96). It has been validated to discriminate EBP domains between participants with differing EBP exposures and professions. While EBP^2 has been validated in Australia among academics, students and multiple health professionals including nursing, physiotherapy, occupational therapy, and podiatry it has not been used for paramedics or internationally (McEvoy et al., 2010b; McEvoy et al., 2011). It has been shown to be adaptable. Later work by Snibsøer, Ciliska, et al. (2018) modified the EBP^2 to produce the EBP^2-N for use in evaluating Norwegian to Nursing, Radiography, Physiotherapy, and Occupational Therapy students. A Chinese version, the EBP^2Q-C, has been validated for practicing nurses (Hu et al., 2020).

4.1.1.1 Valid and reliable tool development of the EBP^2-P

Investigating the preparedness of paramedic academics to teach EBP in Australasia and the UK required an instrument that measured all 5 domains of EBP and while focused on paramedicine was still applicable across other professions that teach into paramedic degrees. It also needed to be logistically achievable to deploy within the scope of a PhD. No paramedic focused EBP instruments have been found to date in the published literature.

The EBP assessment of the PA population was self-reported due to the challenges required to measure EBP attributes in an objective way. While this induces issues in accuracy, bias and sensitivity, findings can still be reliable (McDowell, 2006). The Evidence Based Practice Profile - Paramedicine (EBP^2-P) used in this study is a self-reported questionnaire adapted from the EBP^2 developed by McEvoy et al. (2010a). Support was gained from the author of the EBP^2 questionnaire, Dr Maureen McEvoy to use it as the basis for the EBP^2-P. See *Appendix A Permission to use the Evidence Based Practice Profile Questionnaire*.

The language used in the EBP^2 did not engage the paramedics due to questions phrasing being oriented towards health professionals such as physiotherapy, podiatry and occupational therapy. To improve engagement, some of the questions were reworded to better suit the paramedic academic environment. A panel with experience in paramedic EBP education, questionnaire development and statistical analysis reviewed the questionnaire for content and face validity before pilot testing on a small group of academics in manner similar to McEvoy et al. (2010a).

The survey was conducted online due to advantages of speed, minimal cost, environmental impact, and ease of data transfer to statistical packages (Wright, 2005). Links to the online survey instrument were sent to all universities delivering undergraduate paramedic education in the UK, NZ and Australia via emails to those identified as the course coordinators. Links to the survey were also distributed at paramedic conferences and on social media to groups such as the *Network of Australasian Paramedic Academics*.

EBP^2-P is a *Qualtrics* web-based instrument consisting of 90 items. A set of 74 of the items use a 5-point Likert scale with free text input. The first 58 adopted from the EBP^2 have been shown to assess the five factors of EBP: Relevance, Confidence, Terminology, Practice and Sympathy. The final 16 items were demographic questions adapted from the 13 items in

the EBP^2 tool with additional questions added to gather data on Paramedic qualification, clinical and university teaching experience. A final question was regarding the respondent identifying as a paramedic and an academic.

To make the survey more paramedic focused, the questions in the draft EBP^2-P were modified by altering terms such as "*My profession uses EBP as a framework*" to "*Paramedicine uses EBP as a framework*" and "*There isn't much point in doing EBP because there is a lack of strong evidence to support most of the work I do*" to "*There isn't much point in doing EBP because there is a lack of strong evidence to support most of the work paramedics do*". Other questions were left unchanged, for example, "*I've just had a gutful of EBP*" as it was felt that these were appropriate for the target audience.

The draft EBP^2-P was checked for relevance, readability, and face validity by a group of paramedic academics before being released. EBP^2-P was distributed as a web-based instrument using the Qualtrics software, Version (July 2015) (Qualtrics, Provo, UT). The five paramedics academics had a total of 96 years teaching into paramedic degrees, with two PhDs, four Masters, and extensive academic publication and questionnaire design experience. Their backgrounds included paramedicine, psychology, bioscience, and education. They assessed draft EBP^2-P text for confusing items, potential biases, uninformative questions, discipline specific items, grammar, and spelling. Links to the questionnaire were sent out on July 11, 2015, and remained available until November 2, 2015. See Appendix B Evidence Based Practice Profile - Paramedicine Questionnaire.

4.1.2 Aims

The Sicily Statement on Evidence Based Practice (Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls, Osborne, et al., 2005) defined the competencies and minimum standard educational requirements for training health

professionals in EBP. Paramedic undergraduates need to receive at least these minimum standards and to do that the PA population needs adequate practice, terminology, confidence, sympathy for, and relevance of EBP. No previous work exists specifically on paramedic academics teaching EBP with some focusing on PA demographics (e.g. Munro et al., 2016a; Munro et al., 2019). However, Munro et al.'s (2016a, 2019) work has a slightly different focus, concentrating on academics with a paramedic background rather than paramedics teaching into a paramedic degree.

Study 1 primarily aimed to develop a valid and reliable instrument to measure Paramedic Academics preparedness to teach evidence-based practice. To achieve this aim it needed to sample an appropriate PA population and measure their domains of EBP. Secondly, study 1 aimed to collect demographic data on the PA cohort to predict ability to educate students in EBP. Factors as EBP education, research experience, higher degrees, and publication history were measured as these can be predictive in ability to teach EBP. The consideration of both data sets would enable the assessment of the preparedness of the PA population to teach EBP.

4.2 Method

4.2.1 Sample size calculation

No definitive list of paramedic academics was available for the study population and hence actual population number is unknown. Munro et al. (2016a) estimated the lower limit of the paramedic academic population of Australian and New Zealand to be 66 based on the membership list of the *Network of Australian Paramedic Academics* (NAPA) but did not give an upper limit. At the time of the quantitative survey in 2015 there was 16 Australian, and 2 New Zealand institutions offering paramedic undergraduate degrees giving an average of 3.67 PA per university. Using this value, a pro-rata estimate for the 25 UK institutions would

be 92 PA staff members. This gives an estimate of 158 academics with a paramedic qualification in Australia, New Zealand, and the United Kingdom. For a population size of 158 with an α error of 0.05, a degree of accuracy of 0.05 and variance estimation of 0.50, the minimum sample size is 112 (Bartlet et al., 2001). This thesis however considers all academics that teach into undergraduate paramedic degrees in Australasia and the United Kingdom and thus needs to include academics without a paramedic qualification. From experience with multiple paramedic universities an estimate was made that approximately half the staff teaching into the courses do not have a paramedic qualification, therefore the population estimate was doubled to 316. For this population estimate with the same confidence limits and assumptions the sample size needed is n = 174.

4.2.2 Procedure of participant recruitment

Participants were recruited from Australia, New Zealand, and the United Kingdom in several different ways to maximise participant numbers. Emails explaining the project and containing links to the survey were sent to the course coordinators of all the universities delivering paramedics degrees in Australia, New Zealand and the United Kingdom in July 2015. Contact was made with the peak professional associations in the countries involved; *Paramedics Australasia* and *The College of Paramedicine* (UK) asking to distribute the link to the survey among their relevant members. Finally, fliers were distributed during the 2015 Paramedics Australasia International conference with links to the survey. Participants responded to emailed links or posters with a web address and QR code linking to the *Qualtrix* (Provo, UT, USA) online survey. See Appendix *C Online Survey Flyer*

4.2.2.1 Inclusion and Exclusion Criteria for Quantitative survey

The inclusion criteria for the Quantitative survey was that the participant was teaching into a paramedic undergraduate degree at a University in Australasia or the United Kingdom.

Participants that did not complete at least 75% of the questions were excluded. One university offered a one-year Graduate Diploma and staff from this university were also excluded due to the different Australian Qualifications Framework level and course duration.

4.2.3 Instrumentation

Two measures were used to collect data. The EBP^2-P assessing self-reported EBP and some demographic details potentially relevant to teaching EBP.

4.2.3.1 Demographic details

The respondents age, gender, country of employment, first language, year of first university degree, discipline of that degree, experience in that field, paramedic training, paramedic experience, identification as a paramedic, identification as an academic. academic experience, type of teaching, main work setting, studying, academic qualification, EBP education, research experience and conference presentations were recorded.

4.2.4 Procedures

4.2.4.1 Ethics Approval

This PhD study commenced in 2011 and ethical clearance was sought from the Victoria University, Health Engineering and Science Human Research Ethics Committee. The proposed research project was accepted and deemed to meet the requirements of the National Health and Medical Research Councils *National Statement on Ethical Conduct in Human Research* (2007). Approval was granted HRETH 12/238- Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice. See *Appendix D Ethics approval of the research project*.

To survey academics from the UK, the VU ethics application and approval letter were forwarded to the SGUL, abridged ethic application was completed, and ethical approval from

the SGUL was granted. See *Appendix E letter of support from St Georges, University of London* and *Appendix F letter of support from South East Coast Ambulance Service*.

4.2.4.2 Data collection procedure

Respondents completed an electronic version of the EBP^2-P hosted on the *Qualtrics*© (Provo, UT, USA) website. Before staring the survey, participants were presented a summary of the project, what was expected of them, benefits, and risks of participating and how the information would be used. Participants were reminded the survey was voluntary and a decision to continue would be interpreted as agreeing to participate.

4.2.4.3 Data management

Data was downloaded from *Qualtrics* (Provo, UT, USA) website and imported into SPSS Statistics 23.0 (Armonk, NY, USA). Data was checked for missing values. Participants were excluded from further analysis if they had not completed at least 75% of the non-demographic items following missing data guidelines (Dong & Peng, 2013). Mean substitution imputation (Hawthorne & Elliott, 2005) was used to assign values for the participants (n = 2) with missing data. Time taken to complete the survey was a mean of 16.8 min – with a range of 5 - 112 min.

4.2.5 Data analysis

The first goal of the data analysis was to develop a reliable and valid measure of the five domains of EBP in a manner similar to McEvoy et al. (2010b) and (Snibsøer, Graverholt, et al., 2018). The second goal was to assess the demographics of the PA cohort and examine how they impact on the five domains of EBP. The following statistical procedures were undertaken:

1. Demographic summary of sample based on the following categories: gender, country of employment, age, paramedic training and experience, first degree, highest degree, EBP education, publishing and presenting experience.
2. Assessment of internal consistency using Cronbach's alpha coefficients. Cronbach's alpha greater than 0.70 were considered acceptable (Nunnally, 1978).
3. Exploratory factor analysis to identify constructs within the dataset. A scree plot was used to determine the number of factors in the data set (Pallant, 2016, p. 151)
4. Descriptive statistics for each of latent variables in each of the five domains (EBP Relevance, Sympathy, Terminology Practice and Confidence) and the non domain questions including the mean and frequency distribution for each item were analysed.
5. EBP^2-P Domain Scores and standard deviations for the sample population for each of the five domains (EBP Relevance, Sympathy, Terminology Practice and Confidence) (McEvoy et al., 2010a)
6. Comparison of EBP^2-P Domain Scores of the PA and EBP^2 Domain Scores of Allied Health Academics, Post Graduate students, and undergraduate students using Welch's unequal variances t-test.
7. Factorial ANOVA for country, gender, age, first degree, paramedic trained, time since qualified as paramedic, EBP training, research experience, published and highest qualification EBP^2-P Doman Scores and standard deviations for the sample population for each of the five domains (EBP Relevance, Sympathy, Terminology Practice and Confidence)
8. Factorial ANOVA for country of employment vs EBP^2-P Non-Domain Scores and standard deviations for the sample population

4.3 Results

4.3.1 Participants

Participants were 106 paramedic academics (male: n = 58; female: n= 48) teaching into paramedic undergraduate degrees in Australia (n = 61), New Zealand (n = 20), and the United Kingdom (n = 25). Mean age of the respondents was 39 years (range 25 – 60). A cohort of 89% (n = 94) were trained as paramedics with 68% (n=64) having more than 10 years' paramedic clinical experience.

The first bachelor's degree obtained by the respondents was most commonly paramedicine (n =58) with nursing (n=14), education (n=12) and science (n=12) being the next most prevalent. Only 11% (n= 12) held a PhD while 12% (n=13) held a Masters by Research and 30% (n = 32) a Masters by Coursework.

Most of the respondents, 73% (n=73), were currently studying, with 17% (n =18) at Doctoral level and a further 16% (n= 17) completing Masters degrees. The remainder were undertaking postgraduate Diplomas 9% (n=10) and 7% (n = 8) postgraduate certificates.

Just under half 48% (n = 48) of respondents had undertaken formal education in EBP. Of this group, most (n = 38) completed more than 20 hours in length and as part of a degree with the rest taking short courses (n = 7) and single lectures (n = 3). The online survey found the paramedic trained PAs were experienced as paramedics (68% > 10 years) but were inexperienced as academics (18% > 10 years with 22% being in their first year).

Most of the respondents 57% (n=56) have not presented at a conference or published an academic paper. The mean number of published papers or presentations is 12 (range 0 – 300+) however the median is zero. The output is highly skewed as the top three academics are involved in publishing and presenting most of the papers (55%) with the top ten accounting for 83% of the output.

Professional identity was somewhat fluid. All taught into a degree program but only 85% regarded themselves as an academic. Of the 94 respondents who had been trained as paramedics 90.3% (n =84) considered themselves to be a paramedic. 16% (N = 8) of Australian respondents did not consider themselves to be paramedics despite being trained and working as such while only one New Zealand based individual felt this way.

4.3.1.1 Response rate

A set of 106 responses were considered to have been sufficiently completed to allow inclusion in the data analysis according to the a priori decision in 4.2.4.3 - Data management section. This gives a response rate of 106/316 = 33.5% for the total estimated paramedic academic population. If the paramedic qualified group is considered alone, then the response rate is 95/149 = 63.8%.

4.3.2 Internal consistency

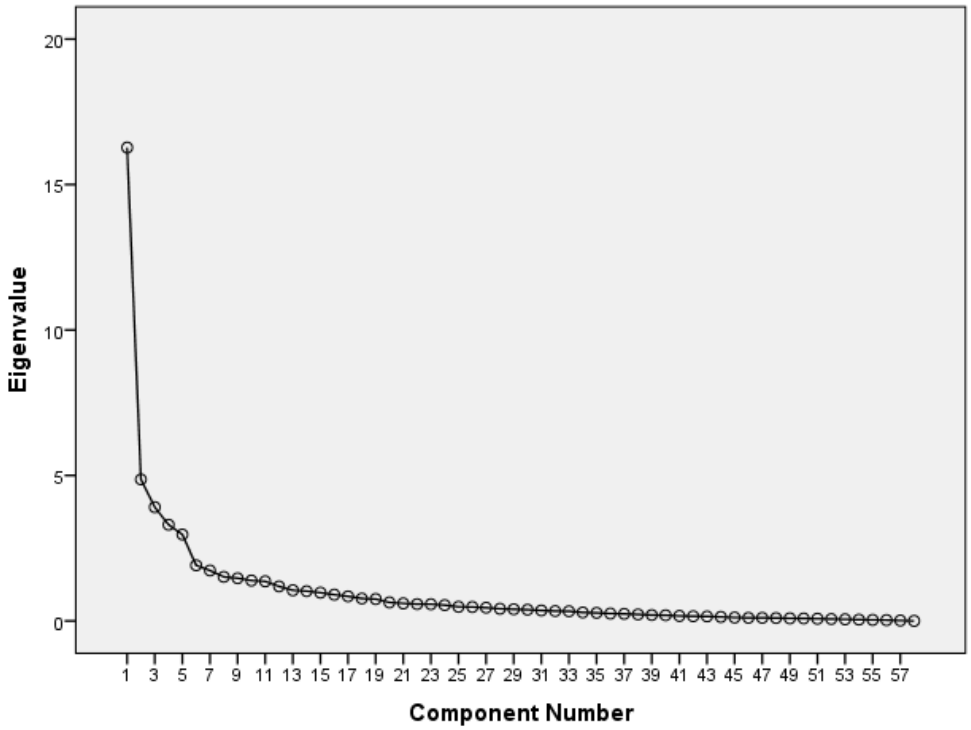
Internal consistency of the 58 questions that compromise the five domains of the EBP^2-P was assessed with Cronbach's Alpha with a resultant value of .945 (N= 58). This indicates high internal consistency because it exceeds the theoretical optimal alpha value of .90. However, the result may highlight that certain questions are redundant, that the questionnaire may be shortened, or specific items refined (Tavakol & Dennick, 2011).

4.3.3 Exploratory factor analysis

The Scree plot of the components shows an "elbow" change in direction at n = 5 to support the use of five domains in the questionnaire. See Figure 14.

Figure 14.

Scree plot illustrating components extracted from the data of the EBP²-P

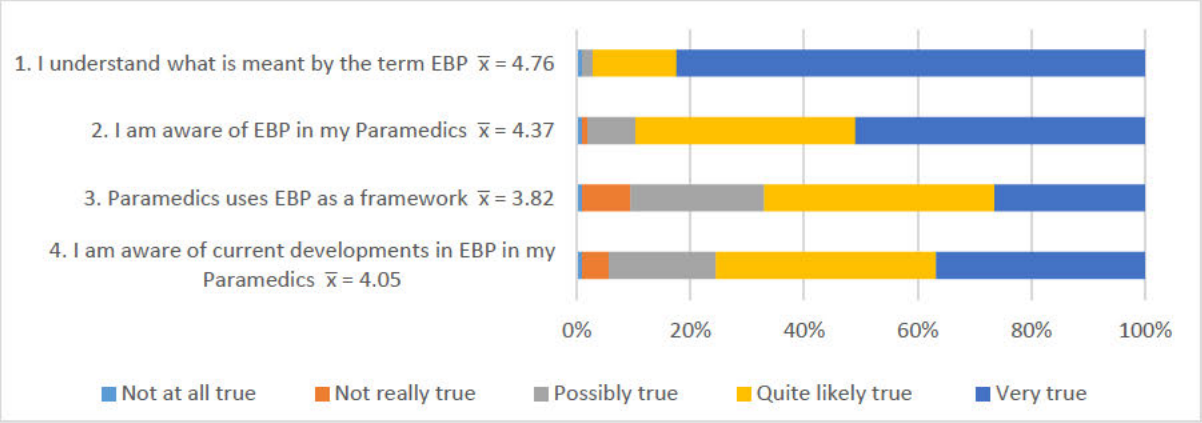


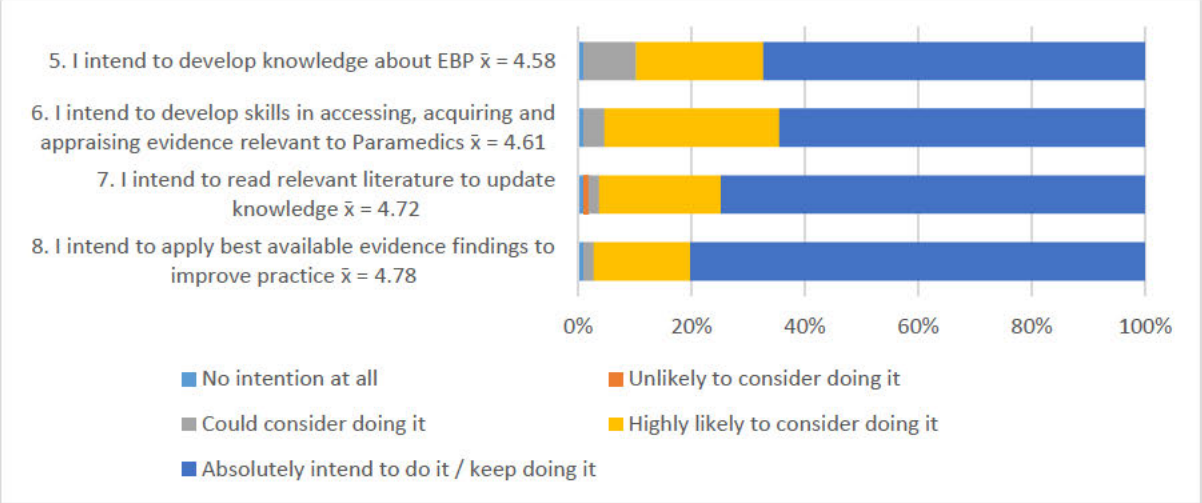
4.3.3.1 EBP Relevance

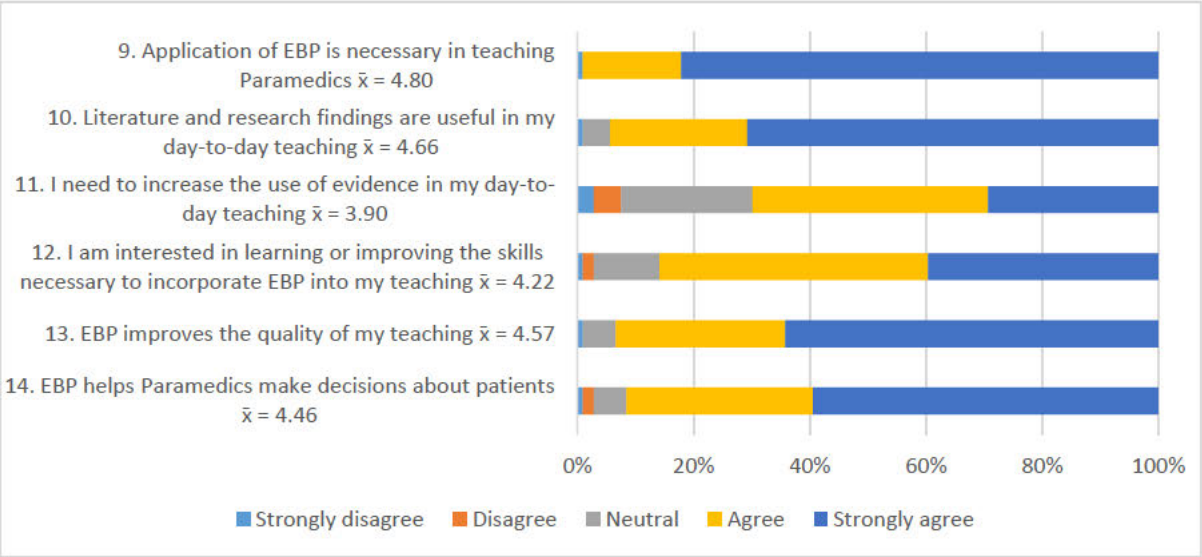
The first 14 items of the EBP²-P consider "EBP Relevance"; the value, emphasis and importance placed on EBP by the participant. Mean score for relevance was 62.3 (SD 6.5) with a range of 14 to 70 out of a maximum possible of 70. See Figure 15.

Figure 15.

Item response distribution scores EBP²-P Relevance domain (items 1 - 14)





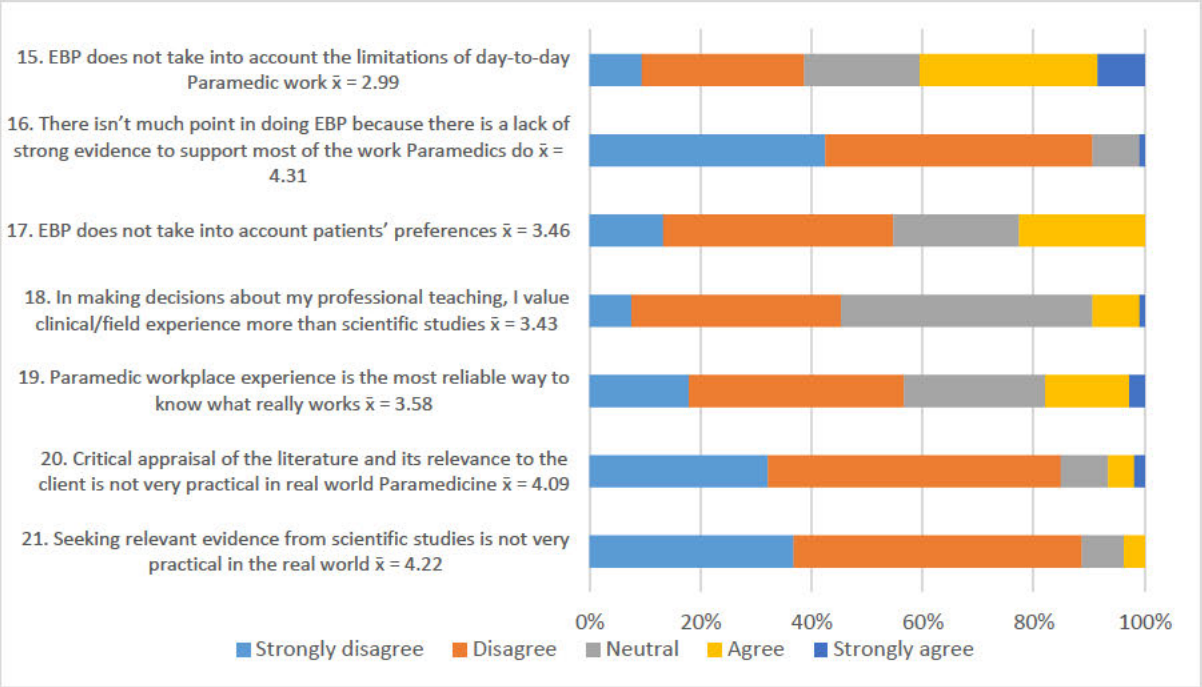


4.3.3.2 EBP Sympathy

Items 15 to 21 in the EBP^2-P examine the domain Sympathy, which is the individual's perception of the compatibility of EBP with professional work. The Likert scale on this section is reversed compared to the rest of the instrument. See Figure 16.

Figure 16

Item response distribution scores EBP^2-P Sympathy (items 15 – 21)

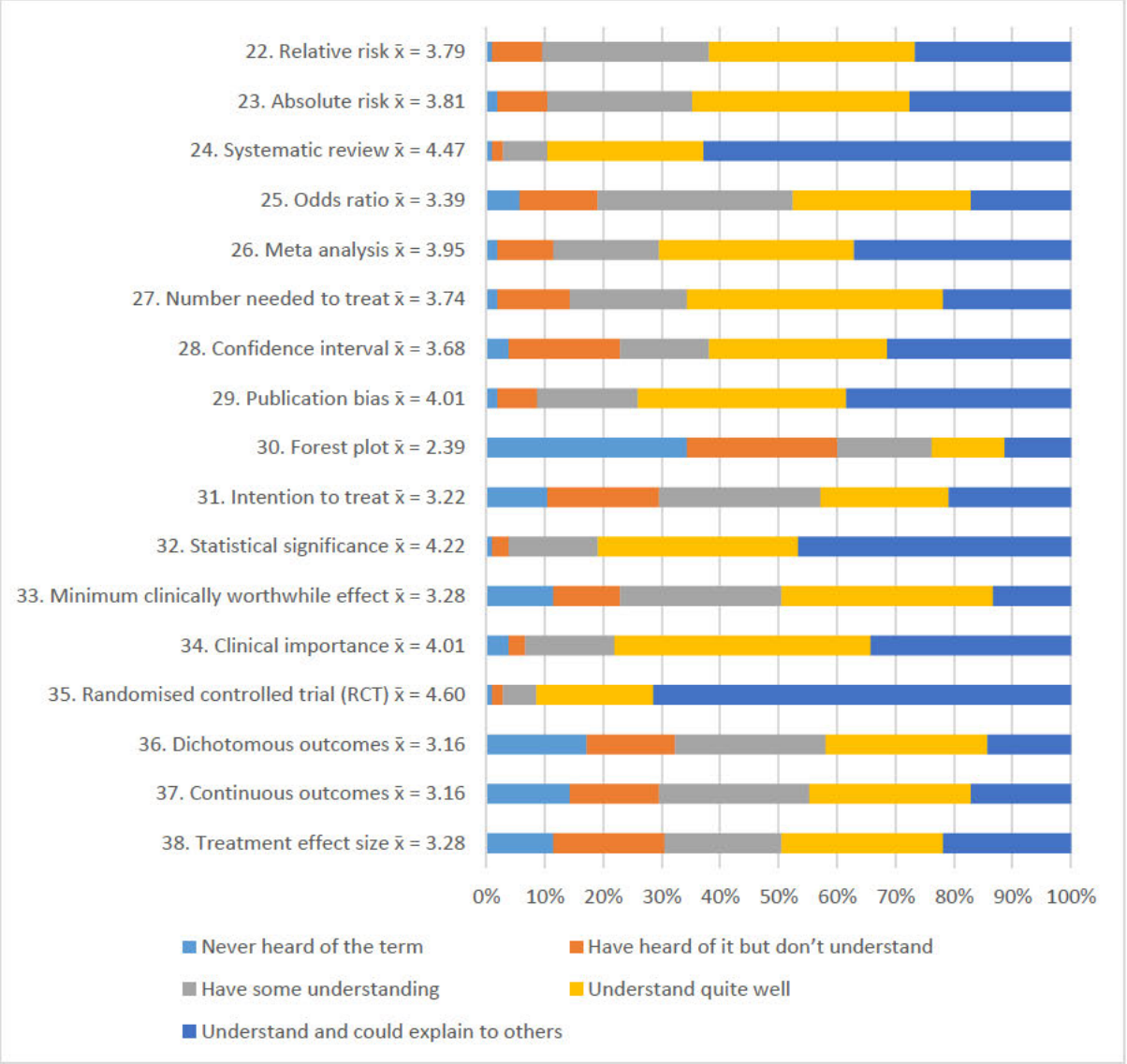


4.3.3.3 EBP Terminology

The Terminology domain examines the understanding of common EBP terms. Items 22 to 38 are self-rated understanding of common EBP terms. The maximum score is 85, the population scored a mean of 62.2 SD = 12.8 Min Max 17-85. Terms such as "systematic review" and "randomised controlled trial" were very well understood while "Forest Plot" was not understood by 60% of the cohort. See Figure 17.

Figure 17

Item response distribution scores EBP²-P terminology domain (Items 22 – 38)

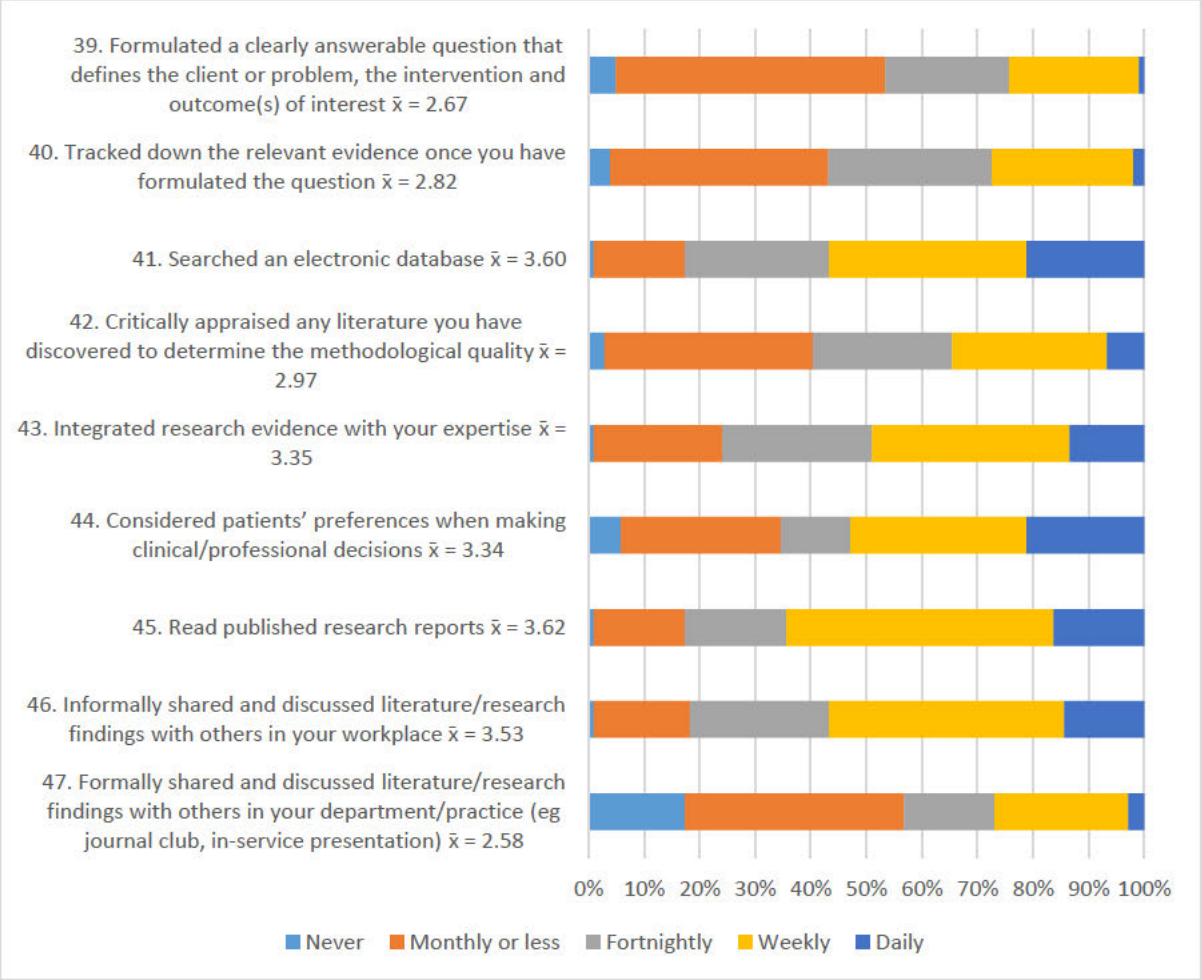


4.3.3.4 EBP Practice

The EBP²-P practice domain considers the use of the skills. Items 39 to 47 are self-rated understanding of EBP in clinical situations. The mean score for the Practice domain was 28.5 (SD 6.5) range 9 – 42. See Figure 18.

Figure 18.

Item response distribution scores EBP²-P Practice domain (items 39 – 47)

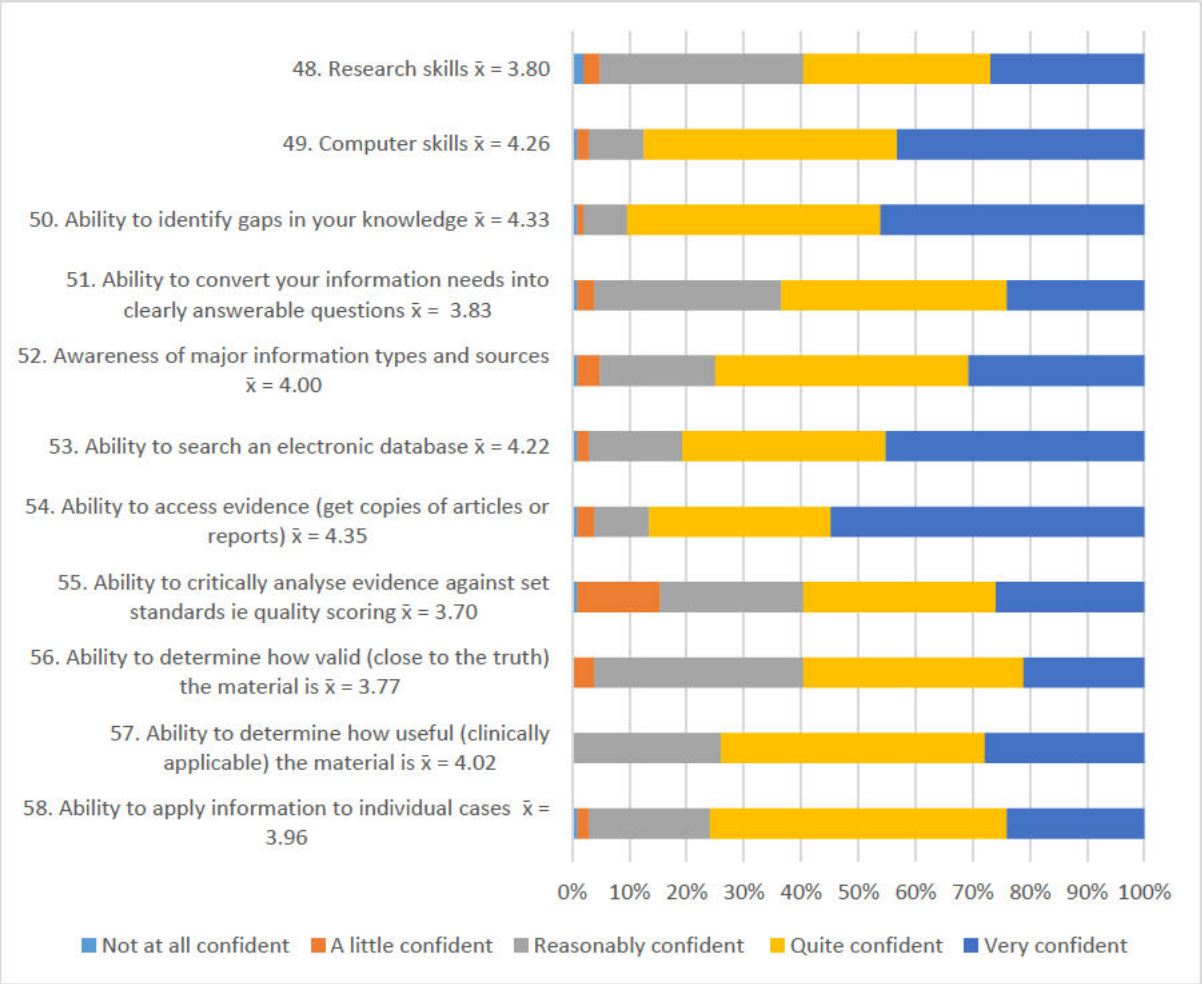


4.3.3.5 EBP Confidence domain

The EBP²-P Confidence domain refers to a perception of the participants own ability with EBP skills. Most participants self-rated themselves highly for most concepts. Mean score was 44.3 (SD 7.0) range 19 – 55. Over 90% were at least "quite confident" that they could identify gaps in their knowledge. See Figure 19.

Figure 19

Item response distribution scores EBP²-P Confidence domain (items 48 – 58)

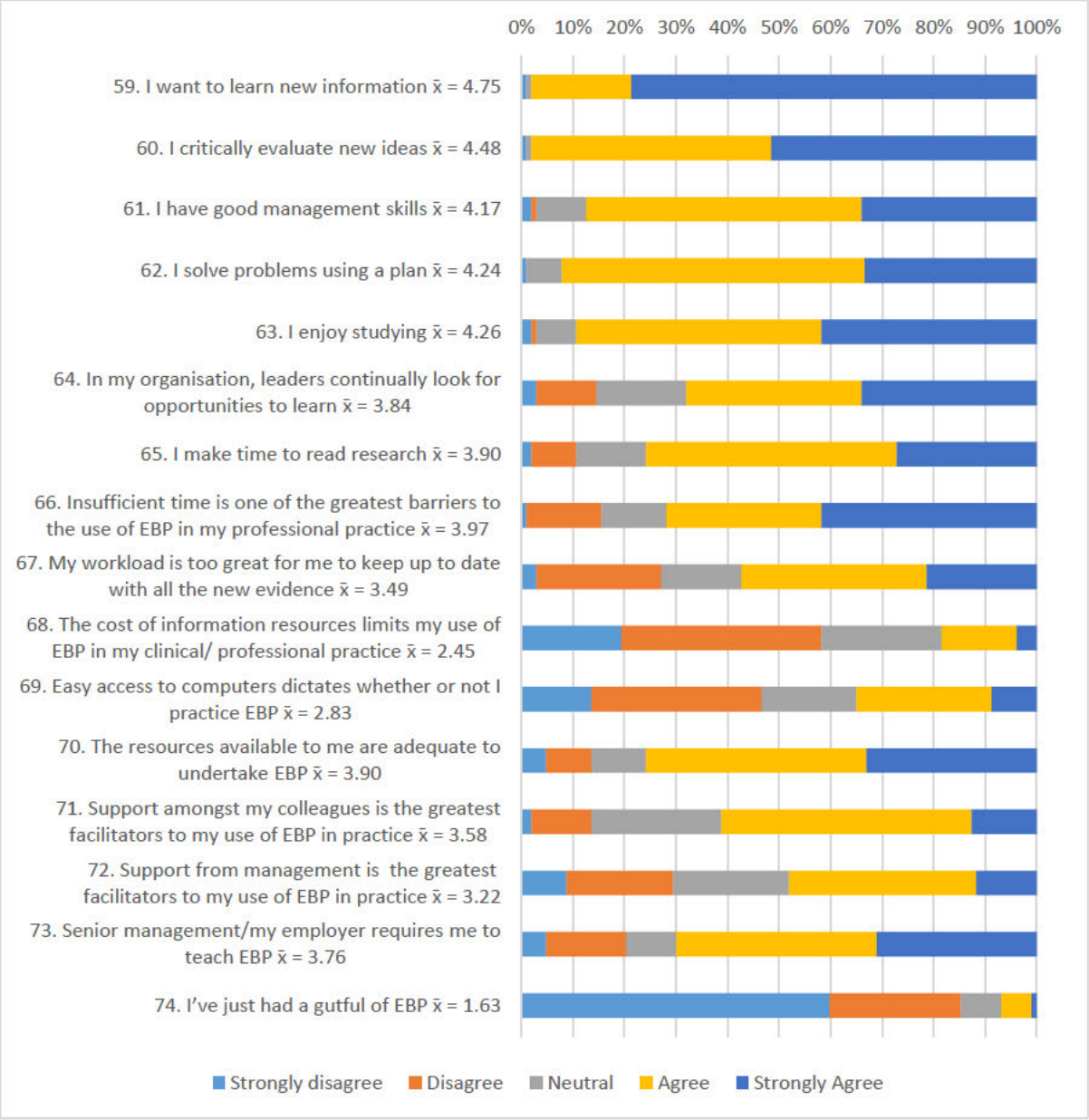


4.3.3.6 Non-domain items

The non-domain items do not contribute to the EBP²-P score but do add information around issues affecting the use of EBP by the participants. The item "I want to learn new information" was rated the highest and "I've just had a gut full of EBP" the lowest. See Figure 20.

Figure 20

Item response distribution scores EBP²-P Non domain items



4.3.4 Domain scores for sample population and comparison with other groups

The mean, standard deviation, and range for the survey population of PA for each domain Relevance, Terminology, Confidence, Practice, and Sympathy along with the corresponding EBP² data of McEvoy, Williams, Olds (2010a & b) are compared. Due to the

unequal samples sizes, Welch's unequal variances t-test was calculated to compare the domain means of the EBP^2-P and EBP^2 with the results presented below in Table 1.

Table 1

Mean and standard deviation values for paramedic academics compared to other health discipline groups for domains within the EBP^2-P

	N	Relevance	Terminology	Confidence	Practice	Sympathy
min-max possible		14-70 $\overline{x}$ (SD)	17-85 $\overline{x}$ (SD)	11-55 $\overline{x}$ (SD)	9-45 $\overline{x}$ (SD)	7-35 $\overline{x}$ (SD)
Academics						
Paramedic[a]	106	62 (6)	62 (13)	44 (7)	29 (6)	26 (4)
Allied Health[b]	10	62 (6)	60 (12)	40 (7)	24 (6)*	22 (5)*
Post Graduate Students						
Allied Health[b]	34	61 (7)	60 (15)	40 (10)*	27 (7)	26 (4)
Students						
Physiotherapy[b]	242	56 (8)***	50 (11)***	35 (8)***	22 (6)***	21 (4)***
Podiatry[b]	44	53 (10)***	47 (14)***	37 (7)***	22 (6)***	21 (4)***
Occupational Therapy[b]	171	53 (9)***	40 (12)***	35 (8)***	25 (7)***	21 (3)***
Medical Radiation[b]	173	48 (8) ***	40 (11)***	35 (7)***	19 (6)***	21 (3)***
Human Movement[b]	257	46 (10) ***	38 (13)***	33 (8)***	20 (6)***	21 (3)***

Note: Group with the same superscript are significantly different to each other within the same domain. * = p < 0.05, ** = p < 0.01, and *** = p < 0.001

The mean (SD) scores and p values for factorial ANOVA for each domain of the EBP^2-P and significant findings for country, gender, age, are presented in Table 2.

Table 2.

Mean (SD) and p values for factorial ANOVA for country, gender, and age

	Domain (max possible score)										
	Relevance (max = 70)		**Sympathy** (max = 35)		**Terminology** (max = 85)		**Practice** (max = 45)		**Confidence** (max = 55)		**n**
	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	
Country of employment											
Australia	60.9	7.6	25.9	4.3	62.3	13.7	28.3	6.6	43.9	7.9	59
New Zealand	63.9	4.6	25.8	4.3	60.3	9.1	27.9	5.7	44.0	5.2	19
United Kingdom	64.3	3.9	26.7	3.5	63.5	14.2	29.1	7.3	45.2	6.5	25
p value	.044		.727		.722		.821		.765		
Male	62.7	4.4	26.3	4.2	61.8	11.8	27.9	6.2	45.1	5.9	58
Female	61.9	8.3	25.8	3.9	62.6	14.1	29.2	6.8	43.2	8.0	48
p value	.519		.456		.748		.309		.148		
20 – 29	61.9	3.3	26.5	2.9	55.4	8.5	29.4	3.9	40.0	4.2	8
30 – 39	63.3	3.6	25.7	2.1	59.1	11.6	28.0	5.0	43.0	5.3	24
40 – 49	60.8	13.6	25.9	5.1	59.7	16.1	27.0	8.5	43.0	9.5	15
50+	60.6	5.3	26.2	3.6	65.7	12.1	29.0	8.9	47.5	8.2	10
p value	.730		.413		.372		.832		.166		

Table 3 details the means and standard deviations for EBP[2]-P in relation to first degree, paramedic trained status, and time since qualifying as a paramedic. The first degree obtained had a significant difference for the Terminology domain (p = .027) as did the trained as a paramedic (p =.022). Time since qualifying as a paramedic was significant for terminology (p = .004) and confidence domains (p = .026).

Table 3.

Mean (SD) and p values for factorial ANOVA, first degree, paramedic trained, time since qualified as paramedic

	Relevance (max = 70) $\overline{x}$ (SD)	**Sympathy** (max = 35) $\overline{x}$ (SD)	**Terminology** (max = 85) $\overline{x}$ (SD)	**Practice** (max = 45) $\overline{x}$ (SD)	**Confidence** (max = 55) $\overline{x}$ (SD)	**n**
			First Degree			
Paramedic	61.7 (7.9)	25.4 (4.0)	59.7 (13.7)	27.6 (6.4)	43.4 (7.3)	60
Nursing	63.6 (2.9)	28.6 (2.7)	60.0 (11.7)	30.1 (6.4)	47.5 (5.1)	14
Psychology	64.0 (1.4)	26.5 (3.5)	79.0 (8.5)	36.5 (2.1)	42.5 (16.3)	2
Law	66.0 (-)	28.0 (-)	50.0 (-)	32.0 (-)	39.0 (-)	1
Education	60.8 (5.8)	24.7 (4.5)	66.3 (7.8)	26.4 (7.1)	41.7 (4.8)	9
Medicine	69.0 (-)	33.0 (-)	85.0 (-)	36.0 (-)	55.0 (-)	1
Science	62.4 (62.4)	26.5 (5.0)	71.5 (7.8)	31.3 (7.7)	44.0 (8.0)	8
Other	63.9 (6.5)	26.8 (4.0)	63.1 (8.1)	27.8 (4.4)	46.4 (4.5)	10
p value	.823	.113	.027	.229	.235	
			Trained as a Paramedic			
Yes	62.3 (6.7)	25.9 (4.1)	61.4 (12.8)	28.3 (6.5)	44.0 (7.0)	95
No	62.6 (4.2)	28.6 (3.6)	73.0 (12.3)	30.7 (7.3)	48.0 (7.8)	7
p value	.912	.098	.022	.356	.150	
			Time since Qualified as a Paramedic			
1 – 5 Years	62.4 (2.1)	26.7 (2.1)	60.4 (9.5)	32.2 (6.1)	41.6 (6.2)	10
6 – 10 Years	59.6 (11.4)	25.1 (3.7)	53.2 (14.3) [a]	27.5 (5.8)	40.8 (7.5) [a]	20
+10 Years	63.0 (4.9)	25.9 (4.4)	63.7 (11.6) [a]	27.8 (6.5)	45.2 (6.6) [a]	64
p value	.153	.548	.004	.115	.026	

Note: Group with the same superscript are significantly different to each other within the same domain. For example, in Time teaching at university the group 1 – 5 years scored significantly different in Sympathy to 10 + year group but not to 6-10 years.

Table 4 details the means and standard deviations for EBP^2-P in relation to highest qualification, participating in formal EBP training, and duration EBP training. Factorial ANOVA indicated that undertaking formal EBP education also was significantly correlated for terminology (p = .002) and confidence (p = .000) domains.

Table 4.

Mean (SD) and p values for factorial ANOVA for EBP training, research experience, published and highest qualification

	Relevance (max = 70) $\overline{x}$ (SD)	**Sympathy (max = 35)** $\overline{x}$ (SD)	**Terminology (max = 85)** $\overline{x}$ (SD)	**Practice (max = 45)** $\overline{x}$ (SD)	**Confidence (max = 55)** $\overline{x}$ (SD)	**n**
Highest Qualification						
Bachelor	61.4 (3.7)	24.8 (3.2)	57.8 (11.8)	25.8 (6.1)	41.2 (6.0)	17
B Hons	62.5 (4.6)	27.2 (3.0)	59.7 (16.3)	31.5 (5.4)	43.5 (6.1)	6
Post Grad Cert	63.5 (4.1)	25.3 (3.2)	59.0 (10.3)	29.2 (6.9)	44.2 (5.3)	25
Grad Dip	62.2 (5.1)	26.4 (5.4)	61.0 (10.3)	26.8 (6.0)	41.7 (6.6)	9
Masters by Course	63.7 (4.4)	26.3 (4.0)	62.7 (12.0)	29.8 (4.9)	45.8 (6.7)	27
Masters by Research	60.3 (6.0)	25.9 (5.8)	69.4 (7.4)	29.1 (6.8)	47.9 (6.7)	9
PhD	59.4 (14.8)	28.7 (4.3)	69.0 (19.7)	27.8 (8.8)	45.4 (11.0)	12
QAP	62.0 (-)	23.0 (-)	78.0 (-)	20.0 (-)	38.0 (-)	1
p value	.578	.269	.110	.303	.217	
Formal EBP training						
Yes	62.8 (8.1)	26.9 (3.7)	66.2 (14.2)	29.3 (7.0)	46.9 (7.7)	48
No	61.7 (5.0)	25.5 (4.3)	58.2 (10.7)	27.7 (6.1)	41.8 (5.7)	52
p value	.393	.084	.002	.222	.000	
EBP training duration						
EBP in degree	63.0 (3.8) [a]	26.4 (3.7)	68.0 (12.8)	30.0 (6.5)	47.9 (6.5)	38
Short Course	56.1 (18.8) [a]	29.7 (2.8)	57.1 (21.1)	27.3 (9.7)	42.1 (12.9)	7
Single Lecture	65.3 (2.9)	27.3 (4.7)	65.7 (3.8)	25.0 (6.1)	45.3 (2.5)	3
p value	.053	.088	.183	.363	.170	

Note: Group with the same superscript are significantly different to each other within the same domain. For example, in EBP training duration the EBP in degree group scored significantly different in Relevance to Short Course but not to Single Lecture.

Table 5 details the means and standard deviations for EBP^2-P in relation to Conducted research, Published or presented research, Time teaching at university in years, and the way EBP teaching is integrated with the degree course. Not having Published or Presented was associated with significantly lower Sympathy (p = .002) and Confidence (p = .037) domain scores. Time teaching at University had significant difference for Sympathy (p = .029), Terminology (p = .006) and Confidence (p = .007).

Table 5.

Mean (SD) and p values for factorial ANOVA for research experience, published, university teaching time, and EBP teaching experience

	Relevance (max = 70) $\overline{x}$ (SD)	**Sympathy** (max = 35) $\overline{x}$ (SD)	**Terminology** (max = 85) $\overline{x}$ (SD)	**Practice** (max = 45) $\overline{x}$ (SD)	**Confidence** (max = 55) $\overline{x}$ (SD)	**n**
Conducted Research						
Yes	62.3 (7.6)	26.7 (4.6)	63.5 (13.4)	29.0 (6.7)	45.1 (7.3)	65
No	62.3 (4.0)	25.2 (2.8)	60.0 (11.7)	27.6 (6.1)	43.0 (6.3)	41
p value	.991	.068	.175	.247	.137	
Published or Presented Research						
Yes	62.8 (8.2)	27.4 (4.2)	64.6 (13.8)	29.1 (6.9)	45.7 (7.5)	51
No	61.8 (4.3)	24.9 (3.5)	59.9 (11.5)	27.9 (6.0)	42.9 (6.2)	55
p value	.444	.002	.061	.303	.037	
Time teaching at University (y)						
1 to 5	62.6 (4.5)	25.4 (4.0) a	58.7 (11.7) a	28.1 (6.3)	42.5 (6.2) a	52
6 to 10	63.1 (5.1)	25.7 (4.1)	65.7 (13.0)	28.2 (7.3)	47.5 (6.2)	19
+10	59.9 (12.3)	28.4 (4.3) a	69.7 (16.6) a	28.7 (8.3)	47.3 (9.6) a	18
p value	.284	.029	.006	.950	.007	
EBP Teaching						
Not covered	58.0 (5.2)	23.8 (6.3)	57.0 (6.9)	29.0 (9.0)	43.0 (7.3)	4
Themed through Course	62.5 (7.5)	26.3 (3.7)	60.5 (12.9)	28.1 (6.9)	43.0 (6.9)	62
Discrete unit I teach	63.4 (4.8)	27.1 (5.3)	68.0 (15.7)	28.3 (4.7)	49.1 (7.3)	8
Discrete unit others teach	60.8 (5.0)	24.9 (4.2)	60.6 (11.4)	27.0 (5.1)	43.6 (7.3)	9
p value	.557	.418	.420	.956	.147	

Note: Group with the same superscript are significantly different to each other within the same domain. For example, in *Time teaching at University* the 1 to 5 year group scored significantly different in Terminology to +10 year but not to 6 to 10 years.

4.3.5 ANOVA of Country of employment and Non domain Questions

ANOVA were performed for each of the questions compared to country of employment. Mean standard deviation and ANOVA result for non-Doman questions for country comparisons are shown in Table 3. Organisational leaders were perceived to significantly more often look for opportunities to learn in NZ and the UK compared to Australia (p = .001). NZ respondents reported that their workload prevented them from

keeping up to date with new evidence significantly more often than the others (p = .033). NZ were significantly more likely to report that support from colleagues (p = .036) and management (p = .000) assisted them to use EBP.

Table 6.

Mean, SD, and ANOVA for non-Domain questions

				ANOVA	
	Country	$\overline{x}$	**SD**	**F**	***p***
I solve problems using a plan (60)	Aus	4.3	0.7	0.211	0.81
	NZ	4.3	0.7		
	UK	4.2	0.6		
I enjoy studying (61)	Aus	4.2	0.9	1.524	.223
	NZ	4.3	0.6		
	UK	4.5	0.7		
In my organisation, leaders continually look for opportunities to learn (62)	Aus	3.5	1.2	7.946	.001
	NZ	4.6	0.6		
	UK	4.0	0.9		
I make time to read research (63)	Aus	3.9	1.1	0.145	.866
	NZ	4.0	0.7		
	UK	3.9	0.9		
Insufficient time is one of the greatest barriers to the use of EBP in my clinical / professional practice (64)	Aus	3.8	1.2	2.418	.094
	NZ	4.4	0.8		
	UK	4.0	1.0		
My workload is too great for me to keep up to date with all the new evidence (65)	Aus	3.3	1.1	3.52	.033
	NZ	4.1	0.9		
	UK	3.4	1.3		
The cost of information resources limits my use of EBP in my clinical / professional practice (66)	Aus	2.5	1.1	0.613	.544
	NZ	2.5	1.2		
	UK	2.2	0.9		
Easy access to computers dictates whether or not I practice EBP (67)	Aus	3.0	1.2	1.147	.322
	NZ	2.7	1.3		
	UK	2.6	1.2		
The resources available to me are adequate to undertake EBP (68)	Aus	3.9	1.0	2.491	.088
	NZ	4.4	0.8		
	UK	3.6	1.4		
Collective support amongst my colleagues is one of the greatest facilitators to my use of EBP in clinical / professional practice (69)	Aus	3.6	1.0	8.834	.036
	NZ	4.0	0.7		
	UK	3.3	0.9		
Support from management is one of the greatest facilitators to my use of EBP in clinical/ professional practice (70)	Aus	3.0	1.2	8.834	.000
	NZ	4.2	0.7		
	UK	3.0	0.9		
Senior management/my employer requires me to teach EBP (71)	Aus	3.6	1.3	2.669	.074
	NZ	4.3	0.7		
	UK	3.8	1.2		
I've just had a gutful of EBP (72)	Aus	1.8	1.1	2.959	.056
	NZ	1.3	0.5		
	UK	1.4	0.7		

4.4 Discussion

One pillar of PA preparedness for educating paramedic undergraduates in EBP is an understanding of EBP. The knowledge of the principles of EBP, the skills to enact them, and a critical attitude to evidence and established practice was defined as a minimum for health care practitioners by Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls, Osborne, et al. (2005). PA must possess these attributes to be able to pass them on to their students.

In the last 25 years, Australasian and UK paramedics have transitioned from being educated in-service and at centres of further education, to higher education at universities (Carney, 1999; Lord, 2003; Strong & Thompson, 2016). As a result, the PA population is relatively immature compared to their counterparts in nursing and allied health where the shift to higher education occurred much earlier. This immaturity is manifest in areas such as qualifications, time as an academic, research experience, professional identity issues, and most critically, gaps in their EBP understanding. The issues identified in the survey results, such as lack of higher qualifications, research experience and academic identity, have also been experienced by other health professions that have transitioned to higher education (McDermid et al., 2012; Timmons, 2011). To contextualise the findings, the data from the questionnaire will be examined and contrasted with the outcomes and perspectives presented in the existing literature.

4.4.1 Paramedic Academic EBP^2-P subgroup scores

Subgroup analysis of the PA cohort produced some highly statistically significant findings. Nearly half the PA sample had not had formal education in EBP and this resulted in significantly lower EBP^2-P terminology and confidence domain scores for this group. Unsurprisingly this supports the concept that EBP education improves EBP^2-P domain

knowledge and confidence (Simons et al., 2018; Wong et al., 2013). Encouragingly, short duration EBP courses of one semester can improve EBP knowledge, skills and attitudes (Al-Youzbaki et al., 2020). Knowledge and skills have been shown to significantly improve with even nine hours of peer taught online classes (Sabouni et al., 2017) or eight hours of seminars (Dinkevich et al., 2006).

There seems to be U-shaped relationship between time since qualification as a paramedic and EBP^2-P domain scores in terminology and confidence. Those PA that graduated 6-10 years before the survey (around 2005 to 2010) rated themselves significantly lower ($p=0.02$) than others with either less (0 – 5 years) or more (10+ years) experience. The middle group began their education when most Australian services were transitioning from an in-service diploma to pre-employment degree qualifications as an entry level (O'Brien et al., 2014). As a result many in this group gained an ambulance service sponsored diploma qualification that did not include EBP education (Brooks et al., 2015; Willis et al., 2009b). The remainder completed paramedic focused Bachelor degrees that often did not include education in EBP as it was introduced between 2002 (Charles Sturt University, 2002; Monash University, 2003) to 2010 (Victoria University, 2011) depending on the university. The 10+ years group despite mostly graduating from diploma level paramedic courses have either competed higher degrees, presentations or published. Each of these activities being strongly correlated with higher EBP^2-P Sympathy and Confidence domain scores. Previous research in nursing academics found no significant relationship between number of years teaching and reported knowledge of EBP (Melnyk, Fineout-Overholt, & Mays, 2008). McEvoy et al. (2011) have shown that self-reported EBP domains of relevance, confidence and practice have a temporary decline in health care graduates during the first two years in industry. They postulate that is possibly due to a mismatch between curriculum and workplace expectations. Later work by Klaic et al. (2019) demonstrated a degradation EBP skills and confidence in

under 5 years among allied health professionals particularly those that did not pursue postgraduate qualifications but not an increase after 10 years . They postulated that lack of opportunities to practice the skills was the cause of the degradation and suggest exposure to research as solution. It is unknown if this provides an additional mechanism for the U-shaped curve of PA but exposure to research is explored later in this chapter.

PA that studied paramedicine as first degree or trained as a paramedic had lower EBP^2-P terminology domain scores than those that had initially studied other health degrees. Other health degrees such as nursing have been teaching EBP since the 1990s (Fairbrother et al., 2016; Wampold & Bhati, 2004) and thus PAs with those initial degrees would have been educated in EBP. A possible factor is the extensive literature base examining the teaching of EBP to nurses and allied health stretching over more than 20 years (e.g. Connor et al., 2016; B. M. Melnyk et al., 2018; Rolfe, 1999; Wonder & Spurlock, 2020), informing the teaching, resulting in more effective EBP education.

PA working in the UK and NZ rated the EBP Relevance significantly higher than the Australian respondents. This may be related to the professional registration that the UK paramedics license to practice being provided by the UK Health and Care Professions Council rather than the employing ambulance service as was the case with the Australian paramedics at the time (Devenish et al., 2015). The UK paramedics were able to be "struck off" the HCPC register if they made a serious error in practice or ethics that previously would have been dealt with by a non career threatening, reprimand from management. While initially thought to steal time from clinical topics, the importance of EBP education was realised when defending practice variations (Givati et al., 2018; Lovegrove & Davis, 2013).

Compared to Australian and UK subgroups, the small NZ PA cohort were significantly higher in their answers to the Non-domain questions "*In my organisation, leaders continually look for opportunities to learn*" (question 62), "*Support from*

management is one of the greatest facilitators to my use of EBP in clinical/ professional practice" (Q69) and "*Support from management is one of the greatest facilitators to my use of EBP in clinical/ professional practice"* (Q70). This suggests that NZ does enjoy better management support for EBP that their counterparts. Alternatively, the results are spurious as the small numbers of the NZ subgroup (n = 20), number of universities (n=2) and Ambulance services (n=2) means it is affected by the law of small numbers. That is a cognitive bias based on the assumption that a small sample should resemble the population. Thus, random effects on small samples are interpreted as having a large apparent effect when analysing the data (Miller & Sanjurjo, 2018; Tversky & Kahneman, 1971). Conversely the NZ group was significantly higher in "*My workload is too great for me to keep up to date with all the new evidence*" (Q65). Again, this may represent a real difference between the subgroups or a spurious result. Overall, the three countries PAs scored similarly apart from these categories, suggesting a commonality of experience. This is not an unexpected finding given the shared heritage and free exchange of ideas and staff between the regions.

4.4.2 Paramedic Academic EBP^2-P scores compared to other groups

The five teaching domains of evidence-based practice as demonstrated by PAs have not been previously considered in a research context. The EBP^2-P measured these five domains but to give context to these values they must be compared to other groups however this is not available. The EBP^2-P was developed from the EBP^2 and results should be comparable.

The EBP^2 instrument has measured these five aspects in Australian allied health academics and postgraduate students (McEvoy et al., 2010a, 2010b; McEvoy et al., 2011). The domains of EBP have also been extensively investigated using other instruments in nurses (Labrague et al., 2019; Sanchez-Garcia et al., 2019; Wonder & Spurlock, 2020) and

medical doctors (Khader et al., 2011; Kljakovic et al., 2004) these provide some wider examples from which to evaluate the PA results.

The Allied Health Academics (AHA) studied by McEvoy et al. (2010b) provide a possible comparator as a group closest in role to PAs. Postgraduates were also surveyed by McEvoy et al. (2011) and provide an additional, point of reference. PA scored significantly higher than AHA in Practice and Sympathy domains but similarly in Relevance, Terminology, and Confidence. Practice relates to application of EBP in a clinical situation while Sympathy measures the participants overall attitude to EBP by assessing the difficulty challenges and worth of incorporating EBP. Given the data collection occurred 5 years later for the PA cohort compared to the AHA, improvement overtime of online access to evidence may explain the difference.

The PA cohort were at significantly higher (at the $p < .05$) level for Confidence than the Allied Health Post Graduate Students with non-significant differences in the other domains. Paramedics personality and hence attitudes compared to other health professionals may differ, perhaps the nature of the job that paramedics perform attracts those individuals that are confident in themselves or selects out those that lack confidence. Paramedics are required to be controlled in stressful situations (Klee & Renner, 2013) and rate higher than other health professionals on emotional stability (Hallam et al., 2016; Mason et al., 2020; Mirhaghi et al., 2016) so this may account for the higher confidence scores. The wider literature on health professionals EBP domains provides a heterogeneous picture. Physicians, nurses, occupational therapists, physical therapists, and psychologists have been shown to have similar EBP attitudes and knowledge (Arumugam et al., 2018). Nurses had greater EBP knowledge while physicians had better technical skills. Nursing, exercise science, radiography and speech pathology academics have similar scores in EBP beliefs and implementation (Milner et al., 2018).

The PA cohort were at significantly higher (at the $p < .001$) level for all domains compared to allied health undergraduate students. Given that the EBP^2 questionnaire has been shown to measure EBP domains that change with education and training (McEvoy et al., 2010a), this type of pattern difference is expected. Also, the PA's as group have reported higher levels of research, publishing and completion of higher degrees compared to the student group. Higher levels of each of these demographic characteristics have previously been shown to be correlated to higher domain scores (e.g. Klaic et al., 2019; McEvoy et al., 2010a). Although some single domains scores are significantly higher for PA overall, they are broadly comparable with other health academics and graduate students in their EBP attitudes and skills. Further objective assessment of PA skills may reveal more granular detail.

4.4.3 Experienced paramedics but inexperienced Academics

The PA cohort consisted mainly of senior paramedics, most with more than a decade in the profession, but having little time teaching at university, few higher qualifications, and little publishing or research involvement. Each of these factors will be examined in more detail in the following sub-sections.

4.4.3.1 Time teaching at university

As a group the paramedic trained, PA's were mostly experienced as paramedics but were inexperienced as academics. This is concerning from a teaching point of view as Coates et al. (2009) has suggested that that an academic takes 7 years to be ready for independent performance in a university. A significant correlation was found to support this with a short time teaching at university predicting low scores in the EBP^2-P domains of Sympathy, Terminology, and Confidence. This differential in paramedic and academic experience is the

result of several factors such as expansion of paramedic undergraduate population, turnover, and has some consequences from a recruitment and staff retention perspective.

4.4.3.2 Higher Degree Qualifications

Only 10% of the respondents lecturing at Australasian and UK universities in paramedic undergraduate degrees held a PhD, with several respondents indicating a bachelor's degree as their highest qualification. This compares with 76.5% of Australian academic staff holding a PhD (Department of Education, 2018), 75% of NZ (Sutherland, 2018) and 52.5% of UK (Higher Education Statistics Agency, 2019) in the same year as the survey. This lack of higher degrees aligns with the Munro et al. (2016a) finding that only 3% of the Australasian paramedic cohort held a PhD before entering academia and hence were mostly underqualified to meet the expectations of their new role (Jackson et al., 2011).

While the relatively recent transition of the paramedic profession to university education explains some of the lack of formal higher qualifications other factors exist. Paramedicine is a marginalized health profession that is marginally integrated with other health services (Brightwell & Bange, 2014). National registration and Higher education are among the hallmarks of a profession (Williams et al., 2010). Australia only received professional registration in 2018 (Paramedicine Board of Australia, 2019b) and NZ in 2021 (Te Kaunihera Manapou Paramedic Council, 2021). While the UK began registration in 2000 it was still transitioning to a Bachelor degree entry level in 2018 (Givati et al., 2018).

A low rate for academics possessing a PhD is common within developing countries and previously marginalised groups, based on data drawn from a large survey of European, Asian, African and Latin American universities (Breier et al., 2019; Jørgensen, 2012). In Australian universities, only 15% of Indigenous academics held PhDs in 2013 (Schofield et al., 2013). In other health professions such as nursing the PhD rate was also low. Shortages of doctorally prepared nurses, both in Australia and internationally, to move into nurse academic

roles were reported by McDermid et al. (2012). Turnbull and Roberts (2002) found 36% of Australian nursing academics held a PhD , however the actual value is probably lower as the sample intentionally over-represented higher ranked academics such as professors and associate professors who are more likely to be doctorally qualified (McKenna et al., 2018).

The Doctor of Philosophy is a research training degree where scholars are required to produce original research that expands the boundaries of knowledge in their field (Dinham & Scott, 2001; Mason et al., 2019). PhD qualified PAs are equipped to conduct independent research projects, develop research methodologies, generate original knowledge, and evaluate existing practice (Boud et al., 2020). Wider effects of doctoral studies have been reported to include extended networks, greater professional confidence, increased impact, and technical skills (Boud et al., 2020). While this skillset is not unique to PhD holders, the PA may be lacking these without a doctoral qualification. A deficit of paramedics with the required skills may result in a lack of paramedic centred research. Paramedic research provides the basis for evidence based practice of the profession (Florczak et al., 2014).

It appears that doctoral training should improve EBP understanding and teaching, however while the PhD skill set overlaps with the EBP skill set, it does not completely serve as an equivalent. EBP specific skills such as developing an answerable clinical question, systematic literature searching, statistical evaluation such as odd ratios, and terms such as “forest plots”, are not universal in PhD programmes and rare before 2000 (Stichler et al., 2011). Hence PhD graduates are likely to still require EBP training.

Amongst nursing academics a PhD was significantly positively correlated with knowledge and skills but significantly negatively correlated with attitudes towards EBP compared to respondents holding a lower degree level qualification (Stichler et al., 2011). Stichler et al. (2011) hypothesised that this was due to the teaching settings where the academics holding a Master’s degree were interacting in students in a clinical setting while

the doctoral prepared staff where more likely to be working in a class room setting. EBP should be integrated with real clinical cases whenever possible.

4.4.3.3 Publishing and research

The pattern of the current findings reinforced that research expertise is lacking with many paramedic academics producing little, if any, published work. Publishing and presenting are ways for academics to demonstrate their understanding of research. A deep understanding of the research process is important to teaching and utilising EBP. Equally EBP works best if there is a relevant, extensive research base upon which to draw. The need for paramedic focused research has been well documented (Jensen et al., 2012; Maguire et al., 2016; O'Meara, Maguire, et al., 2015; Tippett et al., 2003; van de Glind et al., 2016). By paramedic standards, Australia has world quality paramedic research capability (O'Meara, Maguire, et al., 2015) with the UK also well represented (National Institute for Health Reseach, 2016; Woollard, 2009). In the period 2008 -2019, 1,937 publications were recorded in the Web of Science database (Calvairate Analytics, 2019) with a paramedic focus and an Australian author (Australasian Council of Paramedicine Deans, 2019).

From the EBP^2-P data there was a small core of senior paramedic academics doing most of the publishing; three Australian respondents report over 100 articles or conference presentations each with the top ten respondents accounting for 83%. This is an example of the Pareto tendency, where 20% of researchers are responsible for around 80% of the research output (Broome, 2017). It is common for many papers to be published by a minority of researchers with reasons for non-publishing including lack of momentum, support structure, time and confidence (McGrail et al., 2006). This pattern is observed in other health based academic professions. Nursing academics publish an average of 5.3 journal articles each in 2016 (McKenna et al., 2018). Australian lecturer level academics in the field of psychology publish an average of 5 papers for per year. This doubles with each step up the hierarchy;

Senior Lecturers averaged 13 per year, Associate Professors; 24 per year and Professors 55 per year. A similar positive association with scholarly production and academic rank was found in Australian Nursing academics (Turnbull & Roberts, 2002). As might be expected considering their focus on research (Group of Eight Ltd, 2019), academics from the "Group of Eight" universities were about 50% up on the national average (Malouff et al., 2010).

Despite a widespread pressure to publish or perish in academia (Niles et al., 2020; Siegel et al., 2018) most of the survey respondents claimed to have conducted research, however less than half of respondents had either published or presented at an academic conference. This lack of research experience in the PA cohort had been commented on by O'Meara (2006). Later work by Munro et al. (2016a) also reported that a majority (70%) of PA had not published before they entered academia. Nursing Academics in the UK also had little prior experience of research activity before being employed by a university. (Boyd et al., 2015).

The current data revealed a low percentage of the PA sample with PhDs. The shortage of PhD qualified and therefore research capable paramedic academics compared to other professions (O'Meara & Maguire, 2018) may party explain this lack of scholarly work. The relationship of higher degrees and academic output is also found in nursing. Nursing also trails traditional disciplines in terms of scholarly production in Australia. In 2003, 56% of Australian nursing academics had not published in the preceding year. Turnbull and Roberts (2002) found that nursing academics with PhDs published four times more than those without with a lack of mentoring and an oral tradition not suited to research and academic writing being identified as factors. Another profession without a rigorous research tradition is Australian Academic chiropractors, who had a low productivity of 0.62 articles each annually despite 26% holding a PhD (Swain et al., 2013).

The high number of PA respondents with less than a year teaching at university implies a high turnover rate could be a factor. Academic anxiety may be a factor in paramedics to return to a Clinical role resulting in the high number of new PA found in the survey. Anxiety in academics has been reported when transitioning to a new work role as an outcome of the challenges of teaching to a level that satisfies students, publishing in peer reviewed journals, presenting in papers at conferences and grant writing, (McDermid et al., 2013). Higher satisfaction and lower turnover was found when UK academics did more research than teaching (Figueroa, 2015). Many academics value research above teaching which is regarded as a burden that inhibits research (Flecknoe et al., 2016). Wellbeing of academics is negatively correlated with workload with junior staff being particularly vulnerable. Rewarding work such as research, increased status and financial compensation are protective of negative impact of work load (Kinman, 2016). Additionally, the low level of research activity in paramedicine was due to less PhD trained PA, and low funding levels for paramedic research areas.

4.4.3.4 Paramedic academic identity

Amongst the participants in the survey who had been trained as paramedics, 10% (N = 9) did not identify as a paramedic. This was more pronounced in the Australian cohort where 16% (N = 8) felt this way as did one of the New Zealand respondents (6%). The stronger identification as a paramedic for the UK cohort may be due to paramedicine having been a registered health profession in the UK since 2000 (McLaughlin et al., 2016) while this did not occur for Australia until November 2018 (Australian Health Protection Regulation Agency, 2018) and January 2020 for New Zealand (New Zealand Government, 2019). The fees and hurdles that UK paramedics faced to become registered while their antipodean counterparts did not at the time of the survey possibly contributed to this result. The recent introduction of registration in Australian and New Zealand may well reduce the percentage

on non-identifiers. Additionally, the broadening of the roles of paramedics into such roles as paramedic practitioners may widen the self-perception of the paramedic cohort so that paramedic academics are included in the community of practice of paramedicine.

The paramedic professional identity seems to be linked to treating and caring for patients (Campeau, 2008; Woollard, 2009). Canadian research also detailed components including thrill-seeking and sense of duty (Donnelly et al., 2015). Mirhaghi et al. (2016) in a systematic review found paramedics to be high in empathy, conscientiousness and sensation seeking, while low in agreeableness, extroversion, neuroticism and openness to experience.

The challenge of maintaining clinical currency while also lecturing and conducting research has be shown to be a professional expectation which few paramedic academics can meet (O'Meara, 2006). The high work load of teaching, research and further degrees that many of the participants reported leaves little time to work clinically (Willis et al., 2009a) some paramedic academics therefore stop identifying as a paramedic. The challenge of juggling clinical and academic competence identified by the PA is also found in Nursing Academics in the UK who felt pressured to teach, perform research and maintain practice currency while not having sufficient time to do any of these adequately (Carr, 2007). The nursing academic field was also shown to demonstrate a tension between the 'rival knowledge regimes' of research and clinical expertise (Boyd et al., 2015). The development of identity correlated with a clinical work environment that emphasises a team environment, while the competitive hierarchal environment of academia constrained identity development.

The identification as an Academic among the PA respondents was also not universal (85%) despite all teaching at universities. This paradoxical non-identification was present in all the geographic regions. This phenomenon of not associating with the professional or academic role has been identified as the '*The No Man's Land of Professional Identity'*. It has been previously reported in paramedic (Munro et al., 2018) and Nursing (Findlow, 2011;

Kristoffersen et al., 2020) cohorts. Academic professional identity is related to the three related fields of research, teaching and administration (Trautwein, 2018). Teaching is less valued than research in many universities especially research focused ones (Coate et al., 2001; Hancock et al., 2019). With many paramedic academics not participating in research it is unsurprising that that fail to identify as an academic.

For health professionals such as paramedics the transition to academia is a challenging. Their first years at university are stressful as they realise that their paramedic expertise is not sufficient for the new role. This has been dubbed "the expert becomes novice phase" (van Lankveld et al., 2016). Kristoffersen et al. (2020) studied health professionals completing PhDs and described the transition from a peak as a clinical practitioner to a valley as a novice researcher. This struggle, demonstrated as a perceived low competence level is a factor in the scrutiny of belonging to the academic community (Cornwall et al., 2019).

Health professionals tend to cling to their professional identity and expertise to maintain credibility during the first few years teaching at university (Findlow, 2011). A recognition of competence by others seems important to a health professional academics self-worth particularly in the early years of their academic career. The major challenge to the ongoing evolution of professional academic identity in the field of paramedicine for academics remains as the need to find an optimum balance between research, scholarly activity, and practice engagement/development (Andrew and Robb, 2011).

4.4.3.5 EBP Knowledge.

PA rate themselves as highly as other health academics in EBP terminology as assessed by the EBP^2-P terminology domain. Nevertheless, there are some trends in the data that indicate the understanding of EBP terminology is not flawless in the PA respondents. One of the of the most recognisable, core EBP images is that of the forest plot, a graphical representation of the results from a group of scientific studies addressing the same problem

along with the summation of the results (Lewis & Clarke, 2001). It is used to present the findings from a meta-analysis (Deeks et al., 2019, p. 245). It is also the logo of Cochrane, an international collaboration of 130 countries that focuses on EBP (Cochrane, 2019). However, in item 30 of the EBP^2-P questionnaire, more than half of the PA cohort reported either not having heard of it or did not understand a forest plot. This may be interpreted in a few ways. If this is not an anomalous result, there are a least two possible reasons. Firstly, the forest plot is also known as a "blobbogram" (Li et al., 2020) so the respondents may be more familiar with this term. Alternatively, there is a real gap in PA knowledge. Paramedics do not have a significant history in using EBP and hence the support that may be provided by mentors in the field to new graduates in this area is lacking.

4.5 Summary

This study assessed aspects of the preparedness of PA from UK, NZ and Australia to teach EBP. To do this it used a paramedic focused version of a pre-validated survey to measure the self-rated EBP domains of, Relevance, Terminology, Confidence, Practice, and Sympathy. Demographic information on qualifications, EBP training, clinical, teaching and research experience, age, and gender was collected from the respondents.

A good response rate was achieved from Australia and NZ but more modest one from the UK with a total of 106 paramedic academics participating in the EBP^2-P survey. The majority (55%) were initially educated as paramedics and were senior clinicians with most having more than a decade of experience, however time as an academic was lower with many in their first year. Few (11%) had a PhD although most (73%) were enrolled in some higher qualification. Most had not had formal education in EBP, nor had they published or presented at an academic conference. Professional identity was variable with not all respondents considering themselves as paramedics or academics.

Subgroup analysis of the PA cohort showed EBP sympathy was rated higher by the UK and NZ subgroups. This difference may and the professional identity crisis may resolve as all regions now have registration. Other subgroups such as, not having EBP education, trained as a paramedic, graduating from a paramedic degree between 2005 and 2010, not publishing or presenting research, or new to teaching at university were all significantly correlated with one or more lower EBP^2-P domain scores. Field of first degree, level of highest qualification, having conducted research, or method of EBP teaching in course, were not significantly correlated with domain scores. EBP teaching preparedness would be improved by an increased EBP knowledge, understanding, and use by the PA, particularly those that graduated between 2005 to 2010, or have not published or presented as these subgroups showed lower EBP^2-P scores. This would be achieved by focused EBP education, and increased opportunities and funding for research and presentation. A reduction in the turnover of PA would assist the skilling of the cohort this could be achieved by better mentoring, sensible workloads, and wages equitable to clinically focused paramedics.

The PA demonstrated significantly higher Practice and Sympathy domains EBP^2-P scores in comparison with published EBP^2 scores reported for Allied Health Academics and with the Confidence domain scores for Allied Health postgraduate students. PA EBP^2-P scores were also significantly higher for all domains when compared with undergraduate allied health students.

The pattern of the EBP^2-P scores demonstrated that the PA cohort is at least as capable as the Allied Health Academics in regard to the EBP characteristics evaluated. This measure is self-rated and as such, personality and temporal differences between the groups may partially contribute to the differences revealed. However, the EBP^2 has been shown to reliably discriminate between respondents with a range of EBP education across a selection

of professions (McEvoy et al., 2010a) so this serves as valuable evidence to support the current results.

5 EBP CASE STUDIES

As discussed in Chapter 3 mixed methods were used in this research. While collecting qualitative or quantitative data sets allows a researcher to gain increased understanding a mixed method approach allows a more holistic understanding of a phenomenon (Almeida, 2018). In chapter 4, Study 1, a quantitative, validated, self-reported questionnaire the EBP^2-P and associated demographics data was analysed. In this chapter, Study 2, a qualitative, multiple, sequential, case study based methodology was used to assess preparedness of selected Australasian and United Kingdom based paramedic academics (PA) to teach Evidence-Based Practice (EBP) to their respective undergraduate paramedic students.

5.1 Case study research design

5.1.1 Case study method

Data collection methods used in this study was semi-structured interview with follow up after two years. The semi-structured interview method provide a rigorous but flexible tool (Kallio et al., 2016). Semi-structured interview enables the researcher to collect rich qualitative, open-ended data; explore participant thoughts, feelings and beliefs about a particular topic while acknowledging their own personal bias (DeJonckheere & Vaughn, 2019).

A review of the literature and combined with the researcher's status as a PA established a basic understand of the phenomenon to enable development of the research question. Themes from the analyses and assertion about the cases as whole or the quintain emerge. The second round of interviews were conducted after the initial interviews were analysed and a more focused literature review conducted.

5.1.2 Research aims relevant to the Case Study Phase

Study 2 aimed to obtain deep understanding of a purposeful sample of Paramedic Academics (PA) that taught into paramedic undergraduate degrees in Australian and the UK. No previous work specifically exists on paramedic academics teaching EBP. The Sicily Statement on EBP (Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls, Osborne, et al., 2005) defined the competencies and minimum standard educational requirements for training health professionals in EBP. Such factors as EBP education, research experience, higher degrees, publication history have been correlated with ability to teach EBP to other health professions (Melnyk, Fineout-Overholt, Feinstein, et al., 2008; Patelarou et al., 2017; Sin & Bliquez, 2017; Skela-Savic et al., 2020).

5.1.3 Research question

Study 2 aims to investigate the question "are Australasian and UK paramedic academics prepared to teach evidence-based practice to undergraduate paramedic students?" A qualitative methodology will be used to investigate the question.

5.2 Method

5.2.1 Determining the set of Paramedic Academic individual case studies

The sample size needed for a qualitative investigation is contested (Mason, 2010). Samples need to be large enough, so they gather the divergent experiences but not so large that it negatively impacts on the participants and the researcher. The concept of saturation as described by Glaser and Strauss (2017) for grounded theory and clarified by Saunders et al. (2018), is commonly used as something of a gold standard for many qualitative processes (Guest et al., 2006). *Theoretical Saturation* is when no new categories of themes are appearing in the data and collection can be stopped. Before this the diversity of the

population should be sampled where possible to ensure less common themes are not missed (Saunders et al., 2018).

Something of a rule of thumb can be gleaned from previous studies. Guest et al. (2006) found that as few as six interviews may be adequate for the development of meaningful themes and interpretations in a homogeneous population. Constantinou et al. (2017) were satisfied that they found all themes after seven interviews while Eynon et al. (2018) achieved saturation after eight interviews. Mason (2010) studied all accepted PhD abstracts available in the UK from 1716 to 2009 and found that of the 179 case study based thesis, the mean was 36 interviews with a range of 1 to 95 and a standard deviation of 21.1. 80% of all qualitative PhDs sampled used the Bertaux (1981) guideline of 15 being the smallest number of participants for a qualitative study irrespective of the methodology.

Braun and Clarke (2021) argue that while data saturation is widely used in thematic analysis, the decision to cease data collection is subjective and is unable to be determined before analysis so some uncertainty needs to be accepted. They posit that the act of interpretation generates meaning rather than something that can be mined from the data. While not totally abandoning the concept, they suggest utilising a mix of interpretive, situated, and pragmatic judgment when determining sample size.

The sample for study 2 was purposely selected to maximise the breath of variety and ensure representation of the characteristic of interest being, Country of practice, gender, Initial profession, time teaching in academia, highest qualification, and research experience (Creswell & Clark, 2018, p. 173; Palinkas et al., 2015). These factors were chosen from the initial literature study to help best understand the research problem. A sample size of eight individuals interviewed twice with a two-year interval between discussions was believed to offer sufficiently rich data to satisfy theory development but also be logistically achievable.

The sufficiency of the sample size was reviewed during the analysis of the initial interviews by the researcher and supervisors and felt to be adequate.

5.2.2 Paramedic Academic Case Study profiles

Participants were 8 paramedic academics (male: n = 5; female: n= 3) teaching into paramedic undergraduate degrees in Australia (n = 4), and the United Kingdom (n = 4). The initial profession was paramedic (n = 4), nursing (n = 3) and psychologist (n = 1). Most have more than ten years' experience in academia (n = 5), with five to ten years (n = 1) and less than five years (n = 2) being less common in the sample. Age at time of initial interview was over 50 years (n = 2), 40 – 49 years (n = 3), 30 to 39 years (n = 2), and 20 to 29 years (n = 1). Highest qualification held was PhD (n = 1), Masters (n = 5), Graduate Diploma (n = 1), and Bachelor (n = 1). Research experience was self-rated as extensive (n = 1), limited (n = 5), and none (n = 2). To assist in maintaining confidentiality, a pseudonym coding process has been used to represent each participant. See Table 7.

Table 7

Characteristics of the Case Study participants

Case	Country	Initial Profession	Trained as a Paramedic	Time in Academia (y)	Highest Qualification	Research
A	Aus	Other	N	>10	Masters / PhD candidate	Limited
B	Aus	Other	Y	>10	PhD	Extensive
C	UK	Other	N	>10	Masters	Limited
D	UK	Paramedic	Y	0 - 5	Grad Diploma	None
E	UK	Other	N	>10	Masters	Limited
F	UK	Paramedic	Y	6 - 10	Masters	Limited
G	Aus	Paramedic	Y	0 - 5	Bachelor	None
H	Aus	Other	Y	>10	Masters / PhD candidate	Limited

5.2.3 Procedures

5.2.3.1 Ethics Approval

Ethical clearance was sought from the Victoria University, Health Engineering and Science Human Research Ethics Committee. The proposed research project was accepted and deemed to meet the requirements of the National Health and Medical Research Councils *National Statement on Ethical Conduct in Human Research* (2007). Approval was granted HRETH 12/238- Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice. See Appendix A *Ethics approval of the research project.*

As the study was international, additional steps were needed. The VU ethics application and approval letter were forwarded to *St Georges, University of London*, an abridged ethic application completed, and ethical approval from the SGUL was granted. See Appendix B *Letter of support from St Georges, University of London.*

5.2.3.2 Participant recruitment

Purposive stratified sampling was utilised with the aim of representing diversity of gender, age, geographic location, clinical profession, time in academia and academic qualifications. This would enable identification of causal processes (Crowe et al., 2011), theory-testing (Yin, 2018), and also theory-building (Layder, 1998, p. 12).

Potential interviewees were approached by phone or email. They were provided with an explanation of the paper, what was expected of them, what they might benefit, how the information would be used and the potential risks in participating in the research. See Appendix G *Information to participants involved in research – Case study.* All who were approached agreed to participate. Due to financial restrictions, the small NZ PA cohort was not able to be sampled. One UK Case study participant dropped out after the initial interview due to retirement and was lost to follow up.

5.2.3.3 Inclusion Criteria for Case Study

To obtain relevant data, cases study participants were recruited that were currently teaching into a paramedic undergraduate degree program at a university in Australasia or the United Kingdom. The inclusion criteria for the Case Study were that the participant was teaching into a paramedic undergraduate degree at a University in Australasia or the United Kingdom.

5.2.3.4 Data collection procedure

Initial interviews were face to face and conducted between April and October 2013. The follow up interview were via Skype video conference (Luxembourg City, Luxembourg, Skype Technologies) between April and May 2015. Before staring the interview, participants were presented a summary of the project, what was expected of them, benefits, and risks of participating and how the information would be used. Participants were reminded the survey was voluntary and a decision to continue would be interpreted as agreeing to participate. See Appendix I *Consent form for participants involved in research – Case study*.

Interviews were recorded with a digital voice recorder and transcribed verbatim into NVivo 11 (Melbourne, Australia, QSR International Pty Ltd). Data was stored in password protected files on a password protected computer. Back up files were stored on the encrypted Victoria University R drive. To elicit interviewees beliefs and experiences with teaching EBP, a semi-structured interview technique was used. Interviews lasted between 22 and 74 minutes.

5.2.3.5 Case Study Semi Structured Interview question development

Initial questions were informed by the initial literature scan of factors that might influence the ability to teach EBP. These included collecting demographics of the participant, including qualifications, work history, current teaching setting. The semi-

structured design was utilised to provide an opportunity for participants to provide data that cannot be observed directly that would add to the understanding of preparedness of PA to teach EBP. (Kallio et al., 2016). A total of 15 interviews produced 503 minutes of interview recordings resulting in 255 pages of transcript containing 77,083 words.

Questions included:

- What is Evidence Based Practice?
- How did you learn about evidence-based practice? (did you have mentors in field?)
- What does Evidence Based Practice mean to paramedics students? As practitioners? Can you give examples?
- How do you teach EBP to undergraduate paramedics students? Are they different to other professions in this?
- How important is EBP to paramedics?
- It has been suggested that EBP is critical factor in paramedics being a profession. What do you think?
- How prepared are YOU to teach evidence-based practice?
- In his work Lee Shulman talks about a *Signature Pedagogy*. Eileen Willis, Tim Pointon and Peter O'Meara talk about paramedics being in search of a signature pedagogy? What do you think? How is EBP teaching related to this?

In follow up interviews Questions were about guiding theories, alignment of assessments, change in the way the respondent is teaching EBP, and perceived success in teaching EBP. They included:

- Is your EBP teaching integrated with your clinical practical units?

  How is the teaching done; discrete unit and / or integrated? In the clinical units?
- Do you have an underpinning theory that you're using in terms of educational theory? If so which one?
- What are the outcomes you are trying to achieve in your evidence-based practice in your curriculum?
- Do you have *constructive alignment* between your methods and the outcomes you want to achieve?
- What has changed in the way you teach EBP since last time you were interviewed (approx. 2 years)? Have you changed? Has the environment changed?
- Do you use any tools to measure for EBP teaching effectiveness?
- Do you think you are achieving the goal of making EBP ready graduates?

5.2.4 Data Analysis

5.2.4.1 Thematic analysis process.

A rigorous and through research method is vital to ensure the meaningful, trustworthy conclusions. Thematic analysis allows flexibility in interpreting the large data sets produced by case study interviews and has been used to investigate a wide variety of epistemologies (Nowell et al., 2017). This method was chosen because of its ease of use (Braun & Clarke, 2019), theoretical freedom allowing a flexibility of approach, (Braun & Clarke, 2006) and ability to summarise key features of a large data set (King, 2004, p. 256). Trustworthiness is critical to any research and for thematic analysis this is addressed by the criteria of credibility, transferability, dependability, conformability, and reflexivity (Guba & Lincoln, 1989; Lincoln, 2007; Nowell et al., 2017) . Credibility is assessed by the match

between respondents views and the researcher's account of them (Forero et al., 2018). Checking the findings and interpretations with the participants is one way of achieving this as is triangulation with different methods (Korstjens & Moser, 2018). Transferability in qualitative research refers to case-to-case transfer (Maxwell, 2020). The provision of thick descriptions is critical to assessing transferability. Dependability is attained by ensuring the thematic analysis is logical, traceable and unambiguously documented (Tobin & Begley, 2004). Confirmability is articulates the clarity of the process of developing interpretations and findings from the data (Guba & Lincoln, 1989). In thematic analysis, the researcher is the instrument for coding, identifying and interpreting themes, and contextualising the results (Clarke & Braun, 2013). It relies on the researcher's judgment and hence it is acknowledged that the researchers experience as a PA will affect interpretations of the data.

The thematic analysis used in this chapter is similar to that outlined by Nowell et al. (2017). The process was developed to meet the trustworthiness criteria as outlined above. Interviews were performed and recorded as described above. The digital recording was then transcribed by the author into NVivo 11 (Melbourne, Australia, QSR International Pty Ltd). The transcription was checked by listening to the recording while re-reading the text. The digital recordings were re-listened to by the author while committing to work to increase the familiarity with the data. Theoretical and reflective thoughts were documented in NVivo notes. Potential themes arising from the literature review and examination of the interview data were also recorded. The operational definition of theme was, an entity that captures the essence, and brings meaning and identity to a recurrent experience and its variations (Nowell et al., 2017).

Open coding was used in NVivo where the themes were developed and modified as the coding process proceeded. An initial list of codes based on the research question was

created in NVivo. Tree nodes were used to develop hierarchical relationships between nodes to achieve conceptual clarity and identity patterns in the data (Houghton et al., 2015). Peer debriefing was performed by comparing the data and nodes used with the author's research supervisors. Hierarchical coding was used to allow analysis of broader concepts (Nowell et al., 2017). See Table 8.

Table 8.

Examples of Initial Themes arising from the data

Theme	Sub theme	Example
EBP	Barriers to EBP	*"I think we touched on it* (EBP) *in the research component during my undergrad but everything I learned after that has been postgrad."*
Industry factors	In field mentors	*"...you had dedicated practice educators in each ward who checked what you were doing, so even if you did dressings, you would have to explain why you did a specific dressing. So, we had to go and research it, come back and say the reason why we've used this dressing on this patient."*
Paramedic Academic	Paramedic Industry Understanding	*"I think they need to relate to the paramedic industry in respect to teaching evidence-based practice to paramedic students."*
Paramedic Qualities	Paramedic Theory of practice	*"It is difficult because especially in the paramedic world. I mean, I'm used to the nursing world where we have got all our theories in relation to nurse education but how do you use that in the paramedic world? Do you still use the same theories of practice?"*
Pedagogy	Curriculum Design	"*We've got those couple of research units and it's in some of the others like the clinical units, so it is embedded in, it has discrete units and it is embedded all the way through*."

NVivo maps was used to construct diagrammatic representations of the Paramedic Academic EBP teaching skillset and to understand the hierarchies of the concepts and themes that were being generated by engagement with the data. Latent themes, the underlying ideas and assumptions, conceptualisations and ideologies that may emerge from the data were considered. Themes were tested for referential adequacy by reviewing the raw data from whence they emerged using both the text and audio versions to ensure nuances were not misinterpreted. The name chosen for each theme was reviewed to ensure it best captured the essence of the grouping.

5.2.5 Vignette construction

Narratives concerning individuals and the context they operate in, illuminate the nuances in the study of perceptions, beliefs and attitudes (Castleberry & Nolen, 2018).

Vignettes are usually used in surveys or interviews to selectively stimulate the participant with components of the research topic under consideration (Alden et al., 2015; Hughes & Huby, 2002). In this research vignettes are a pragmatic approach at providing a rich description of the individual who is experiencing the phenomenon in question (Bradshaw et al., 2017). The philosophical underpinning of this is that it is an inductive process describing an image of the phenomenon that is being examined. It also recognises that it is subjective both from the participant and the researcher perspective. The researcher becomes part of the phenomenon being explored as they interact directly with and hence influence the case study participants (Bradshaw et al., 2017).

To enable results from this study to be extrapolated with greater confidence, a vignette of each case study participant is presented. The descriptive nature of thematic analysis allows the investigator to build a holistic, deep picture of the phenomenon in a natural setting (Castleberry & Nolen, 2018). Their confidentiality is preserved as much as possible while relevant detail of their lived experience is described. Where possible the professional career is summarised focusing on their work experiences, qualifications, and research output. Their definition of EBP, relevant education, and mentors in the process are described. The changes they perceive in the way they teach EBP over the two years between the two interviews is also presented.

5.2.6 Presentation of results

The themes identified six themes with ten sub themes. Themes found were definition of EBP, Importance of EBP to paramedics, facilitators and barriers to EBP, EBP pedagogy, outcome goals for EBP graduates, and PA readiness to teach EBP. Sub themes emerging from the data include Thought leader influence, Resistance from non EBP-educated supervisors, Access challenges, Lack of student engagement with nonclinical units, Variation in paramedic students learning engagement with EBP, Lack of student

engagement with non paramedic academics, Theory, Progression of EBP teaching, Signature Pedagogy, and EBP Curriculum Design.

5.3 Results

The data from the eight case study participants who provided 15 interviews is presented below. The first section is in the form of vignettes that capture the relevant demographics of each participant. This is followed by themes identified in the data provided by the themes and subthemes that were detected in the data.

5.3.1 Case Study vignettes

Vignettes of the case study participants are provided to demonstrate the diversity of the sample group characteristics of gender, duration in academia, country of employment and background as a paramedic, qualifications, and research and presentation experience.

5.3.1.1 Case Study A

At the time of the interviews, case study participant A was a non paramedic registered health professional holding Master's Degrees in Public Health and Business Administration along with multiple diplomas. He had over 20 years of experience in academia, teaching paramedics at both further and higher education level in Australia. Case study participant A was enrolled in a PhD and had some experience publishing and presenting at conferences.

Case study participant A was awarded a psychology degree prior to 1990 and was taught about using research results during this period of study. EBP was not mentioned at the time because the phrase was not introduced in medical journals (EBM) until 1992 (Guyatt et al., 1992). Case study participant A shared that his early motivation to do what later became known as EBP, originated from a realisation that while psychological theories

such as psychoanalysis were appealing and elegant, they were much less effective than other methods such as the study of operant behaviour. Participant A stated that the catalyst of his change was the evidence about effectiveness. Now he cares more about outcomes and less about elegant theory. Perhaps because of this, Participant A's definition of EBP is functionally oriented rather than textbook perfect; "*EBP is when you have evidence to support an intervention or approach rather than hearsay*."

Case study participant A indicated that his psychology clinical supervisors were his mentors in developing skills around reading research but believes that his EBP understanding is "really self-taught". He stated that teaching EBP to paramedic students should utilise a scaffolded approach, as well as evidence and outcomes with legal and ethical education to guide decision making. The skills of research should be taught first and then, when the student knows something about their profession, EBP. Case study participant A declared he uses Kolb's experiential learning in combination with Dewey's constructivist learning as a framework for his pedagogy. When reflecting on what was the biggest change in the last two years regarding his EBP teaching, Case Study participant A believes the main change in his teaching is that he has found more teaching resources for research and EBP due to increased availability.

5.3.1.2 Case Study B

Case study participant B works in Australian and commenced his education in nursing before transitioning to paramedicine in the 1990s. He holds a Master of Clinical Epidemiology and a PhD. At the time of the first interview Case study participant B was a well-established PA. He had been teaching at university for nine years, had conducted randomised controlled clinical trials, published approximately 40 peer reviewed papers, and presented many sessions at conferences.

Case study participant B has a definition of EBP consistent with the Sicily Statement (Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls, Osborne, et al., 2005) in terms of expecting students are able to construct an answerable question, source best available evidence, critically evaluate that evidence, apply results to practice and evaluate the performance. He also expects the students to be able to communicate their EBP decision making process to other health professionals.

Although case study participant B has a background in nursing and paramedicine, he attributes his understanding of EBP to his Master's in Clinical Epidemiology. During his Master's studies, a leading professor acted as a mentor to develop his EBP skills.

Participant B shared insight into what students think about EBP and how it is used in the field. He believes that encouraging students to identify the relevance of EBP is critical in engaging them with research. Participant B feels that clinical placement is very influential in, and sometimes counterproductive to, EBP, but believes that students need to use EBP as a tool to cut through the confusion of what they see on road. He feels that the importance of EBP is, like other non-clinical subjects such as sociology, something students only realise later, often after a few years working on the road.

Participant B believes that relevant examples are needed when teaching EBP to paramedic students but otherwise they are no different to other health care students. He considers that a clinically and legally judicious position for Ambulance Services to possess regarding EBP and paramedics is for graduates to start with EBP based guidelines. As paramedic graduates gain experience and clinical judgment, they then have increasing autonomy to deviate from these as the evidence, patient and system factors vary.

In the two years since the first interview, participant B has attended a weeklong course on teaching evidence-based practice at Oxford University. He has indicated that he feels more confident and has developed further teaching techniques. He has changed the way

he teaches since the first interview mostly as a result of doing the Oxford course but also due to pressure from university logistics. Participant B states that the content is the same, but he is trying to use examples more "*focused to the emergency, pre-hospital space*." He stated that he was aware of the large body of published education theory but believes it can be summed up as "*adults should take responsibility for their own learning*."

5.3.1.3 Case Study C

Case study participant C is a UK based nurse who had 20 years' clinical experience in the UK and South Africa at the time of first interview. She holds a Master of Nursing and had been teaching both nurses and paramedics at university for six years. Case study participant C had published four academic papers and presented at seven conferences at that point in time.

Participant C states her development of an understanding of EBP was assisted by clinical mentors who insisted on weekly reports critically evaluating her nursing interventions during her graduate year. Case study participant C believes that "*EBP is at the core of what paramedics do*". She offered, as evidence that her EBP teaching works, that several of her students have gone on to change UK paramedic practice by performing and publishing research.

Case study participant C was already an established lecturer when first interviewed but commented she perceived that she was still developing. "*I've grown and I think I've become more comfortable in my own skills and knowledge."* She says that this development helps her "*understand the students and use the knowledge better."* She declared that "*you never stop developing in academia*".

5.3.1.4 Case Study D

Case Study participant D is a male paramedic based in the United Kingdom who was in his first year of teaching at university at the time of the first interview. He had worked as a paramedic for 15 years including two years on a helicopter-based service. He also had several years' experience as an Emergency Care Practitioner (ECP). This position requires a Postgraduate Diploma or Masters and allows an extended scope of practice of prescribing a limited number of medications, ordering x-rays and referring patients to other health professionals.

Case Study participant D learnt about EBP in his Bachelor of Science (Honours) Emergency Care practitioner degree. His mentor for his EBP education was a university supplied tutor. Case Study participant D stated that experience from critiquing papers during his BSc gave him an insight that journal articles may not be perfect even in highly rated journals. He acknowledged that paramedics have a challenge applying EBP to complex patients. Participant D asserted that he had refined his EBP practice by consulting ECP Clinical leaders who gave guidance based on experience and published research of previous similar cases.

In the second interview, participant D, when asked about what had changed with his EBP teaching, stated "*having more time to being able to read around more (sic) when teaching a topic"*. The extra time was a result of not being in his first year of teaching and therefore was more familiar with the course content and systems. He used the time by, "*looking at the evidence behind the diagnostic guidelines paramedics use such as the Wells Criteria for identifying pulmonary embolism*". This was a more sophisticated take on EBP than the simple "*Best practice*" he talked about in the first interview. Case Study participant D says he doesn't have underpinning pedagogical theory but was planning on starting a Master of Clinical Education to improve his understanding.

5.3.1.5 Case Study E

Case Study participant E has been nursing in the UK since 1973. She upgraded to a BSc (Nursing) in 1992 and a Master of Science in Health Care in 2005. Case Study participant E had been teaching nurses and paramedics for 10 years and had published two papers at time of interview.

Case Study participant E sees EBP in terms of patient safety. Her Director of Nursing pushed quality care through EBP methods and was something of a mentor in developing participant E's EBP skills. Case study participant E believes that nurses need to use EBP to be accountable and this is the same for paramedics. She started teaching EBP decision making rules such as the Ottawa ankle rule to paramedics when up-skilling them to an emergency care practitioner role around 2008.

Case Study participant E states she uses the nursing theories of the Roper–Logan–Tierney model of nursing (Roper et al., 2000) for paramedics as she feels it is transferable. Participant E was not available for a follow up interview.

5.3.1.6 Case Study F

Case study participant F is a male with more than 10 years' experience as a lecturer in UK universities. He has been a paramedic for more than 20 years with experience in training and as a specialist paramedic clinical advisor with the local ambulance service. Participant F holds a Bachelor of Science with Honours in psychology and a post graduate Certificate in Learning and Teaching in Higher Education. At the time of first interview, he had presented at conferences but had not published research.

Although he has studied various options, case study participant F does not have an underlying theory of pedagogy but uses the teaching methods he thinks works. His stated goal with his EBP teaching is to make students aware of the limitations of the quality of evidence available and that as evidence changed then best practice would also change.

Case study participant F's definition of EBP is "*using good quality evidence to support good quality care, using good quality randomised control trials wherever possible to inform best practice, then adopting that.*" He pointed out that he tried to ensure that his graduates "*have the skills and competencies in order to make use of that evidence*". Case study participant F stated that his EBP understanding was the result of his own study and reflection but with some influence from high profile science communicators such as Dr Ben Goldacre.

5.3.1.7 Case Study G

Case study participant G was in her first-year teaching at a university when this study started. She has a Bachelor in Paramedicine with five years' experience as a paramedic. She had no experience in research but had started her Honours research project before she was interviewed the second time. In her teaching she tries to produce students that have safe work practices with supporting evidence. She reported that she does not talk about EBP with first year students so as not to overwhelm them but does use guidelines underpinned by EBP.

Despite being a high achieving student and a very competent paramedic, case study participant G stated that she felt unprepared to teach EBP in her initial interview. *"It's (EBP) not something that necessarily that after university that it's drilled into your profession... I don't think it teaches you how to be an evidence-based practitioner*."

In her second interview she felt much more comfortable, and her pedagogy had developed in response to an improved evidence base and experience. She expressed a clear understanding of what she wanted her graduates to achieve in terms of understanding the evidence underpinning their practice but also the variability of the outcomes.

5.3.1.8 Case Study H

Case study participant H worked in Australia and started as a Registered nurse more than 20 years ago before becoming a paramedic through the in-service diploma education route. He has a Master's in Education and has recently finished his PhD. Participant H has been teaching at university for seven years. He had presented and published approximately 10 articles in peer-reviewed journals at the time of the first interview.

Case study participant H was introduced to EBP during his undergraduate nursing degree while his later ambulance training did not contain any EBP education. His Ambulance mentors were very protocol driven. Even at his second interview Case study participant H didn't think most paramedics were motivated to engage with EBP; "*the average ambo probably wouldn't see the point because a lot of them want to do their job and go home.*"

5.3.2 Context of the results

The goal of the case studies is to gather rich data about the preparedness of Australasian and UK paramedic academics to teach EBP to undergraduate paramedic students. The data will be arranged into themes emerging from the literature. This will then be analysed considering the available literature.

5.3.3 Definition of EBP

Case study participants provided a range of definitions of EBP. All spoke about evidence but with varying references to the steps to be taken and other factors involved. Only case study participant B, who had a formal EBP education, provided a near textbook definition involving the five steps of constructing a question, gathering evidence, critically apprising the evidence, implementing, and evaluating the impact. He drew a distinction between competing all the steps and just accessing evidence-based guidelines. Participant B

stated, "*To undertake true evidence-based practice means you have to go to the literature, make sure the evidence is sound and high quality, it's valid and it's applying that to your care*". None of the other seven participants gave a definition encompassing all the five steps of the EBP process.

Case study participant D was alone in offering a definition involving the best available evidence, the patient's values, and the clinician's expertise. He stated that EBP involved the integration of evidence, "*fit for purpose research, randomised controlled trial for example*", the patient, "*you have to consider the patient's wishes, their desires, their wants*" and the clinicians gestalt, "*adapting what we know will work in the situation of the patient in front of you, what treatment will be good and what's bad*." No other participants mentioned patient's values or clinician's judgment in their responses.

Defining EBP in terms of patient safety was a clear theme amongst three of the UK based participants. Case Study Participant E defined EBP as "*trying to practice as safely as possible"*. She went on to link this to the evidence used, "*the safest evidence that you've got from research that you can put into practice*." Quality health care was also a factor with Case Study F, another UK based participant defining EBP as; "*Evidence based practice is using good quality evidence to support good quality care".* Five of the case study participants gave a definition relating to the quality of the evidence such as Case Study participant A, "*when you do something, a therapy an intervention or an approach, there is actually some real evidence to support it. As opposed to tradition or hearsay or because you think it is a good idea*." With a similar theme, Case Study Participant D put it as, "*Evidence-based practice is practice that has been evidenced, through research to be the best method"*.

Case study participant C's definition of EBP was focused on keeping abreast with the latest research, "*It's keeping up to date with current practice, constantly researching the latest evidence on what you are doing, following not just the government guidelines but*

looking at what research is out there and about how we are doing things." She highlighted that clinical practice guidelines may have become out of date with the emergence of new evidence, "*because what was acceptable previously may not be acceptable now because the evidence may show that it actually doesn't work*."

5.3.4 Importance of EBP to paramedics

All eight case study participants were unanimous in the need for paramedic undergraduates to be educated in EBP. The four UK participants were very firm in their position that EBP is integral to being a health professional. As an example, Case Study participant C put it as, "*EBP, it is the core of what we do*". She continued, "*Everything we do is evidence based. You know, we shouldn't be practising unless we know what is the best current treatment*."

Six respondents believed that without EBP, paramedicine would be less a profession and more a vocation. Australian Case Study participants also thought that EBP was a critical component of being a professional. Case study H mused, "*There's lots of things that you need in a profession. I think that evidence-based practice is one of those.*" Case Study participant G stated, "*I think it heightens the issue that surrounds professionalism and whether we are actually deemed a profession or not".*

The theme of EBP being related to safe practice was also common among the UK participants. Case study participant E summarised it as "*evidence-based practice is trying to practice as safely as possible*". Case study C also referred to the need to change practice over time as the evidence base evolves to maintain safety, "*We recognise that what may be safe now, may not be in the future. We have to keep up with the evidence to try to continue to be safe by applying that evidence-based knowledge in practice all the time."*

The importance of EBP to practicing paramedics was substantiated by Case Study E pointing out that some UK based, post-graduate paramedics chose to pay for their EBP

education; "*we've got paramedics on our CPD programs, self-funding, it must mean something to them that they want to look at evidence-based practice*".

Case study participant A summed the importance of EBP as, "*essential to the development of paramedics as a profession*." He continued to explain his position, "*If you want technicians, you don't need it, if you want people to be thinking, self-actualised, independent practitioners then it is central along with other attributes like ethics and evaluating you own practice*."

5.3.5 Facilitators and Barriers to EBP

Five subthemes were detected in the participant interviews as facilitators or barriers to student paramedics practicing EBP. The five were, thought leader influence, access challenges, resistance from non EBP-educated supervisors, lack of relevant evidence, pragmatic reasons, and lack of engagement by students with non paramedic academics.

5.3.5.1 Thought leader influence

Examples of thought leaders being an enabling force for adoption of EBP in Ambulance services were provided by three respondents. The role modelling of EBP by well regraded senior management for making decisions and the encouragement for paramedics to do the same in clinical situations was seen as crucial in the service embracing the process. Case study participant E spoke about EBP being championed by a high-profile paramedic. She stated that he "*operated in a EBP way and by that influences and gets people to question their practice*."

Not all influences were seen as causing positive EBP behaviour. Case study participant B referred to charismatic high profile though leaders that had a significant influence on the cohort's clinical practice in non-EBP ways. He stated, "*Just because Dr X cares for patients in a particular way we think (incorrectly) that is evidence. The difference is that evidence should come from good valid studies*". While these leaders may or may not

practice in an evidence-based way the other Health care professionals, including academics follow blindly without invoking the deeper questioning in which the EBP practitioners should be engaging. Participant B also shared his observation of eminent doctors influencing the rest of the medical staff in hospitals with a bleed over effect into the paramedic's care delivery.

> *"I think paramedic students come from the view that the doctor does it in the hospital therefore we can do it in the prehospital setting, and we will be fine, but I think it's happening in hospitals as well. So even with the doctors, the reason doctors are doing it is because when they are residents that the registrar does it that way and because of registrar does it that way must be the way to do it. So, there is this reliance on both eminence-based following and also just the old "that's what they did" so they talk about in evidence-based practice as the "doers", and people are doers, and they do something because someone else that was quite senior initially showed them the way to do it so that must be right."– Case Study B*

Participant B indicated that initially he thought behaviour was just paramedic centric but later observed that medical doctors do the same things based his experiences educating both medical and paramedical cohorts. The above set of responses suggest that participants are observing considerable influence on student practice of EBP by thought leaders during clinical placement.

5.3.5.2 Resistance from non EBP-educated supervisors

Traditionally paramedic clinical actions have been controlled by protocols or the more flexible clinical practice guidelines (CPG). These provide some safety for the practitioner and patient despite not always being the optimum treatment. Early career paramedics were reluctant to go outside guidelines even when EBP detailed otherwise. They

were more comfortable with driving CPG change rather than allowing paramedics to vary practice on an individual patient basis. Participants, mainly from Australia, spoke about an inertia against variations of patient treatment from Clinical Practice Guidelines CPG by the students due to resistance from a largely vocationally trained Clinical supervisor and management workforce. This was colourfully illustrated by Case study participant H, an experienced Australian PA, "*I had a student in my office this morning because he got blasted because he took the RBG (Blood Glucose measure) before the temperature. You know who gives a flying toss? For that mentor, that was a real significant issue*." Deviation from the (CPG), which some case study participants referred to, as "*The Bible*", was often seen as substandard care by supervisors. Even for case study participants that were well versed in EBP, but mid-career paramedics, found were uncomfortable to follow EBP when it did not match CPG's when working clinically. Case Study G who had been working clinically for five years, commented in discussing variation from a CPG. *"…it's very hard because you're obviously driven by guidelines.".* UK Case study participant E observed that EBP was not universal amongst paramedics, "*it would be an assumption to say that all of them value evidence-based practice*."

Some increase in flexibility was noted by Case Study participant B. He considered that the paramedics now look for evidence when a change of practice is considered. Participant B stated, "*Over the last 5 years we have seen a shift to a resistance to change the way we practice, unless we see the evidence - now I am talking from a paramedic stance, I see that is a really positive thing."*

The resistance to student EBP behaviours by senior paramedics in the field to EBP was seen by participant A as stemming from their pre-degree era in-service training which encouraged rigid rule following. Case study participant B stated that exact recall of the Clinical Guidelines was highly valued and the attitude to deviation from them varied from

tolerance to disciplinary, depending on the ambulance service and seniority of the paramedic. Case study participant H suggested that students were allowed little leeway, "*We get our kids (students) going out there and trying something as per the evidence to do with, the use of Panadol and Ibuprofen together for example and get smashed*."

Case study participant B pointed out that as paramedic degree courses have only been teaching EBP in the last 10-15 years, there is a large cohort of otherwise very experienced Clinical Instructors and senior managers that don't have the EBP skills to read and apply the literature. He commented that this had resulted in many of the experienced ambulance service being very wary about letting inexperienced undergraduates, practice in an EBP.

Participant B observed that students, despite being well educated at university, were sometimes strongly influenced away from EBP when on clinical placement by mentors, "*the paramedics say no, no, no, that's crap, don't bother doing it, it won't work. Do it that way the way I do it*". He stated that they come back to university the next semester with conflicting ideals and the attitude of "*what you are teaching us is wrong*". Case study participant E indicated that although the clinical preceptors, known in the UK as Paramedic Placement Educators (PPEds), had a five-day mentoring program which included an EBP component, they may not have adequate EBP education to support the students. Participant E stated that "*some of the PPEds out there don't have the skills to really decode and analyse the literature*"

5.3.5.3 Access challenges

Ability to access literature and pre-digested databases for paramedics when they were on placement and later when they were employed was identified as a barrier by two case study participants. Australian based Case study participant G was concerned that all students may not have access to the appropriate IT equipment and if in a remote geographic

location, internet access. UK based Participant E thought good internet access and the challenge of manipulating IT devices while caring for a patient in a moving vehicle could be a challenging but were surmountable, "*paramedics are very good with gadgets and IT, so they will find the evidence base either on their phone or their iPad*." Participant H agreed that paramedics could do EBP while clinically active, *if they have a patient in front of them, with perhaps an uncommon problem which they don't know about, they access a literature base or pre-digested like BestBETs on their phone."* Paywall protected journals were another issue identified by participant E that could hamper EBP, "*I'm not sure about the paramedics out on the road, how many of them have access to the journals."* she stated.

5.3.5.4 Lack of student engagement with nonclinical units

Four case study participants agreed that their students were usually very focused on their clinical subjects while considering the non-clinical subjects somewhat peripheral. Case study H stated, "*You know, especially if it's not a paramedic unit, you might have a full quota of 200 for the first lecture and then it just drops down to 20*." The four case study participants found students harder to engage in the nonclinical subjects such as law and ethics, anatomy and Physiology, and EBP. Participant H continued, "*You've got to engage students to learn because if they don't see the point of it, their eyes roll back and start snoring. They'll turn up for the first three lectures and then don't see them again*."

Participant B suggested that early in the paramedic degree the students don't see the point of studying the nonclinical subjects but after some experience it becomes more relevant to them. He stated, "*I guess some students don't realise why we do things. I think, when they hit the road* (clinical placement), *they kind of see the relevance of, the social science subjects*". Participant B also linked the lack of perception of importance with lower student satisfaction with those units, "*they get an idea that it is a waste of their time and you always get very poor reviews for those subjects*". Participant D shared a similar statement

regarding the lack of perceived important of the nonclinical units by the students, "*We try and tell them why we're teaching it and have diagram at the beginning, saying this is why we do it all, this is how it all fits together. But, I don't think they get it, until too late*."

5.3.5.5 Variation in Paramedic students learning engagement with EBP

The case study participants provided mixed views on the theme of paramedic students being different to engage in the teaching processes of EBP than other health care students. Case study H observed that the teaching experience can be somewhat adversarial if the paramedicine students don't warm to the academic and linked this to early identification with the paramedic culture.

> *Nurses don't identify with a culture until they actually graduate into the workforce. Whereas paramedic students, I think, identify with the culture from day one of the degree. Some of the teachers in other fields like pharmacology etc. hated having students, especially the double degree, nursing and paramedicine, because they hunt in packs and go straight for the jugular. They're not backwards in coming forwards. They (non-paramedic academics) say look we're not used to these paramedic students. If paramedic students don't like something, they will let you know in no uncertain terms whereas other, you know, medicine, nursing and other allied health students are a bit more tactful. – Case Study participant H*

Three of the case study participants reported that paramedic students seem to be strongly influenced by early clinical placement and conform to the on-road culture. Case study participant H stated,

> *"You can start seeing the culture coming about after the first clinical placement, they're talking about, this job was a waste of time, and that patient was a*

nutter, and this is a rubbish job, and you're thinking, yeah, you've been here for what two months?"

Case study participant H believed the attitudes were a result of paramedic students embracing the paramedic ethos, "*they're assimilating their culture*". He observed that it was quite distinct from nursing students who "*don't identify with their profession until they're in the workforce*". Participant H observed, "*I don't know whether our students expect to be treated just the same as a qualified person on placement whereas the nurses take more of a visiting role on clinical placements.*" He also hypothesised that the paramedic culture was being transmitted by the sessional staff who were mostly clinically active paramedics, stating "*we have a lot of industry involvement in our courses, tutors and they bring it with them, the culture and the language*." Case study participant H linked this to the student focus on trauma and acute illness over the more commonly encountered chronic illness and social problems. He outlined that, "*they have a totally unrealistic expectation of what ambulance work is all about and that pretty much marries up with ambulance culture too."*

Case study participant B saw the same sort of resistance to teaching EBP to paramedic and other health profession students when they had been exposed to the work culture.

"I thought that was just related to paramedics but it's not it's related to medicos as well and I base that on teaching to an evidence-based practice emergency medicine research course for advanced trainees, these are brilliant people, incredibly smart, they are doctors. Yet they haven't had that much exposure to evidence-based practice or research methods so they are not unlike a paramedic student" – Case Study B

Case study participant B expressed his view that individuals who show an interest in this area are different to the majority of students. He believed that health care students that fully engaged with EBP and research subjects were "*different from the start*". These students begin their degree "*with an inquiring mind and from day one they're interested in research, interested in, the evidence, literature*." He thought they were "*different to the other ninety percent of students, in some way*". Participant B reported thinking that they "would be higher achievers ultimately". He tried to nurture that interest in these students because. "*They are the ones that go on to do post graduate studies, change protocols and become academics*." The university that he worked in had attempted to nurture this talent by employing the gifted students on short research projects over their semester breaks.
He suggested an area of further research on student paramedics, framed by his comment that "*assessments of perception of evidence-based practice or perception of role of research would be really interesting. Because I think they're different."*

Case study participant C stated that "*I enjoy teaching paramedics; they are very eager to learn.*" She believed that this was due to especially for people who were already working in the industry upgrading to the paramedic degree qualification. She stated, "historically they haven't been given as many opportunities to advance their careers. Suddenly there has been a lot of investment in their careers." Participant C whose initial degree was in nursing stated, "*I find sometimes nurses take a lot for granted and also they just accept knowledge, not very keen to go out and get for themselves*." She contrasted this with her experience with paramedics, "*the paramedic students, they are so eager to learn that if I say go out and research this, I get pretty much most of the paramedic students will go and look it up and respond*."

5.3.5.6 Lack of student engagement with non paramedic academics

Two of Australian respondents related a lack of engagement of paramedic students with non-paramedic academics teaching EBP. Case study participant H stated that sometimes there is lack of respect from students for the non-paramedic staff despite having equal or superior academic qualifications and research output to paramedic trained lecturers. He observed that students questioned the competency of academics when they didn't use paramedic examples in their teaching. "*It's not actually from a paramedic point of view. They're thinking, well this person is not a paramedic what do they know?*" Participant H indicated that a compounding factor was that the paramedic academics tended to move into the clinical areas because although they could teach both clinical and non-clinical, the non-paramedic academics needed a workload and were restricted to non-clinical subjects such as research or evidence based practice. "*From the two universities, that I've worked at, it wasn't a paramedic who taught evidence-based practice, it was the non-paramedical people on staff that have research outputs and PhDs*".

Case Study Participant H indicated that non paramedic academics could successfully teach EBP to paramedic students but they "*need to make it relevant; you need to use paramedic examples*." Case study participant B agreed that it was not essential to be a paramedic to teach to teach EBP to undergraduates. "*You don't need to be a paramedic to teach EBP but it helps with the examples and engaging the students".* However, he identified the importance of understanding current practice, "*understanding the job and, and having an appreciation for what paramedics do*". Being up to date with current practice was also an issue "*we have a genuine pharmacology subject that's taught across all different degrees, but we have someone there that doesn't really understand paramedic practice and they're still teaching things like rectal diazepam. That went out 15 years ago*."

Case Study Participant H stated that non-paramedic background academics needed to understand the paramedic ecosystem to best teach paramedicine students. He stated,

> *"I don't mind, other disciplines getting involved as long as they are willing to learn about the profession, learn about what paramedics are all about. Learn about culture, learn about what our students are doing out on the road (clinical placement), and not teaching from their perspective as if they don't have understanding, if they don't care."*

Case Study Participant H colourfully described the need to using appropriate examples when teaching paramedic students. He stated, "*unless paramedics see it's relevant to them, personally. I think, they're, they're just going to switch off*". Participant H further observed that,

> *"paramedics [students] seem to identify with the culture from day one of their course if you don't make it relevant to paramedics they are going to switch off and they are going to hate ya [sic]. They're pack animals, they'll go for the jugular."*

Most (six) of the case study participants expressed that understanding of the paramedic profession, the challenges they faced and the conditions they work under was critical to teaching paramedic students. The consensus was that you don't have to be a paramedic to teach EBP to paramedic students, but you must use relatable examples for paramedic students.

5.3.6 EBP Pedagogy

5.3.6.1 Theory

Despite most of case study participants having more than ten years of experience teaching at the tertiary level, not all were able to describe their underlying theory of

education. Many had put considerable thought into the process, but some felt their method did not fit the main classifications while others had only limited exposure to education related to pedagogy. Existing knowledge of theory was presented by case study participant A, a very experienced academic, "*I use Dewey's Constructivism, a form of constructivist learning. It is the one that integrates, I think, it's a combination of Kolb, and Piaget*." He outlined his understanding of the theory, "*It is an experiential learning type thing. You apply, new knowledge to previous experience, so it has, has meaning."* Participant A explained why he adopted the concept, "*I had to think about what sort of theory I was using once, and I looked at all the theories that were around and I thought that was the one that was appropriate for what I was doing*." He emphasised that, "*I didn't do it the other way around. Have a theory and then make it apply to the task*".

By contrast, case study participant B, who was also a very experienced academic with a paramedic background, had little respect for learning theory.

> *I have an issue with theory. Oh, I just think they're a bit w**ky. You know, like adult learning theory there's probably books on it that have hundreds of pages that essentially say, grownups should be able to take responsibility for their own learning and I'm sure they include lots of diagrams and circles that, that cover off each other and yep. Uh, I just think it's a w**k. – Case Study B*

He continued to explain they he had some sympathy for Andragogy as a concept but disclosed that he lacked comprehension, "*I always talk about adult learning as a theory that I subscribe to. I probably don't really understand what that really means. But I do think people are responsible for their own learning*." Participant H also was a supporter of andragogy over pedagogy, "*I prefer the term, andragogy which comes from Knowles, where it's actually teaching adults, actually getting adults to get more involved in the process using*

other aspects apart from just a lecture type scenario." While Participant H conceded that there was always going to be some elements of didactic instruction he tried to "*actually integrate lectures into online activities, problem solving, problem-based learning, scenarios, and simulations so they can actually learn by doing.*" He also acknowledged using reflective models to guide his teaching, "*you've got Kolb you've got Gibbs, you've got Johns, all those different types of reflective models that we use to reflect on cases*."

Case study participant F divulged that in terms of underpinning theory of teaching, he was "*quite sort of eclectic in how I approach it*." He struggled to name one and stated, "*it's some years since I've looked at teaching theories and I suppose I just adapted what works. I'd have to revise and look at the theories to be conscious of a particular model*." He also confirmed that he taught reflective practice but was sceptical of it. Participant F shared, "*I'm a little bit sceptical about it because I, think it views all aspects of cognition as being, capable of being inspected through a conscious reflective process and I don't think that's the case.*" He continued his commentary, stating that, "*I think a lot of what happens, a lot of what we do is based on heuristics but operate below the level of conscious control from a human factor type perspective*".

Case study participant C found it difficult to classify her theory of teaching, "*I would assume I would be using adult learning theory."* She explained that a lot the theory underpinning her teaching was "*about integrating practical teaching with knowledge and evidence. So it's sort of threefold. We're not just doing andragogy*."

Case study participant E, an experienced UK academic used a theory adopted from another profession, remarking that "*we use nursing theories and I think those are probably the ones that I still apply when I'm teaching paramedics*." She identified the Roper-Logan-Tierney Model (Roper et al., 2000) as a main nursing theory that "*we can transfer that into the paramedic program because it's still the same, it's still the patient.*"

Participant G explained that her teaching was *"very much based around, adult learning and peer to peer reviewing*". She stated that student-to-student feedback was important as self-reflection as well as peer development as "*they're often all treading the same path in their knowledge gaps.*" Case study participant D disclosed he did not have a theory of teaching but was looking forward to studying a Masters in Clinical Education.

5.3.6.2 Progression of EBP teaching

All case study participants at follow up, provided examples of how their teaching of EBP altered over time due to 'best practice evidence' influencing the profession of paramedicine. Case study participant G stated how her teaching developed with a change in evidence, "*I think my teaching based on current research relating to how and why we do things, particularly certain reasons for giving certain drugs."* She recalled a relevant example outlining, "*the research that was done several years ago on the effectiveness on compressions versus ventilation in CPR. These studies then changed the way we conducted our practice and so we had to learn a completely new approach."*

Some case study participants described changes in themselves over time. Case study participant C, who had been lecturing for eight years at the time of the interview declared, "*I have changed, as a lecturer over time, I've grown. I think I've become more comfortable in my own skills and knowledge*." She felt that this had "*helped me to branch out and understand the students and transfer the knowledge better*."

Case study participant B described how he endeavoured to increase the amount of EBP inserted in his teaching. He stated, "*I suppose that the biggest change, was to try and embed evidence-based practice more broadly. The thing I tried to do is to use more case studies to illustrate the value of evidence-based practice*." Participant B stated that they change was based on feedback from students that he was too abstract, indicating he "*tried to*

sort of make it more concrete. It's a conscious decision really to try and contextualise it and make it more, real world relevant."

Case study participant D commented that "*I think I've developed in my desire and in my ability to teach EBP. I was already trying to develop my ability to teach evidence-based practice, but I'd say I've further developed*". He had been working clinically in a walk-in medical centre in the time since the first interview and used the patient cases he saw to direct his self-education. Participant D described his development process as, "*I see something that I've not seen before, then I do a little bit of reading around the topic.*"

Participant D explained that the Health and Care Professionals Council, UK changed the standard of proficiency for paramedics and hence their scope of practice, but he felt that expectations from stake holders had also altered. He stated, "*I think the expectations from the public and from other health professionals has changed*." He continued, "*rather than going to the scene, picking somebody up, and taking them to hospital, now the scope of what people think we do and what people want us to do has changed*." Participant D referred to a change in availability of out of hours' General Practitioner service, which has put more pressure on paramedics, "*on the front door of the health service*." He saw that as one of the 'best practice' drivers for paramedics needing to be better at triaging patients safely, "*you can't keep putting the same number of people through the front doors of the hospital. We need to keep them away from the front door*."

Case study participant B had attended *Teaching Evidence-Based Practice,* a short course at Oxford University in the time between interviews. He stated that as a result his EBP teaching had changed, "*I'm still presenting the same content but I'm trying to make it more focused to the emergency, pre-hospital space."* Case study B stated, "*students, don't want to be doing it and they particularly don't want to be doing it if they don't see it as being relevant to what they're studying*." He also remarked "*I've changed some of my methods*

based on some of their [Oxford] *teaching*." Participant H explained he no longer used, his university's standard template for PowerPoints outlining that, "*I use a whole range of different ones to try and keep people interested*." He described how he, "*never ever used to use, pictures and little funny pictures and things. Whereas now I do. I'm always trawling Google images just to try and make it a little bit interesting and keep people's attention*." Participant B also described that he used electronic classroom response systems "*to do real time quizzes in class with clickers, it's brilliant. I've been using that a lot and the students love it and, it creates valuable discussion that gives you a break from talking."*

5.3.6.3 Signature Pedagogy

The question of existence of a signature pedagogy for paramedics was posed to the case study participants. Case study H stated that paramedicine need a signature pedagogy, but had not yet achieved it, specially outlining "*I think, if they we going to be taken seriously, we need to definitely develop one. I don't think we actually have one, I think we're working towards it, but I don't think we can actually say we're there*."

Case study participant B was also supportive of the development of a signature pedagogy and that we had not attained it yet. Participant B noted, "*the development of a signature pedagogy is part of the journey we are on but no, not yet*." He did state that "*it's probably a multistage thing starting with theory, then skills, then beside the mannequin, and finally translating that to the clinical placements with what we used to call, the bonnet discussion".* He explained that the bonnet discussion occurred after handing over the patient at the hospital, while leaning across the bonnet of the old-style ambulances, talking with your clinical instructor. Case study B added that it didn't quite happen that way now "*unfortunately we don't have bonnets anymore that we can lean on but it's still a post-case debrief*."

Case study participant G also gave support that paramedic pedagogy involved staging the development from pathophysiology and individual skills, then to in practical labs and finally clinical placement as third person on an Ambulance. She stated, "*you learn the pathophysiology in one subject, see demonstrations of how to practice the skill then you go away and practice the skills in isolation, then put it together in a simulated environment.*" Participant G added that students later participated in clinical placements, "*actually see it in field and then come back and see if you can relate it back into your scenarios*." She came to a similar conclusion to the other participants stating, "*I think it's still evolving*."

Case study A was unsure if what paramedicine was doing was different to other health professions or even other degrees as different as engineering. He stated, "*our signature pedagogy is much like other health professions with lectures, tutorials, simulations and clinical placements*." He reflected that some of the points of difference from other profession was the "*the rarity and unpredictability of true emergency cases, that paramedics usually operate in teams of two and the lack continuity of care in that most patients are only seen once for about an hour*." He shared his opinion that the consequence of this is that we rely heavily on "*simulation and then debrief of rare but critical incidents*". Case study A also suggested that the signature pedagogy could be seen in the architectural design of paramedic departments with a "*heavy focus on simulation areas*".

5.3.6.4 EBP Curriculum Design

All of the case study participants supported the concept that EBP should be themed through an undergraduate course with integration into all subjects. However not all had a standalone EBP unit. For example, case study participant B described his curriculum as having EBP themes through the course, outlining how "*it is embedded really broadly so we don't have a discrete subject on evidence-based practice. What we try to do is embed it throughout the program*." Other respondents such as case study D were supportive of also

having a standalone EBP unit in the first year of the program. Participant D stated that "*In year one we talk about different types of studies and trials, descriptive statistics, hierarchy of evidence and levels of evidence, and critiquing literature. It is very basic but enough to get them by."* There was support from Australian participants to put a dedicated EBP unit in second year and a research unit in third year due to the lack of insight as to the significance of EBP in first year. Case study participant H stated, "*I don't think they recognise the importance behind EBP until they hit the road and then you know."* He was certain that EBP needed to be themed through all the subjects but felt the evidence was equivocal about the position in the course. Participant H highlighted how he thinks *"there is a lot of evidence out there that we need to embed EBP into the curriculum. Some people say at the end and some people say it's got to be at the beginning up front."*

The integration of EBP into Capstone units in the final year of the degree was also well supported. Case study D gave an example of the third-year unit he was teaching into, the learning task was to write a letter to the health minister suggesting a change in practice about an issue they have come across. He stated the students had to "*see where it fits into the current clinical practice guidelines or practice and support it with evidence*. *Of course, that requires the students utilise skills around literature searching, knowing where to identify where to source information, and critiquing articles.*" He further explained that they needed be able to summarise the evidence and communicate it a concise way, concluding that "*it is what you need to be able to do as health professional*."

The importance of integration of EBP across the curriculum to support its significance was highlighted by Case study participant B. He stated.

> *"The trouble is, if it's only you and I talking about EBP when we say it is incredibly important for any healthcare professional when they come across the other six people that are teaching them in their other six units that don't mention it*

or say oh that's rubbish then it undermines EBP and that's why it's important to spread and theme through all the years and all the other units. But if we'll talk the same talk then it is okay."

A spiral curriculum that builds on itself was advanced by participant A. He stated that the curriculum needed to be "*build up to the point we can do evidence-based practice by constructing a basis for it. Initially you talk about ethics and law then you talk about evidence-based practice and research.*"

While integrating EBP across a curriculum was universally supported by the Case study participants, Participant H pointed out that a dedicated EBP unit was not universal across other health degrees at the university which he teaches. He stated *"a lot of other degrees here at* [his university] *in the health sphere don't actually teach evidence-based practice. It's embedded in the subjects but it's not a subject standalone whereas we* [paramedicine] *have a standalone, evidence-based practice subject."*

This set of responses firmly supports embedding EBP though all the subjects in a Paramedic degree. A dedicated EBP subject was also well supported but with heterogeneous optimal timing suggestions.

5.3.6.5 Assessment

All four UK case study participants discussed using portfolios, Essays and Objective Structured Clinical Examinations (OSCE) to assess students' mastery of EBP. Case study participant C described how she used OSCE to assess analysis of a clinical case using EBP principles stating that, "*we give them a scenario with a standard patient* [an actor playing a patient]." She continued with the scenario presentation example, detailing that "*an asthmatic who's got an ankle injury, students have to actually assess the ankle injury, then describe what sort of treatment they would give them*." Participant C then described what she felt was the critical part of the EBP assessment;

> *"They need to remember, in inflammatory conditions you would give ibuprofen, but ibuprofen is contraindicated in asthmatics unless they can take it, so that's where the evidence comes in that they've had to have read this up, and that's where we're analysing a little more exploration of the evidence than just you know, knowledge and understanding."*

Case Study participant E discussed that her role as a senior PA was to develop the PA team to think more academically. She gave an example of a third-year practice subject that had an Objectively Structured Clinical Examination (OSCE) and a theoretical assessment. She described that at the beginning of the year when she was managing the subject the OCSE went beyond 'what were the eight reversible causes of cardiac arrest' as it also required students to understand the application of this knowledge into other settings. She stated, "*it wasn't just what are the four H's and the four T's? It was, how are they applied into A&E, into ICU, into coronary care in relation to your patient?*" She continued to remark that later in that academic year, another PA had managed the subject and they have pushed its focus to include more practical knowledge and less of the higher order thinking. She commented that "*they made it much more clinical practice and, that is my challenge because they will run away with modules and hide these modules [subjects].*" She then described trying to stop the loss of higher order thinking from that part of the curriculum. This was exemplified in her response that she, "*sent an email saying, before you write any guidelines for the assessment, could you share it with the team*?". She revealed that the new PA were required to undertake teaching courses "*but change is slow*".

Case Study participant E described how certain OSCE assessments were performed by the paramedic tutors, who are experienced paramedics that mentored students on the road but were not full-time academics. Participant E stated, "*They're experts* [paramedic tutors] *in critical care, they are there to assess the skills and to make some sort of verbal assessment*

of the clinical reasoning." Participant E continued, "*I was sitting with the paramedic tutor and his questions were only around the practical management. He didn't draw out the evidence base that underpinned the management of this asthmatic patient that had a cardiac arrest*". Participant E stated that she had to intervene and ask the student questions assessing the higher-level comprehension and application of knowledge, "*I'm the only academic there and I had to push in! Where were the decisions in relation to the evidence base?".* She revealed that this was brought up in post assessment moderation and as a result, subsequent OSCE will be altered and staffed by academics that had transitioned from professional service into academia.

Case study participant C then noted her underpinning framework for assessment, "*Bloom's Taxonomy, have you heard of it? It's fantastic stuff in terms of assessing, you know."* She indicated that she aimed to assess the higher order thinking, "*During clinical placement students log ten clinical cases. Later they write up the assessment and care with the evidence to support it. Finally, they write a 1500-word essay which critically analyses the care in light of best available evidence.*" Participant C suggested that this enabled her to exam the analyse and evaluate levels of Bloom's Taxonomy by applying EBP skills to an actual clinical problem that the student had attended.

Many participants stated that they had essays that required the students to assess the evidence base or a paramedic intervention. Some also required their students to write a mock proposal for a change of clinical protocol to their ambulance service's medical committee. - This would assess 'create', the highest level of the taxonomy. Participants D and C of the UK based case study participants used portfolios of work where the student reflected on their use of EBP often using Gibbs Reflective Cycle (Gibbs, 1988).

5.3.6.6 Achieving graduate outcomes

All participants referred to their students passing university-based assessments as evidence that they were achieving their goals of producing EBP ready graduates. Some participants were also able to refer to other evidence validation of graduates achieving EBP competence. UK Participant C stated that "*seven students have actually published"* in academic journals and participant D referenced a graduate that had a UK National Clinical Guideline changed though his efforts. Australian participant G relied on feedback from employing ambulance services as an external indicator of success of EBP education. Australian experienced participant A indicated you couldn't be sure graduates were EBP ready unless you, "*come back a year later and see what they've done in the intervening year*." He was able to name some past students that had gone on to academic roles and posited that as evidence that those graduates were EBP competent. The pattern of responses suggest that participants generally relied on university-based assessment of EBP competence but regarded real world success utilising EBP as a higher level of evidence.

5.3.6.7 EBP integration in practical units

All case study participants were in strong support of EBP being incorporated into clinical practice and clinical placement subjects. Case study participant H explained that EBP needed to be integrated into clinical practice units to highlight the importance and significance of the process. He stated, "*You look at the whole, epidemiology, ideology. how many people get this disease or disorder, how often does it occur and, you bring that sort of evidence into to try and make it relevant for them*." He explained that the paramedic students were usually interested in the infrequently used advanced skills and, rare major trauma while not engaging with common clinical problems. He described that paramedic students, "*just want to be putting intravenous cannulas in and decompressing chests; they don't want to be doing elderly falls*." Participant H then stated that their attitude could change when presented

with more information. He provided an example involving educating students about elderly people who had fallen, stating that "*you start to talk about this as the number one case you are going to get called to, the evidence suggests this treatment is effective, this presentation is going to be a big part of your work*." Participant H then shared that this transition in thinking was when some understanding of the actual work of the paramedic profession and importance of EBP occurred. He shared the comment that, "*You see the light start to go on, the eyes start going, oh really? Then they go on clinical placement, and they get to attend those cases. So very much yes, integrate the evidence with practical experience*." Participant H further stated, "*that is what we really emphasises is our reason for being*". He reiterated the importance of students acknowledging the relevance of the non-clinical subjects in the clinical theory and practical subjects through his reflection that you cannot, "*look at pharmacology or evidence based practice in isolation, they* [students] *can't fit it together if you don't make it relevant and it's not integrated enough, they're going to switch off*."

Participant H shared an example of bringing EBP into practical classes, sharing the following scenario of the possible circumstances regarding an elderly person who has fallen at home. He outlined that, "*you've got polypharmacy, environmental, cardiac, sepsis, etcetera. All the different things that get recorded as the reasons for the fall*." After participating in this scenario, he further explained that the students were directed to review academic literature on the epidemiology of falls in the elderly at home. He commented that if you cover EBP in isolation it does not engage the students but had to be blended into the practical units to, "*make it more relevant".* Participant H stated that students need to be told, "*hey guys you need to take a lot of notice of this because this is a lot of your work, not blood, guts and lights and sirens. It's old people falling over*". He stated that next class he would get them to participate in a similar scenario where they could put their newly acquired knowledge into practice and do, "*a really good investigation*." However, in this scenario

there is, "*something a bit more sinister to that case than just an old person tripping and falling over*". He highlighted that, "*this time they can assess the patient with the knowledge of what is common and what is potentially fatal."* The second scenario was set up so the students can assess the patient correctly, detect the underlying medical problem, treat and transport the patient with a good outcome at the end.

Case study participant D discussed using EBP underpinned assessment criteria such as the Wells' Score (Wells et al., 1995) in the practical assessment of respiratory distress. He related that this would be delivered in a lecture and then incorporated into a scenario in a later practical session. Participant D stated that, "*Paramedics don't have the blood tests and CT scans to aid the diagnosis so things like the Well's Score help make safe decisions on what to do with a patient*."

Case study participant C talked about incorporating evidence into the treatment pathways for patients. She gave the example of using a patient that had suffered a fracture of the scaphoid bone. Participant C stated that she gets students to, "*assess a scaphoid injury and then look at all the evidence and studies that support the best treatment for scaphoid injuries*." They then formulate a treatment plan for that patient. The rationale behind Clinical practice integration was summed up by Case study participant B, *"People, people learn better when they can actually put into practice what they're trying to learn"*.

5.3.6.8 Constructive Alignment

Six case studies indicated they had 'constructive alignment' (Biggs & Tang, 2007) in their paramedic courses. Case study participant A stated that the units in the paramedic degree into which he taught were planned with constructive alignment principles so that "*assignments are aligned with the learning outcomes we are looking for, the teaching is aligned with the assessments, so it all aligns together*." Case study C described the process that her team used to validate the paramedic degree units stating that "*It is about identifying*

what the students need to learn from our course, how we assess that and what kind of activities do we need to prepare them for this." Participant B also defined the process he used when designing paramedic units outlining the use of "*a number of outcomes around evidence-based practice and we test for their understanding of that with assignments."* He extrapolated further by highlighting an expectation that*, "in all clinically based assignments, there will be a critical discussion of the evidence used in decision making around those particular interventions*." This set of participant responses reinforces the commitment to constructive alignment amongst the sample group.

Three of the UK participants pointed out that constructive alignment of their student outcomes, assessments and teaching activities was part of the validation of degree programs. Some of the case study participants were actual performing constructive alignment while not knowing the term for it and realised an awareness of the process following explanation of the term. Case study participant D displayed his unfamiliarity about constructive alignment process by insisting that, "*we have learning outcomes in our module handbook, and we achieve those*". This demonstrated a lack of constancy around their understanding of constructive alignment and actual use by some PA.

5.3.7 Outcome goals for EBP graduates

The ability of paramedic students to perform the five steps of EBP, defined by Wilson et al. (2021) as Ask, Acquire, Appraise, Apply, and Evaluate, was a goal identified within all of the case study members interviews. Participant B stated that he wanted, "*the students to understand where evidence-based practice fits into their clinical practice and the importance of it*." He further commented that the students should not be in a position where they had to "*take on practice based on somebody else's word but to be able to go away and, find the relevant literature and critique it themselves and make their own decision*." This professional autonomy of was echoed by participant D who wanted to give paramedic

graduates, "*tools to be able to look at the evidence, make a sound judgement on the quality of that evidence and how it might apply to them. It's to make them independent learners and independent practitioners*." Case study participant F expressed a goal that the graduates should apply critical thinking to accepted practice and be agents for change. He opined that he wanted students to, "*challenge their practice educator with new knowledge and evidence…in a good way so that they will be more sceptical and be more willing to challenge current thinking*." Participant H flagged that graduate may have some challenges to implement EBP in the workplace due to entrenched attitudes when he stated, "*I don't think evidence-based practice is being really ingrained into the paramedic culture*."

Graduate awareness of the structure needed to safely implement EBP was outlined as a goal by participant A. He discussed how graduates need to have *"a scaffolded approach, where things like ethics and legal issues in terms of negligence and legal responsibilities to patients and liabilities put their practice into context."* Participant A further outlined that he wanted the students to understand that "*paramedics are not some sort of god, they are answerable to society at large. And the institutions that society has put in place to protect itself."* Case study F shared that graduate need to understand the clinical and practical significance not just theoretical significance of EBP. He stated that, "*graduates need to be developed by providing a basis for EBP, a reason for it, an importance for it and the tools with which to do it."*

Case Study Participants consistently outlined they expected that graduates would be able to perform the five steps of EBP. They wanted the students to be able to construct an answerable question, find and access the best available evidence, critically appraise the evidence, integrate the appraised evidence with their own clinical expertise and evaluate the results. Participant F spoke about graduates performing the first step in EBP, stating that, "*Forming an answerable question is something that should be happening often in the*

assessment and treatment of patients when in a clinical setting". Responses presented reinforced how the second and third steps involved finding and critically appraising the best available information. For example, participant A stated that he wanted his graduates to be able to, "*read the articles, and evaluate the quality of the research design and the worth of the evidence*".

In a similar theme, case study F stated he wanted to produce graduates that are "*information literate and know how to utilise databases, read and critically appraise the literature, and make an assessment of the quality of the literature*." This was echoed by case study G when she remarked, "*students need to be able to find and understand the literature*". Case study D alluded to the importance of understanding by outlining his goal was for graduates to able to "*read between the lines in these papers and work out the validity of their evidence*". Case study B reported that he expected his graduates, when faced with an unfamiliar patient condition, to be able to, "*come up with an answerable question, find evidence, assess that evidence and come up with some sort of synthesis as a healthcare professional*". He added that while he didn't expect them to be, "*doing randomised control trials as a chief investigator they would be able to defend their actions if questioned by a doctor in an emergency department about why they're doing a certain type of practice."* The goal of being able to implement the final step of evaluation of the effect of applying the best available evidence was referenced by case study A when he opined that he wanted to produce practitioners that can, "*evaluate their practice with aim of improving it, making it more effective*." He also stated he wanted his graduates to be able to, "*adapt their practice and to argue for a change protocol if needed."*

The six case study participants were pragmatic with their perception of their success of producing graduates competent in EBP. Some were confident in their ability, especially in small groups to identify learners having problems in lectures. Case study participant C, who

teaches in smaller groups stated "*in the first lecture I try to suss out the group, so then I can identify if there is going to be learning needs. I try to pick out those who are going to need tutorial support".* Participant C found that the formative assessments midway in the subject were particularly valuable in identifying under achievers. Specially commenting that students may *"appear very confident, saying all the right things but when you actually put them in a formative, they fall down to pieces."* Participant G was also unsure of the competency of the graduates when she stated, "*I don't know how necessarily well prepared they are for translating EBP into the field and dealing with the pressures of the environment as well*." Comments of the participant revealed a consistent refection regarding pursing specific goals to facilitate student success in developing their EBP.

5.3.8 Paramedic Academic readiness to teach EBP

All the case study participants discussed confidence in their own ability to teach EBP however this was contrasted within their commentaries pertaining to a lower level of confidence in other PA's capacity to teach EBP. It was reported by case study participant B that some PA did not possess the required knowledge to teach EBP*," I don't think they have the necessary skillset themselves to do it".* He explained that PA who graduated with a paramedic degree in Australia before around 2010 may not have studied EBP in their undergraduate curriculum, specifically commenting that, "*I doubt it would have formed part of their undergraduate programs or their training to date*." He continued that, "*evidence-based practice is relatively new within our discipline, so unless people have specifically gone out and sought education in the area, they're just in that cohort of people that missed out*." Participant B stated that PA with a lack of EBP education, usually chose to emphasis other topics in their teaching, highlighting their perception that they may not be "*comfortable with evidence-based practice themselves, so if they have a choice of either focusing on that or focusing on something they're comfortable with around their skills,*

they'll probably chose that." He noted that PA who had completed the previous Master of Emergency Health offered by his university, did not access EBP education, and depending on the topic it was not considered in their PhD. He remarked that at his university there was "*a cohort* [of PA] *that would have just missed any training in evidence-based practice and are now coordinating units*." Participant E also commented about the preparedness of early carer Academics to teach EBP. She shared that "*they've got professionalism, it's the understanding of the academic world and EBP that is lacking when they first come in. Their PowerPoints don't have one reference on them, they avoid the evidence and focus on the flashy clinical things*." She revealed that the applicant pool for teaching positions was not large, "*in the UK there's not a huge supply of paramedics that have a degree and experienced in academia."* Participant F commented that PA's varied in their areas of proficiency, "*academics are very smart people and have various areas of content expertise but if it's not evidence-based practice and research methods epidemiology then they may not have the skills."* He continued that PA were open about the variations, "*In my department there are several people with EBP skills, and we can very effectively teach that, but there is some that don't and will openly say to me they don't have those skills*." The participant responses taken as a whole, show a confidence in their own abilities at teaching EBP and an acknowledgement of the variance in the population of those skills.

5.3.9 Summary

The eight case study responses represent a rich stratified sample of the PA workforce in the UK and Australasia with a range of academic experience, qualifications, professional background, country of practice, and gender. A variety of definitions of EBP were collected but all centred on using the best available evidence to provide safe and effective patient care. EBP was seen as central to both paramedics being a profession and community confidence in their work as health care providers. Resistance from non-university educated supervisors,

access to sufficient evidence in a timely manner, and student engagement with nonclinical units and non-paramedic academics were seen as barriers to EBP learning for paramedic undergraduates. A perception was present that paramedic students that engage fully with EBP may be different from their peers prior to entrance to the degree. Most respondents were able to cite the learning theories they used with Dewey's Constructivism, Knowles, Kolb, and Piaget being referenced as well as a nursing model of care. All respondents felt they had developed in the two years between interviews. The question of a paramedic signature pedagogy had wide support, but consensus varied as to the progress toward that aim. A spiral curriculum with a EBP taught in a dedicated unit but also themed through the course had consensus support. Assessment usually took the form of essays and OSCEs, while the use of EBP specific tools use was not identified amongst the respondents. The integration of EBP with practical clinical experience was also supported with acknowledgment of some implementation challenges noted. Widespread commitment to constructive alignment of assessment and learning outcomes was noted. Student EBP related outcomes involved attitudes, and skills of the five steps of asking a question, searching for best available evidence, critically apprising that evidence, implement the findings, and evaluating the result. Participants had good confidence in their own ability to teach EBP but thought that the skill level across the PA faculty varied.

5.4 Discussion

The goal of this section is to interrogate the data obtained from the eight case study participants and contrast resultant findings with the available literature. While there is a paucity of published research dealing specifically with EBP education for paramedics, there is a considerable body of work focusing on other health care professions. The themes presented in the data will be discussed below with a final summary considering the preparedness of paramedic academics to teach EBP.

5.4.1 Definition of EBP

To enable a common understanding of a topic a shared definition is vital. While all case study participants were able to give a definition of EBP these varied considerably. Only participant A gave a definition involving the best available evidence, the patient's values, and the clinician's expertise. His commentary was consistent with a much cited definition of EBP by Sackett, Rosenberg, et al. (1996, p. 71) that stated "*Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients*." The participant response is also close in meaning to the succinct definition presented by Straus et al. (2018, p. 20) as "*Evidence-based medicine (EBM) requires the integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances*." None of the other participants mentioned clinical gestalt, patient values or circumstances. Omitting the patient in the working EBP definition puts at risk the ability to incorporate accurate patient preferences in the decision making process but also the ability for the patient to form informed preferences during the evidence-informed deliberations (Hoffmann et al., 2014).

Only participant B gave a definition encompassing all the five steps of EBP first described by Cook et al. (1992), refined by Dawes, Summerskill, Glasziou, Cartabellotta, Martin, Hopayian, Porzsolt, Burls, Osborne, et al. (2005), and abbreviated Wilson et al. (2021) as Ask, Acquire, Appraise, Apply, and Evaluate. These five steps were endorsed as core competencies in EBP for all Health Professionals in a Delphi survey encompassing 36 countries including the UK, Australia, and NZ (Albarqouni, Hoffmann, Straus, et al., 2018). Six participants included the Acquire phase and all participants described the Appraise and Apply steps whilst most neglected the Ask and Evaluate stages. The omission of crucial elements of basic EBP steps is concerning and may point to a lack of content knowledge. This is plausible as the participants had varying EBP education and experience. A deficit of

content knowledge would impact negatively on their ability to effectively teach EBP (Carlson et al., 2019; Larsen et al., 2019). A lack of EBP knowledge has been identified as a barrier to implementing EBP by several studies in health professionals (e.g. Hisham et al., 2016; Veziari et al., 2021; Zanaridah et al., 2021). The first three steps - Ask, Acquire, Appraise - were included in the definition given by many of the case study participants perhaps as these are the domains that can be most easily practiced in the coursework setting of an undergraduate degree (Lehane et al., 2019; Murphy et al., 2018; Thomas et al., 2011). However, confusion on the definition of EBP and hence of the outcomes of the curriculum is bound to cause issues. A similar confusion in the social work profession has caused instability in teaching and funding (Parrish, 2018). A distinction between the definition and the process of EBP has been suggested (Gambrill, 2010). The phrase *evidence-informed practice* (EIP) is suggested as providing more clarity and encompassing patient preferences but also embracing a wider range of sources including qualitative methodology, case studies and clinical insights and excluding non-scientific prejudices and superstitions (I. Nevo & V. Slonim-Nevo, 2011). Kumah et al. (2021) proposed a six element systems based model that builds on McSherry (2007). The authors postulated that the main processes the graduate goes through to apply evidence into clinical practice could be summarised in to six elements, *Professional accountability; Informed decision-making; Research awareness; Application of Knowledge; Evaluation; and Conditions affecting research utilisation,* with two factors, *Drivers for Evidence Based-Informed Practice*, and *Critical Thinker and Doer*. The influential Straus et al. (2018) stated that most UK general practitioners are applying EBP summaries and guidelines generated by others dubbing this the "*user*" mode. To operate in this manner the *Evaluation* is skipped but the other four steps are retained Straus's *user* is not consistent with the definitions given he majority of focus group participants.

Two of the UK respondents with nursing backgrounds referred to the quality of the evidence affecting the excellence of practice. Participant C stated, "*what was acceptable previously may not be acceptable now because the evidence may show that it actually doesn't work*" and F indicated, "*good quality evidence to support good quality care*". This hint that the nursing definition may be different is by Stannard (2019, p. 1080). She suggested the classic definition by Sackett, Gray, et al. (1996) was not broad enough for diverse nursing applications and gave a pragmatic definition of "*EBP for nursing is a way of entering the situation with curiosity and engagement that follows the nursing process by responding to the issue or problem using the best available evidence."* Stannard (2019) considered the five steps applicable to nursing but judged that the steps could be nonlinear while Melnyk et al. (2010, p. 51) suggested seven steps adding "*Cultivating a spirit of inquiry"* as step zero and "*Disseminate EBP result*s" as step six.

The variation of participant responses to the question of EBP definition is worrisome. While there is some debate in the literature, there is fair consensus that EBP is integrating the best available research evidence, with clinical expertise, the patient's unique values and circumstances, and the characteristics of the practice context (Hoffmann et al., 2017a, p. 4). The five-step core process of EBP is also well supported (Dolezel et al., 2021). A shared definitive definition of EBP in the context of paramedicine is needed.

5.4.2 Importance of EBP to paramedics

Case study participants unanimously identified it was essential for paramedic undergraduates to be educated in EBP. Existing literature highlights the importance of EBP in health care education (e.g., Albarqouni, Hoffmann, & Glasziou, 2018; Bala et al., 2021; Ramis et al., 2018). The rationale provided by participants was variable but typically included characteristics of professionalism, quality of care and patient safety.

5.4.2.1 Professionalism

The nexus of paramedicine, posited by six of the case study participants focused on being a profession, being educated in, and utilising EBP. The signal from the case study participants was very clear that they considered EBP to be crucial to paramedicine being a profession rather than a technical occupation.

The transition to tertiary education for paramedics in Australasia in the late 1990's (Lord, 2003) led to some introspection on the topic of professionalism, or more specifically, consideration of the status of paramedicine as a profession (O'Meara, 2009; Reynolds, 1998; Wyatt, 1998). The UK paramedics registration process as health professionals occurred earlier than Australasia. However, the slow rate of transition to higher education also sparked debate in the UK on their standing as professionals (Newton & Hodge, 2012; van der Gaag & Donaghy, 2013). Central to this discussion was the definition of the complex construct that is professionalism. A definition that works across health professions has been challenging to identify (Birden et al., 2014; Burford et al., 2014).

Most definitions of professionalism in the health professions include '*clinical excellence, altruism, pursuit of patients' best interests, patient advocacy, technical knowledge, professional responsibility, and self-governance*' (Townsend, 2017, p. 1). This expectation of clinical excellence and patient advocacy link to an increased focus on paramedics practicing in an evidence-based way (McEwen & Trede, 2014; Williams et al., 2015). This supports the statement by participant H that EBP is needed for paramedicine to be a profession. Education standards are vital to develop and maintain a professional culture of excellence (van der Gaag et al., 2017).

The link between EBP and registration as a health profession is strong in Australasia and the UK. Demographic data revealed that all professions registered under the National Registration Accreditation Scheme by Australia's Health Practitioner Regulation Agency

(AHPRA); United Kingdom's, Health and Care Professions Council (HCPC); and New Zealand's Health Practitioners Competence Assurance Act 2003 are required to be educated in and employ EBP (Australian Health Practitioner Regulation Agency, 2019; Chambers et al., 2016; New Zealand Government, 2003). This pattern of professional expectation clearly highlights the importance of EBP to the registration bodies of these nations. All relevant national bodies responsible for paramedic registration in Australia, the UK, and NZ require practice in an evidence-based way, typically with references to self-reflection or quality of care. In Australia, AHPRA supports the Paramedicine Board of Australia to register paramedics, develop standards and accredit programs of study (Paramedicine Board of Australia, 2019a). The Paramedic Board of Australia's statement of professional capabilities for Australian registered paramedics specifies, "*paramedics' responsibility to engage in evidence-based practice and to critically monitor their actions through a range of reflective processes*" (Paramedicine Board of Australia, 2021). These requirements support the statement participant H mused, "*There's lots of things that you need in a profession. … evidence-based practice is one of those*."

The Paramedic Board of Australia's accreditation standards also require the programs of study to address all professional capabilities including EBP (Paramedicine Board of Australia, 2020). In New Zealand, the Ministry of Health delegates the responsibility of regulating paramedics scope of practice, standards of competence and education, to the NZ Paramedic Council (New Zealand Ministry of Health, 2021). The NZ Paramedic Council requires paramedics to "*Deliver care based on best available evidence and best practice*". Their Standard of Cultural Safety and Clinical Competence (Paramedic Council of New Zealand, 2020) is adopted from the Paramedicine Board of Australia. In the UK, the HCPC's Standards of proficiency require all health professions including paramedics to "*be able to assure the quality of their practice*" and in particular to, "*be able*

to engage in evidence-based practice, evaluate practice systematically and participate in audit procedures" (Health and Care Professions Council, 2014). The HCPC Standards relevant to education and training require "*The delivery of the programme must support and develop evidence-based practice*" (Health & Care Professions Council, 2017). Participant commentary regarding regulatory oversite was reflected in comments of participant C asserting, "*be safe, by applying that evidence-based knowledge in practice all the time*" and participant A statement, "*if you want people to be thinking, self-actualised, independent practitioners then it [EBP] is central along with other attributes like ethics and evaluating you own practice*." The connection between regulatory body standards and the perceptions of participants reinforced the need for registering bodies to maintain an oversight of the implementation of EBP. The legal framework that surrounds the registration and regulation of the paramedic profession in the three countries strongly embraces EBP and its links to quality of care supporting the participants' statements linking EBP and professionalism in the health sector.

5.4.2.2 Patient safety and optimal treatment

Respondents linked using EBP with being able to provide the safest or best current treatment available. This linkage is well supported by the literature as EBP is regarded as gold standard in the health professions and has been endorsed as a core competency by the Institute of Medicine (IOM) since 2003 (Knebel & Greiner, 2003). The importance of EBP in the delivery of health care with optimal safety, efficacy, cost-effectiveness, and continual improvement in accordance with patients wants and needs has been widely recognised (e.g., Albarqouni, Hoffmann, Straus, et al., 2018; Frenk et al., 2010; Malterud et al., 2016). This supports participant C's commentary around keeping up with evidence to continue to optimise safety, "*We have to keep up with the evidence to try to continue to be safe*". The continual improvements in response to changing evidence as referred to by participant C and

others, is known as the ‘evidence to practice gap’. The time between when a new idea is published in the academic literature and when it is incorporated in normal clinical practice and was widely reported as 17 years in 2001 (Grant et al., 2003). While that period may have reduced over time (Morris et al., 2011), it is still considerable (Desveaux et al., 2021; Medlinskiene et al., 2021; Nguyen et al., 2021), with marginalized groups being more severely affected (Odeny, 2021). This ‘evidence to practice gap’ (Lau et al., 2016) delay has been attributed to various factors including, overwhelming volume of new research (Bourgault & Upvall, 2019), out of date textbooks (Veziari et al., 2021), and incorrect experts (Oxman & Paulsen, 2019). EBP is claimed to reduce the evidence to practice gap (e.g. Huckson & Davies, 2007; Melnyk et al., 2012; Zimmerman, 2017) although even leading supporters admit there are some challenges and limitations (Greenhalgh, 2020; Ioannidis, 2016). The goal to minimise the evidence-to-practice gap as far as possible is one of the main drivers of EBP (Greenway et al., 2019; Lau et al., 2016) and hence it is unsurprising that the respondents referred to it as a factor.

The current COVID-19 pandemic has exacerbated the need for improved healthcare decision-making (Nunan, 2021). The concept that EBP leads to better clinical outcomes for patients is well supported (Crabtree et al., 2016; Durlak & DuPre, 2008; Hälleberg Nyman et al., 2019; Wu et al., 2018) but not all reviews found evidence of this (Simons et al., 2018).

The case study participants did not refer to shared decision making. Patients and health care professionals using collaborative decision-making is an important component of EBP (Hoffmann et al., 2021). Assisting the patient to assess the trustworthiness of treatment claims, making a fair comparison between treatments so they can make an informed choice is vital (Chalmers et al., 2018). Omission of this concept again reveals an incompleteness in understanding of EBP by the case study participants and hence PA’s.

5.4.3 Facilitators and Barriers to EBP

5.4.3.1 Thought leader influence

Three participants reported examples of thought leaders being an enabler for the adoption of EBP in Ambulance services. Clinical managers and those in elite sections, such as aeromedical, of the ambulance services were identified as thought leaders by the participants. Ambulance services having historical military origins and structure habitually retain the hierarchical power structure (Goniewicz, 2013; Grantham, 2004). Role modelling by these leaders was found to be particularly effective with leaders, both formal and informal, at multiple levels having an influence particularly when they consistently used EBP (Stetler et al., 2014). The thought leader's behaviours are more influential than their attitudes in the success of the innovation (Farahnak et al., 2020). This is supportive of participant E's assertion that a prominent paramedic that role modelled using EBP in his position as a clinical leader and "*influences and gets people to question their practice".*

Stetler et al. (2009) identified the need to institutionalize the use of EBP so that it becomes the organisational norm as the way forward. Later, Stetler et al. (2014) identified an array of other interrelated and synergistic factors that influence EBP utilisation in an organisation. Workplace culture is seen as important with leaders having a substantial influence (Bianchi et al., 2018). Clinical managers have been identified as having a gatekeeping role with EBP utilization (Fleiszer et al., 2016; Innis & Berta, 2016; Yoder-Wise, 2014).

Several theories and models have been identified that attempt to explain the effect of leader behaviours on EPB uptake including; Fast and slow thinking (Gigerenzer & Brighton, 2009), Heuristics (Kahneman, 2011) Cognitive Biases (Saposnik et al., 2016), Theory of planned behaviour (Fishbein & Ajzen, 1977), and Adult learning theory (Knowles, 1968; David A Kolb, 1984), and Stages of change theory (Grol & Wensing, 2004; Prochaska &

DiClemente, 1992; Rogers, 2010). Greenhalgh et al. (2017) posited the "diffusion of innovations model" with nine components, one of which is the role of opinion leaders who are defined as high-status peers or experts that others seek to copy. Thus, the observations by the participants are consistent with the published evidence.

Participant B observed that some paramedic students and registrars were being influenced by eminent doctor's actions rather than utilising EBP. This eminence based practice was described by Isaacs and Fitzgerald (1999) and occurs where seniority increases their influence on the care delivered by other clinicians irrespective of EBP (Fouad et al., 2021). Before the widespread adoption of Clinical Practice Guidelines by physicians in the 1990's, clinical gestalt played a large part in decision making while experimental evidence was used to inform medical education (Hampton, 2011). Concerns were expressed by physicians at the time that EBP influenced CPGs mean that a clinician was unable to vary treatment to suit a patient's individual circumstances (Schwalm & Yusuf, 2011). While this was not the result in medicine, paramedics, depending on how strictly protocols were enforced in individual; Ambulance services could find themselves unable to tailor practice to their patient (Perry, 2016). EBP does of course include the patients wants and needs but the implementation and clinical freedom particularly of junior paramedics varies. Australian Participants referred to this lack of clinical freedom; participant H commented on the push back from clinical supervisors when his students deviated from rigid protocols even with valid reason and participant G, a qualified Australian paramedic even commented on the push to stay within the guidelines with her own practice.

5.4.3.2 Resistance from non EBP-educated clinical supervisors on placement

All four Australian participants reported students EBP practice during clinical placement was frequently resisted by supervisors particularly those that had not had a tertiary level education in paramedicine. Usually this involved the undergraduate students

but participant G, a paramedic with five years clinical experience, reported a pressure from Ambulance service supervisors to not be guided by EBP, "*it's very hard because you're obviously driven by guidelines*". This resistance in the clinical workplaces was also found in the UK with participant B relating that students are being told "*Do it that way the way I do it*" and E observed that EBP was not universal amongst paramedics in the clinical supervisor role, "*it would be an assumption to say that all of them value evidence-based practice*."

The ability to reflect critically on EBP use with the assistance of a clinical supervisors is a vital lifelong skill for all health care professionals (Mlambo et al., 2021). Application of EBP skills learnt in clinical environment is beneficial (Larsen et al., 2019; Nilsen et al., 2017) . While most Australian services currently require a bachelor's degree as an entry level that is a transition that only began 15 years ago (O'Brien et al., 2014), additionally, many early paramedic degrees lacked EBP education (discussed other chapter). This has resulted in a diversity in EBP and other skills of clinical supervisors available for undergraduate students. This diversity is compounded by the absence of a national standard for paramedic clinical mentors in Australia. (Furness & Pascal, 2013). The diversity in education of the clinical supervisors and the variety of pedagogical backgrounds of the students from multiple year levels and universities results in conflict of what is taught and what is practiced (Ross et al., 2015). This culture clash when students try to implement EBP in clinical practice has also been observed in nursing (Smith-Strøm et al., 2012) and occupational therapy (Jeffery et al., 2020). The coming together of diverse viewpoints represents an opportunity for learning on both student and clinical supervisor. However only 18% of paramedic undergraduates report having EBP based conversations on clinical placement (Bourke-Matas et al., 2020). A power imbalance and lack of experience leaves some students unwilling to challenge the culture of many Australian ambulance services where each state's Clinical Practice Guidelines (CPGs) are provincially regarded to be a

gold standard of EBP (Colbeck & Maria, 2018; Wilkinson-Stokes et al., 2021). This unwillingness is felt in the 33% of student participant felt there would be negative repercussion of engaging in a EBP discussion (Bourke-Matas et al., 2020). This lack of support for EBP is also found in nursing in Australia (Bickhoff et al., 2016; Pajakoski et al., 2021) and the UK (Koskinen et al., 2021). Clinical managers should be leading this change but studies in Nursing which should be more advanced due to their increase time in higher education, have found managers deficient in skills to lead this change, due to lack of EBP education and practice for the role (Hølge-Hazelton et al., 2016; Phillips & Byrne, 2013). Lack of EBP education has been reported as barrier by a number of researchers in Nursing (Hines et al., 2021; Leach et al., 2016; B.M. Melnyk et al., 2018), Medicine (Lafuente-Lafuente et al., 2019), other health professionals (Leach et al., 2019; Ugolini et al., 2014). This supported participant E's insight into the EBP skills of the paramedics practice educators [PPEds] supervising the undergraduate students that "*some of the PPEds out there don't have the skills to really decode and analyse the literature*". This lack of support for newly qualified practitioners entering clinical practice in which evidence-based approaches are infrequently utilised, hampers their application and refining of EBP skills acquired as an undergraduate (Kubiak et al., 2020; Mooney, 2012). The literature base suggests the variability of support of EBP by clinical supervisors is widespread.

5.4.3.3 Access challenges

Case study participants spoke about paramedic students being able to access literature and pre-digested database but may face challenges accessing evidence when in mobile, particularly remote, ambulance settings. Paramedics usually have access to the internet at their workplace (Simpson et al., 2012), however some care for patients in remote locations (McManamny et al., 2018; O'Meara et al., 2018) with poor internet access (Marsh-Feiley et al., 2018). Australia has good mobile internet coverage with over 99% of the

population having access however this translates to only 27% of the landmass (Australian Govenment, 2021). Additional access to high speed data and resilience to emergency is variable outside of regional centres (Gregory, 2021). Access to high speed mobile internet is less of a problem with the UK (NICE, 2018) and NZ (Milner, 2020; Stevenson, 2014) but still can occur (Lumley et al., 2020; Mihandoust et al., 2021; Tovey et al., 2018). Satellite internet devices can provide global coverage but data costs are prohibitive with current technology although low orbit constellation (Rawls et al., 2020) or high altitude balloon (Katikala, 2014; Rengaraju et al., 2021) may enable this. The challenge of paramedics accessing data to support EBP while treating remote patients as noted by the case study participants may continue until affordable remote internet access becomes available. A possible solution that is emerging with the increasing availability of high capacity data storage is offline knowledge-based systems for digital clinical decision support (English et al., 2016). An example of this is the NeoTree system which uses Android based phone applications to provide evidence based clinical support to nurses and midwives in low resource countries such as Malawi and Zimbabwe. When the NeoTree phone has Wi-Fi or cellular coverage it then uploads the data collected for quality improvement and research to further optimise care quality (Heys et al., 2022).

Participant E was concerned that academic journal paywalls were a barrier for some students to perform EBP. While paramedic undergraduates have access through their university library to academic sources this is variable with all journals and databases are not available to all students. Despite often being the produced by academic in publicly funded institution who don't receive payment for the articles, medical research is commonly behind a paywall with only 28% being open access (Piwowar et al., 2018). The speciality of emergency medicine reflects this with 15 of the top 50 journals being open access (SCImago). Of the two journals focusing on UK or Australian paramedicine only the

Australasian Journal of Paramedicine is open source. Not being able to access the articles due to paywalls was identified as a barrier in Saudi paramedics (Samarkandi et al., 2018). Many other medical professions also have been reported to being hampered in EBP by paywalls including Australian nursing graduates (Blackman & Giles, 2017), Canadian Surgeons (Sullivan et al., 2017), UK medical and dental students (Hong et al., 2019), UK Dentists (Sellars, 2020) and complementary and alternative medicine professions in Australia and New Zealand (Veziari et al., 2021). Academic paywalls also impair patient access so thereby restricting full participation in the informed decision-making aspect of EBP. (Day et al., 2020). While there are number of schemes to increase access to articles both legal (e.g. Caldwell et al., 2020; Else, 2018; Laera et al., 2021) and illegal (Faust, 2016; James, 2020) the situation is improving (Bannour et al., 2021; Gadhvi et al., 2020) but likely to continue for some time yet (Fyfe et al., 2017; Haucap et al., 2021; Larivière et al., 2015).

5.4.3.4 Student engagement with nonclinical units

All case study participants with a paramedic background from both Australia and the UK observed that students were engaged with clinical subjects but less involved with non-clinical units associated with content related to EBP, the supporting sciences, and law and ethics. This lack of engagement was linked by the participants to low student satisfaction scores, reduction of attendance and engagement across the semester and poor student learning.

Students enrolling in health profession degrees often do so because they are focused on patient care and outcomes (McEvoy et al., 2018). Paramedicine students are particularly focused on clinical interventions and the outcomes of acutely ill and injured patients (Wilson et al., 2021). The often perceive the nonclinical subjects such as EBP, research, ethics, sociology and supporting biosciences as not linked to practice and therefore less relevant (Hazelwood, 2015). These attitudes are also common amongst allied health (Hitch & Nicola-

Richmond, 2017) and medical students (Ilic & Forbes, 2010), and have been identified as potential barriers to learning with associated high fail rates (Sinnayah et al., 2019; Whyte et al., 2011).

The observation of student drop of student engagement across a semester noted by participant H was supported by findings from Hazelwood (2015). She found that paramedic and nursing students reported greater dissatisfaction with a first-year communication subject than psychology and other students, giving a lack of relevance to their profession as the reason. Also supporting H's observation is the Beovich, Gosling, et al. (2021) study of Australian paramedic undergraduates that also found a drop across the semester in lecture attendance with the largest reduction in a research and evidence unit and the lowest in clinical subjects. These observations are also consistent with the finding by Lim et al. (2016) that the paramedic undergraduate cohort, especially in the early years, does not have sufficient clinical maturity to appreciate the need for EBP and other supporting disciplines such as epidemiology, bioscience, communications, law and ethics. The pattern of observations can be interpreted as a sign that the relevance of EBP and other non-clinical units needs to communicated better to paramedic students. An alternative interpretation is to timetable EBP and non-clinical units later in the paramedic degree, however this would mean the students would miss the insights these areas of knowledge provide when experiencing clinical placement.

5.4.3.5 Student engagement with non-paramedic background lecturers

Two of the case study participants emphasise that even well qualified academic staff without a paramedic background were less likely to get respect from students who displayed an arrogant attitude. This pattern was directly outlined by participant H stating that "*well this person is not a paramedic what do they know*?" The source of this arrogance in students of a

profession perceived as caring, and empathetic (Murcot et al., 2014) requires investigation. Paramedicine historical had an alpha male culture that still persists (Furness et al., 2021). The professionally autonomous paramedic systems, as used in Australasia and the UK, have supported the evolution of a paramedic-led model of expertise, further enabled by their university entry level, national registration and practice standards (Makrides et al., 2021). This autonomy has led to professional distancing other professions when paramedics work in traditional roles in jurisdictional Ambulance services in Australasia and the UK (Mulholland et al., 2019). While paramedics do interact with other professions often at the beginning and end of patient care events, they typically operate alone or in pairs. Interprofessional education in clinical placement within paramedic degrees is increasingly common but still not universal (Nijhawan et al., 2021; Reed et al., 2021). Due in part to registration requirements (Paramedicine Board of Australia, 2020), the majority of clinical placement still occurs with jurisdictional ambulance services (Reid et al., 2019) despite the escalation of paramedics practicing in other venues where they are more likely to work alongside other health professions (Devenish et al., 2019). This lack of inter-professional working collaboration between healthcare professionals has been correlated with poorer staff relationships, decreased job satisfaction, and a reduction in professional acknowledgment and respect (Mulholland et al., 2019; Schot et al., 2020). This lack of respect for other profession's capability feeds into the paramedic culture that the students may adopt and results in a lack or appreciation for the non-paramedic academics as detailed in the earlier comment by participant H.

Australian paramedic Participant H observed that paramedic students identified with their profession's culture very early in their studies, often after the first clinical placement, while nursing student did not seem to identify with their profession until graduation. He believed this early adoption of professional culture, resulted in them being more aggressive,

"*they hunt in packs and go straight for the jugular*" with the non-paramedic academics. Counterintuitively the students enrolled in the double degree of nursing and paramedicine were observed by participant H as particularly forward and tactless towards non-paramedic academics. Participant H linked this to the students also having an unrealistic concept of the paramedic caseload due to an outdated perception of paramedic work being dominated by time critical trauma patients. This observed pattern may be explained by the sociological concept of group dynamics, in particular out-group derogation. Group dynamics, which concerns how the behaviours, thoughts and feelings of the individual are influenced by the perceived norms of the group (Forsyth, 2018; Thibaut & Kelley, 2017). The expected behaviours, attitudes of members of a group such as the paramedic profession are shaped by institutionalised definitions of cultural memberships (Abbott, 2014). In-group is the social group to which a person mentally identifies as being a member, in this case paramedicine. The out-group is a social group with which an individual does not identify (Lees & Cikara, 2020). The double degree students referred to by participant H may be expected to have some allegiance to both nursing and paramedic groups. However perhaps the double degree students' early adoption of paramedic culture and the perceived low position of the nursing profession in the health care hierarchy results in an enhanced in-group effect for paramedicine. Research by Johnston and Bilton (2020) supported the statement by participant H that paramedic students strongly identify with their profession from early on in their education. This early identification does not seem to be due to earlier experience as Johnston and Bilton (2020) reported that few students had prior exposure to paramedicine through volunteerism or paramedic friends, however over half had friends in nursing. Other work by Annear et al. (2016) in the setting of interprofessional education found that some medical and paramedic students positioned themselves as hierarchically superior to nursing students. There was a perception among some medical and paramedic students that they had

superior knowledge and skills to their nursing peers, thereby adopting existing hierarchies within the health sector and delineating the boundaries of collaboration by engaging less with the nursing students. Medical students identify as doctors in the first year of university more strongly than the objectively valid identity of being 'university students' (Burford & Rosenthal-Stott, 2017). This can be understood as wanting to be part of the high-status group, 'doctors' as opposed to a lower status group 'university students'. It is unsurprising that paramedics students are more attracted to self-rate themselves closer to the high-status medicine than the lower status nursing (Latrofa et al., 2012). Differences between nursing and paramedic students were detected by Bramble et al. (2018) with paramedics being more forward and proud of their culture. Similar to the findings of Goldie (2012) the students enrolled in the double degree programs within the current research should have an understanding and respect for the nursing profession, however this was not reported. Perhaps they perceived themselves as an elite subgroup and thus superior to "ordinary" nursing students. Students often self-rate the prestige and social status of their university course from the entry score required (Coster et al., 2008). In Australia paramedic degrees generally have higher entry scores than nursing with the double degree of nursing/ paramedicine higher still (e.g. Queensland Tertiary Admissions Centre, 2021; Universities Admissions Centre, 2021). By comparison the UK the Universities and Colleges Admissions Service score required for 3 year BSc(Hon) degrees in paramedicine, nursing, or a nurse Paramedic (Adult) MSci(Hon) are all around 120 to 128 points depending on the university (The Uni Guide, 2021). This perception of being part of an elite group may explain, in part, why the paramedic student hostility towards non paramedic background PA reported participant by Australian participants is not replicated in the UK participants data.

The observation by Participant H of students bullying academics, who professionally have more power in an education setting, is dubbed Contra-power harassment This

incivility crosses national boundaries as it has been documented in Australian Egyptian (Ibrahim & Qalawa, 2016), and American (Ziefle, 2018), nursing students toward academics. The issue is not confined to nurses with Contra-power harassment being reported in diverse faculties with female academics more likely to be the recipient (Lampman et al., 2016). The increase in Contra-power harassment has been attributed to students treating higher education as a consumer driven experience with a heightened sense of self entitlement (Christensen et al., 2019). The undergraduate students consider themselves as paramedics, they perceive EBP as being tangential to the imagined "real" work of a paramedic and see the non-academics teaching EBP to be hindering their progress toward graduation. As a consequence, the antagonism toward non-paramedic academics as described by participant H may continue to be an issue warranting attention.

5.4.3.6 Variation in Paramedic Students' Learning Engagement with EBP

Participant B observed that some students were "*different from the start*" and had an exceptional capacity to engage and understand EBP. From the prospective of considerable paramedicine-based teaching experiences, he added that these were the students that go on and "*do post graduate studies, change protocols and become academics*." He also stated that they perceived EBP differently from very early on and was not sure that university contributed to any significant change in their initial engagement. This cohort is interesting in that it may provide insight into assisting this exceptional subgroup to progress the profession and go on to academic roles. O'Meara (2006) recognised the need for more paramedic academics and called for strategies to facilitate their development. He and others were still calling for this 12 years later (O'Meara & Maguire, 2018) and the problem also extends to allied health (Wakely, 2021). Professional wages (Bavas, 2017; Willingham, 2016) in the clinical paramedic sector, and Australian and UK academics having Mental Wellbeing Scores below community averages (Fetherston et al., 2021) mean that universities sill

struggle to fine suitably qualified paramedic academics to fill vacancies (Munro et al., 2019). An increase in the number and uptake of higher degree paramedicine courses (e.g. Monash University, 2022; University of Hertfordshire, 2021) and research mentoring programmes (Australasian College of Paramedicine, 2021; Lowery-Richardson, 2019) are encouraging signs.

5.4.4 EBP Pedagogy

5.4.4.1 Theory

The case study participants demonstrated a breadth of awareness and understanding of learning theories, with Andragogy and Constructivism being the most acknowledged by academics in both the UK and Australia. Participant A and H could each provide a detailed, reasoned explanation on why they chose a particular learning theory, whereas participants B and F were clearly cognizant and knowledgeable of learning theories but were somewhat more cynical. Participant C, an experienced academic, cited andragogy as influential but modified this with "*integrating practical teaching with knowledge and evidence*" that she was certain was not just andragogy. Participant G, a newer academic, also referred to andragogy with the addition of as "*peer-to-peer feedback*". Case study participant E an experienced UK academic with a nursing background shared that she used Nursing theories as an educational philosophy in particular the Roper-Logan-Tierney (RLT) Model (Roper et al., 2000). While participant D, a more recently recruited UK academic admitted to having no theory of teaching citing a lack of education in the area.

The variety of approaches displayed by the participants speaks to the ongoing search in the literature regarding the most appropriate theoretical framework for underpinning learning of EBP skills, behaviours, and attitudes (e.g. Aglen, 2016; Bala et al., 2021; Ramis, Chang, Conway, et al., 2019). EBP requires not simply the skills of research, but also those of critical thinking (e.g. Cui et al., 2018; Horntvedt et al., 2018; Majumder et al., 2019),

knowledge about how evidence relates to practice (Lehane et al., 2019; Ramis et al., 2018), clinical judgment (e.g. Albarqouni, Hoffmann, Straus, et al., 2018), and information literacy (Deshotels, 2019; McCloskey, 2022). No single theory has been identified to be optimal for teaching and learning EBP (Dagne & Beshah, 2021). Pedagogical strategies that enable development of critical thinking, translation of evidence to practice, clinical judgment, and literacy skills should be prioritized in paramedic EBP education.

The use of RLT brings in questions around suitability of a nursing model, both for paramedics and for teaching EBP. RLT is a practice-centred theoretical model that originated in the UK and has now been adopted widely in academic and clinical nursing education settings (Williams, 2017). In the clinical setting RLT is a framework for the nursing model of assessment, diagnosis, planning, intervention, and evaluation (Holland & Jenkins, 2019) but can also be used to research questions about deficits detected in patients (Mattar, 2011). RLT also allows hypothesis testing in academic setting (Kara, 2007). The RLT model would seem to be commensurate with EBP as both have question formulation, assessment, planning, implementation and evaluation. Gournay (2001) rejected the RLT model as outdated in EBP shaped health care while McCrae (2012) asserted that educators should incorporate theory-based practice as well as evidence-based practice. This tension between theory and evidence is addressed by Jafaru (2021) who considers they are inextricably linked with EBP evolving from nursing theory, theory guiding practice, and practice generating further models to test through EBP.

The second question is regarding the nursing based RLT model's suitability for teaching paramedicine as espoused and utilised by participant E to teach undergraduate paramedic students. Both nursing and paramedic are science based, caring profession with a large overlap of skills and knowledge. However, there are significant differences in the paramedic praxis to nursing. In their traditional roles the encounters between paramedics

and their patients are usually shorter, one off and more likely to be time critical than those with nurses (Carter & Thompson, 2015). The environment of a paramedic working in the traditional jurisdictional ambulance service setting is chaotic and unplanned compared to traditional ward nurse (Clarke, 2018). As well as the paramedicine and nursing external factors being different, the students themselves may also differ. Holland's theory of vocational choice highlights that choice of vocation is really an expression of their personal and hence vocational choice and personality are related (Holland, 1997). This has been shown to effect career choices for health care (Patterson et al., 2018) and STEM (Blotnicky et al., 2018). This difference in personality may influence the optimum pedagogy although this is contested (e.g. Childs-Kean et al., 2020; Mukhalalati & Taylor, 2019; Shamsuddin & Kaur, 2020). As the personality traits differ between nursing and paramedicine cohorts (Mason et al., 2020) using the RLT model as un underpinning theory for undergraduate paramedics as stated by participant E may not optimal. Further research of the applicability of the RLT model for use in paramedic is warranted.

The third issue is that academics are teaching without having the required education at career commencement. While many universities require the new academic to complete a diploma of teaching in higher education this is often not mandatory before commencing (e.g. Botham, 2018; Kandlbinder & Peseta, 2009). Participant D had not started his pedagogy education while participant G had just begun her Graduate Diploma in Higher Education. This is concerning as academics without pedagogical training have to rely on their experiences gained as learners manage their classrooms and learners (Burke, 2021). Pedagogical education assists new academics to benefit from on the established theories, techniques, and skills of the scholarly community. Teachers of paramedicine including PA's require both in-depth, discipline-specific and pedagogical knowledge to effectively meet the complex nature of the discipline. A recent review of 139 articles found that a PhD alone was

insufficient to meet the needs of a nursing academic (Bullin, 2018) it would be reasonable to assume it would not be sufficient for paramedicine either. The increasingly turbulent higher education climate necessitates improving teaching quality to maintain consistent quality (Saroyan & Trigwell, 2015). Increasing demand for higher education qualifications in paramedicine (Wallis et al., 2015) is also linked with high turnover of PA staff at Australian universities. This has resulted in many PA staff underprepared for academic teaching such as participants D and G. Their experience is consistent with the data presented by Munro et al. (2016a) that most PA starting employment with universities have mostly vocational teaching experience and neither academic publications, research or higher degrees. Potentially a discipline-specific training that address paramedicine and paramedic specific issues may provide some benefits. This pedagogical content knowledge has been shown to increase confidence of teachers (Burke, 2021; Silva-Fletcher & May, 2018).

5.4.5 Curriculum & Pedagogy

This section will consider the content needed to be delivered, the assessment and the course scheduling to optimise EBP education for paramedic undergraduate paramedic students.

5.4.5.1 Content

All participants discussed practices to support the graduates to apply the best available evidence to their paramedicine and referred to various parts of the five steps of EBP, defined by Wilson et al. (2021) as Ask, Acquire, Appraise, Apply, and Evaluate. Participant F further stipulated that graduates need to be able to perform these steps in a clinical setting. These abilities in the clinical setting would comply with the registration requirements for Australia (Paramedicine Board of Australia, 2018), UK (Health and Care Professions Council, 2014) and New Zealand (Te Kaunihera Manapou Paramedic Council,

2020). Participant B and F proffered that graduates required an understanding of the context, clinical relevance, and practical significance of EBP. Participant A stressed graduates requiring knowledge of a need for safety, an understanding of ethics, awareness of legal boundaries, and responsibility to society. Improvements in patient safety due to EBP implementation have been outlined by Finn et al. (2013) within the Ambulance services, and by many authors (e.g. Farokhzadian et al., 2015; Scott, 2009; Sinclair et al., 2016) in other health settings. Several researchers have measured effects such as reduced time on ventilators, reduced hospital readmissions and improved patient satisfaction (Melnyk et al. (2017) and improvement in hospital patients safety based on EBP (Sonğur et al., 2018). Paramedics, like other health professionals, need to respect legal boundaries. One limit is respecting the autonomy and self-determination of the patient by obtaining informed consent before medical treatments are initiated (Taylor & Brogan, 2020). Carver et al. (2020, p. 6) asserts that patients wishes take precedent over 'evidence-based treatments' which is true. However, the perceived conflict is a non sequitur as EBP inherently considers patients wants and needs (Kelly et al., 2015) and has since the seminal definition by Sackett, Rosenberg, et al. (1996). In particular, participant A wanted EBP used in a responsible way. Dixon et al. (2009) showed that paramedics with extra training could use EBP in the care of older people, the paramedics spent longer with patients but less time in hospital with overall saving in cost and increase in quality adjusted life years. In other health care reduced cost to society through use of EBP has been demonstrated (e.g. Avşar & Karadağ, 2018; Melnyk, 2020; Rahja et al., 2020) and has reduced time to healing with similar cost (Wilson et al., 2019).

More broadly participant B, D and F wanted graduates to be critical thinkers, independent learners, and independent practitioners with professional autonomy. Specifically, they wanted paramedic graduates to have an ability to adapt practice, defend

their actions and argue for guideline change if necessary. Critical thinking is thought to be vitally important by senior educational and operational paramedics (AlShammari et al., 2018). While evidence-based guidelines for paramedics are available (Carter et al., 2018; Colbeck & Maria, 2018; Joint Royal Colleges Ambulance Liaison Committee, 2019) they cannot optimally apply to all patients and all situations. Critical thinking as described by the participants is vital for paramedics to deliver optimal health care outcomes autonomously in a rapidly changing, complex environment (Williams et al., 2021; Wilson et al., 2021). Critical thinking is a challenge to develop in 3 a year undergraduate course when many students enter at the completion of secondary school. Graduates employing EBP need to be able to deal with three different complex ill-structured problems, the clinical situation and question construction, the literature search problem, the appraisal of the evidence (Aglen, 2016).

5.4.5.2 Course EBP scheduling

All case study participants reinforced integrating EBP through all the subjects in the undergraduate degree. The integration of EBP into undergraduate units is widely supported by (André et al., 2016; Niven et al., 2013; Straus et al., 2018). However a small study of UK undergraduate nursing students failed to find a difference between embedded and discrete EBP in terms of student attitudes, skills, and knowledge (Scurlock-Evans et al., 2017). The integration of EBP in the clinical placements is highly effective at improving attitudes (Draaisma et al., 2021; Horntvedt et al., 2018; Wakibi et al., 2021).

Participant B stated that having EBP as a common message from multiple PA was important in the student's attitude towards EBP. The importance of students "catching" the attitude from staff and not just learning the knowledge is supported by Bhatt and Sheth (2021). Having PA's of both paramedic and non-paramedic background delivering the same

messages about EBP may also modify the attitudes of paramedics students towards the non-paramedic background PA's.

Providing a standalone EBP unit in first year was supported by participant D with enough content to enable engage with the academic literature for the rest of the degree. This early placement is supported by Dotson et al. (2015) who also advocates integration of EBP throughout the curriculum. However, participant H wanted the standalone EBP unit in second year with a research unit in third arguing that the students did not realise the significance of EBP until after clinical placement. Post first placement timing is supported by Oh et al. (2010) who argue that students may not understand the context of EBP early in the course and support the teaching of EBP competencies later in the bachelor degree. The implementation in health care courses is variable, with most Australian nursing degree programs offering a dedicated EBP unit as well as being themed through the course (Gulzar Malik, Lisa McKenna, & Debra Griffiths, 2016).

Participant D supported EBP into a capstone unit in the final semester of the degree. Participant A however, wanted EBP to be taught in a spiral curriculum developing skills and acquiring context so that students "*build up to the point"* they can master EBP. Capstone projects that encompass all steps of the EBP have been shown to be an effective education strategy with substantial improvements in competent (Kim et al., 2019).

5.4.5.3 Signature Pedagogy for Paramedicine

Participants H and B both asserted that paramedicine needed a signature pedagogy but had not yet progressed this higher education outcome. A signature pedagogy, as championed by Shulman (2005b), is a distinguishing form of learning and teaching, which defines one profession from another. Examples of signature pedagogies in other domains of higher education include law students in mock court and medical residents making ward rounds in hospitals (Shulman, 2005a). A paramedic signature pedagogy could assist

development of curricula, appropriate learning outcomes and assessment strategies optimally matched to the profession (Crookes et al., 2019). Unfortunately, participants H and B's perspectives are well supported by the literature whereby no agreed signature pedagogy exists for paramedicine. (Bell et al., 2021; Weber, Lawson, & Keen-Dyer, 2021) and continued requests for a signature pedagogy that supports the unique traits of Paramedicine have been proposed (Acker & Johnston, 2015; Weber, Lawson, & Keen-Dyer, 2021; Willis et al., 2009a).

The participants B and G suggested that components of the developing paramedic signature pedagogy should include lecture, tutorials, simulation, clinical placement, and post- case debrief, in a spiral curriculum. There is strong support from the literature that the suggestions of lecture and tutorials (Sendall et al., 2021; Sinnayah et al., 2019), clinical simulations (Barr & Foster, 2017; Clarkson, 2018; Lynch et al., 2012), Clinical placement (Bourke-Matas et al., 2020; Hanna et al., 2021), clinical debrief (Colleen et al., 2021; Devenish et al., 2019; Snowdon, 2021) and spiral curriculum (Lehane et al., 2019; Seymour-Walsh, 2019; Simons & Davidson, 2017) should be included in a paramedic pedagogy. While these certainly have support for inclusion in a paramedic signature pedagogy they are not unique to the profession. Participant A was unsure if what PAs were doing is different to other health professions or even other degrees as dissimilar as engineering. Participant A further stated that many other health professions have the same elements in their signature pedagogy but the difference was that paramedics needed to be able to look after the full spectrum of primary health care patients including the rare, high acuity cases, often in very small teams and in dynamic workplaces. A progression toward the goal of a paramedic Signature Pedagogy should be characterised similarly to other health professions with academic sessions and clinical placements, however the nature of the traditional paramedic caseload causes a defining feature of the profession (Williams et al., 2021). While the bulk

of the caseload are low-acuity (Eastwood et al., 2019; Henderson et al., 2019), paramedics also need to manage, rare, complex time critical, high-acuity cases (Andrew et al., 2019; Brewis & Godfrey, 2019; McCann et al., 2018). A consequence of this is a heavily reliance on high fidelity clinical simulation of rare but critical incidents (Birtill et al., 2021; Kumar et al., 2019; Murray et al., 2019) and debrief (sometimes across the ambulance bonnet) after critical patient care episodes (Colleen et al., 2021; Wilson & Asbury, 2019). Participant A also pointed out that signature pedagogy is seen in the architectural design of university departments with simulation areas tailored to the needs of paramedic simulation (Diamond & Bilton, 2021).

5.4.6 Outcome goals for EBP graduates

5.4.6.1 Graduate Outcomes

When asked if they were sure that they were achieving their goals of producing EBP ready graduates all participants referred to their students' passing assessments however a few expressed some reservation in the validity of these measures. Four were able to refer to other evidence for graduates achieving EBP competence via success in publishing academic journals, Clinical Protocol Guideline change or employment as academic lecturers.

5.4.6.2 Professional Context of Assessment

All four UK case study participants discussed using portfolios, essays, and Objective Structured Clinical Examinations (OSCE) to assess students' mastery of EBP. UK Participant E was concerned that some PA focused entirely on practical aspects and excluded higher order thinking. UK participant C gave Blooms taxonomy as the underpinning framework. Two Participants, D and C, of the UK based case study cohort used portfolios of work where the student reflected on their use of EBP often using Gibbs Reflective Cycle.

Assessment of competence in EBP requires the assessment of construction of a answerable question using the PICO mnemonic, the application of literature searching skills to acquire evidence, understanding of epidemiology and biostatistics to evaluate the evidence, synthesise and communication of the results to the patients, evaluation the EBP process, and assessment of impact within the clinical context in which it was implemented (Ilic, 2009). A number of validated tools specifically exist to assess all aspects of EBP competence including the Berlin assessment tool (L Fritsche et al., 2002), Fresno assessment tool (McKinley, 2003), and the Evidence-Based Practice Profile questionnaire (EBP2) (McEvoy et al., 2010a). The Berlin and Fresno tools are only designed to assess EBP competence in Medicine. The EBP2 is self-assessed which is not suitable for a summative evaluation. While they are available a systematic review of 85 studies evaluating EBP educational interventions Albarqouni, Hoffmann, Straus, et al. (2018) found that greater than half did not use a psychometrically robust, high-quality instrument to measure their outcomes. MCQs, are utilised to assess clinical knowledge but are not suitable for the full range of EBP competencies. (Leung, 2000). OSCE as used by the participants has potential, as it combines assessment of cognitive skills including knowledge, reasoning and communication. Kumaravel et al. (2021) have shown that OSCEs are a viable method of authentically assessing medical student EBP performance. While OSCE is commonly utilised amongst the UK participants to assess competence in EBP the literature is not available to fully support this with paramedic students.

5.4.7 Paramedic Academic Readiness to Teach EBP

All case study participants expressed confidence in their own ability to teach EBP. Even the new to academic PA conveyed faith in themselves to be able engage undergraduate students. However, many distinguished themselves from their interpretations of other PA's capacity to teach EBP. It was related by case study participant B that some PA did not

possess the required knowledge to teach EBP. He stated that this knowledge gap was due to EBP not being included in paramedic undergraduate degrees before approximately 2010 or the early Master of Emergency Health. As discussed in Chapter 4, few paramedic degrees covered EBP before 2010. The Masters of Emergency Health which was popular among Australian PA did not include EBP until after 2010 (Monash University, 2010). Degrees and short courses incorporating EBP did exist prior to the transition to (Monash University, 2002) registration but paramedics would choose to only infrequently access these professional learning opportunities (Gent, 2016; Martin, 2006). While other profession such as medicine and nursing have a long tradition of self-directed continuing professional development, paramedicine had to transition to from a situation where most education was delivered to paramedics by their employer (Sibson, 2008). This cultural shift is something paramedics are still experiencing (Williams & Edlington, 2019). Most Australasian and UK paramedics now have good access to online or face to face EBP education however this may be challenging for time poor paramedics (Adefuye et al., 2020). The situation of PA with a deficiency of EBP education as described by participant B will hopefully continue to reduce as time goes on.

UK Participant E commented about a lack of experienced paramedics that also possessed academia experience. She also referred to some other PA having an overemphasis on "*flashy clinical things*" and citing a lack references on PowerPoints as evidence on a deficiency of EBP embedded in the units. The observation by participant E is supported by Lavender (2013) study that noted UK paramedics transitioning to lecturer roles were having problems meeting the academic expectations of the university. The lack of suitably prepared new academics for paramedic undergraduate programs has also been noted in Australasia for decades (O'Meara, 2006; O'Meara & Maguire, 2018).

5.4.7.1 Progression of EBP Teaching

All participants gave examples of their teaching content changing over time as the evidence underpinning various aspects of paramedicine developed. This implies that knowledge translation is in progress and is commensurate with expected change over time in practice that is evidence-based (Sharon E Straus et al., 2011). The need for knowledge translation is expected to increase as the paramedic specific literature base has been growing rapidly (Beovich, Olaussen, et al., 2021; Wensing & Grol, 2019). Participant D from the UK a PA with paramedic background but in the first years of Academia reported substantial changes in his teaching. Participant D had improved his knowledge of the evidence from working in walk in centre with experienced EBP clinicians around him. This development is supported by the evidence that clinical integration (Larsen et al., 2019; Melnyk, Fineout-Overholt, Feinstein, et al., 2008) and EBP mentors assist in the development of EBP skills (Heitschmidt et al., 2021).

Participant B a very experienced Australian based PA with a paramedic background attended a three-day EBM course at the highly regarded (Widyahening et al., 2019) Oxford university Centre for Evidence Based Practice. He reported that he embedded "*evidence-based practice more broadly*" and used "*more case studies to illustrate the value of evidence-based practice*" in his teaching since attending the course. These actions are consistent with the best practice in teaching EBP. There is strong support for academics to focus on demonstrating the clinical relevance of EBP and embed health care students within that model (e.g. Lehane et al., 2019; Malik et al., 2018; Scurlock-Evans et al., 2017). The observation that a highly experienced PA benefited from a short course supports the notion that others in the profession would also value these opportunities. Health care professionals need multiple levels of engagement with EBP education across their career to provide optimum care and education (Cullen et al., 2020) .

5.4.7.2 PA Self-assessment Validity

Overall, the PA participants self-assessed themselves as competent to teach EBP while finding some of their peers lacking. As stated by participant B *"I don't think they have the necessary skillset themselves to do it".* Competency of academics teaching in higher education has been defined by Williams (2003) and consists of four domains. These are learning and instruction, communication and interaction, management and administration, and technology. Competency in these domains was self-rated as higher by academics with more than five years' experience (Martin et al., 2019) except for technology which was rated higher by younger teachers (Dimaculangan et al., 2021). High self-assessment was found to be strongly correlated with motivation and satisfaction and only weakly with ability (Sitzmann et al., 2010). Accuracy of health profession academics self-assessment displays significant heterogeneity in the literature. In Medical faculties the self-evaluations by academics have been reported to correlate with students assessments of teaching by Steinert et al. (2006) and harsher than the student's by Windish et al. (2004). Eva and Regehr (2005) contends that self-evaluations are mostly uncorrelated with other evaluations citing a failure to of health care professionals to regularly self-assess. Potentially the Dunning Kruger effect is in play where PA with low skills are not in a position to recognise they have deficits because of those shortfalls (Kruger & Dunning, 1999). Despite their self-confidence, there is evidence in the understanding of EBP, qualifications, skills and experiences of participants that implies they may not be fully prepared to teach EBP in the data. There was a large heterogeneity of definitions for the process and concept of EBP when a common understating would seem to be critical in the process of educating undergraduate paramedics. The other suggestion that the PA cohort may be lacking is the variation in the in education in pedagogy, EBP and understanding of the paramedic environment present in the focus group participants vignettes. While this is the result of the stratified sampling,

quantitative data for Australasia is available. Munro et al. (2016a) contends that most paramedics entering academic roles are underqualified, lacking higher degrees, research experience and pedagogy education. While the requirements of many universes is that a graduate certificate in higher education is completed in the first few years of starting academia (Charles Sturt University, 2022; Monash University, 2020), this still allows a period of teaching without adequate preparation. As noted in the vignettes, participants D and G were in their first two years of teaching and did not have teaching qualifications, higher degrees, or research experience. Taken as a whole these observations suggest that the participants self-assessment of competency in teaching EBP to paramedic undergraduates may be lacking validity.

5.4.7.3 External Context of EBP Teaching

The PA work within a university and external professional ecosystem to produce paramedic graduates. Adequate support from this system is needed if the goal of paramedics graduates competent in EBO is to be achieved. There is strong evidence from the literature that EBP needs to be incorporated into clinical practice and not be an isolated academic undertaking. This relies heavily on the backing of the health organisation within which the student is placed and more importantly the cooperation of the supervising health professional. Data from the participants is that many of the clinical supervisors are not supportive of students practicing EBP. Other health professions utilise lecturer practitioners to support students on clinical practice in venues such as hospital wards but this is logistically and financially challenging for Ambulance service placements (Lavender, 2013). Getting a critical mass of PA well educated in EBP teaching would seem to be critical in getting a sustained change in the profession (Lehane et al., 2019).

5.4.8 Summary

The qualitative data clearly highlighted that within the interview cohort the definition of EBP was variable. All participants were able to give an EBP definition but only one matched the definition most cited in the literature with the remaining missing clinical gestalt, patient values or circumstances. Also, only one participant referred to the five steps of the EBP process. This variability of definitions from the participants raises concerns about their understanding of EBP. All participants considered EBP essential to paramedicine citing its relationship to professionalism, registration, and safe patient care.

Positive modelling by thought leaders was seen as supportive of EBP uptake by students. Barriers to students becoming competent in EBP were reported to be resistance from non EBP-educated clinical supervisors, access challenges, and student engagement with nonclinical units and non-paramedic background lecturers. A variation in paramedic students' learning engagement with EBP that exceeded normal cohort diversity was noted by experienced PAs.

A variety of education theories were reported with Andragogy and Constructivism the most cited, and the nursing-based Roper-Logan-Tierney model also being utilised. An issue with paramedic-based academics beginning teaching without suitable preparation was noted. The development of a paramedic signature pedagogy was acknowledged as important; however, it was agreed to be a goal yet to be achieved. All sources were supportive of EBP being integrated in all subjects with particular need in clinical and capstone units. Most were supportive of a dedicated unit to teach the EBP process but varied as to the optimal timing

Participants wanted their graduates to perform the five steps of EBP within ethical, legal and safety boundaries. Independent critical thinkers that could deal with complex professional situations. They assessed this with essays, multiple choice and OSCE however none used

one of the validated EBP tools to attain this outcome. Participants were fairly comfortable that the graduates were competent. They have more confidence in the few that had published, changed practice, or become academics. Overall, the participants felt they were prepared to teach EBP but other academics teaching into paramedic degrees were not. An examination of the participants education and experience highlights a substantial level of variability in the academic focussed preparation of the participants.

6 GENERAL DISCUSSION AND CONCLUSION

6.1 Introduction

This discussion integrates the findings of the two studies that contribute data for this thesis. The available literature is contrasted with the key findings of each study to evaluate the preparedness of Australasian and UK Paramedic Academic to teach EBP to undergraduate paramedic students. The ability to understand, and practice in a EBP way is critical as it is a paramedic registration requirement (Australian Health Practitioner Regulation Agency, 2019; Health and Care Professions Council, 2014; New Zealand Government, 2019) and a core competency needed for continuous improvement of quality and safety of paramedical care (Albarqouni, Hoffmann, Straus, et al., 2018; Melnyk et al., 2016). As secondary outcomes the Paramedic Academics' EBP profile including relevance, terminology, practice, confidence, and sympathy together with their knowledge of, and attitudes towards, pedagogy, pedagogical content knowledge and experience of the paramedic industry will be reviewed. Differences between countries and factors influencing PA engagement with EBP with be analysed. Recommendations for industry and further research will be made.

6.2 Paramedic academic EBP profile

This section covers the issues around PA relevance, terminology, practice, confidence, and sympathy of EBP. A critical requirement of PA preparedness for educating paramedic undergraduates in EBP is a satisfactory level of understanding of EBP. Engagement in the domains of relevance, terminology, practice, confidence, and sympathy of EBP would imply a level of competency in EBP.

6.2.1 Paramedic academics variable EBP training levels

The PAs have variable levels of EBP education raging from none to a PhD and Masters in epidemiology combined with a short teaching EBP course at the university ranked number one in the world for medical sciences. Surprisingly, less than half (48%) of the EBP^2-P respondents had undertaken any formal education in EBP with less than 2/5 (38%) having more than 20 hours of instruction. This is commensurate with an Australasian survey of paramedic trained PA (Munro et al., 2016a) reporting that 86% of their paramedic initial training was at vocational level and hence less likely to include EBP. They also described only 13% having a research qualification before entering academia with only 3% having a PhD at that point. Although PhD holders do not necessarily have the required knowledge or understanding of EBP (Melnyk, 2013; B.M. Melnyk et al., 2018; Vessey et al., 2017).

All participants in the purposively sampled case study population had EBP training in their previous education but despite this some (A and F) described themselves as self-taught. As an example, participant G initially felt unprepared to teach EBP in her initial interview indicating that her education and professional experience up to that point was inadequate stating, *"I don't think it teaches you how to be an evidence-based practitioner*."

The results from the EBP^2-P show a U-shaped relationship between time since qualification as a paramedic and domain scores in EBP terminology and confidence. Those that graduated around 2005 to 2010 rated themselves significantly lower. This result is explained by participant B's observation that few early paramedics' degrees incorporated EBP and unless the PA accessed postgraduate training, "*they're just in that cohort of people that missed out*." UK based Participant E corroborates this, with her statement regarding novice PA's "*EBP that is lacking when they first come in*". A sample of the available paramedic curriculums (e.g. Charles Sturt University, 2002; Monash University, 2003; Victoria University, 2011) supports these observations. The above factors lead to the conclusion that the PA cohort while having

some outstandingly talented individuals has a sizeable cohort that lack of education in EBP. This needs to be addressed as a priority.

6.2.2 PA experience of EBP use

The PA cohorts have variable experience with the use of EBP in Academic and Clinical settings. In both settings EBP practice is not universal.

6.2.2.1 PA academic EBP use

The lack of EBP use by paramedics newly transitioned to academia was mentioned by UK based Participant E stating they, "*don't use references in their PowerPoints*". All the case study participants stated they used EBP in their teaching, but most knew of other PAs that did not. Presenting at a conference or publishing an academic paper would be indicative that the individual was competent in the skills of EBP. However most (57%) of the EBP^2-P respondents have not presented or published while the top three academics are responsible for most (55%) of the output of the cohort. Neither of the case study participants D and G, who were in their first year of academia when initial interviewed had presented or published a paper. These findings are supported by Munro et al. (2016a) reporting 70% of PAs not having published an academic paper before starting work in higher education.

6.2.2.2 PA clinical EBP use

The use of EBP by PA in the clinical environment is also restricted, as the push back against EBP by clinical supervisors reported by case study participants B, H and F was experienced by both academics and students. Case study participant G referred to pressure to stay within the guidelines during own clinical practice. The lack of skills to perform EBP among some of the clinical supervisors was suggested by case study participant E. The lack of support for EBP informed clinical practice from industry based clinical supervisors was found by Givati et al. (2018) and Eaton (2019) in the UK and Bourke-Matas et al. (2020) in Australia. The evidence for PA EBP use indicates that it highly variable in implementation among PAs.

6.2.3 PA rate themselves highly in EBP²-P domains

PAs responding to the EBP²-P self-rate highly, but some considerations cast doubt on the validity of their score. PA rated themselves significantly higher ($p = <.05$) than Allied Health Academics in Practice and Sympathy domains but similarly in Relevance, Terminology, and Confidence. This confidence was undermined by 60% not having heard or not understanding the term, *Forest plot* despite it being a commonly used graphing technique in EBP utilized to combine the results of multiple studies (Boyles et al., 2011; Rücker & Schwarzer, 2021). All the case study participants discussed confidence in their own ability to teach EBP however this was contrasted within their commentaries pertaining to a lower level of confidence in other PA's capacity to teach EBP. Participant G highlighted this with his statement that there are academics teaching into paramedic degrees that, "*missed any training in evidence-based practice and are now coordinating units*." Participant F commented that PAs areas of competency varied and when it came to teaching EBP some, "*may not have the skills".*

The correlation between of EBP attributes self-rating, object measurement, and implementation may be lacking. Wonder and Spurlock (2020) found only a weak positive correlation between nurses' evaluation of their EBP knowledge and objective measures of these attributes. In a systematic review of healthcare professionals, Saunders et al. (2019) reported that self-rated EBP knowledge, skills, attitudes and beliefs did not translate into EBP implementation. From the available evidence, despite the high ratings in the domains of the EBP²-P, all members of the PA cohort may not actually possess adequate skills to implement EBP.

6.3 PA pedagogy profile

To teach EBP successfully a PA requires both an understanding of the topic and an awareness of relevant pedagogy. This section will summarize the current findings and literature on the factors contributing to the PA cohort's pedagogical knowledge and awareness.

6.3.1 PA inexperienced academics

While the PA sample responding to the EBP^2-P were on average experienced paramedics (68% > 10 years) many were early career academics, with nearly a quarter (22%) in their first year working in academia and a median of 4 years. While there is an experienced core of PAs (18% >10 years) which tend to be in more senior roles. Given that Coates et al. (2009) declared that it takes seven years to produce an academic, a sizable proportion are still on a steep learning trajectory. Additionally many of the older PAs entered paramedicine via vocationally-based in service education and their only experience of university is via distance education, thus reducing their knowledge of the Academica (Munro et al., 2019). The case study participants were purposively sampled to represent the diversity of experiences including the time working in academia. While predicably participants D and G who were new to teaching at Higher Education reported significant changes, in the first two years, the other more experienced PAs also noticed progress. Participant C, reflecting on the changes she noticed between years six and eight in academic stated that "*I've grown. I think I've become more comfortable in my own skills and knowledge. which has helped me to branch out and understand the students and use the knowledge better*."

6.3.2 PA lack of Higher degrees

Only 11% of the PAs in the sample held a PhD, 12% held a Master's by Research, and 30% (n = 32) a Master's by Coursework. While professional based disciplines such as nursing have a lower percentage of PhD holders (McDermid et al., 2012) this is still far lower than the

76.5% of Australian academic staff holding a PhD (Department of Education, 2018), 75% of NZ (Sutherland, 2018) and 52.5% of UK (Higher Education Statistics Agency, 2019). The paramedic results are comparable with academics in developing countries (Breier et al., 2019; Jørgensen et al., 2006) and marginalised groups such as indigenous Australians (Schofield et al., 2013) and Māori (Richardson et al., 2017). This lack of doctoral studies may lead to reduced professional networks, less professional confidence, decreased impact and technical skills (Boud et al., 2020). The lack of paramedics with a PhD may result in a lack of paramedicine focused research with provides the basis for EBP in the profession (Florczak et al., 2014). This lack of doctorates was typified by the eight case study participants whose highest qualification was PhD (n=1), masters (n=5), Graduate diploma (n=1) and bachelor's degree (n =1). Participant H stated that the paramedics without PhDs tended to work in the clinical areas and those that taught EBP tended to be the "*non-paramedical people on staff that have research outputs and PhD*s". As Wonder and Spurlock (2020) found nurses with higher degrees had better objectively measured EBP knowledge, the lack of PAs holding PhD is suggestive of a lack of EBP knowledge and use.

The lack of paramedics with PhD degrees is worse in countries not covered in this research. An international register of PhDs in the field of paramedicine puts the number as UK 70, Australia 68, USA 23, Saudi Arabia 16, Canada 15, South Africa 12, and Finland 5 (Whitley, 2022). As of 2020 there are 790 paramedic programs in the USA (Cash, Clay, et al., 2021) only 27% of the 826,000 paramedics and EMT's held a Bachelor degree or higher (Cash, Rivard, et al., 2021). With 15 times the population as Australian, the USA has 1/3 the number of paramedics with a PhD. This has ramifications in the lack of PhD qualified paramedics to conduct research, educate, and lead organisations. As an example of the 52 USA state EMS directors, only 2 held a doctorate in 2018 (Cumbie, 2018).

6.3.3 PA identity

Some PAs were uncertain of their professional identity. Despite all the respondents with a paramedic background teaching at university, 15% did not identify as an academics and 10% reported not recognising they are paramedics. The later value rising to 16% if the Australian cohort is considered as no UK paramedics felt this way. Paramedicine in the UK has been a registered profession since 2000 (McLaughlin et al., 2016) while Australia and New Zealand did not progress to registration until after the EBP^2-P survey was completed (Australian Health Protection Regulation Agency, 2018; New Zealand Government, 2019). This "*No Man's Land"* of professional identity previously described by Munro et al. (2018) was also identified in the PA cohort. Trautwein (2018) proposes academic professional identity is related to the three related fields of research, teaching, and administration. As discussed previously most paramedic academics were not conducting research therefore teaching took up the majority of their workload, however this was less valued by many universities (Coate et al., 2001; Hancock et al., 2019). This effect is similar to a related phenomenon where an expert becomes novice, identified in health professionals transitioning to academia from a peak as a clinical practitioner to a valley as a novice researcher (Kristoffersen et al., 2020; van Lankveld et al., 2016). The perception of self-worth is related to the perception of competence, novice health profession academics remain tied to their diminishing clinical persona (Findlow, 2011). Unsurprisingly some early career PAs failed to identify as an academic. A similar pattern was also revealed in the data with participant G specially highlighting the transition to teaching, "*I don't necessarily think I'm that prepared for it. Some days are OK, and some days are not*." She pointed out that it was challenging because she had been operating as a paramedic under guidelines for some time and now was "*switching to a different practice that has less rules. Sometimes you feel like an imposter*".

The paramedic identity issue may have resolved somewhat with paramedic registration becoming a uniform requirement in all countries being considered in this thesis. The professional academic identity in the field of paramedicine for academics remains an issue and needs more support for research activities and joint appointments to find an optimum balance between research, scholarly activity, and practice engagement and development (O'Meara & Maguire, 2018). Reed et al. (2019) described themes of an expanding role of paramedics which was interpreted as an indicator of professional evolution. They also reported a rapid evolution of profession of paramedicine, and confusion amongst PA as to the process of professionalisation. This swift transition in roles and responsibilities may contribute to the identity disorientation displayed by some of the PA respondents.

6.3.4 Embryonic signature paramedic pedagogy

Crookes et al. (2019) believes a signature pedagogy for paramedicine would assist development of curricula, learning outcomes and optimally matched assessment strategies. Participants A, B, H and G agreed that paramedicine needed a signature pedagogy, but no participant believed it had been fully developed. Participant H summed it up as, "*I don't think we can actually say we're there*." These comments were echoed in the literature with calls for a paramedicine signature pedagogy (Acker & Johnston, 2015; Weber, Lawson, & Keen-Dyer, 2021; Willis et al., 2009a) and statements that none is established. (Bell et al., 2021; Weber, Lawson, & Keen-Dyer, 2021).

The participants had reasonable consensus that a paramedic pedagogy would involve a spiral curriculum, starting with underpinning knowledge (e.g., pathophysiology) and skills focussed on applied areas such as taking blood pressure, then within practical labs utilising manikins and simulations, and finally clinical placement as third person on an Ambulance. Case study A, pointed at this was much like other professions but our point of differences was "*the rarity and unpredictability of true emergency cases, that paramedics usually operate in*

teams of two and the lack continuity of care in that most patients are only seen once for about an hour." Participant A reported that the need to competently manage critically ill patients combined with the rare and erratic nature meant the "*simulation and then debrief of rare but critical incidents*." This need to have a heavy focus on simulation was reflected in the architecture of paramedic departments with large simulation areas. The literature supports the paramedic signature pedagogy to include clinical simulations (Barr & Foster, 2017; Clarkson, 2018; Lynch et al., 2012), Clinical placement (Bourke-Matas et al., 2020; Hanna et al., 2021), clinical debrief (Colleen et al., 2021; Devenish et al., 2019; Snowdon, 2021) and spiral curriculum (Lehane et al., 2019; Seymour-Walsh, 2019; Simons & Davidson, 2017). The changing scope of practice has resulted in the current pedagogy and curriculum impairing development of the profession (O'Meara et al., 2017; Weber, Lawson, & Williams, 2021; Wilson et al., 2015). There is a need for the paramedic profession to develop a signature pedagogy through an expert consensus process such as Delphi methodology (Barrett & Heale, 2020) based on a suitable conceptual framework (Shulman, 2005b) and a fundamental paramedic clinical judgement.

6.3.5 Non-Paramedic PAs face challenges

PAs that do not have a paramedic background often bring expert knowledge such as law, ethics, bioscience, or EBP, to the team teaching a paramedicine degree. For example, non paramedic trained PAs scored higher than paramedic trained PAs in all domains of the EBP^2-P reaching significance in the *Terminology* section. However, unless they have actively obtained experience by placements or other means, PAs without a paramedic background may lack understanding of the paramedic ecosystem and challenges.

The cases study participants comprised of three who were initially trained as paramedics, one psychologist, and five nurses, two of which, H and B who subsequently trained as paramedics. Case study H observed that students questioned the competency of

academics when they didn't use paramedic examples in their teaching remarking, "*It's not actually from a paramedic point of view".* He indicated that non paramedic PAs could be successful teaching EBP but needed to use, "*paramedic examples*", and "*need to make it relevant*." He contended that if paramedics students didn't see the content as relevant to them, "*they're just going to switch off*". Case study participant B reiterated this. He stated, "*You don't need to be a paramedic to teach EBP, but it helps with the examples and engaging the students".* While a principle of constructivism, particularly in health professional education, is the use of relevant examples (Mukhalalati & Taylor, 2019), paramedic students seem particularly sensitive to this factor.

6.3.6 Summary

The PA cohort contains a high proportion of academically inexperienced, under qualified individuals. This has implications in terms of quality of teaching and the resulting graduates particularly in the area of EBP. Some PAs struggle with professional identity as well as personal angst, such uncertainty no doubt contributes to the increased turnover of PA and hence the need to recruit new academics. A signature paramedic pedagogy is critical for the development of the profession but work still needs to be done to establish it and the underpinning theory. This task is one that would benefit from the collaboration of the paramedic profession bodies the UK College of Paramedics and the Australasian College of Paramedicine.

6.4 Differences in paramedic EBP adoption

The current research acknowledges that the three countries considered have substantial levels of commonality in areas such as language, culture, educational, and paramedic systems there are also differences that may be instructive in developing the profession globally. The key

differences identified were time of registration, resistance from clinical supervisors, support from managers, and use of a nursing model for education.

6.4.1 Registration differences in perception of EBP relevance

Several differences were detected in the perceived relevance of EBP between nations. The UK and NZ scores for the EBP^2-P domain of Relevance were significantly higher (p = .044) than the Australian cohort while all other domains were similar. As described above Paramedicine have been a registered profession in the UK since 2000 (McLaughlin et al., 2016) whereas this professional status change occurred in 2018 in Australia (Australian Health Protection Regulation Agency, 2018) and 2021 in New Zealand (Te Kaunihera Manapou Paramedic Council, 2021) at completion period of the current EBP^2-P survey. This has implications as the UK paramedics were required to practice in an EBP way and could be "struck off" the HCPC register if they failed to do so (Chambers et al., 2016). By comparison the Australians making a clinical error would more likely receive a reprimand from management (Givati et al., 2018; Lovegrove & Davis, 2013). The enhanced realization in the UK that EBP was relevant to paramedicine was evident in the case study participants' statements. UK based Participant C comparing her students from different disciplines remarked, "*paramedic students, are so eager to learn that if I say go out and research this bit of EBP, I get pretty much most of the paramedic students will go and look it up and respond*". Participant E also was positive about paramedic students and EBP, "*they do want to find the evidence and they don't want to just jump on somebody's chest*." With professional registration for all three countries fully operational, it be important to further investigate if the differences detected are due to the pressure to maintain registration or some other factor.

6.4.2 Resistance from Clinical Supervisors

Resistance to paramedic students practicing EBP during clinical placements was noted by all four Australian and two UK participants. Participant B reporting that students were being told, "*Do it that way the way I do it*". This pressure extended was also felt when the PA themselves worked clinically to not be guided by EBP with participant G commenting, "*you're driven by guidelines*". Participant F remarked that he had been confronted a few times when being clinically audited when he followed EBP but diverged from standard clinical guidelines, "*I have been challenged by managers because I haven't followed the rules*".

Australian based research by Bourke-Matas et al. (2020) found only 18% of paramedic undergraduates had EBP based conversations with their Clinical Supervisors on clinical placement with 33% perceiving that doing so would result in negative consequences. Participant E noted that not all clinical supervisors, "*value evidence-based practice*." This reluctance to embrace EBP by clinical supervisors may in part be due to a lack of EBP skills. Many of the clinical supervisors lack EBP skills due to their entry to the profession prior to EBP education being commonplace in paramedic education (O'Brien et al., 2014) and the absence of a national standard to compel them to update (Furness & Pascal, 2013). This causes a disconnectedness between what is taught at university and what is practiced clinically (Ross et al., 2015). This lack of support and inability to practice EBP hampers their refining of skills acquired as an undergraduate (Kubiak et al., 2020; Mooney, 2012).

6.4.3 Support from managers

The PA UK and NZ subgroups perceived their support from management to be the greatest facilitators in their use of EBP in clinical and professional practice significantly ($p < .001$) more often than the Australian cohort. This may be due to the professional registration requirements as described above. However the PA UK and NZ subgroups perceived that their organisational leaders looked for opportunities to learn significantly (p

= .001) more often than the Australian cohort. Participant E spoke about a paramedic leader who role modelled EBP and facilitated staff to "*implement research into practice*." The individual she referred to was a consultant paramedics who had the remit of professional leadership from a systems and strategic perspective that encompassed all areas of paramedic practice (The College of Paramedics, 2018) These individuals are well placed to lead and inspire individual paramedics and ambulance services to engage with EBP (Hodge, 2014). Leaders have been shown to have a critical role in EBP uptake (Bianchi et al., 2018; Farahnak et al., 2020) and the lack of this role in Australia (Colbeck, 2014) may account for the differences observed. An alternative explanation for observed disparities could be cultural differences between the subgroups (Boer et al., 2017; Davies et al., 2000).

6.4.4 Use of Nursing model

Experienced UK based case study participant E, utilised the Roper-Logan-Tierney Model (RLT) (Roper et al., 2000) a nursing theory stating, "*we can transfer that into the paramedic program because it's still the same, it's still the patient*." RLT is widely used in the UK and elsewhere a framework for the nursing model for clinical care (Holland & Jenkins, 2019) and academically (Kara, 2007; Mattar, 2011). The RLT model shares question formulation, assessment, planning, implementation, and evaluation. with EBP. The RLT model is contested in nursing use (Gournay, 2001; McCrae, 2012) but Jafaru (2021) considered RLT was inextricably linked with EBP and fit for purpose.

The nursing based RLT model's suitability for teaching paramedics has not been explored in the literature. Differences exist in students (Mason et al., 2020), environments (Clarke, 2018), patients, and objective of care (Carter & Thompson, 2015) which may make the RLT unsuitable for use with paramedics in traditional roles. The RLT model may find application in educating community paramedics which operate in the non-emergency space and as such share additional elements with nursing (Martin & O'Meara, 2020; Rasku et al., 2021).

6.4.5 Summary

From the evidence presented engagement with EBP seems to be correlated with professional registration and support from managers. Resistance from clinical supervisors is negatively correlated with EBP engagement while the effect of the use of a nursing model for education of paramedics is unclear.

6.5 Factors Influencing Paramedic Academic EBP Engagement

Despite EBP being considered a gold standard in health care, an abundance of published evidence and EBP being a registration requirement for health professionals, many patients do not receive evidence based care (Duff et al., 2020). Clinicians report lack of knowledge, skills, ability to access evidence, and time as barriers to implementing EBP (Castellini et al., 2020; Labrague et al., 2019; Naghibi et al., 2021) Academics have a crucial role in preparing future health care professionals, including paramedics, as evidence-based practitioners (Gulzar Malik, Lisa McKenna, & Debra Griffiths, 2016). Furthermore, educators cite of lack of knowledge, information and literacy skills, insufficient confidence in teaching EBP, frameworks for curricula as barriers for themselves to practice and teach EBP (Gulzar Malik, Lisa McKenna, & Virginia Plummer, 2016; Milner et al., 2018; Upton et al., 2015). This section considers the factors related to PAs engaging with EBP.

6.5.1 Personal

The personal factors that contribute to each individual PA's profile such as understanding and attitude to EBP, education, experience, and X-factor. The results from the EBP^2-P provided some insights to factors that are correlated with higher domain scores. The access and engagement with EBP education was significantly positively correlated with sympathy, terminology, and confidence domains. A first degree other than paramedicine was also significantly positively correlated with terminology. Time since achieving a qualification

demonstrated a U-shaped relationship with having lower domain scores in terminology and confidence with those qualified as a paramedic between 2005 and 2010. The factors of having published or presented research and Time teaching at university were both independently significantly positively correlated with sympathy, terminology, and confidence domains. As discussed in Chapter 4, education, time teaching at university, having a degree other than paramedicine and publishing or presenting research improved some of the EBP^2-P domains. The lower domain scores for the 2005 to 2010 graduates probably relates to EBP not being incorporated in paramedic degrees before 2010 while those that graduated before 2005 have competed some other higher degree.

Higher education experience seems to be correlated with improved confidence to teach EBP. While all the case study respondents felt confident to teach EBP, all felt they had improved when interviewed two years later. While this may be expected with new academics such as participants D and G, it also occurred with Participant B, who had been teaching for more than 10 years. Specifically, Participant B felt his EBP teaching had notably improved after an EBP focused course. Other participants spoke about the importance of having a mentor to assist them when starting to use EBP. Participant D remarked that he had multiple mentors when he was working on a physician led, helicopter-based ambulance unit, "*anytime you had a question to ask there was always somebody to offer an answer, to teach you*".

The existence of an EBP X-factor was hinted at in the data. Participant B, an experienced PA, believed that there was a small cohort of students that had an *X-factor*. He asserted, "*I think these students are different from the start, they come in with an inquiring mind and they say from day one that they're interested in research and EBP*". He continued, "*they are different to the other 90% percent of students, ultimately they change clinical practice guidelines, or become leaders in the industry, or go onto to do Honours, Masters, PhD*". He contended that most new PAs come from that background, and they needed to be

identified and nurtured. Participant B also clarified that it was not just about intelligence as he had experience teaching in the medical faculty and the same phenomena was present.

Lehane et al. (2019) described an *X-factor* required to teach EBP. It entailed having expertise in integrating the four components of the best available evidence, the patient's individual circumstances and preferences, clinical expertise, and the systems resources resulting in an evidence-based decision.

The tantalising prospect that some students arrive at university with an aptitude for EBP is difficult to evidence. Universities do provide talented undergraduate students research opportunities such as vacation research scholarship programs (Monash University, 2021b) and research projects led by academic staff (Galka et al., 2019; Hutchins et al., 2019). However, these seem to be focused on evidence production rather than EBP.

6.5.2 Environment

The engagement of the health care professions with EBP is affected by external factors including systemic, organisational, and legal (Castellini et al., 2020; Ferreira et al., 2022; Pitsillidou et al., 2021). Health care academics, such as PAs, are impacted by these when practicing clinically and by time, learning environment, teaching strategy, resources, clinical placement suitability, and organizational support when teaching (Skela-Savic et al., 2020; Wakibi et al., 2021).

All case study participants supported integrating EBP through all the subjects in a paramedic undergraduate degree, with a dedicated unit focussed on teaching basic skills early and a capstone unit incorporating all steps of EBP near the conclusion of the course. Previous literature strongly supports this approach to integrating EBP within course structures (e.g. Malik et al., 2015; Ruzafa-Martínez et al., 2016; Skela-Savic et al., 2020). However, this was not the case with all paramedic curricula with all participants reporting a lack of integration in some units, particularly clinical placement. Resistance from clinical supervisors to both

students and PAs practicing EBP was reported by the participants as a major barrier which also negatively influenced the students attitudes to EBP. Bourke-Matas et al. (2020) reported that 30% of students were fearful of bringing up EBP in discussions with clinical supervisors. Lack of support from supervisors is also strongly correlated with lower EBP use by health care professionals. Lack of time to keep up with new evidence due to workload was mentioned by most case study participants. EBP^2-P respondents rated significantly more of an issue in Australia than NZ or the UK. Leadership support of evidence based practice was seen as critical in EBP readiness (Schaefer & Welton, 2018).

6.5.3 Paramedic Academic Preparation to Teach EBP?

PA cohort rated themselves highly in EBP^2-P, scoring at least as well as other health academics and post graduate health students, and significantly higher in all areas than undergraduate health students. All case study participants expressed confidence in their own ability to teach EBP. However, many case study participants did not share the same confidence in their colleagues. From the above pattern of data, those prepared to teach EBP to undergraduate paramedics were not initially trained as a paramedic but do understand the paramedic profession, the have had EBP training, presented or published in an academic journal, hold a higher degree and have been teaching for more than 10 years at university.

6.6 Recommendations

6.6.1 Recommendations for Practice

The following recommendations have been formulated based on the findings of the current research and the available literature.

6.6.1.1 Recruit, Develop, and Retain Paramedic Academics

The proposals from industry to recruit, develop and sustain the PA workforce are not new (O'Meara, 2006; O'Meara & Maguire, 2018; O'Meara, Maguire, et al., 2015). The current research highlights that the PA cohort have skills gaps in EBP but also a lack of completed PhDs, research activity, and peer reviewed publications. High workloads and comparatively low wages compared to clinically active paramedics contribute to a substantial turnover in academic staff evidenced by the large percentage of junior PA seen in this study, with a resulting lower average professional experience level within the workforce. To be better at teaching EBP and to assist in the production of evidence of practice, the PA workforce need to be supported with manageable workloads, assistance to upgrade qualification to PhD, specific education in EBP, and financial supplements to the academic wage so that it is comparable with an ambulance service educator rather that a student. Clinical active paramedics need a mentoring pathway into teaching, research, and PhD programs. Paramedic professional bodies, universities, and the Ambulance services need to come together to have joint appointments so paramedics can maintain clinical currency like other health professions (Murray et al., 2014). Ambulance services should utilise these joint appointments for clinical governance and targeted research (O'Meara & Maguire, 2018). These focussed working arrangements could increase the profile and status of paramedic academics thus increasing satisfaction and reducing turnover rate (French et al., 2020).

6.6.1.2 EBP Education Program for Clinical Supervisors

The current research identified clinical supervisors as critical in influencing attitudes to and ability to practice EBP in undergraduate paramedic students. This is well supported by the literature (e.g. Bourke-Matas et al., 2020; Goorts et al., 2021; Wilson et al., 2021). Many of these clinical supervisors would have entered the clinical workforce before EBP was common in the undergraduate degrees. Some of the newer clinical supervisors would have had their own

EBP experience affected by unsympathetic supervisors. This cohort need access to, and provision of, education in EBP. Ideally this would be equivalent to an undergraduate unit of around 40 hrs contact time (Moore et al., 2019), however the current research showed that even short courses improve EBP^2-P domain scores. Establishing a critical mass of clinical supervisors well educated in EBP teaching would be essential in getting a sustained change in the profession (Lehane et al., 2019). Paramedic clinical supervisors with both a strong understanding of EBP and positive attitudes towards EBP should foster an academic workforce that is better equipped to enable and encourage the application of EBP by undergraduate students.

6.6.1.3 EBP Integration in Undergraduate Degree

When paramedic undergraduate degrees are rewritten for accreditation, EBP should be integrated with all units. The integration of EBP was supported by all case study participants and this academic practice is widely supported by literature (e.g. André et al., 2016; Niven et al., 2013; Straus et al., 2018). Students must see EBP as an integral part of the paramedic process not something tacked on by academics (Bhatt & Sheth, 2021). Consensus of case study participants and literature is to have a dedicated EBP unit in the first semester (Dotson et al., 2015; G. Malik et al., 2016) and a capstone unit incorporating EBP as a major theme (Kim et al., 2019). The importance of EBP being a central part of clinical placements has strong support in the literature (Fiset et al., 2017; Malik et al., 2017).

6.6.2 Recommendations for research

6.6.2.1 EBP^2-P of Paramedic Students Transiting into the Workforce

Only a limited number of studies exist on the relationships between the applied attributes of paramedic undergraduate students and the efficacy of their pedagogical connection

to EBP. Previous studies have identified they are motivated toward research (Callaghan et al., 2011), demonstrate traits relating to knowledge translation (Williams, Jennings, et al., 2013), understand the production of evidence (Strong & Thompson, 2016), engage in learning epidemiology (Lim et al. (2016), possess a positive perception of EBP (Givati et al., 2018; Murphy et al., 2019; Wilson et al., 2021), engage in shared decision making (Eaton, 2019), report an intention to use EBP (Ramis, Chang, & Nissen, 2019), undertake EBP conversations with clinical supervisor Bourke-Matas et al. (2020), and possess information literacy (Barr et al., 2020). However, no study could be identified that has examined the applied effectiveness of EBP education on the professional performance of paramedic students. Hence the research question is, "Are paramedic graduates prepared to use EBP in clinical practice?"

I propose a prospective, observational, longitudinal design will be used with a positivist philosophy. The EBP^2-P as described in chapter 4 will be deployed which is customized for paramedics and consist of the self-reported EBP domains of relevance, terminology, confidence, practice, and sympathy. Students will be recruited and sampled early in first year, at the end of their final year, and at the end of their first year in the workforce. Mixed model analysis with sequential Bonferroni adjustment (Thalheimer & Cook, 2002) will be used to analyse the data. Means scores of the descriptive data and analyses for the cohort over the three survey times and across the five EBP domains will be calculated. Effect sizes will indicate the impact of EBP undergraduate education and graduate year on paramedic students. The results could also be benchmarked with the data from this thesis and compatible studies in healthcare students (e.g. Hu et al., 2020; McEvoy et al., 2011; Snibsøer, Graverholt, et al., 2018).

6.6.2.2 Development and Evaluation of Assessing EBP Competency using OSCEs in Undergraduate Paramedics

Competence in EBP is needed for paramedics for safe practice and registration. This necessitates an authentic, valid, and reliable way of assessing all five steps of EBP in

undergraduate paramedics. Research question for this proposed study is, “Can OSCEs be, used to reliably and authentically assess undergraduate paramedics on all steps of EBP?”.

Current EBP assessment tools used in paramedic education are text based focusing on skills and knowledge. When assessed using the classification rubric for EBP assessment tools (CREATE) framework (Tilson et al., 2011) these tools lack assessment of behaviour of students in a realistic clinical scenario. Objective structured clinical examinations (OSCEs) have a long history of use in many health disciplines, including paramedicine (Bell et al., 2020), for assessing clinical competencies, and have been validated to assess EBM in undergraduate medical students with high reliability (Kumaravel et al., 2021). EBP assessment integrated in to OCSEs undergraduate paramedic course would be able to assess all components of the CREATE framework. Different OCSE scenarios with increasing complexity could be used at different stages of a paramedic undergraduate spiral curriculum to match the development of EBP core competencies though the course. Kane’s theory of validity, the use of OSCEs, as well as Miller’s assessment of “knows” and “knows how” (Khan et al., 2013) will be used to inform decisions on competency.

OSCE scenarios would be written by clinical and EBP content experts, reviewed by the teaching team for face validity, piloted with volunteer students then trailed in formative assessments before summative use. OSCE targeted at first year level would involve construction of an answerable clinical question from a clinical scenario, searching online for a suitable article and analysing the selected article. Final year scenarios would involve a more complex clinical scenario followed by all five steps of EBP with the patient circumstances considered. Marking rubrics would be prepared and examiners trained including pre-assessment moderation. Peri-assessment moderation would be achieved with a roving moderator and post moderation of a 10% sample and all fails via video recording of the OSCEs. Consequential validity would be established by using criterion-based standard setting

methods. Internal structure validity would be verified by psychometric measures at the station level and across the complete OSCE mean scores and pass rates (Tavakol & Dennick, 2012).

6.6.2.3 Paramedic Signature Pedagogy: Consensus Statement Based on a Systematic Review and Delphi Survey

A paramedic signature pedagogy has been widely called for 13 years (Acker & Johnston, 2015; Bell et al., 2021; Willis, 2009), one has yet to be established (Weber, Lawson, & Williams, 2021). Signature pedagogies are distinctive styles of teaching and instruction tailored to a profession, often common across institutions, that suitably prepares graduates for that profession to think and act like experts (Shulman, 2005a). For this proposed research a constructionist approach in which knowledge is considered to be subjective and gained though interaction with an informants will be utilised. A Delphi methodology would be used constructed on the belief that decisions from a structured group of individuals are more accurate than those from unstructured groups (Diaz & Soriano, 2021). Delphi techniques are used analyse future developments to find consensus. A Delphi survey target respondent population would be the PA cohort as the as they are considered a priori to be competent in the area (Niederberger & Spranger, 2020). For this modified Delphi survey study, a paramedic signature pedagogy suitable for undergraduate education will be developed in four stages:

1. Generation of an initial set of paramedic pedagogy derived from a systematic review of education studies of undergraduate paramedics.
2. A 2-round, web-based Delphi survey of paramedics, selected using purposive sampling of academics and educators in countries utilising higher education for paramedics, to prioritize and gain consensus on the most essential elements of the paramedic signature pedagogy.
3. Consensus meetings, both face-to-face and via video conference, to finalize the consensus on the elements of the paramedic signature pedagogy.

4. Feedback and endorsement from representative bodies of paramedic academics, paramedics professional groups and industry bodies.

The resultant paramedic signature pedagogy would be disseminated along with examples of learning resources on an open access data base. Future work would include evolution of the signature pedagogy based on feedback from stakeholders and monitoring of student outcomes.

6.6.2.4 Focus Group of PA on EBP

The teaching of EBP to paramedic undergraduates by PA is ill-defined and poorly understood. This makes it appropriate to use focus groups methodology to more deeply explore participants' knowledge and experiences enhance by capitalizing on group dynamics and interpersonal communication (Stalmeijer et al., 2014). The focus groups study finding will be used to extend the qualitative findings from this thesis. Individuals and sites would be purposively sampled from the Countries delivering paramedic Bachelor degree level including, Australia, Canada, Finland, New Zealand, Norway, Qatar, South Africa, the United Kingdom, and the United States of America to increase understanding of the EBP teaching (Creswell & Clark, 2018). All participants will be currently teaching into a paramedic degree program. Focus groups will continue until theoretical saturation occurs (Rowlands et al., 2016).

To elicit interviewees beliefs and experiences with teaching EBP, a semi-structured interview technique will be used. Initial questions informed literature review include of factors that might influence the ability to teach EBP such as pedagogy, curriculum, student perceptions, academics experience and qualifications needed. Thematic analysis will be used to identify patterns in the data (Castleberry & Nolen, 2018). Themes from the data will be interpreted and analysed in light of the available literature. Findings may assist the teaching of EBP to paramedic undergraduates in respect to the pedagogical content knowledge, signature pedagogy, and educational relationship between student paramedics and non-paramedic PAs.

6.6.3 Limitations

6.6.3.1 EBP^2-P

The response rate for the EBP^2-P was 33.5% (106/316) using best estimates for the population size (Munro et al., 2016a). While this is close to the average for an online survey (Nulty, 2008) it did not reach the 174 needed from the power calculation using values of α error of 0.05, a degree of accuracy of 0.05 and variance estimation of 0.50 (Bartlet et al., 2001) despite efforts to increase response rate. This power constraint would increase the probability of a type I error and hence increases the likelihood of failing to detect small differences between groups (Jones et al., 2003).

The EBP^2-P was based on the EBP^2 questionnaire, a measure psychometrically examined for convergent validity, discriminative validity, and test-retest reliability (McEvoy et al., 2010a). The EBP^2-P had a Cronbach's Alpha of .945 (N= 58) which is slightly high (> .90) suggesting that some items are redundant, and the instrument could be shortened.

Although convenient for logistical reasons, the EBP^2-P is a self-reported study and so is susceptible to response biases such as social desirability bias (Krumpal, 2013) and recall bias (Rosenman et al., 2011). However it has been argued that self-reported surveys issues are overstated (Spector, 2019). Future research may include objective measures of the PA's EBP and pedagogical competence, the students EBP competence and more ambitiously improved patient outcomes.

6.6.3.2 Case Studies

While the case study participants were purposefully sampled and resampled two years later, there were some limitations. Firstly, there were no New Zealand academics in the cohort. This was partially due to financial limitations as the initial interviews were conducted in person. This omission would limit the nuances and depth of understanding of a New Zealand based participants lived experience that the qualitative approaches bring to a mix methods

study. Secondly case study participant E was lost to follow up due to retirement. Thirdly the sampling of the PA for the case studies did not include individuals that had not received EBP training or were not positive about EBP. These individuals, although harder to access, could provide valuable insights into barriers and negative attitudes toward EBP.

6.6.3.3 General

The thesis main research question concerned the preparedness of PA to teach EBP and thereby focused on academics, in doing so it omitted consideration of the important stake holders of students, clinical supervisors, and industry leaders. Future research may provide would benefit from the inclusion of their insights and viewpoints.

The thesis has an English speaking country bias due to paramedic literature being dominated by USA, Australia and the UK (Olaussen et al., 2021). Only limited literature was sourced from the authors based in New Zealand. The thesis authors own bias was primarily Australian, however their UK experience teaching paramedics in higher education must also be acknowledged.

6.7 Conclusion

In considering the primary aim of this thesis the resultant quantitative and qualitative data has indicated that there is progression towards Australasian and UK Paramedic Academics demonstrated adequate preparedness to teach EBP. A validated self-report survey instrument, the EBP^2-P, collected demographic data and assessed the domains of relevance, terminology, practice, confidence, and sympathy. Qualitative data was collected by semi-structured interviews of eight purposively sampled paramedics academics in Australasia and the UK, with follow up after two years. Thematic analysis was performed with open coding initially as themes were identified.

The PA cohorts' results from the EBP^2-P revealed significantly higher scores than those reported for Allied Health Academics in the practice and sympathy domains and similar values in the other three domains. In the case study interviews, all participants stated they were prepared to teach EBP to their paramedic undergraduates. However, most mentioned colleagues who they rated unsatisfactory due to lack of EBP knowledge, understanding of the paramedic environment, or inappropriate pedagogy. The demographic data highlighted that the PA cohort had a high proportion of inexperienced academics at the tertiary level, with a notable portion lacking post graduate qualifications, research or publishing experience, and engagement within EBP education programs. It was encouraging to see a notable percentage of PAs (33%) enrolled in some form of higher degree. A small subgroup of the PAs did not identify as a paramedic or an academic despite being both. Participants considered clinical placements were critical for paramedic students developing positive attitudes to EBP, however, this and the ability to practice EBP in a clinical setting was tightly controlled by clinical supervisors who themselves may lack EBP skills. Overall, the survey results for the PA subgroups of Australian, NZ and the UK were similar. The differences that were present, such as in the EBP relevance domain, between the three countries were mainly due to professional registration starting earlier in the UK.

To ensure graduating paramedics have the skills and attitudes to practice EBP the profession would benefit from several improvements. Specifically, PA cohorts need to be mentored and supported to reduce turnover to make certain an adequate number are available to meet the needs of the paramedic profession. A partnership of the professional groups, universities, and ambulance services need to ensure adequate funding and wage equity with clinical peers, foster PhD training, create research opportunities, and facilitate pedagogical content knowledge sharing. Finally, the clinical supervisors and managers in ambulance services need to be educated in EBP. Nearly 200 year ago German polymath Johann Wolfgang

von Goethe (1833) wrote, "*Knowing is not enough; we must apply. Willing is not enough, we must do*". This applies to the transfer of research knowledge to clinical practice but also to development of a cadre of trained experienced PA and to a system that lets paramedic students practice in a safe evidence-based approach.

7 APPENDICES

7.1 Appendix A: Permission to use the Evidence-Based Practice Profile Questionnaire

RE: Evidence-based practice
Maureen McEvoy
To:

Scott Stewart

Date:

3/28/2012 9:58:04 AM

Attachments:

Scoring of Evidence-Based Practice Profile Questionnaire.docx, Evidence-Based Practice Profile (EBP2) questionnaire.doc

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Scott
I've attached a copy of the questionnaire and a copy of the marking schedule.

Let me know if you need further information and all the best with your teaching and research.

Maureen

From: Scott Stewart [mailto:Scott.Stewart@vu.edu.au]
Sent: Tuesday, 27 March 2012 3:13 PM
To: Maureen McEvoy
Subject: Evidence-based practice

Maureen,

Hi. I am a lecturer at Victoria University teaching into the Paramedic Degree.

I am currently undertaking a PhD with the provisional title of "The preparedness of paramedic academics to teach Evidence Based Practice". It is envisaged that this will be a mixed methods study involving, in part, the surveying of academics teaching into paramedic undergraduate courses.

I have read with interest your papers on the development of your EBP2 questionnaire .

Would it be possible to discuss gaining access to a copy of the questionnaire as I believe it would be very instructive.

Looking forward to hearing from you.

Regards

Scott

Scott Stewart
Nurse to Paramedic Pathway & 3rd Year Coordinator
Paramedic Science Lecturer
Victoria University

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7.2 Appendix B: Evidence Based Practice Profile – Paramedicine Questionnaire

Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice

You are invited to participate

This project is being conducted by a student researcher Mr Scott Stewart as part of a PhD study at Victoria University under the supervision of Professor Maureen Ryan and Dr Elizabeth Thyer.

Project explanation

Paramedics in Australia and the UK are required to be educated in Evidence Based Practice (EBP) however no profession specific literature exists to guide this process. This project aims to explore factors that could affect the preparedness of Australasian and UK Paramedic academics to teach Evidence Based Practice. It will examine Paramedic Academics' attitudes towards and knowledge of teaching, EBP knowledge, paramedic examples of EBP and awareness of the paramedic industry. It will do this through case studies, focus groups and online surveys.

What will I be asked to do?

If you agree to be part of the research study, you will be asked to complete an online survey about teaching Evidence Based Practice. The questions include will include your views, experience and thoughts on teaching EBP to paramedic students. You may be also asked about your pedagogy, EBP knowledge, and paramedic examples of EBP and awareness of the paramedic industry. We expect this survey to take 10 to 15 minutes to complete. Some of the survey questions ask about your attitudes and thoughts and may be distressing to you as you think about your experiences. If you need to talk to someone about these feelings, please contact Lifeline 131114 (in Australia or NZ) or the UK Samaritans helpline 08457 90 90 90 (in the UK). Researchers will not be able to link your survey responses to you. The Qualtrics survey software has been set so that no identifying information is captured. We may publish the results of this study, but will not include any information that would identify you.

What will I gain from participating?

You will not receive any reimbursement or payment for participation, however, you will have the opportunity to partake in a study that could directly impact and improve the future education of paramedic students in EBP

How will the information I give be used?

The results of this study will be published in a thesis and may also feature in a journal, report, poster and/or conference presentation.

What are the potential risks of participating in this project?

You may choose not to answer any discussion question and you can stop your participation in the focus group at any time. Participating in this study is completely voluntary. Even if you decide to participate now, you

may change your mind and stop at any time. You may choose to not answer an individual question, or you may skip any section of the survey.

How will this project be conducted?

The study will use interviews, focus groups and online questionnaires to produce an overall understanding of Paramedic EBP undergraduate teaching in Australia, NZ and the UK.

Who is conducting the study?

Chief Investigator: Professor Maureen Ryan +61 (3) 9919 4179 Maureen.Ryan@vu.edu.au
Scott Stewart +61 (3) 9919 2642 scott.stewart@vu.edu.au

Any queries about your participation in this project may be directed to the Chief Investigator listed above.

If you have any queries or complaints about the way you have been treated, you may contact the Research Ethics and Biosafety Manager, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 or phone +61 (03) 9919 4148.

I have read & understood the above consent form and desire of my own free will to participate in this study.

Yes
No

If No Is Selected, Then Skip To End of Survey

I currently teach into a paramedic undergraduate degree.

Yes

No

If No Is Selected, Then Skip To End of Survey

Rate your RESPONSE to the following statements:

	Not at all true	Not really true	Possibly true	Quite likely true	Very true
I understand what is meant by the term evidence-based practice (EBP)					
I am aware of EBP in my Paramedics					
Paramedics uses EBP as a framework					
I am aware of current developments in EBP in my Paramedics					

Do you have any comments about your responses?

Rate your RESPONSE to the following statements:

	No intention at all	Unlikely to consider doing it	Could consider doing it	Highly likely to consider doing it	Absolutely intend to do it / keep doing it
I intend to develop knowledge about EBP					
I intend to develop skills in accessing, acquiring and appraising evidence relevant to Paramedics					
I intend to read relevant literature to update knowledge					
I intend to apply best available evidence findings to improve practice					

Do you have any comments about your responses?

Rate your RESPONSE to the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Application of EBP is necessary in teaching Paramedics					
Literature and research findings are useful in my day-to-day teaching					
I need to increase the use of evidence in my day-to-day teaching					
I am interested in learning or improving the skills necessary to incorporate EBP into my teaching					
EBP improves the quality of my teaching					
EBP helps Paramedics make decisions about patients					
EBP does not take into account the limitations of day-to-day Paramedic work					

There isn't much point in doing EBP because there is a lack of strong evidence to support most of the work Paramedics do					
EBP does not take into account patients' preferences					
In making decisions about my professional teaching, I value clinical/field experience more than scientific studies					
Paramedic workplace experience is the most reliable way to know what really works					
Critical appraisal of the literature and its relevance to the client is not very practical in the real world of Paramedics					
Seeking relevant evidence from scientific studies is not very practical in the real world					

Do you have any comments about your responses?

Rate your UNDERSTANDING of the following terms:

	Never heard of the term	Have heard of it but don't understand	Have some understanding	Understand quite well	Understand and could explain to others
Relative risk					
Absolute risk					
Systematic review					
Odds ratio					
Meta analysis					
Number needed to treat					
Confidence interval					
Publication bias					
Forest plot					
Intention to treat					
Statistical significance					
Minimum clinically worthwhile effect					
Clinical importance					
Randomised controlled trial (RTC)					
Continuous outcomes					
Treatment effect size					

Do you have any comments about your responses?

In the PAST YEAR HOW OFTEN have you

	Never	Monthly or less	Fortnightly	Weekly	Daily
Formulated a clearly answerable question that defines the client or problem, the intervention and outcome(s) of interest					
Tracked down the relevant evidence once you have formulated the question					
Searched an electronic database					
Critically appraised any literature you have discovered to determine the methodological quality					
Integrated research evidence with your expertise					
Considered patients' preferences when making clinical/professional decisions					
Read published research reports					
Informally shared and discussed literature/research findings with others in your workplace					
Formally shared and discussed literature/research findings with others in your department/practice (eg journal club, in-service presentation)					

Do you have any comments about your responses?

Rate your CONFIDENCE in the following EBP activities:

	Not at all confident	A little confident	Reasonably confident	Quite confident	Very confident
Research skills					
Computer skills					
Ability to identify gaps in your knowledge					
Ability to convert your information needs into clearly answerable questions					
Awareness of major information types and sources					
Ability to search an electronic database					
Ability to access evidence (get copies of articles or reports)					
Ability to critically analyse evidence against set standards ie quality scoring					
Ability to determine how valid (close to the truth) the material is					
Ability to determine how useful (clinically applicable) the material is					
Ability to apply information to individual cases (ie integrate research evidence with personal preferences, values, concerns, expectations)					

Do you have any comments about your responses?

Rate your RESPONSE to the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
I want to learn new information					
I critically evaluate new ideas					
I have good management skills					
I solve problems using a plan					
I enjoy studying					
In my organisation, leaders continually look for opportunities to learn					
I make time to read research					
Insufficient time is one of the greatest barriers to the use of EBP in my clinical / professional practice					
My workload is too great for me to keep up to date with all the new evidence					
The cost of information resources limits my use of EBP in my clinical/ professional practice					
Easy access to computers dictates whether or not I practice EBP					
The resources available to me are adequate to undertake EBP					
Collective support amongst my colleagues is one of the greatest facilitators to my use of EBP in clinical / professional practice					
Support from management is one of the greatest facilitators to my use of EBP in clinical/ professional practice					
Senior management/my employer requires me to teach EBP					
I've just had a gutful of EBP					

Do you have any comments about your responses?

Demographics

What country do you work in?
- Australia
- New Zealand
- United Kingdom

What is your age? __ (years)

When was your final year as an undergraduate student? (This is for your first Diploma or Degree if you have multiple)

Sex
- Male
- Female

Have you worked as a Paramedic?
- Yes
- No

If No is Selected, Then Skip yo do you regard yourself as an Academic?

Do you still work as a paramedic?
- Full time
- Part time
- Casually
- No

Do you still regard yourself as a paramedic?
- Yes
- No

What is your profession? (apart from paramedics tick all that apply)
- Nursing
- Physiology
- Psychology
- Law
- Ethics
- Medicine
- Other please specify _____

Do you still work in this (these) profession(s)?
- Full time
- Part time
- Casually
- No

Do you regard yourself as an Academic?
- Yes
- No

How many years have you been teaching at university?

Which of the following best describes your MAIN work setting: (Tick one box only)
- Public sector
- Private sector
- Academic
- Other (please specify) _____

Type of work: In which area have you mainly worked in the past year? (Tick one box only)

- Paramedic (On Road)
- Paramedic (in service education)
- Manager (eg Health / Education Manager)
- Education (Lecturer at University)
- Health (eg Diagnostic, Promotion, Therapy, Allied Health, Medical, Nursing other than Paramedics)
- Information, Communication, Technology
- Legal, Social and Welfare
- Arts and Media
- Business, Human Resources and Marketing
- Design, Engineering, Science and Transport
- Other (please specify)

Please provide a brief overview of your work experience in the past 12 months:

Are you currently studying? If Yes what are you studying?

- Yes - Full time _____
- Yes - part time _____
- No

What qualifications have you attained? (select all that apply)

- Registered Nurse
- Qualified Paramedic
- Diploma
- Foundation Degree
- Bachelor
- Honours (Bachelor WITH Honours or Bachelor AND Honours degree)
- Post graduate certificate course
- Graduate Diploma
- Masters course work /Graduate Entry
- Masters (Research)
- PhD
- Other (Please specify) _____

Have you formally undertaken any training in EBP?

- Yes
- No

Answer If Have you formally undertaken any training in EBP
If YES: choose longest completed course if you have done more than one

- EBP course as part of University education (Bachelor, Masters etc) >20 hrs
- Short course 10 - 20 hours
- Weekend course 3 - 10 hrs
- Single lecture 1- 3 hrs

Is English your first language?

- Yes
- No

Have you conducted research?

- Yes - Enter the total number of published papers & conference presentations _____
- No

In your teaching of paramedics, is EBP: (select all that apply)

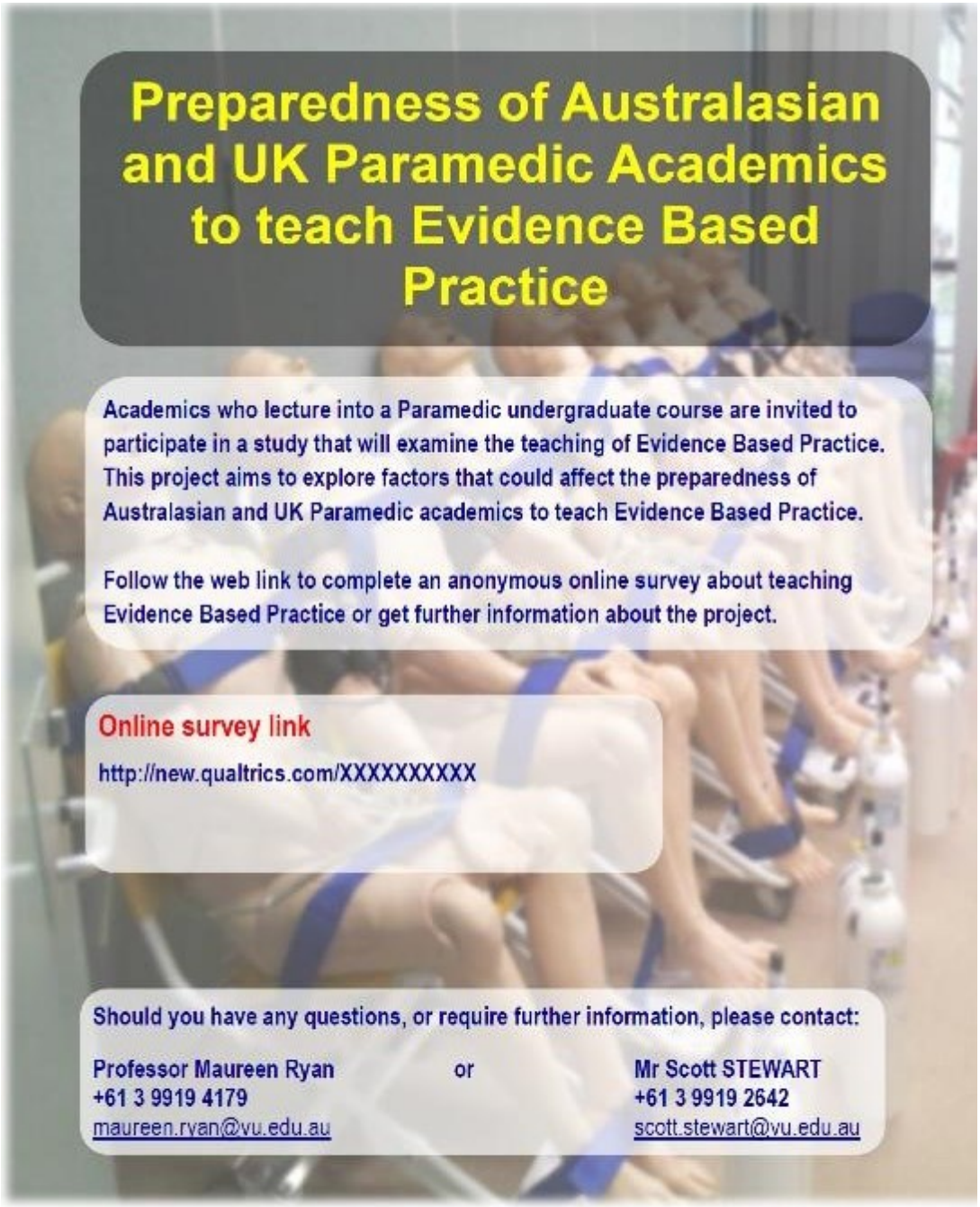
- Not covered at all
- Covered as a discrete unit that I teach into
- Covered in a discrete unit taught by others
- Themed throughout the course

In the paramedics course you teach into, EBP is covered in: (select all that apply)

- 1st year
- 2nd year
- 3rd year
- 4th year
- Not at all

Thank you for assisting with this survey. If you know of any other academics teaching into an undergraduate Paramedic degree that has not completed this survey, please forward the web link on.

7.3 Appendix C: Online Survey Flyer



VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

7.4 Appendix D. Ethics approval of the research project

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

MEMO

TO Professor Maureen Ryan
School of Education
Faculty of AEHD
Victoria University

DATE 25/10/2012

FROM A/Professor Liza Heslop
Chair
Health Engineering and Science Human Research Ethics Committee

SUBJECT Ethics Application – HRETH 12/238

Dear Professor Ryan,

Thank you for submitting this application for ethical approval of the project entitled:

HRETH 12/238 - Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice

The proposed research project has been accepted and deemed to meet the requirements of the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007)' by the Chair of the Health Engineering and Science Human Research Ethics Committee. Approval has been granted from **25 October 2012 to 25 October 2014.**

Continued approval of this research project by the Health Engineering and Science Human Research Ethics Committee (HES HREC) is conditional upon the provision of a report within 12 months of the above approval date (**25 October 2013**) or upon the completion of the project (if earlier). A report proforma may be downloaded from the VUHREC web site at: http://research.vu.edu.au/hrec.php.

Please note that the Human Research Ethics Committee must be informed of the following: any changes to the approved research protocol, project timelines, any serious events or adverse and/or unforeseen events that may affect continued ethical acceptability of the project. In these unlikely events, researchers must immediately cease all data collection until the Committee has approved the changes. Researchers are also reminded of the need to notify the approving HREC of changes to personnel in research projects via a request for a minor amendment. It should also be noted that it is the Chief Investigators' responsibility to ensure the research project is conducted in line with the recommendations outlined in the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007).'

On behalf of the Committee, I wish you all the best for the conduct of the project.

Kind regards,

A/Professor Liza Heslop
Chair
Health Engineering and Science Human Research Ethics Committee

7.5 Appendix E: Letter of Support from St Georges, University of London

Hi Scott,

that is all fine.

Happy to help.

Sue

Susan Coppard
Principal Lecturer
Course Director/Deputy Head of The Centre for Paramedic Science
Faculty of Health and Social Care Sciences
2nd Floor Grosvenor Wing
St Georges Hospital
Cranmer Terrace
London SW17 ORE
Office 0208 725 2381
Mobile 07880786771

Hi Paul & Sue,

The reason I am emailing is that I would like to use St Georges as one of the venues for a Focus Group & also interview 2 x staff. The focus group would be 8-12 academics that teach into the paramedic degree (from St George's or elsewhere) it would take approximately 1 2 hrs.

I would also like to interview 2 x staff members using semi structured interviews. This would happen late 2012/early 2013.

I need your support to show the ethics committee so I can proceed.

The overall plan of a mixed methods (qualitative and quantitative study) of case studies, focus groups & online questionnaire to build up a picture of evidence based teaching of paramedic undergraduates in Australia and the UK. The attached poster may help explain.

The attached candidature document explains more fully.

Scott

Scott Stewart
Nurse to Paramedic Pathway & 3rd Year Coordinator
Paramedic Science Lecturer
School of Biomedical and Health Sciences
Faculty of Health, Engineering & Science
Victoria University

Phone + 61 3 9919 2642
Mobile 0434 264 900

7.6 Appendix F: Letter of support from SECAmb service.

Andy Newton [Andy.Newton@secamb.nhs.uk]

PhD

Friday, 27 July 2012 5:59 AM

Happy to support Scott and I am sure that we can find a room, perhaps at Tongham, Chertsey, Lewes or elsewhere?

When you are ready to move to the next stage just let me know and I'll find someone to help co-ordinate any SECAmb input.

Regards Andy.

PS. We have had Cameron from VA with us this afternoon and I had lunch with the new Chairman [Just] a couple of weeks ago, very interesting stuff and there is a good chance of some collaborative work between the two organisations. I have mention you of course, so that may be a useful angle.

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7.7 Appendix G: Information to participants involved in research – Online Survey

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

You are invited to participate in a research project entitled "*Preparedness of Australian and UK Paramedic Academics to teach Evidence Based Practice*".

This project is being conducted by a student researcher Mr Scott Stewart as part of a PhD study at Victoria University under the supervision of Professor Maureen Ryan from the Faculty Arts, Education and Human Development and Dr Elizabeth Thyer from Faculty of Health, Science and Engineering.

Project explanation

Paramedics in Australia and the UK are required to be educated in Evidence Based Practice (EBP) however no profession specific literature exists to guide this process. This project aims to explore factors that could affect the preparedness of Australasian and UK Paramedic academics to teach Evidence Based Practice. It will examine Paramedic Academics' attitudes towards and knowledge of teaching, EBP knowledge, paramedic examples of EBP and awareness of the paramedic industry. It will do this through case studies, focus groups and online surveys.

What will I be asked to do?

If you agree to be part of the research study, you will be asked to complete an online survey about teaching Evidence Based Practice. The questions include will include your views, experience and thoughts on teaching EBP to paramedic students. You may be also asked about your pedagogy, EBP knowledge, and paramedic examples of EBP and awareness of the paramedic industry.

We expect this survey to take 20 to 30 minutes to complete.

Some of the survey questions ask about your attitudes and thoughts and may be distressing to you as you think about your experiences. If you need to talk to someone about these feelings, please contact Lifeline 131114 (in Australia) or the UK Samaritans help line 08457 90 90 90 (in the UK).

Researchers will not be able to link your survey responses to you. The Qualtrics survey software has been set so that no identifying information is captured. We may publish the results of this study, but will not include any information that would identify you.

Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. You may choose to not answer an individual question or you may skip any section of the survey. Simply click "Next" at the bottom of the survey page to move to the next question.

What will I gain from participating?

You will not receive any reimbursement or payment for participation, however, you will have the opportunity to partake in a study that could directly impact and improve the future education of paramedic students in EBP.

How will the information I give be used?

The results of this study will be published in a thesis and may also feature in a journal, report, poster and/or conference presentation.

V.1106 1 of 2

What are the potential risks of participating in this project?

You may choose not to answer any discussion question and you can stop your participation in the focus group at any time. If you need to talk to someone about these feelings, please contact:

- Dr Carolyn Deans, Senior Lecturer in Clinical Psychology, Victoria University +61 (03)9919 2334
- In Australia, Lifeline
  - 13 11 14 (24 hours a day, 7 days week) or
  - 1800 18 SANE (7263), Monday to Friday 9.00am-5.00pm.
- In New Zealand, Lifeline 0800 543 354 24-hour service.
- In UK Samaritans (08457 90 90 90) 24-hour service.

How will this project be conducted?

The study will use interviews, focus groups and online questionaries to produce an overall understanding of Paramedic EBP undergraduate teaching in Australia and the UK.

Who is conducting the study?

Chief Investigator
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Any queries about your participation in this project may be directed to the Chief Investigator listed above.
If you have any queries or complaints about the way you have been treated, you may contact the Research Ethics and Biosafety Manager, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 or phone (03) 9919 4148.

7.8 Appendix H: Information to participants involved in research -Case study

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

You are invited to participate in a research project entitled "*Preparedness of Australasian and UK Paramedic Academics to teach Evidence Based Practice*"

This project is being conducted by a student researcher Mr Scott Stewart as part of a PhD study at Victoria University under the supervision of Professor Maureen Ryan from the Faculty Arts, Education and Human Development and Dr Elizabeth Thyer from Faculty of Health, Science and Engineering.

Project explanation

Paramedics in Australia, NZ and the UK are required to be educated in Evidence Based Practice (EBP) however no profession specific literature exists to guide this process. This project aims to explore factors that could affect the preparedness of Australasian and UK Paramedic academics to teach Evidence Based Practice. It will examine Paramedic academics' attitudes towards and knowledge of teaching, EBP knowledge, Paramedic examples of EBP and awareness of the paramedic industry. It will do this through case studies, focus groups and online surveys.

What will I be asked to do?

If you agree to be part of the research study as a case study, you will participate in five interview sessions approximately six months apart. The first interview will be face to face with subsequent interviews conducted via Skype or telephone.

The interview question topics include will include your views, experience and thoughts on teaching EBP to paramedic students. You may be also asked about your pedagogy, EBP knowledge, and paramedic examples of EBP and awareness of the paramedic industry.

The interview will last about one hour and will be digitally voice recorded to make sure that it is documented accurately.

You will also be asked to participate in a web based blog, between the interviews, with the three other paramedic academics involved as case study subjects. The blogging will be anonymous and only viewable by the participants and the researchers named above. Topics discussed on the web blog will be similar to the interview questions. Web blogs enable participants to respond, reflect and interact with each other.

What will I gain from participating?

You will not receive any reimbursement or payment for participation, however, you will have the opportunity to partake in a study that could directly impact and improve the future education of paramedic students in EBP.

How will the information I give be used?

The results of this study will be published in a thesis and may also feature in a journal, report, poster and/or conference presentation. To protect your privacy it will not include any information that would identify you. To keep your information safe, the audio recording of your interview will be placed in a locked file cabinet until a written word-for-word copy of the discussion has been created. The researchers will enter study data on a computer that is password-protected and uses special coding to protect the information.

To protect confidentiality, your real name and work place will not be used in the written copy of the interview. In a similar manner you should chose a pseudonym to use on the web blog.

What are the potential risks of participating in this project?

You may choose not to answer any question and you can stop your participation in the research at any time. The interviewer will have a list of local agencies that can provide you with additional information or support if you are interested.

While unlikely, there is a chance that another member of the case studies could reveal something about you, your teaching practice or university that they learned in the blog. All case study members are asked to respect the privacy of other study members. You may tell others that you were in a case study online blog and the general topic of the discussion, but actual names and stories of other participants should not be repeated.

How will this project be conducted?

The study will use case studies, focus groups and online questionaries to produce an overall understanding of Paramedic EBP undergraduate teaching in Australia and the UK.

Who is conducting the study?

Chief Investigator
Professor Maureen Ryan
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Any queries about your participation in this project may be directed to the Chief Investigator listed above.
If you have any queries or complaints about the way you have been treated, you may contact the Research Ethics and Biosafety Manager, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 or phone (03) 9919 4148.

7.9 Appendix J. List of Universities in Australia, New Zealand and the United Kingdom offering a paramedic focused degree at the time of the quantitative data collection

Institution	Country	Qualification
Auckland University of Technology	New Zealand	Health Science (Paramedic)
Australian Catholic University	Australia	Paramedicine
Birmingham City University	United Kingdom	Paramedic Science
Bournemouth University	United Kingdom	Paramedic Science
Canterbury Christ Church University	United Kingdom	Paramedic Science
Central Queensland University	Australia	Paramedic Science
Charles Sturt University	Australia	Clinical Practice (Paramedic)
Coventry University	United Kingdom	Paramedic Science
Edge Hill University	United Kingdom	Paramedic Practice
Edith Cowan University	Australia	Health Science (Paramedic)
Flinders University	Australia	Health Science - Paramedic
La Trobe University	Australia	Health Sciences
Liverpool John Moores University	United Kingdom	Paramedic Practice
Monash University	Australia	Emergency Health (Paramedic)
Oxford Brookes University	United Kingdom	Paramedic Emergency Care
Plymouth University	United Kingdom	Paramedic Science
Queensland University of Technology	Australia	Health Science (Paramedic)
Glasgow Caledonian University	United Kingdom	Paramedic Practice
Sheffield Hallam University	United Kingdom	Paramedic Practice
St George's, University of London	United Kingdom	Paramedic Science
Staffordshire University	United Kingdom	Paramedic Science
Teesside University	United Kingdom	Paramedic Science
The Open University	United Kingdom	Paramedic Science
University of Brighton	United Kingdom	Paramedic Science
University of Central Lancashire	United Kingdom	Paramedic Practice
University of Greenwich	United Kingdom	Paramedic Science
University of Hertfordshire	United Kingdom	Paramedic Science
University of Northampton	United Kingdom	Paramedic Science
University of Portsmouth	United Kingdom	Paramedic Science
University of Surrey	United Kingdom	Paramedic Practice
University of Tasmania	Australia	Paramedic Practice
University of the Sunshine Coast	Australia	Paramedic Science
University of the West of England	United Kingdom	Paramedic Science
University of East Anglia	United Kingdom	Paramedic Science
Victoria University	Australia	Health Science (Paramedic)
Whitireia Community Polytechnic	New Zealand	Health Science (Paramedic)

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