When things go wrong: An exploration of the effectiveness of Te Whatu Ora – Waikato 'Patient-at-Risk' service, from the perspective of healthcare professionals

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A mixed methods study exploring the effectiveness of the Patient-at-Risk service within the Waikato Hospital

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Abstract

Background: Within an acute hospital, critically ill patients are not always located in the intensive care or high dependency unit. Most often, deteriorating patients are managed in the emergency department or wards (Jevon et al., 2012). Signs of decompensation are subtle, but often occur prior to deterioration or an acute event. Therefore, early recognition and timely management improve patient outcomes and reduce admission into critical care services (Jevon et al., 2012). Internationally, acute care teams have been developed to improve patient outcomes through early identification and escalation. The Waikato Hospital Patient-at-Risk (PaR) team is a wraparound service that act as a safety net to support staff during this time. Conflicting evidence is found in the literature that debates the effectiveness of acute care teams, part of this is due to the composition of acute care teams that differ worldwide, and this study sought to explore the value of the Waikato service.

Objective: To explore the perceived value of the Waikato Hospital Patient-at-Risk service from the perspectives of those who utilise this service and those who provide the service. Furthermore, the study seeks to identify the characteristics of patients treated by the PaR service.

Participants: Interviews were held with a total of 13 participants (Ward Registered Nurses = 7; PaR service Registered Nurses = 5; Medical doctors = 1). Medical notes for 1,212 PaR patients were analysed.

Methods: A mixed method research over two phases. Phase one involved matching medical notes with routinely collected hospital data to explore the correlation between PaR patient characteristics and outcomes. Phase two involved 13 semi-structured interviews with staff from the PaR team and in the wards. Findings from phase one, informed the questions in phase two and interviews underwent a thematic analysis employing a general inductive method of inquiry.

Results: This study identified that patients who are seen by the Waikato hospital Patient-at-risk service experience greater complexities contributing to increased length-of-stay. In addition, this service contributes to increased feelings of safety for staff.

Conclusion: This study identified that there was significant value of the PaR service in relation to teaching and training of junior nurses as well as reassurance of ward staff when patients began to deteriorate.

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Contribution

I, the researcher undertook all aspects of this study under the direct guidance of my supervisors. This entailed selecting the appropriate research design, the data collection and analysis and the publishing of the findings in this thesis.

Dedication

I dedicate this research thesis to myself, Rangi Marie Harrison. I stumbled across the postgraduate honours from a former graduate Michelle Cameron who suggested I consider it post my new graduate year. I never thought that I was academically smart enough to do this paper, yet here I am at the end of it. I am proud of myself for giving it a fair chance. I have learnt so much knowledge along the way and found a new passion in academics. This year has not been kind to me with various mental health and new life challenges, however, I am so proud of myself that despite all the shortcomings, I carried on and persevered despite wanting to quit every step of the way.

I am stronger than I give myself credit for, for this isn't the end, this is just the beginning.

Poipoi te kakano kia puawai- nurture the seed and it will blossom.

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Chapter I: Introduction

Research is formalised curiosity. It is poking and prying with a purpose.

Zora Neale Hurston, 1903 – 1996

The last century has seen a dramatic reduction in mortality rates and an associated increase in life expectancy. Consequently, illnesses and disease which once resulted in death are now treated and survivable, but often with an associated morbidity. This confluence of factors has meant that acute hospital care is increasingly more demanding and complex (World Health Organization, 2019). Effectively and efficiently caring for acutely unwell patients requires considerable skills, capabilities and competencies as a patient's condition can change very rapidly.

Recognising deterioration and responding in a timely and appropriate fashion is a complex process that has significant potential for error. Getting it wrong or indeed getting it right greatly impacts the cost of treatment, hospital length-of-stay as well as morbidity and mortality. Important considerations relate to how care is delivered by the healthcare systems and the access in which healthcare professionals have to prompt effective critical thinking for early recognition of deterioration. As deterioration prevention becomes a priority for the healthcare services, a number of approaches have been developed to enable early recognition and response, including early warning scales, nursing assessments and patient / whānau led escalation, as well as discrete teams that supplement existing ward care. The identification of deterioration within Waikato Hospital is centred on a combination of the early warning scale, nursing assessment and patient and whānau led escalation, as well as the establishment of the Patient-at-Risk (PaR) service. This small mobile team of senior registered nurses respond to referrals and deliver care alongside ward staff to reduce the incidence of adverse events.

PaR nurses have extensive acute care experience, and previous leadership roles. These registered nurses aim to work in partnership with the ward based multidisciplinary team to create a plan of care in order to reduce morbidity and mortality. Utilising

advanced nursing knowledge and evidence-based decision-making, PaR nurses aim to empower all staff members to develop skills, gain knowledge and escalate accordingly. However, the PaR team is a costly intervention and the actual role they have is often difficult to clearly describe. In an era of health rationalisation, being able to link the health dollar with positive outcomes is important. Therefore, this mixed methods study aims to explore the role of the PaR service from the perspective of those providing the service, the PaR registered nurses themselves as well as those working alongside them on the ward. The study also identifies the characteristics of PaR patients associated with adverse outcomes, mortality, morbidity and hospital length-of-stay. More specifically, the research aims to address the following questions:

1. What are the characteristics of patients who are referred to the Patient-at-Risk service, and what is the relationship with hospital length-of-stay and mortality?

2. What are the views of ward-based healthcare professionals concerning the Patient-at-Risk service?

3. What are the views of the registered nurses within the Patient-at-Risk team concerning the service they deliver?

Chapter II: Literature review

> *Research is seeing what everybody else has seen and thinking what nobody else has thought.*
>
> Albert Szent Gyorgyi, 1893-1986

2.1 Literature review introduction

Well considered and executed research is informed by a comprehensive overview of existing literature. Undertaking such, enables identification of gaps in knowledge, defining what exists in the literature, presents new evidence and divulges the themes. This way, questions can be generated to fill gaps in current research.

This chapter is organised into two parts. The first discusses patient demographics, length-of-stay, comorbidities and deteriorating patients, whilst the second focusses on the care of the deteriorating patient and the approaches adopted internationally to aid the recognition and response.

2.1.1 Definitions of terms

Deterioration is defined as a worsening clinical state resulting in organ dysfunction and an increased likelihood of experiencing morbidity and mortality. Acute illness, exacerbation of chronic disease, or complications of healthcare interventions can occur at any point, describing the aetiology of clinical deterioration. *Vital signs* are observed and recorded through the use of standardised tools to capture the physiological decompensation of a patient. Negligence of abnormal physiological parameters can lead to deterioration, cardiac arrest and serious adverse events (Jones et al., 2013; Padilla & Mayo, 2018).

To recognise and respond to deterioration, routine measurement of vital signs is essential. The *National Early Warning Score* (EWS) is a standardised tool that tallies the monitoring and documentation of seven core vital sign parameters measured within Aotearoa-New Zealand, respiratory rate, oxygen supplementation, oxygen saturation, heart rate, blood pressure, temperature, and level of consciousness. An elevated EWS

prompts the primary nurse to escalate potential physiological decompensation to the appropriate healthcare professionals such as, acute care teams and physicians (Health Quality and Safety Commission New Zealand, 2017).

An *adverse event* is classified as unintentional, unplanned, or unexpected negative response, injury or complication, resulting in prolonged hospital stay or disability, caused by healthcare interventions rather than the underlying disease states. Minimising adverse events is a national priority, as serious adverse events lead to cardiac arrest and unplanned admission into critical care services, overall, contributing to increased hospital costs and length-of-stay (Chung et al., 2019; Health Quality and Safety Commission New Zealand, 2020).

The definition of *acute care teams* is continually revolving. Hospitals nationally and internationally utilise the term, acute care team differently. Although the overarching intentions are equivalent, the scope of practice, staff combination, and interventions provided are invariably unique. *Cardiac arrest teams* can be comprised of multidisciplinary team members working together as a discrete team to healthcare professionals, 'pulled-in' from other areas across a hospital when cardiac arrest ensues. Similarly, *critical care outreach* or *patient-at-risk* teams are often comprised of senior registered nurses who provide follow-up care to patients discharged from critical care services, offering support and guidance towards staff who are caring for deteriorating patients. However, there is also variation within such services ranging from single discipline; senior nurses or senior medical staff to a team-based approach. Lastly, *medical emergency teams* tend to be physician led, which provide critical care support at a patient's bedside. The evolution of acute care teams has arisen from local need, staff availability and identifying the most effective solution given the significance of the context. That said, the unpredictable nature of the deteriorating patient will invariably mean that having a consistent team readily available regardless of time or day, benefits those in need of help (Health Quality and Safety Commission New Zealand, 2016a).

2.1.2 Literature search

The literature search for this research commenced on the 9th of August 2020. The search terms used included 'patient deterioration,' 'patient-at-risk' team,' 'early warning

score,' 'rapid response team,' 'medical emergency team,' 'acute' OR 'critical' OR 'deteriorating patient' and 'deterioration'. These terms were searched through the following databases: Medline, google scholar, CINAHL, ClinicalKey, ScienceDirect, PUBMED and ProQuest and yielded over 412,000 results. Applying a filter of peer-reviewed articles, including meta-analyses and systematic reviews, reduced the 'hits' to 519. In addition, cited reference searching was employed as a valuable resource to access additional publications related to the topic. Finally, the search dates were initially from 2000 to 2022 but modified to 2012 to 2022 to ensure that research articles were relevant.

The search identified various articles relating to the detection, management and escalation of deteriorating patients and the results were primarily quantitative. There were emerging themes from qualitative studies concerning the experiences of registered nurses with deteriorating patients. The search was narrowed to patients who deteriorated within the hospital's medical, surgical, or acute settings and focused on acute deterioration rather than slow or mental health deterioration or decline in overall function. Overall, there were few findings relating to the effectiveness of in-patient acute care teams.

Inclusion criteria for the literature review included adult (18+ years) patients that deteriorated outside of the Emergency Department (ED) or the Intensive Care (or Treatment) Unit (ICU or ITU) and an escalation from the early warning scale. Papers were included if published in full and in English. Studies were excluded if it focussed exclusively on children (under 18 years) or older people (over 80 years). However, articles were included if these population groups were considered part of a general team.

Part 1: The deteriorating patient

2.2 The impact of disparities on health

Over five million people reside within Aotearoa-New Zealand and 435,690 people live within the Waikato region. Waikato has a high population of Māori in Aotearoa-New Zealand, almost a quarter of the region identify as Māori, which is significantly greater than the national average of 16.6 percent. Further, a larger proportion of the Waikato population live in deprived areas and Māori are heavily over-represented within such areas (Ministry of Health, 2021b).

Although not the sole focus of this research, Māori are heavily over-represented as consumers of healthcare services in the Waikato. Indeed, Māori make up 24 percent of the population in Waikato, Māori account for almost half of all health care episodes at Waikato Hospital (Waikato District Health Board, 2019) and therefore, understanding the reasons for such is important, when considering acute hospital care and how to address a deterioration in condition.

Throughout history, significant health disparities have existed for indigenous populations due to complex intertwined ideologies. In fact, this is not unique to Aotearoa-New Zealand and is often found within other countries who have undergone colonisation. Underlying drivers include the inability to access resources such as education and health, as well as increased exposure to risk factors such as tobacco use, nutrition and poor quality of housing (Walsh & Grey, 2019). To illustrate, in 2021, 17.7 percent of Māori were diagnosed with asthma, requiring medication for treatment versus all other ethnic groups, where the rate was significantly lower at 12.7 percent. Rates of type II diabetes are similarly over-represented; with rates for Māori at 6.7 percent and Pacific people at 9.0 percent, compared to all other ethnic groups at 4.5 percent (Ministry of Health, 2021a). Rates of all co-morbidities are higher for Māori and Pacific people than any other ethnic group, which is in turn a large contributor towards the burden of disease. There is a strong association between the number of co-morbidities and poverty. The New Zealand index of deprivation is a classification tool that quantifies area-based socioeconomic deprivation. Measured with a decile score, one representing an area of least deprivation and in contrast, associated with a

decile score of ten reflects an area that is most deprived (Environmental health indicators, 2021). In 2013, almost a quarter (24%) of all Māori in Aotearoa-New Zealand lived in socioeconomic deprived areas (lower than three on the scale) compared to non-Māori at 12 percent (Ministry of Health, 2019, 2021b). People who live in areas of greater socioeconomic disposition are more likely to develop comorbidities, which in turn results in poorer health outcomes, worse functional status, and lower quality of life (Stanley et al., 2018).

Understanding the mechanisms for deterioration amongst acutely unwell patients and examining why it occurs at a higher rate for Māori is important, as it allows healthcare professionals to prepare and prevent deterioration. When exploring risk-taking behaviour, which is defined as the potential to damage the wellbeing of oneself or others; Māori are more likely to engage in risk taking behaviours than those of other ethnicities. For example, Māori are 2.5 times more likely to smoke than non-Māori and although the rates for smoking has decreased over the years, Māori are still identified as the largest participating group. In addition to smoking, prevalence of cannabis use is almost twice as likely for Māori (31.5%) compared to non-Māori (16.3%) and the occurrence of obesity, is observed higher in the Māori population (78.3%) compared to non-Māori (67.2%) (Ministry of Health, 2015). In fact, the top five major causes of death in Aotearoa-New Zealand for Māori, surround the causality of chronic conditions, including ischaemic heart disease, lung cancer, chronic obstructive pulmonary disease, suicide, and diabetes (Ministry of health, 2018). All these factors increase the risks of adverse events, particularly when an individual is in a vulnerable state such as when they are acutely unwell in hospital. Adverse events such as a cardiac arrests rarely occurs suddenly and are ordinarily preceded by a period of clinical deterioration (Considine et al., 2015). Predicting and recognising such decline is the only way to prevent adverse events from occurring (Chung et al., 2019).

The last century has seen a significant and consistent increase in life expectancy, due to developments in healthcare practices, but mostly in improvements in sanitation, nutrition and clean water supplies. Long term conditions, such as heart failure, respiratory disease, diabetes and cerebro-vascular disease are most prevalent in later life and the increase in life expectancy has meant that developed countries such as

Aotearoa-New Zealand have progressively moved to a healthcare system orientated to deal with infectious diseases to one of non-communicable disease. Survival following catastrophic trauma and disease is now commonplace but with that comes changes within the acute hospital. Increases in acutely unwell patients either because of existing morbidities such as a long-term conditions or trauma, has meant that healthcare systems must be able to meet the demand and complex needs of those with comorbidities. Shared goals of care are negotiated with healthcare professionals, patients and families, to identify the values and develop a plan of care, that best meets the needs of patients. Optimal time to discuss these needs is upon admission to hospital to prevent the risk of unwanted treatments and inappropriate care if deterioration transpires.

Upon admission to hospital, patients who are most at risk of deterioration are invariably identified, through the existence of co-morbidities they may have or the presence of an acute illness or exacerbation of a chronic disease and abnormal changes in physiological parameters, which occur at any time during admission. Recovery from a critical illness or interventions provided by healthcare professionals, is additionally a period where patients are at a greater risk of deterioration (Welch et al., 2020). Patients who deteriorate have a higher occurrence of admission into critical care services, increased length-of-stay and heightened risk of in-hospital mortality. More importantly, healthcare professionals must remain vigilante to detect early physiological signs of deterioration, to reduce the development of serious adverse events or death (Massey et al., 2017).

2.3 Acute hospitals in Aotearoa-New Zealand

The Ministry of Health is the governing body within Aotearoa-New Zealand that serve to improve, promote and protect health and disability. District Health Boards (DHB)[1] work under and receive funding through the Ministry of Health to resource health services to the region covered in New Zealand (Ministry of Health, 2020). There are 20 DHBs within Aotearoa-New Zealand that utilise both primary and secondary

[1] District Health Boards were replaced in 2022 with a new structure, Te Whatu Ora – Health New Zealand with four regions. For the purposes of clarity, District Health Boards (DHB) will be employed within this thesis.

healthcare services. Bed capacity of hospitals within Aotearoa-New Zealand and across the developed world has generally reduced over the last decade as hospitals focus on increasing surgery day stays, moving long-term patients into care facilities such as Aged Residential Care (ARC) and utilising community pathways for escalation of care. While this reduces hospital throughput, it requires greater hospital efficiency (Jacqueline Cumming et al., 2014). Table 1 depicts the total amount of beds available within each DHB.

Table 1: Bed capacity by District Health Board

Formerly District Health Board region	Total number of beds
Northland	328
Waitemata	1,069
Auckland	1,441
Counties Manukau	201
Waikato	965
Bay of Plenty	456
Tairawhiti	115
Lakes	259
Taranaki	208
Whanganui	172
Hawkes Bay	384
Midcentral	390
Wairarapa	89
Hutt Valley	322
Capital and Coast	764
Nelson Marlborough	355
West Coast	128
Canterbury DHB	1492
South Canterbury DHB	132
Southern DHB	634

From 1 July 2018 to 30 June 2019 (12 months), there were more than 1.2 million publicly funded discharges in Aotearoa-New Zealand (Ministry of Health, 2021c). One in three of these hospitalisations were for people over 65, one in four adults had a reported comorbidity and people who identified as Māori were 1.3 times more likely than non-Māori to be hospitalised. This represented a modest increase from ten years earlier, when 999,582 publicly funded discharges were reported. Of this population, 16.8 percent identified as Māori and the largest age group by presentation were pre-school children under five (Ministry of Health, 2014). Understanding why people are admitted and stay in hospital is an important consideration addressed in the following section.

2.3.1 Factors influencing the hospital admission

The average hospital length-of-stay indicates the mean number of days a patient spends in the hospital. A higher length-of-stay is associated with worse health outcomes, independent of baseline risks, such as disease and diagnosis (Stambough et al., 2015). Furthermore, it is generally accepted that a shorter length-of-stay is associated with a reduction in the cost of care per episode through lower inpatient care days (Kaboli et al., 2012; OECD, 2021; Stambough et al., 2015) and indeed, when all other factors such as disease severity are considered, a lower readmission rate occurs (Rinne et al., 2017; Vorhies et al., 2012). Factors affecting the length-of-stay and in-hospital mortality are multifocal in aetiology and present some of the greatest challenges in modifiable versus non-modifiable considerations.

Characteristics of those more likely to deteriorate include males, those over 65 and people with one or more underlying health conditions. Overall, the more complex care becomes, the greater the demand is on the healthcare system, as well as an increase in the length-of-stay, morbidity and mortality (Adamuz et al., 2021; Adamuz, González-Samartino, et al., 2018; Adamuz Tomás et al., 2021). Intricately linked with the complexity of care, an association between the number of comorbidities and demands on healthcare is established (Liechti & Beck, 2021). Comorbidities are the development of two or more health conditions that significantly impact a person's life (Mankidy et al., 2020; Recio-Saucedo et al., 2017). Other contributing factors that

impact length-of-stay include nosocomial infections, complications of the disease processes and patient variables such as age and gender, which influences readmission rate and mortality (Aubert et al., 2020; Librero et al., 1999; Sankey et al., 2016). People with comorbidities are more likely to present to the hospital, experience avoidable admissions, adverse events and are more at risk of deterioration and in-hospital mortality.

Socioeconomic status is indirectly correlated with increased hospital length-of-stay (Curtiss & Grahn, 1980). During an acute admission, a person of greater socioeconomic deprivation (lower than five) experiences an average length-of-stay of 2.57 days for acute (un-planned) admission and 1.46 days for elective (planned) admission (National Service Framework Library, 2021). This compares unfavourably with people living in areas of less socioeconomic deprivation (above five on the scale) who experience an average length-of-stay of 2.49 days for acute admissions and 1.48 days for electives (Nationwide Service Framework Library, 2021). Overall, diverging levels of socioeconomic deprivation influence the length-of-stay during acute and elective episodes. Areas of increased socioeconomic deprivation present more issues within an acute environment and, therefore, have an increased length-of-stay compared to those who are least deprived. In addition, those who live in areas of socioeconomic deprivation are at increased risk of environmental hazards with fewer resources available for protection (Environmental health indicators, 2021), such as access to quality housing, efficient heating/insulation, no access to transport or healthcare, overcrowding and living in higher levels of stress (Atkinson et al., 2019; Environmental health indicators, 2021).

Ethnicity is a further variable that impacts hospital length-of-stay, though the results need some interpretation. It is established that a longer length-of-stay is associated with increased risk to the individual. Māori and Pacific people experience worse health outcomes than Europeans during hospital admissions (Ministry of Health, 2019), yet the mean length-of-stay is lower than New Zealand Europeans. For Māori, an acute episode is 2.23 days and an elective is 1.40 days, whereas the average length-of-stay for acute and elective for New Zealand Europeans is 2.64 days and 1.51 days respectively. Tragically, the face anomaly is related to the significantly lower life expectancy for

Māori and Pacific than for New Zealand Europeans. Māori admitted to hospital acutely and electively are younger than other ethnic groups and increasing age is directly associated with increasing length-of-stay (Matthew Hobbs et al., 2019).

2.3.2 Recognising deterioration

Critical illness left unresolved results in an increased risk of emergency admission into critical care services. People admitted to the intensive care unit (ICU) under emergency circumstances experience a longer length-of-stay by a mean of 20 hours, compared to other admission types within ICU (Mankidy et al., 2020; Recio-Saucedo et al., 2017). On average, 5.9 people out of every 1,000 are admitted into the ICU under emergency circumstances (Health quality and safety commission New Zealand, 2021). Overall, patients are subject to an increased length-of-stay, in-hospital mortality and a higher readmission rate once admitted to the ICU. National readmission rates for Aotearoa-New Zealand stand at 12.2 percent. In contrast, readmission within the Waikato region has reduced over time, from 13.8 percent in 2019 (Nationwide Service Framework Library, 2022), to 12.9 percent, which remains higher than the national average.

Afferent and efferent pathways exist to support the management of deteriorating patients. Afferent pathways facilitate recognising deterioration, while the efferent focuses on responding to deterioration. National Early Warning Score (NEWS) quantifies physiological vital signs as an afferent pathway, whilst escalation to an acute care team is an example of the efferent pathway. An unambiguous framework for healthcare professionals to follow in response to the identified deterioration. Patient and family-led escalation is an emerging practice that offers patients and family members a pathway to escalate clinical concerns or unrecognised deterioration that healthcare professionals may miss. Although these frameworks have been well developed and implemented throughout the world, the imminent evolution of health within the population, emerging comorbidities and hospital thoroughfare place an extended amount of strain on healthcare professionals to provide optimal care in suboptimal conditions.

In summary, patients with comorbidities, living in areas of socioeconomic deprivation and indigenous populations experience an increased prevalence of acute hospital

admission and increased length-of-stay proportional to the acute phase. Therefore, the risk of deterioration and being subject to mortality is higher, with increased costs to the healthcare system. Of these people who deteriorate, many patients do not follow the normal recovery trajectory and are more likely to experience adverse outcomes. For indigenous populations, research has reiterated that barriers remain at the forefront when accessing healthcare, which increases the risk of developing comorbidities and being subject to deterioration. An awareness of predicting factors should be employed to prevent the deterioration in the first instance, an area explored in the next section.

Part 2: Responding to the deteriorating patient

2.4 Deterioration in an acute hospital

Preceding an adverse event is a critical period of physiological decompensation. If identified promptly, an acute care team can respond and instigate corrective actions. In such a way, acute care teams have been introduced as a component of an efferent pathway to provide timely response and outreach of experienced clinical knowledge, preventing the likelihood of increased mortality and morbidity. Those most at risk are characterised in Table 2 (Australian Resuscitation Council & Council, 2021). In addition, the changes in acuity levels in hospitals over the last two decades have meant that acutely unwell patients are treated routinely in general medicine wards as opposed to ICU as was typical.

Table 2: Risk factors for deterioration

At risk characteristics
• Under 10 years
• Over 65 years
• Comorbidities
• Immunosuppressed
• Indigenous populations

Most people and healthcare professionals who encounter deteriorating patients have different knowledge sets and backgrounds. These include healthcare assistants, enrolled nurses, registered nurses, medical officers, patients and families. Healthcare professionals rely on each other for support and guidance when a patient deteriorates (Stevens, 2021).

2.5 Patient deterioration early warning tools

In 2012, the Royal College of Physicians in London recommended standardising an assessment tool that evaluates the severity of acute illness, which came to be known as the 'National Early Warning Score' (NEWS) or later 'Early Warning Score' (EWS) (Jones, 2012). The tool advocated that upon reaching a pre-prescribed threshold, the

patient's care is escalated to an advanced nursing team, an acute care team and/or a cardiac arrest team. However, concerns are identified with the tool, Freathy et al. (2019) reported that there was a lack of guidelines that dictated the escalation pathways and, in Particular, a lack of timeframes to escalate care to the appropriate personnel. Additionally, variations in policy gave staff little information on when to escalate and monitor frequencies during this period, while other hospitals had clear guidelines for this.

Further criticism surrounded how the tool was too focused, meaning that clinical cues and subtle physical and mental changes are missed, leading to delayed recognition in deterioration (Massey et al., 2017). In addition, incorrect calculation of the EWS scores contributes to wrong interpretation. Under or overvalued scores dictate whether a nurse escalates care or not, accompanying dismissive behaviour and leaving unmet critical cues (Credland et al., 2018). Considine et al. (2015), in a review of the tool, reported that those patients who deteriorated after hours were also more at risk of unmonitored and delayed recognition, as nurses were less likely to complete vital sign monitoring secondary to heavy workloads, shift work fatigue and staff availability. The researchers highlighted that this increased the risk of cardiac arrests and unexpected death due to monitoring failure.

Smith et al. (2021) point to how the implementation of EWS has resulted in a heavy reliance by nurses on the tool rather than prioritising nursing assessments, which underestimates the ability to detect clinical cues. However, the researchers also highlight how the EWS is a valuable tool for junior nurses and enables validation and support around the early identification of deterioration. Additionally, it aids in developing clinical judgment to identify and rationalise deviations from the standard parameters or the patient's baseline (Smith et al., 2021; Wood et al., 2019).

However, despite this tool, nurses often miss a significant proportion of patient deterioration because of multiple barriers. An extensive body of literature supports that workload is the highest contributor to delays in nursing. In addition, heavy workloads impede the ability to report findings, document accurately and escalate

concerns due to prioritisation of other tasks and sourcing equipment necessary to escalate care (Considine et al., 2015; Jensen et al., 2019).

Qualitative findings generally support the adoption of the tools across the National Health Service in the United Kingdom. Researchers and clinicians (Adamuz, Samartino, et al., 2018; Jayasundera et al., 2018; Ozdemir et al., 2021; Stevens, 2021) highlight how the EWS tool empowers registered nurses to communicate at the right time, to the right personnel and overall, positively contribute a critical role in the early detection and prevention of deterioration. In addition, adopting the EWS tool has been reported to reduce mortality and cardiac arrests directly, as well as prompt early transfer to critical care services (Ozdemir et al., 2021; Stevens, 2021).

Although the significant focus on preventing patient deterioration has been through standardising tools and utilising acute care teams, there remain significant factors affecting healthcare professionals' ability to recognise and respond to deterioration. Escalation of care for deteriorating patients is affected by various factors. For example, hospital culture, technical and staffing issues (Welch et al., 2020). In addition, suboptimal care is preceded by a lack of knowledge and experience, miscommunication, failure of urgency, failure to escalate and lack of seeking advice (Stevens, 2021).

The EWS within Aotearoa-New Zealand provides a ubiquitous safety net for patients who deteriorate acutely in the hospital. Recognising signs of physiological decompensation by identifying abnormal vital signs, abnormal trends for a patient and continuously assessing for worsening or improving conditions (Health Quality and Safety Commission New Zealand, 2017). Once deterioration is recognised, a registered nurse can follow the escalation pathway, in which the level of clinical risk dictates the urgency and physiological manifestations exhibited. As the numerical value increases on the EWS, an increased risk of deterioration, need for further treatment, escalation, admission into critical care services and increased mortality is observed (Jayasundera et al., 2018; Jensen et al., 2019).

2.6 The pathway for when deterioration is recognised

A set trajectory is established through policy and prior experience when a patient deteriorates. Those responsible for escalating care include a broad range of healthcare professionals, patients and families described in further detail below.

2.6.1 The role of the whānau / family member

If an individual can identify changes in behaviour, the patient or a family member can recognise deterioration quickly and does not necessarily need a trained healthcare professional. Family-centred care is a well-established healthcare model that nourishes decision making with family and facilitates participation in care. Family offers socio-emotional support based on the patient's best interest and improves experiences while in care (Guinane et al., 2017). Empowering family members to detect the onset of new symptoms or changes within the current management benefits the patient and the wider system. However, for such actions by families to have positive outcomes, health professionals need to proceed with further investigation, but unfortunately, this often gets dismissed (Guinane et al., 2017; Links et al., 2019). Indeed, concerns about deterioration are often reported to be expressed by patients and families; however, a lack of response or acknowledgement from healthcare professionals' results in feelings of being unheard and creates a sense of mistrust between families and healthcare members. Dismissal behaviour is a barrier identified by patients and families (Tilley & Spencer, 2020). Furthermore, once distrust is established, difficulty occurs for patients and families to question or challenge a medical professional for fear of being a burden or labelled as an overreacting or challenging person (Guinane et al., 2017).

Guinane et al. (2017), in a large qualitative study, reported that family/whānau members of patients with co-morbidities often have a greater understanding and knowledge about a patient's baseline status and monitoring for symptoms of deterioration. Exacerbations of comorbidities concomitant with hospital admission and readmissions, mean that family members grow accustomed to the organisational culture in the hospital. This allows the family to speak up about symptoms, treatment and care needs. At the same time, family members may be more passive when the experience is new or novel. Trust between the family members and healthcare

professionals can be detrimentally impacted when medical jargon is employed during communication. Informed decisions are completed in partnership with patients, family and healthcare professionals, therefore, when using medical jargon, a barrier is observed around this due to the lack of understanding (Guinane et al., 2017; Links et al., 2019). The primary nurse's establishment was partly to improve the communication between the family and the healthcare team. Patient and family-led escalation services exist to help patients feel comfortable with extra support available to convey clinical concerns (Guinane et al., 2017). Despite the apparent success of this approach, hesitancy remains amongst healthcare professionals to embrace this model of care. In a review of the approach, Dwyer et al. (2020) report that healthcare professionals see it as undermining professional judgement, being repeatedly misused for minor issues and utilised as a complaints service, increasing the workload for healthcare professionals.

Within Aotearoa-New Zealand, patient and whānau - led escalation pathways (known as kōrero mai) are a relatively new initiative, introduced slowly within the hospital systems to complement existing pathways. The pathway is based on the pretext that patients and families can identify subtle changes in characteristic behaviours. However, such early signs of deterioration are often present before any physiological signs and therefore missed by those less familiar with the patient. Moreover, this places value on the ability of family members and patients to advocate for deterioration (Gill et al., 2016). Unfortunately, due to the low level and recent adoption, no research to date has been undertaken within Aotearoa-New Zealand to evaluate its effectiveness. Without doubt, important themes exist within the literature, which highlight the need for more work to be undertaken by stakeholders to bridge this gap and the need for effective communication between healthcare members, patients and families to improve care plans and experiences (King et al., 2018; McKinney et al., 2019; Vorwerk & King, 2015).

2.6.2 The role of the inpatient care team

Generally, diagnosis and treatment of deterioration fall within the role of the primary healthcare team. When registered nurses detect deterioration, it is escalated to the primary physician to create a care plan. When referring to physicians, a hierarchy is

observed, which dictates that the escalation process commences with junior doctors, who are most accessible and then work up to the consultant if needed (Chua et al., 2019). Escalation to the primary team encourages familiarity with the patient regarding appropriate care and treatment. However, after hours medical doctors face delays finding vital information to build a clinical picture, which contributes to delays and inappropriate treatment pathways.

Outside of the normal working day, staff capacity is reduced significantly compared to daytime. Therefore, if a patient deteriorates, the primary team can be unavailable and escalation proceeds to the limited on-call staff. Workload constraints contribute to delays and calls are generated to acute care teams for senior clinical guidance and experience (Chua et al., 2019). Due to the workload of medical doctors, prioritisation of patients helps to navigate appropriate responses based on urgency and risk. To facilitate a quick review, a registered nurse would invariably communicate data of physiological decompensation supported with subjective information, a skill that requires practice over time, to convey the urgency of a deteriorating patient succinctly. Stevens (2021) describes patients who had experienced an in-hospital cardiac arrest, reports that in 45 percent of cardiac arrest cases, a junior medical doctor is the most senior person to review clinical signs of deterioration 24 hours before an arrest (Hilman et al., 2005). Further, 68 percent of cardiac arrests were identified as avoidable, 35 percent experienced a delay in nursing staff communication with the physician and 29 percent experienced a delay in the physician responding to the nurse's request. Ambivalence is noted among junior doctors and the hesitancy to call senior staff members due to the fear of being criticised, feelings of inadequacy and ability to cope (Chua et al., 2019). Common barriers medical staff face when recognising, responding and managing deteriorating patients include lack of confidence with technical and nontechnical skills, lack of sleep or breaks, lack of clinical supervision and stress (Callaghan et al., 2017; Liang et al., 2019).

Suboptimal care is preceded by miscommunication, unsuccessful escalation of urgency, inability to seek advice/escalate and lack of knowledge and experience. Miscommunication is a major contributor to delays in patient care; without knowledge and experience, communication lacks important information, contains unnecessary

information and does not convey the needs or knowledge of the problem and background.

Registered nurses play a critical role in identifying deteriorating patients. The largest health workforce, with the most frequent contact with patients, is more likely to detect and respond to deterioration. The Nursing Council of New Zealand and the Australian Nursing and Midwifery accreditation council have developed codes of conduct, which promote the responsibility to do no harm and work in partnership with consumers to promote and protect the health, but what dictates the escalation pathway for deterioration (Fowler, 2015; Nursing Council of New Zealand, 2012). Many initiatives exist to prevent patients from deteriorating. For example, the implementation of education and training for staff members, the contrivance of the early warning score and the development of acute care teams, the effectiveness of such initiatives will be explored in the following few sections.

2.6.3 The role of the registered nurse in the detecting deterioration

Upon graduation, new graduate nurses are novice practitioners, though through knowledge, experience and exposure, registered nurses gradually become experts over time. Benner (1984a) developed a model describing how at the beginning of the career, nurses have the knowledge but lack the in-depth experience compared to expert nurses, who recognise algorithms and know the resources needed to reach the goal. Transferable to patient deterioration, those who are experts are familiar with the algorithm of deterioration and recognise the signs earlier, as well as have the experience to predict the escalation trajectory, assessments and treatments required to help the patient achieve wellness. The experience level of staff will invariably dictate the form and timeliness of the escalation pathway. For example, intermediately experienced nurses are far more likely to escalate than junior staff and senior nurses identify and intervene in deterioration sooner, knowing the appropriate management trajectory (Connell et al., 2021). Escalation, therefore, appears to rely on the nurses' skill mix and experience, while recognising that the ability to escalate is increased when stressors and nurse-patient ratios are ideal, suggesting that when hospitals run at or over capacity, patient safety is affected (Connell et al., 2021).

Registered nurses' level of experience is linked with the leadership roles and capabilities. Nurses with strong leadership abilities are more confident in responding to and encouraging others to escalate concerns. A supportive team environment can encourage nurses to escalate through the appropriate channels. Support can be from other nurses, medical officers, whether it be senior or junior and acute care teams, to build effective communication, confidence and increased skill level/experience (Massey et al., 2017). Non-technical skills are equally as important as technical skills. Effective communication, leadership, teamwork and situational awareness are highly beneficial and efficient in emergencies (Guinane et al., 2017; Mushta et al., 2017).

The organisational culture influences task performance within the hospital. Fear of being wrong and ridiculed by other healthcare professionals act as a barrier (Tilley & Spencer, 2020). Escalating concerns require a mixture of subjective and objective data to communicate the clinical picture; however, those with lower levels of experience struggle to communicate information, creating fear of being reprimanded and looking stupid, contributing to delayed escalation. For the culture to change within nursing, transformational leadership influences a nurse's performance by envisioning better outcomes (Azimirad et al., 2021; Dwyer et al., 2020). Deterioration often brings forth heightened emotions such as anxiety, fear and panic, especially when concerns are dismissed, but with the collaboration of acute care teams, support is available to work as a team (Chua et al., 2019; Duff et al., 2018; Massey et al., 2017; Wood et al., 2019).

The roles and responsibilities of nurses are expanding, therefore, delegation to non-registered healthcare professionals is increasing. Although non-registered staff are trained to perform the task, interpretation and importance of the findings may not relate back to the nurse overseeing this, inadvertently creating delays. In addition, heavy workloads impact the quality of obtaining vital signs with high nurse-patient ratios, nurses become overwhelmed by the excessive workload and the monitoring frequency of vital signs is decreased (Chua et al., 2020; Lee et al., 2018; Mok et al., 2015; Wood et al., 2019). Familiarity with the patient allows easier detection of deterioration by identifying out of characteristic behaviour or deviations from the normal or patient's baseline and when assessment equipment is unavailable, delays in care occur (Massey et al., 2017). In response to deteriorating patients, acute care teams

have been implemented as a standard of care. Responding to deterioration at the appropriate time is equally important as recognising the changes, a delay in both, increases' hospital mortality.

Due to the constantly changing environment, skill mix is a hard balance to achieve. Skill mix represents an equal distribution between senior and junior staff members, that nurtures experience and exposure with the support of senior expertise. Safe nurse to patient ratios, balanced skill mix and education influence patient outcomes and in-hospital mortality (Haegdorens et al., 2019). Senior staff have clinical expertise and knowledge to draw upon, whereas junior staff rely on seniors for guidance and support along the way to put knowledge into skill (Molla et al., 2018).

2.7 Education available to staff

To meet the population's diverse needs within modern society, nurses must continually upskill with education. Education takes part in an important role in identifying deterioration as it provides staff with the ability to utilise identification tools and equipment, aiding in the detection, as well as developing clinical thinking and assessment skills necessary to discern deterioration. In-service education is provided within the clinical practice to improve nurses' competencies, which can be but are not limited to, area specific learning needs (Azimirad et al., 2021). Moreover, giving nurses the skills to recognise, escalate and manage deteriorating patients while adapting to the resources available within the specialty area to provide the best care possible. Utilising in-service education imparts nurses with the confidence and skills to recognise and respond appropriately to deterioration as well as promoting area specific education (Azimirad et al., 2021).

Simulation-based education is employed to develop human factor skills, such as teamwork, communication, confidence and leadership skills (Aebersold, 2018). Providing a safe learning environment to explore complex situations, promoting reflective practice and active participation encourages participants to deconstruct and construct knowledge in problem solving activities (Bennion & Mansell, 2021; Bliss & Aitken, 2018). Development of non-technical skills are key components in escalating and managing deteriorating patients. Online-based learning supports education

through the application of technology and encourages learning that is easily accessible at any time (O'Doherty et al., 2018). Online learning is rapidly expanding by promoting education without the physical space barrier and improving education equity for all people, as one module can branch across the country to provide education. With this, participants must be actively engaged and disciplined to sit for a period to complete the modules as well as have technical skills to access the content.

Education is important in teaching staff to recognise and respond to deterioration. Therefore, ongoing education is needed to refresh and support those who are not faced with deterioration regularly, as well as keep up to date with best practice guidelines. Additionally, postgraduate degrees provide staff with advanced clinical judgement to discern deterioration in an efficient manner (Massey et al., 2017). Different education activities have aimed at improving technical and non-technical skills; however, no clear evidence suggests which education supports learning outcomes best for staff, especially around patient deterioration (Duff et al., 2018). Educational activities teach the base assessments and processes for emergency management of a deteriorating patient, but actual skill and knowledge arise from experience and exposure, which is accumulated over time.

Nurses are at the forefront of monitoring and interpreting the results of deterioration. Experience, exposure and education are all key factors needed to build an efficient, skilled nurse and throughout the world, similarities are seen in how care is tailored for deteriorating patients. Similar strategies are utilised globally in managing deterioration patients. Set policies and procedures dictate the hospital response to escalate concerns in an appropriate manner, including the early warning score and implementation of acute care teams or medical emergency teams. However, the standard method of detecting deterioration comes down to staff experience, exposure and skill mix.

2.8 The development of acute care teams

Acute care teams (ACT) are a group of senior healthcare professionals who provide clinical expertise and guidance to patients who deteriorate. The teams have been established in order to reduce in-hospital mortality, adverse events and emergency admission to critical care services (Azimirad et al., 2021). ACT are called many

different things depending on the staff involved, the team's role and the hospitals' location. More common names include rapid response teams, cardiac arrest teams, critical care outreach teams, medical emergency teams and/or importantly for this current study, patient-at-risk teams (Lyons et al., 2018). Such services comprise of multidisciplinary team members with doctors and nurses, or led by nursing or medicine, but characterised by the extensive knowledge and experience in the intensive care unit and/or emergency department (Chan et al., 2008). Implementing such teams have become a standard mechanism internationally in addressing the needs of deteriorating patients.

While literature does suggest that acute care teams reduce hospital mortality and in-hospital cardiac arrests, if a delay occurs in referring to ACT, there is increased mortality (Barwise et al,. 2016; Chan et al., 2008; Soloman et al., 2016a, 2016b); likely due to the absence of other mechanisms. However, findings are mixed, as other research (Kollef et al., 2014) suggests that although ACT reduce length-of-stay, there has been no observed reduction in mortality. Notwithstanding these internationally mixed results, indications within Aotearoa-New Zealand are that ACT services do reduce mortality rates (Health Quality and Safety Commission New Zealand, 2016b). Interpreting the results around ACT effectiveness is difficult. Most referrals to ACT occur after hours when nurse-patient ratios are low. Disturbing patient sleep will often minimise the chances of nurses identifying deterioration. However, there is a strong correlation between delays and the increased risk of hospital mortality (Barwise et al., 2016). ACT is only as effective as the staff who activates the system. Reliance on the ACT is argued to decrease the feelings of responsibility of ward-based staff (Stevens, 2021). Internationally and even nationally, the composition of ACT services varies (Chan et al., 2008) and therefore, evidence reporting positive or negative results must be viewed cautiously.

Despite the mixed results in the literature, the New Zealand Health Quality and Safety Commission has strongly encouraged all DHBs to establish a well-recognised response system for acutely deteriorating patients (Health Quality and Safety Commission New Zealand, 2016b). Most health regions within Aotearoa-New Zealand have a cardiac arrest team utilising a range of staff, such as, one senior nurse and one house officer,

to a six-person team with anaesthetic, cardiology and intensive care registrars. Additionally, some of the larger health regions have a separate ACT to provide early identification and intervention of deterioration, avoiding admission into the intensive care unit. Waikato established a discrete ACT service in 2016 called the Patient-at-risk (PaR) service.

2.9 Research aims and questions

This mixed methods study aims to explore the role of the PaR service from the perspective of those providing the service, the PaR registered nurses themselves as well as those working alongside them on the ward. More specifically, the research aims to address the following questions:

1. What are the characteristics of patients who are referred to the Patient-at-Risk service, and what is the relationship with hospital length-of-stay and mortality?

2. What are the views of ward-based healthcare professionals concerning the Patient-at-Risk service?

3. What are the views of the registered nurses within the Patient-at-Risk team concerning the service they deliver?

2.10 Literature review summary

As the population of the world expands, the growing demand for the healthcare system leads to increasing pressure. Accompanying this is an ageing population who are more likely to present comorbidly, increasing the risk of deterioration, length-of-stay and in-hospital mortality. Within Aotearoa-New Zealand, the indigenous Māori population and those who live in socioeconomic disposition, have been identified as the most common group to develop comorbidities and, therefore, are more at risk of deterioration and developing serious adverse events. With the increased risk factors and a strong drive to reduce hospital mortality, the implementation of acute care teams has been introduced. In Waikato, the PaR service was established and existed as a nurse-led discrete service to improve patient outcomes as well as support staff.

Chapter III: Methodology

Research means that you don't know but are willing to find out.

Charles F. Kettering, 1876-1958

3.1 Methodology introduction

Philosophical and theoretical frameworks are implemented within the methodology to underpin the research being undertaken (Jirojwong et al., 2014) and are ascertained through meticulous exploration and examination of the chosen framework that contextualises and ground this research. Moreover, a methodology positions itself to bring forth an enhanced understanding of the foundational value of the relationship(s) between the researcher, the 'real world' and rationalising the selection of methods.

A mixed methods approach will be employed, utilising quantitative and qualitative data, to establish healthcare professionals' perspectives on the Patient-at-Risk (PaR) service. As well as explore the characteristics of patients who are referred to this service and describes the relationship between hospital length-of-stay and mortality. Hence, the chapter will discuss and deliberate the methodology implemented within the research and explores the appointed paradigm as well as the associated methods.

3.2 Research paradigm

Paradigms exist to define a researcher's way of looking at the world. Each Paradigm has its purpose that must be understood. Positivism, interpretivism and criticism are the three paradigms that guide research. The positivist paradigm of inquiry is characterised by objectivism, meaning there are individual variables to each component of the research within the real world. Quantitative research is where this is generally observed, as the relationship between objectivity through numerical data were explored (Avramidis & Smith, 1999; Dempsey & Dempsey, 2000; Rehman & Alharthi, 2016).

The interpretivist paradigm of inquiry conjects that there are multiple realities that are constructed and subjected to by participants. Therefore, findings are generated based on the interaction with the participants. The disadvantage is that the findings are subjective, bias cannot be avoided and must be addressed as part of the research. Qualitative research is where this is best observed, as the methods are based on narrative rich data and participant experiences (Dempsey & Dempsey, 2000; Jirojwong et al., 2014; Rehman & Alharthi, 2016). Lastly, the critical paradigm of inquiry believes that research is based on the values to empower participants to change or challenge the world (Dempsey & Dempsey, 2000; Jirojwong et al., 2014; Rehman & Alharthi, 2016). The interpretivist paradigm of inquiry enables the researcher to observe the world through a participant's lens to understand multiple perspectives within reality. Therefore, research based on perspectives provides a true representation of the research questions and can determine an individual's behaviour through direct contact with the phenomena. The social realities of a participant are perceived with the interpretation and interaction within the position held within the organisational culture. To identify the perspectives of the benefits and barriers, nurses face when delivering or receiving a service, the interpretivist paradigm must be employed.

3.3 The Māori worldview

Through a Māori indigenous lens, the conceptualisation of research involves the integration of Kaupapa Māori principles. The research conduct presents as follows; Aroha ki te tāngata – A respect for people, Kanohi kitea – present face to face, Titiro, whakarongo, korero – look, listen and speak, Manaaki ki te tāngata – be hospitable, Kia tūpato – be cautious, Kaua e takahia te mana o te tāngata – be mana enhancing and kia māhaki – do not flaunt knowledge. These values are used within Māori social constructs for culturally appropriate behaviour, which are placed at the centre of practice to privilege indigenous traditions (Smith, 2012). Ontology, epistemology, methodology and axiology are the four principles of utilising Kaupapa Māori in research. Ontology presents the nature of reality. Through genealogy, indigenous people are connected to the environment, other people and the spiritual world, employed through tinorangatiratanga - self-determination, taonga tuku iho - cultural aspirations, whānau - family and philosophy.

Moreover, this articulates what it means to be within Te Ao Māori - the Māori world. Epistemology is characterised by the underpinnings and meaning of Māori knowledge and methodology is concerned with how to gain the knowledge that makes research culturally acceptable. Lastly, axiology is the nature of ethics, which pays close attention to the tikanga -cultural protocols of the community where the research takes place (Beazley, 2020; Cram, 2017; Hiha, 2015).

Methodological approaches concern broad politics and the goals of indigenous research. This is obtained through discourse and dialogue with kaumātua to ensure cultural appropriation while maintaining research rigour. From a Māori worldview, this speaks to the ideologies about the social, economic and political situations and to elaborate, Kaupapa Māori falls under the broad category of the critical paradigm of inquiry, as it utilises both pragmatic and theoretical practices (Smith, 2012). Kaupapa Māori has different meanings based on an individual's perceptions and interpretations. However, the overarching theory within Kaupapa Māori research is the "Māori way of doing things" (Curtis, 2016, pp. 399) that is transferable to many areas of life (Curtis, 2016; Durie, 2012).

3.4 Qualitative research

Qualitative research values the significance of recognising the social and personal relationships within the natural world and valuing participant experiences and beliefs rather than numerical data. Therefore, the fundamental values of this include understanding that there are multiple perspectives of realities that exist within a participant's natural world (Miles et al., 2015). Qualitative data are commonly seen through interviews or observations and because of this, the researcher has a close relationship with the participants as they collect and analyse the data. To encapsulate rich descriptive data from the participants' narration, the researcher must capture the authentic experiences voiced by the participant. Grounded theory, ethnography and phenomenology are common research pathways under qualitative research design (Leedy & Ormrod, 2015).

A general inductive method of inquiry is employed within this research through interviewing participants. Research findings are generated on emerging significant

themes found from the raw data without imposed structured methodologies. Employing a general inductive approach encourages the findings to present predominant themes rather than building theories, establishing a clear relationship between the research objectives and findings. Data collection utilising a general inductive method of inquiry is concluded based on data saturation rather than theoretical saturation (Jirojwong et al., 2014). Utilising a general inductive method of inquiry allows the researcher to extract key emerging themes from the interviews and identify healthcare professionals' perspectives concerning the value of the Patient-at-Risk (PaR) service.

3.5 Quantitative data

Quantitative research has a fixed structured method of inquiry and is based on the philosophy that people gain knowledge through the ability to reason (Bernard, 1994; Kumar, 2011). Correlations between phenomena is the construct of quantitative research (Goodman & Moule, 2014). Sample sizes in quantitative research tend to be greater in order to prove reliability and research rigor and the analysis focuses on measuring data and testing for statistical significance (Kumar, 2011). In contrast with qualitative researchers, quantitative researchers are separated from the data collection, which is obtained through the use of data tools. Surveys and descriptive designs propose to rigorously detail the characteristics of a given phenomenon or the relationships between the events and the phenomena (Goodman & Moule, 2014; Merriam & Tisdell, 2009). The main types of quantitative data are experimental, quasi-experimental and non-experimental design. To describe characteristics and frequency within a particular phenomenon, a non-experimental comparative research design is employed.

3.6 Mixed-methods research

Mixed methods research combines qualitative and quantitative characteristics to incorporate narrative and numerical data (Jirojwong et al., 2014). Researchers encapsulate the phenomenon in its complete form and saturate data with narratives to improve the robustness of the research. By utilising a mixed methods approach in this research, the reliability is improved and generalised value to the results is added, which

enables the researcher to endorse the accuracy of the data. Mixed methods in healthcare are employed to examine different perspectives, relate results and produce comprehensive data. Therefore, exploring and integrating different research methods that examine the same phenomena clarifies the results (Andrew & Halcomb, 2009). Development of mixed methods research is becoming increasingly popular as it systematically evaluates health issues and services (Brannen, 2005; Goodman & Moule, 2014).

A mixed methods approach is employed to understand the value of the PaR service based on healthcare professionals' perspectives. Data triangulation is employed to evaluate rich descriptive narratives and numerical data to answer the research questions in a way that immerses the phenomenon.

3.7 Triangulation

When exploring broad and multifaceted areas of healthcare, as is the focus of the current research, triangulation of research methods is critical to invoke an enhanced understanding of the phenomenon under question. To answer the research questions and associated aims, triangulation enables the researcher to integrate several methods of data collection from qualitative and quantitative methodologies, which divulges different aspects of a participant's reality (Denzin, 2009). Data, investigation and theoretical are the three main types of triangulation in data sourcing and research methods (Denzin, 2009; Jirojwong et al., 2014). For this research project, both triangulation of data and methods occurred through qualitative interviews and quantitative datasets.

3.8 Credibility and trustworthiness

Reliability of research varies depending on the methodology that is employed. For example, through quantitative research, reliability is established by the stability of measuring tools over time. Whereas, with qualitative research, the random variations that may have influenced the consistency of results are measured (Dempsey & Dempsey, 2000; Leung, 2015).

Similarly, validity is measured differently depending on the research methodology. For example, measuring the data gathering instruments against the purpose it was designed for is utilised in quantitative research. In contrast, qualitative research aims to measure the extent to which the research findings represent reality (Dempsey & Dempsey, 2000; Leung, 2015). Furthermore, the results found in this research must be credible, as this influences the current practice within a healthcare setting (Jirojwong et al., 2014).

As this research utilises qualitative and quantitative methods, reliability and validity must be explored for both. From a qualitative lens, reliability was found based on the stability of responses observed in the interviews. Due to this, validity was established, as the accuracy of the results represented in the participant's true reality. On the other hand, from a quantitative lens, the aim was to explore the characteristics of patients seen by the PaR service, therefore, the reliability and validity were established from the consistency of one dataset.

3.9 Researcher background

The researcher completed an undergraduate degree at the Eastern Institute of Technology, Hawkes Bay. After graduation in 2019, she commenced a new graduate position within the Waikato District Health Board (DHB) at Tokoroa Hospital in South Waikato. In the second year of practice, the researcher moved to the operating theatres completing the Bachelor of Nursing Honours. The researcher identifies as an indigenous Māori to Aotearoa-New Zealand and through the sharing of pepeha, is able to connect genealogically and geographically to tribal ancestors, whānau (family), waka (canoe), māunga (mountain) and awa (river) (Smith, 2012). Ko maungahaumi te māunga, Ko Waiau te awa, Ko Takitimu te waka, Ko Ngati Kahungunu tōku iwi, Ko Pakowhai tōku marae, no Wairoa ahau. Being raised as an indigenous Māori in Aotearoa-New Zealand, provides the researcher a different perspective on life and research. Important values and principles are taught within whānau to reflect the tikanga – protocols of Te Ao Māori - the Māori world, which influences the wider Aotearoa-New Zealand Society. Whanau – family as a social construct includes physical, emotional and spiritual dimensions of wellbeing. Values and traditions are passed down through generations of whānau and are adapted to fit a more

contemporary world. One of these values is whakawhanaungatanga, the process of establishing relationships and connectedness with new people. This occurs through sharing ancestral connections, experiences and working together to create a sense of belonging. Whakapapa (genealogy and kinship) aids the researcher in identifying and establishing the ancestral place of origin including, self-identification, birthplace/home and how each person fits into the constructs of Te Ao Māori. Manaakitanga demonstrates kindness, caring for others and being hospitable, an important value that uplifts personal mana, care, courtesy and consideration to promote a positive environment that encourages to share information. By employing the values important to the researcher as an indigenous Māori within Aotearoa, New Zealand. Whanaungatanga with participants is enhanced by ensuring that relationships are built upon a safe, equal and respectful basis.

3.10 Methodology summary

The value of the PaR service will be explored through utilising mixed methods research, which underpins the research approaches to provide narrative and numerical data. The interpretivist Paradigm of inquiry acknowledges that multiple realities exist as part of each participant's experience and therefore, the research results are influenced by this. Data triangulation strengthens the results by integrating several data collection methods. Utilising this methodology rationalises the theoretical frameworks used within this research.

Chapter IV: Methods

If we knew what we were doing, it would not be called research, would it?

Albert Einstein, 1879-1955

4.1 Introduction

Research methods delineate the process for collecting and analysing data, which rationalises the strategy employed in this research to create a 'research design'. Common research methods include interviews, surveys and case studies, which are chosen to best answer the research questions at hand.

In this chapter, the two main research activities will be discussed, identification of the sampling framework alike and data collection as well as analysis will be explored. This research aims to understand perspectives of the Patient-at-Risk service (PaR) service from those who utilise this service and those within the service, as well as identify the characteristics of patients referred to the PaR service and their relationship with in-hospital length-of-stay and mortality. Therefore, the step-by-step processes will be illustrated with the PaR service and ward nurses to address the research questions.

4.2 Study design

Utilising a mixed methods approach enables the researcher to explore narrative and numerical data for comprehensive, corroborative research (Jirojwong et al., 2014). This research is divided into two phases. Firstly, phase one explores descriptive statistics through quantitative data from the patient information management system and PaR datasets. Phase two explores qualitative data accumulated through interviews, employed to obtain rich narrative data about the PaR service. The design is illustrated in Figure 1.

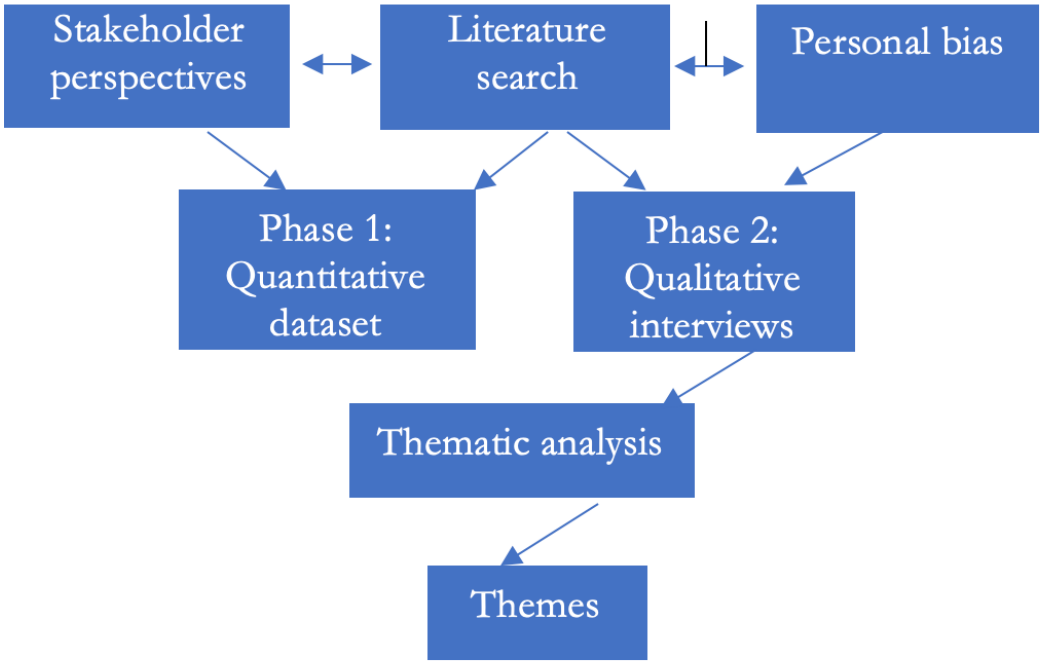

Figure 1: Research design

4.2.1 Phase I

To gain insight into the activities of the PaR service and cognisant of the seasonal effect through communicable diseases, a full year (from 01/08/2020 to 31/08/2021) of medical records (through the Patient Information Management System [PIMS], handwritten records and routine hospital discharge datasets) will be analysed. PaR records are not available electronically, therefore require manual recording. Gathering this data enabled the researcher to draw assumptions and provided direction to the research throughout (Dempsey & Dempsey 2000).

4.2.2 Phase II

Face-to-face semi-structured interviews were employed and underwent a general inductive method of inquiry. Allowing the researcher to comprehend the value of the PaR service based on healthcare professionals' perspectives from those who utilised this service and those who delivered the service. Interviews were audio recorded and later transcribed verbatim to develop emerging themes (Thomas, 2006a). In addition, open-ended questions were employed to gather participants' experiences. Semi-

structured questions guided the interview process and formed a framework for further questions and consistency during this data collection phase (Jirojwong et al., 2014). It was anticipated that interviews would occur with up to 20 registered nurses from the PaR service and ward-based registered nurses and in the end, a total of 13 interviews were conducted.

4.3 Data collection

Data collection is the foundational piece of the research process that considers all the aspects of information gathered. This sets the boundaries that guide the research and aims to determine the methodology, which relates to the questions around sampling and leads the evaluation process for this research (Boswell & Cannon, 2017). The two data collection activities that took place are described below.

Retrospective data were utilised from the patient information management system and PaR records to gather information on patient variables, such as ethnicity, age and patient clinical complexity levels, concerning patient deterioration. To draw conclusions on how the population is affected by deterioration, the researcher collected and analysed data, identifying preventable actions that can be put in place to avert this. Therefore, the information from the data provided an essential source to answer the research question (Boswell & Cannon, 2017).

Interviews enabled the researcher to gain an enhanced understanding of a participant's experience and perspectives, from this, the researcher was able to identify the barriers that prevented people from accessing or delivering a service and it highlights the areas that are working well, based on the opinions of people related to the area of question. The structure of interviews ranges from closed format to open-ended questions that dictate the response the researcher wants to obtain from the participants. Overall, interviews bring forth themes reflecting the true reality of participants' lives (Jirojwong et al., 2014).

As this research aimed to explore the value of the PaR service through healthcare professionals' perspectives, the best way to undertake the data collection phase was through interviews. Semi-structured open-ended interviews allowed the researcher to

ask a predetermined set of questions that addressed the research topic, while providing a guide to other questions that arose throughout the interview. Participants received a participant information sheet that detailed the study and a written consent form was signed prior to the conduction of interviews. Interviews were 30-60 minutes long in a quiet secluded room. Once the interview process was completed, the researcher undertook a general inductive method of inquiry that identified themes.

4.4 Analysis

4.4.1 Thematic analysis

Once the data collection phase had taken place, the researcher began to compile and interpret the data to develop emerging themes from interviewing participants. Overall, data analysis is guided by the research questions to identify the most appropriate approach to gathering, condensing and analysing data (Thomas, 2006b). In this research, interviews were based on the participant's narrative. Therefore, placing importance on the experience identified by participants to truly represent the nature of reality. The thematic analysis enabled the researcher to interpret and draw conclusions from the whole picture and the rationale that guides it. Interviews were audio recorded with transcribed verbatim, imported onto a transcription tool 'otter', which enabled the transcript to be viewed electronically. Through exploration and examination of the interview transcript, the researcher identified the consistent themes that presented itself. Key characteristics found in the transcript were given a code to assess the commonalities between characteristics.

4.4.2 Statistical concerns

Descriptive statistics enabled the researcher to organise and summarise the data, elucidating important features from condensed datasets and the comparability of participants were identified. Further, the research was concerned with any relationship between: (i) Hospital length-of-stay and characteristics of PaR patients; and (ii) Mortality and characteristics of PaR patients. To explore this, a parsimonious approach was employed, which involved a trade-off between multiple variables and sample size. Independent variables were identified using a mixture of extant literature and expert opinion arising from the qualitative phase of this research. Analysis of

variance, or ANOVA was first used in the model development. ANOVA is a statistical method that separates observed variance data into different components to use for additional tests. A one-way ANOVA is used for three or more groups of data, to gain information about the relationship between the dependent and independent variables. This initial univariate analysis was employed first to explore the association separately between each of the independent variables of interest and hospital length-of-stay and mortality, respectively. Those variables identified as significant in the univariate phase were then entered into a multivariate model to ascertain the significant relationships.

4.5 Ethical concerns

Research was conducted through the University of Waikato in partnership with the Waikato District Health Board, as data were collected from the Waikato Hospital. The study received ethical approval from the University of Waikato Human Research Ethics Committee on the 14th of July 2021, the reference number being HREC (Health) 2021#39. Prior to the commencement of any research activities, participants were given a participant information sheet that details information about the research. Consent forms were signed and obtained by the researcher before the interviewing process began. In addition, all participants were assured of confidentiality and the ability to withdraw up to two weeks post the interview.

4.6 Methods summary

In summary, this research utilised a mixed methods approach to highlight the relationship between patient deterioration and characteristics of those who deteriorate and gathered narrative rich data on healthcare professionals' perspectives through interviewing. The qualitative part of this research underwent a general inductive method of inquiry, which analysed the interview transcripts and main codes were extracted to create themes. In contrast, the quantitative data underwent a statistical analysis and descriptive statistics were employed to report the data of those who are seen most by the PaR service. By employing these data collection methods, the researcher is able to understand the true value of the PaR service and the result from this are explored in chapter six.

Chapter V: Findings

The best research you can do is talk to people.

Terry Pratchett, 2009

5.1 Introduction

Acute care teams were introduced as an efferent response to deteriorating patients. The Patient-at-Risk (PaR) service is an acute care team utilised within the Waikato District Health Board (DHB) set to improve patient outcomes by responding to all hospital emergencies and providing clinical support, as well as guidance in managing complex or deteriorating patients. Therefore, this research aimed to identify the effectiveness of this service through healthcare professionals' perspectives to capture the arm of support desperately needed by the population, as well as analysed the patient throughput of the PaR service.

Within this research, a mixed methods approach was employed to triangulate a comprehensive understanding of the phenomena under question. Therefore, this chapter is split into two parts and details the results generated from the data collection activities. Detailed in part one is the results from the qualitative analysis of semi-structured interviews through a general inductive method of inquiry, where seven themes resulted. While part two described the results from the quantitative descriptive statistics, which are presented in tables and graphs to reveal the characteristics of patients seen by the PaR service.

Part 1: Exploring the Patient-at-Risk service

5.2 The interviews

This section is dedicated to exploring the qualitative findings gained from the semi-structured interviews, undertaken with healthcare professionals in the Waikato DHB. Questions were formulated around the research aims, presented as follows: (1) What are the characteristics of patients referred to the Patient-at-Risk (PaR) service, and what is the relationship with hospital length-of-stay and mortalrty (2) What are the perspectives of ward based registered nurses concerning the PaR service (3) What are the views of the registered nurses within the PaR service concerning the service they deliver? A sum of 13 interviews were undertaken. Five were senior registered nurses in the PaR service, four junior nurses from surgical wards, three senior registered nurses in management and surgical wards and one medical registrar.

Table 3: Summary of interviews

Descriptor	Ward-based staff	PaR team
Junior nurses	Junior registered nurse	
Senior nurses	Senior registered nurse	Senior PaR Nurse
Medical staff	Senior medical registrar	

Employing semi-structured interviews allowed the researcher to have a predetermined set of questions that guided the interview but gave freedom to participants to take the interview in any given direction. Thematic analysis of the interviews concluded over 800 codes, condensed into 82 categories and from this emerged seven themes as illustrated in Figure 2.

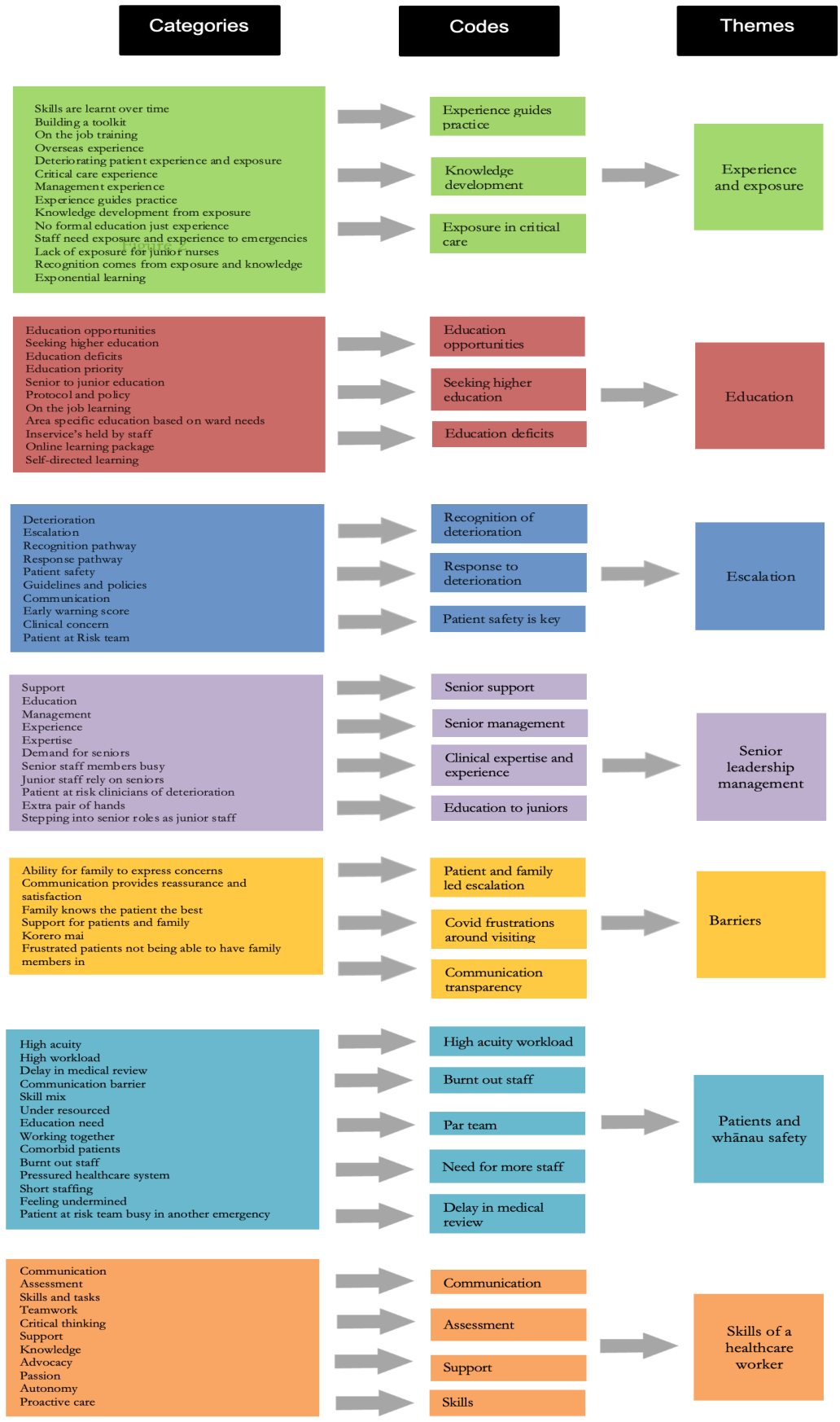

Figure 2: Inductive process post semi-structured interviews

5.2.1 Experience and exposure

'Experience and exposure', a dominant theme condensed into 14 categories, which considers the multifactorial considerations in healthcare, when assessing and responding to deteriorating patients. Experience and exposure are similarly defined as the process of gaining knowledge or skill from doing, feeling and seeing things. Each person within the multidisciplinary team has a varying level of experience and exposure, which is unique to the individual.

> *I've trained at Waikato and I spent two years at this District Health Board before I went overseas working in critical care units. Then I came back here in critical care and then the critical care pool in the nursing agency, the nursing resource team now. And then I came into the PaR team*
>
> Senior PaR Nurse

> *…because to have a primary nurse, who hasn't necessarily had this really sick patient experience before, they're missing out*
>
> Junior Registered Nurse

> *…and I remember, being the junior nurse and you know what now? It's bad, it's horrible and it's frightening, that makes you want to leave. But all these years later? With lots of experience, I don't feel like that*
>
> Senior PaR Nurse

The path of gaining experience comes from extensive knowledge and practice in many different specialties, such as, medical versus surgical or critical care versus geriatrics. Background experience is what builds a 'toolkit' of knowledge that nurses utilise daily. Exposure and experience with critically ill patients are necessary in order to feel comfortable in uncomfortable situations and what allows healthcare professionals to recognise deterioration in order to respond to it.

> *…people might go months and months without having a deteriorating patient. Well, they might never see a deteriorating patient their entire career.*
>
> Senior PaR Nurse

> *…you just pull on your experience and you just don't know, what you don't know*
>
> Senior PaR Nurse

> *…talking to someone the other day and they've been nursing for 10 years and they've only just been to the first cardiac arrest. So, we can't judge people because opportunities don't arise*
>
> Senior PaR Nurse

> *…experience counts a lot. I think having that exposure when you're in training and going through the higher risk wards*
>
> Senior Medical Registrar

The knowledge trajectory of an individual is completely unique and specialised, meaning that some nurses never see a patient deteriorate, while others encounter it daily. To foster this learning, working in partnership with senior staff members who have that experience helps to provide clinical guidance and support during this time.

> *Senior nursing knowledge and experience is invaluable*
>
> Senior PaR Nurse

> *What they provide is extremely experienced, so they provide that high-level senior nurse clinical expertise*
>
> Senior Nurse Manager

> *We were there for our clinical expertise and experience to assist in any kind of situation*
>
> Senior PaR Nurse

The role of senior staff members is incredibly undervalued within the healthcare setting. Through many years of practice, a senior nurse is able to navigate through a various number of situations and lead junior staff members through these experiences. Not only does experience guide practice, but it aids in knowledge development. The Patient-at-Risk service is a team of senior registered nurses who are well seasoned with experience and knowledge. Junior nurses who are beginning to develop and perfect skills, will rely on the PaR service for guidance and support. A strong theme within the interviews showed overwhelming support for the abilities that the PaR service have. Irrespective of experience level, the PaR service are called by anyone who simply needs help; albeit the PaR service may not know the answer to all clinical concerns, wielding a vast knowledge of resources plays to its strengths. A model developed by

(Benner, 1984b; J. Christensen, 1988) depicts that novice nurses have some knowledge of nursing processes but lack experience, whilst expert nurses identify and respond to recognised algorithms in a timely manner from vast amount of experience and knowledge.

5.2.2 Education

Education is the foundation for all frameworks applied within nursing practice. Without education, there would be a huge deficit in nursing practice and an increase in adverse events seen. This theme is one that has a multitude of categories to answer the research questions at hand.

> *…we do weekly teaching. Otherwise, we can do courses online*
>
> Senior Medical Registrar

> *Probably not a lot under in the undergrad, but certainly in my post grad, there's always opportunities to improve and for additional education*
>
> Senior Nurse Manager

> *I did a coronary course; I was second in charge on the ward. So, it was a little bit of management theory of staff. In ICU, I was a preceptor, I did shift coordination and I did the ICU course in between. When I left ICU, I did a social science degree, a post-grad certificate and I did the diploma*
>
> Senior PaR Nurse

> *…so, it's always been part of me to know that you just carry on doing study. I did the NICU intensive care course with postgraduate and took that route towards my Bachelor of Nursing. I did some post graduate study around health management. I did some early childhood education development papers, did my Plunket postgraduate course and then later on to my master's in nursing. I obviously did some cultural training through Pacifica and then currently I'm doing Te Reo*
>
> Senior Nurse Manager

The education opportunities available to healthcare professionals are vast and rich in knowledge, including online modules, postgraduate papers, in-services and simulation-based training. Each focused with a task of identifying educational deficits to provide and improve evidence-based practice and patient outcomes. However, the uptake of

education is based on self-motivation and an individual's drive for change. Albeit theoretical opportunities for education exist within the world, a strong theme was identified around the demand for more education.

> *…there still needs to be some education.*
>
> Senior PaR Nurse

> *New grads do the online module, but I think some nurses can get focused on tasks. Rather than looking at the whole picture and sort of bringing knowledge and science together.*
>
> Senior PaR Nurse

> *…but I don't think I can pinpoint any specific education that I've done, just living experience*
>
> Junior Registered Nurse

> *I think it's still a knowledge gap. I think people aren't familiar with it (deterioration)*
>
> Senior PaR Nurse

An identified gap in education was pinpointed by both senior and junior staff. However, to cut both ways, building knowledge comes from not only formal education but an aspect of 'learning on the job'. Therefore, to create the ideal nurse, education must arise from in depth knowledge, mixed with exposure from many different scenarios.

> *You only develop skills when you've been in situations. They are put into my library of knowledge; I think it's just that exposure.*
>
> Senior PaR Nurse

> *…a lot of learning on the job scenario and learning from your colleagues.*
>
> Junior Registered Nurse

> *We have got the education, got the training and got the tools I think we've got the structure there, what we need and is often the struggle, is around that learning on the spot.*
>
> Senior Nurse Manager

An equilibrium of theory and experience is what builds a 'toolkit' of knowledge. This means that when exposed to a similar scenario again, healthcare professionals rely on previous knowledge and experiences for efficient recognition and response. Similarly, with the first theme, a strong voice was noted around the support and knowledge gained by working with experienced senior staff.

> *They are involved with education training on the ward. They look at the learning need in the department and then offer that for the in-service*
>
> Senior Nurse Manager

> *We advocate strongly for the education and advice needed for procedures they're unfamiliar with.*
>
> Senior PaR Nurse

> *Such knowledge and such expertise, they really are about supporting the development of the staff member as well*
>
> Senior Nurse Manager

> *…being able to share that education on, it's really important*
>
> Senior PaR Nurse

> *…assisting senior nurses with deteriorating patients*
>
> Junior Registered Nurse

Senior staff are expert clinicians in the designated area and some have over 20 years' experience. Therefore, the knowledge imparted onto others is significant and invaluable. From these interviews, the Patient-at-Risk service is a perfect example of this, well known for the support and guidance given to staff in unknown procedures, as well as having the ability to identify a deficit and turn it into a learning opportunity for the clinical area. A team that is passionate about advocating for the educational needs of staff. However, what are the educational needs?

> *…bit more frequent and simulation training for dealing with deteriorating patients,*
>
> Junior Registered Nurse

> *I think an interactive study day would be really good. Even if that was bolstered by ko awatea*
>
> Junior Registered Nurse

> *I don't think I've been to a deteriorating patient study day, but that's something I'm interested in. In-services potentially from educators on the ward and a clinical support nurse who is just floating to help upskill the staff. Even the PaR team, I know they're quite busy, but come around and do education as well*
>
> Junior Registered Nurse

> *So, people might learn by textbooks or by videos, or by real time or by clinical experiences*
>
> Senior PaR Nurse

Currently a four-hour online module is the only education tailored to deterioration available to nurses in Waikato hospital. Although a great module, nurses would prefer to utilise a mixture of learning tools. For example, simulation-based training, interactive study days, in-services and regular refreshers. Not only does this allow nurses to upskill and keep up to date with evidence-based practice, but it also adapts to all learning needs.

5.2.3 Escalation

Identified in the literature review, a major factor in managing deterioration, relies on the recognition and response from the primary nurse. Education and experience predict the process of recognition, while the response is dictated by local guidelines and escalation to the medical team, as well as acute care teams. This theme was developed from reoccurring codes about the early warning score and activation of the escalation pathway to acute care teams.

> *With a deteriorating patient, you never know what's going to happen. Some days people just deteriorate and some days they don't*
>
> Junior Registered Nurse

> *… and people tend to deteriorate more after-hours and sometimes they improve to deteriorate again*
>
> Senior PaR Nurse

I guess that deterioration heightens situations

Junior Registered Nurse

…and it's the nursing staff that are recognizing deterioration themselves. I think it comes with experience and knowing a patient.

Senior Medical Registrar

The nature and presentation of deterioration appears in many different forms. Trends show that healthcare professionals predict patients who may deteriorate, such as comorbid people. Heightened situations are created, as deterioration is often unpredictable, despite knowing a patient's background history. Therefore, the early warning score is the most common tool for detecting deterioration.

Junior nurses, you can't expect them to see those subtle signs of a deteriorating patient. They have to rely on the ews scores and they do that very well. Whilst there are other signs that a more senior nurse might recognise.

Senior PaR Nurse

… ews score provides early detection of the deteriorating patient. So, we've got that to help guide us as well

Senior Registered Nurse

I always follow the ews protocol. If there's a six or seven, they (PaR) get a call regardless, because that's protocol

Junior Registered Nurse

I just think that ews scores a really good tool but supplemented with your own clinical knowledge. Using that ews score to bolster or escalate straight to the registrar or PaR team is how to get on board for another pair of eyes.

Junior Registered Nurse

The early warning score is a tool created to aid healthcare professionals in detecting abnormalities and unexpected trends in vital signs. This tool has exceeded its expectations by improving the identification of deteriorating patients and empowering junior staff members with the confidence to escalate. However, as identified in the literature review, lack of identification around deteriorating patients, as well as the

inability of nurses to complete charting, creates missed opportunities for escalation. When recognising deterioration, healthcare professionals rely on objective measures used in conjunction with critical thinking. This ensures that the appropriate escalation pathways are followed.

> *…looking at a trend to recognise a pattern in terms of deterioration. We rely on that heavily. What they're normally, what they've been like previously and I think that trumps ews score.*
>
> Senior Medical Registrar

> *We can follow a recognised algorithm, when someone's deteriorating, because it's a good guide and it becomes a little bit automatic*
>
> Senior PaR Nurse

> *I think it gives staff of any level of expertise the confidence to make the call, actually you need to notify now, it doesn't give you that feeling of getting yelled at by the doctor, I can say actually, this is what it is and this is what needs to happen*
>
> Senior Nurse Management

> *…but there are guidelines and staff that will help you.*
>
> Senior PaR Nurse

The escalation pathway should be easy to navigate for people, regardless of level or expertise and gives the confidence to escalate to the medical team, as well as acute care teams.

> *They're really useful and they help the time management of working with other patients as well as, deteriorating patients and they help escalate to doctors more forcibly than us*
>
> Junior Registered Nurse

> *…as that was being introduced (early warning score), we saw a huge increase in our workload, but we knew that we were seeing patients that we needed to see*
>
> Senior PaR Nurse

> *PaR nurses they're expert clinicians in patient deterioration. From nurses for nurses and another pair of senior hands*
>
> Junior Registered Nurse

> *Yeah, they're just kind of superheroes. Honestly though, they just fly in and kind of fix things*
>
> Junior Registered Nurse

Acute care teams utilise a good balance of imparting knowledge to others, recognising the familiar algorithm of deterioration and escalation processes. The PaR team is a service that all juniors or seniors can look to in order to provide support and guidance for deteriorating patients and any help in a clinical setting. Conflicting evidence was found in the literature that debates whether acute care teams statistically improve the morbidity and mortality of patients. Through subjective information, healthcare professionals suggest that acute care teams are pivotal in improving patient welfare and feelings of safety among staff.

> *We help with complex things in wards and we help with deteriorating patients. I'd say it's increased patient safety (EWS)... it is definitely safer for the patient*
>
> Senior PaR Nurse

> *Every situation is different. Every patient is different. Your primary concern is patient safety. But they (PaR) can get very complex situations*
>
> Senior PaR Nurse

> *…always a safety net and a friendly safety net*
>
> Junior Registered Nurse

> *It's supporting wards where they've got a more junior mix on. It may well be just supporting them with that decision making if they're not confident themselves, but also supporting them with the process to escalate it up further to get a medical review.*
>
> Senior Nurse Manager

Throughout the evolution of healthcare, many initiatives have come and gone. However, one that remains constant is the early warning score and utilisation of acute care teams. Foundation of these initiatives are centred around improving patient safety, albeit many things affect this, such as skill mix, delays in escalation reviews and workload. Through meticulous experience, exposure and education, healthcare professionals build a library of knowledge that facilitates the identification and

response to adverse events efficiently. Tools such as the early warning score provide healthcare professionals with a foundation when escalating concerns. As nurses develop and gather more experience and knowledge, the early warning score is utilised in conjunction with critical thinking.

5.2.4 Senior nurse and leadership management

Senior staff members excel in many different areas, a senior member on the floor, a leader, or in management positions. It is someone that other staff members can look to, to provide support and guidance in unfamiliar processes. Woven throughout, each theme highlights the importance of senior staff within this niche.

> *I feel quite supported by the senior staff that are around me. They provide skills that I probably don't have yet*
>
> Junior Registered Nurse

> *We usually rely a lot on our senior nurses to help us just because they've been here longer, they'll be more exposed to the experiences. So, they might know what to do, or how to help out*
>
> Junior Registered Nurse

> *…being able to work alongside them and tap into that senior nursing knowledge and experience is really invaluable*
>
> Senior PaR Nurse

With the accrual of knowledge and experience created over time, senior staff can not only recognise and respond to deterioration more efficiently, but are able to support, educate and advocate for junior staff. Over time, senior staff impart knowledge and skills into junior staff and this pattern is seen throughout the history of healthcare.

> *We were senior experienced nurses who only worked out of hours and we were there for our clinical expertise and experience to assist in any kind of situation.*
>
> Senior PaR Nurse

> *Patient-at-Risk nurses who are really senior nurses, they're the advocate, they can be the one that's putting in the stern word. It's quite helpful because they've got the skills and knowledge*
>
> Junior Registered Nurse

> *Having that really good mix of senior, intermediate and junior staff. So, it's ongoing clinical coaching. I think it's crucial they provide that really high-level senior nurse clinical expertise*
>
> Senior Nurse Management

Albeit the value of senior staff cannot be discouraged, increased pressures from the healthcare system are building. The distribution density of senior to junior nurse ratio favours a larger junior workforce. In fact, according to the Nursing Council of New Zealand (2021), 42.5 percent of the nursing workforce is under 25. Placing pressure on the remaining senior staff to take heavy workloads, nurse unwell patients and coordinate shifts, whilst guiding and supporting others.

> *…because there's not that many seniors around now. I think there's a lot more younger nurses and even though they're very good, they just haven't had the exposure. So, to get that exposure, you want to be in a comfortable, safe environment*
>
> Senior PaR Nurse

> *…with the PaR team, it's actually quite nice to know that if I'm coordinating the shift and the skill mix isn't great and something's happening to one of the junior nurses that there is that help out there for them*
>
> Senior Registered Nurse

> *…they don't want to disturb some of the seniors who are busy coordinating. So, I think a lot of juniors feel that they can't ask.*
>
> Senior PaR Nurse

Senior nurses are expected to coordinate, take a patient load and support junior staff members, but do not let this discredit the work junior staff do. Building a toolkit filled with knowledge and experience is a skill that comes in time. Therefore, since the implementation of the Patient-at-Risk service, senior and junior staff feel reassured that there is always a 'safety net' to fall back on when senior expertise is needed.

Yeah. And just get on with the little tasks that often become really difficult in a deterioration situation. A great advocate and a bridge for nurses to access senior clinicians.

Senior PaR Nurse

5.2.5 Patients and family led escalation

If a patient or family member is concerned, a set escalation trajectory takes place. The primary nurse is the first point of contact, who escalates the matter to the medical team and nurse in charge. The literature review identifies that despite this escalation pathway, patients and family members feel unheard and dismissed by members of the healthcare team. Recent initiatives aimed to give patients and family members a separate escalation pathway to ensure that concerns are taken and escalated accordingly. Within the Waikato District Health Board, the pilot, kōrero mai- listen to me talk to me, is being trialled. It was a part of this research to understand the effectiveness of such service delivered by the Patient-at-Risk nurses.

…she called our team and she just felt unheard.

Senior PaR Nurse

…he said that no one's listening.

Senior PaR Nurse

…they have called themselves because they are unhappy with the care that they're being provided.

Junior Registered Nurse

…and there's family members with patients who know them well and can tell us what has gone wrong, I think it's important that they're able to escalate it and generally, I found that if it's been a family member alerting, the nursing staff then escalated it on. That's just kind of been a normal process.

Senior Medical Registrar

Patient and family-led escalation provide family members with confidence if feeling unheard. From this qualitative analysis, healthcare professionals love the concept of patients and family members having an escalation pathway to empower the voice,

however, when put into practice, it does not work as well as anticipated. Majority of concerns are voiced around the service being utilised as a complaints-based service.

> *So, I love the concept, I think we're still in the early stages working out how it's going to work. Even if we just put out one big disaster then it will all be worth it. The concept is a great concept*
>
> Senior PaR Nurse

> *I think in theory it's really good, but practically, it's dreadful. I think the kōrero mai escalation for clinical concern is fantastic. The family are the ones who have walked alongside them, to manage them, they're full-time carers. So, when something does go wrong and they're clinically deteriorating, their family members are often the holder of all the information and advocate*
>
> Senior PaR Nurse

> *…families particularly knowing their loved one is not well, they might not have a score, but they know that they're not themselves,*
>
> Senior PaR Nurse

Family members accompany a patient's journey and because of the extensive experience with the patient, detecting minuscule changes is quicker. In the Waikato District Health Board, phone calls from concerned family members are triaged by the Patient-at-Risk service and although there have been some appropriate referrals, a large portion remains inappropriate and calls are mainly complaint-based rather than clinical concerns.

> *I haven't had a real problem with it, but I know some people are being tied up for a long time. I felt it's not really their role, but I think it's a powerful tool*
>
> Senior PaR Nurse

> *I think that's a great idea and that patients have a way to escalate. I'm wondering if the PaR nurse is the right one initially*
>
> Senior Nurse Management

> *I think as a service the concept is a great. I really like that concept. But I think the framework for me is slightly off piece. I think it would be better directed to a dedicated group because if you've got a PaR nurse sitting in the middle of something acute and*

then having to take a phone call and actually deal with that situation, even if it is to say I'll call you back shortly, I think it's quite disruptive

Senior Registered Nurse

Throughout the research, there have been significant changes to how the initiative is delivered within the Waikato District Health Board. Whilst it remains an integral part in the detection of deteriorating patients, it is now managed by a third party who refers clinical concerns to the Patient-at-Risk service. It continues to be a work in progress, but the value of this initiative cannot be undermined.

5.2.6 Barriers

Interwoven throughout healthcare are many barriers that impede movement. Barriers have existed for many years and continue to be a heavy burden contributing to delay. During the qualitative analysis, many barriers were identified that will be discussed.

…high acuity patients, we've had a lot of staff leave. So, it's been a bit challenging having to step into a senior role as a junior nurse

Junior Registered Nurse

…the delays that we are having and seeing those patients are due to our workload

Senior PaR Nurse

…high workload, particularly in a morning shift? Like, you're just so bombarded by every single different multi discipline including the multiple teams that are involved with your patients

Junior Registered Nurse

It just so much depends on workload as to how quickly that response is

Senior Medical Registrar

Each member in healthcare is affected by the burden of workload, despite the place in the hierarchy. For example, junior nurses are stepping into senior roles due to the lack of staff, whilst the limited senior nurses coordinate shifts, manage patient loads and

support junior staff. In addition, both PaR nurses and medical staff get calls to review patients whilst having to prioritise workload.

> *The infrastructure is that suboptimal, not a lot of the infrastructure is working. From that time, I never wanted to feel like I couldn't do right by the patient again*
>
> Senior PaR Nurse

> *… just lurching from one crisis to the next*
>
> Senior Nurse Management

> *Medical reviews are delayed because they might be in hand over or in ED or theatre. So, we don't have a plan of care to move forward on. We do advocate strongly to get them there and if we can't get one person, we just go up the chain. But that can delay the patient journey*
>
> Senior PaR Nurse

> *…because they're all very busy and if they're getting called to multiple emergencies, you're obviously getting slowed down*
>
> Senior Medical Registrar

Delays in the medical review are an important point highlighted during this process. Due to multifocal aetiologies, medical staff have high workloads and have to prioritise patients, creating frustration and delays in patient care.

> *I was so frustrated, so I called PaR team and talked through it but my frustration there was definitely escalating to the registrar and getting no response.*
>
> Junior Registered Nurse

> *…because the doctors were on their ward round and they didn't want to be bothered, but I don't think they got the message, I'm not sure why*
>
> Senior PaR Nurse

> *If there's a registrar or a doctor, that are not particularly helpful, they're (PaR) really good at pushing the right buttons*
>
> Junior Registered Nurse

> *The delays, particularly when we're concerned about a patient and their safety often fall with your surgical patients and maintaining that protocol of review. The registrars needed to see the red zone patient within half an hour and they might be stuck in theatre. Often, they'll refer to the house officer to come and assess the patient on their behalf, which is still viewed as a bit of a delay*
>
> Senior PaR Nurse

Not only is the frustration limited to delays in medical reviews, but there is significant pressure on the nursing staff as well. With the high acuity workloads and an increased burden of disease, a high burnout rate is common for those in healthcare.

> *…it's quite a busy ward with high acuity patients, we've had a lot of staff leave*
>
> Junior Registered Nurse

> *We all get stressed and you can talk to someone and debrief with them but then not sleeping properly is not ok*
>
> Senior PaR Nurse

> *…we're fairly understaffed. Yeah, we've had a lot of sick leave lately as well.*
>
> Junior Registered Nurse

Due to high acuity and stressed work environments, staff often have increased numbers of sick leave, staff burnout and turnover rates. This, therefore, puts pressure on the remaining staff to perform at an optimal level in suboptimal conditions. In addition, due to the workload pressures, staff are scared to share concerns for fear of being ridiculed.

> *You see something you're not happy with and feel that they can actually share that without being led to feel stupid. Sometimes it's better communication, because some of us do not want to bring up something if it's not a score, because they feel like they're going to be ridiculed*
>
> Senior PaR Nurse

> *…medical staff because I know the house officers often don't call the registrar because they want to just try sort it themselves and don't want to be seen as if they can't manage or the fear that they're going to be told off.*
>
> Senior PaR Nurse

Interwoven within healthcare are complex barriers that have remained relatively static over the last century. High acuity workloads resulted in staff burnout and increased turnover rate, which are some of the significant contributors to the burden. Due to this high workload, delays in patient care result and the growing responsibility of juniors to step up into senior roles without the experience and exposure is common. However, the Patient-at-Risk service acts as a safety net that all healthcare members can rely on in order to provide clinical support and guidance.

5.2.7 Specialised skills

The last theme identified in the thematic analysis highlights the importance of knowledge and skills, including clinical and non-clinical skills. To build a toolkit, skills are often developed from the experience and exposure a person is subjected to. Communication, escalation and critical thinking are typical examples of skills that strengthen over time.

> *So how you assess someone and how you communicate their deterioration, assessment and communication are pivotal, but you have to prioritise and base it on what they tell you*
>
> Senior PaR Nurse

> *…to have that real time education of tools to be able to communicate in a different way*
>
> Senior PaR Nurse

> *I think your core assessment skills are essential and your ability to communicate those really clearly. Articulate what you're worried about over the phone as quickly and clearly as possible. If you have a vague conversation with someone that can't see the patient, of course, you're not going to get a good response. If you can say really clearly, what you're concerned about and what you expect from them, that's good.*
>
> Junior Registered Nurse

Communication is the main foundation that bridges skills together. Communication not only dictates relationships with others, but it allows for the expression of thoughts and concerns about patient safety. Due to the high workload and complex patient needs, there are many communication delays, which are pivotal and influence the urgency of the matter at hand. Healthcare professionals utilise communication while

assessing a patient and again when escalating concerns. With increased experience and exposure, the more confident and succinct communication becomes. In distressing situations, communication allows for a team-based structured approach to take place.

> *I would want all the help I could have. I wouldn't be someone to just try and muddle through it myself, it's good to have a team approach because you can just get the patient and the things that need doing, done so much quicker.*

Senior PaR Nurse

> *…we do have support, we're a team and so we all help one another*

Junior Registered Nurse

> *…you might not be able to interpret what the underlying problem is, because that's why you work as a team*

Senior PaR Nurse

Teamwork within healthcare is vital. Each individual has unique abilities and problem-solving becomes more manageable when working together in a team. Not only does teamwork enhance learning opportunities but it results in happier staff members. Facilitating a positive environment with open communication, working together to solve a problem and contributing towards a common goal becomes easier within the multidisciplinary team. Critical thinking is culminated during this process.

> *Critical thinking is definitely good assessment skills.*

Junior Registered Nurse

> *…this patient is actually deteriorating and it's becoming a bit of a task, rather than looking at the critical thinking of the patient. I find the early warning score is really good as a tool, because sometimes someone can be deteriorating and their score could be quite low, but if you look at them and do your clinical assessment, this patient is really unwell. Some nurses aren't really seeing it*

Senior PaR Nurse

> *So, it's trying to foster that critical thinking as much as we can but that comes in time. I think having the understanding and the patience, that skill set and that clinical reasoning, to be able to manage deteriorating patients comes in time and everybody learns differently, everybody's a completely different learner*
>
> Senior PaR Nurse

In conclusion, experience and exposure dictate a person's ability to recognise and respond to deterioration. In conjunction with this, education is used to build upon knowledge and experience. With this knowledge and experience, healthcare professionals can follow a recognised algorithm in escalation, while senior healthcare professionals with extensive knowledge and experience support those who are more junior. Patients and families know the patients best and detect subtle changes that happen more efficiently. While the ideology of patient and family-led escalation is an initiative healthcare professionals love, many details continue to be a work in progress.

Part 2: Quantitative findings

5.3 Sample characteristics

During the quantitative phase, raw data were collected from the Patient-at-Risk (PaR) records to identify patients who had been referred to the service and then matched with the Patient Information Management System (PIMS). The PaR records are manually recorded and stored and were required to be gathered directly by the researcher prior to processing, cleaning and analysis. This process took place over two months to ensure the accuracy and validity of data.

This section presents both the descriptive statistics arising from the two matched datasets and then continues to present the findings relating to the relationship between mortality and independent variables as well between hospital length-of-stay and independent variables. Over the period of 12 months (01/08/20 to 31/08/21), a total of 1,212 patients received care from the PaR service. Table 4 highlights the key characteristics of the sample.

Table 4: Key characteristics of patients seen by Patient-at-Risk service

Characteristic	Result
Count of Ethnicity (%)	
Asian	53 (4.4)
European	730 (60.6)
Māori	377 (31.3)
Pacific Islander	32 (2.6)
Other	12 (1)
Null	8 (0.1)
Count of Age (%)	
0-19	97 (8)
20-29	73 (6)
30-39	78 (6.4)
40-49	95 (7.8)
50-59	149 (12.3)
60-69	185 (15.3)
70-79	231 (19.1)
80-89	196 (16.2)
90-99	55 (4.5)
100-109	3 (0.25)
Null	50 (4.13)
Count of Deceased by Ethnicity (%)	
Asian	5 (4.5)
European	71 (65.1)
Māori	30 (27.5)
Pacific Island	3 (2.7)
Count of Deceased by Age (%)	
0-19	0 (0)
20-29	2 (1.82)
30-39	3 (2.73)
40-49	6 (5.45)
50-59	7 (6.36)
60-69	19 (17.27)
70-79	26 (23.64)
80-89	36 (32.73)
90-99	10 (9.09)
100-109	1 (0.91)

Table 4 (continued): Key characteristics of patients seen by Patient-at-Risk service

Characteristic	Result
Count of referrals per month (%)	
January	123 (10.2)
February	91 (7.5)
March	126 (10.4)
April	122 (10)
May	119 (9.8)
June	161 (13.3)
July	108 (8.9)
August	158 (13)
September	63 (5.2)
October	63 (5.2)
November	29 (2.4)
December	49 (4)
Count of referral by specialty (%)	
Emergency	51 (4.2)
Medical	722 (59.6)
Surgical	411 (33.9)
Other	28 (2.3)
Count of Patient Clinical Complexity Level (PCCL) (%)	
0	253 (20.9)
1	8 (0.6)
2	114 (9.4)
3	239 (19.7)
4	429 (35.4)
Null	169 (13.9)

The population of the Waikato region is 458,202 people and within this, the majority are European (74.4%). The Waikato region has a high population of Māori in the country at 108,076 (23.9%) and a growing population of Asian, 43,529 (9.5%) and Pacific Island, 20,619 (4.5%). Most of the sample (60%) were of European descent, who had a mean age of 64 years, and were in the hospital for an average of 6.5 days. A total of 31 percent of Māori accessed the service, who were younger (mean age= 49) and in hospital for an average of 6.3 days. When comparing the PaR dataset with the regional population, Māori were more likely to be referred and were younger.

The Patient Clinical Complexity Level (PCCL) is an integer value calculated according to a mathematical formula between 0 and 4. It describes the patient-related overall

severity in medical-economic classification systems, such as the Diagnosis Related Groups (DRG). A value of '0' represents no or minimal co-morbidities or complexities relating to the stroke, where as a value of '4' represents significant complications or co-morbidities. The PCCL therefore, acts as a useful tool in characterising patient complexity and as the table illustrates, perhaps understandably that a significant proportion were classified as most complex (PCCL=4).

There was a mild seasonal effect within the PaR service, with a slight increase seen during the winter months. Additionally, the PaR service saw patients admitted to the medical ward almost twice as likely as those in surgical wards and a small number of patients in the Emergency Department and other clinics around the hospital. Specialties were explored to identify whether certain areas had more referrals to the PaR service than others and no significance was noted.

5.4 Exploring the data

The parsimonious statistical modelling utilised a two-step approach, the first involved discrete univariate analysis of the dependent variables, hospital length-of-stay and mortality against the independent variables (ethnicity, month of referral, specialty, age and PCCL). If three of more variables result as statistically significant, it will then undergo a multivariate analysis. Once the statistically significant (at the 5% level) variables have been established, the final model can be finalised. The statistically significant matches are marked and explored in further detail below.

5.4.1 Relationship between PaR characteristics and hospital length-of-stay

Table 5 illustrates the results of the univariate ANOVA and present both the F value (used to determine whether the test is statistically significant) and the P value.

Table 5: Univariate analysis of Length-of-stay with independent variables

Independent variable	F value	P value
Ethnicity	0.01	0.976
Month throughput	1.293	0.256
Specialty	0.334	0.564
Age	1.316	0.251
Patient clinical complexity level	**105.03**	**<0.0001 ***

Note. * significant at the 5% level

The independent variable identified as statistically significant at the five percent level is PCCL. Given that only PCCL was significant, no further analysis was required, and the results of the relationship are explored more in Figure 3.

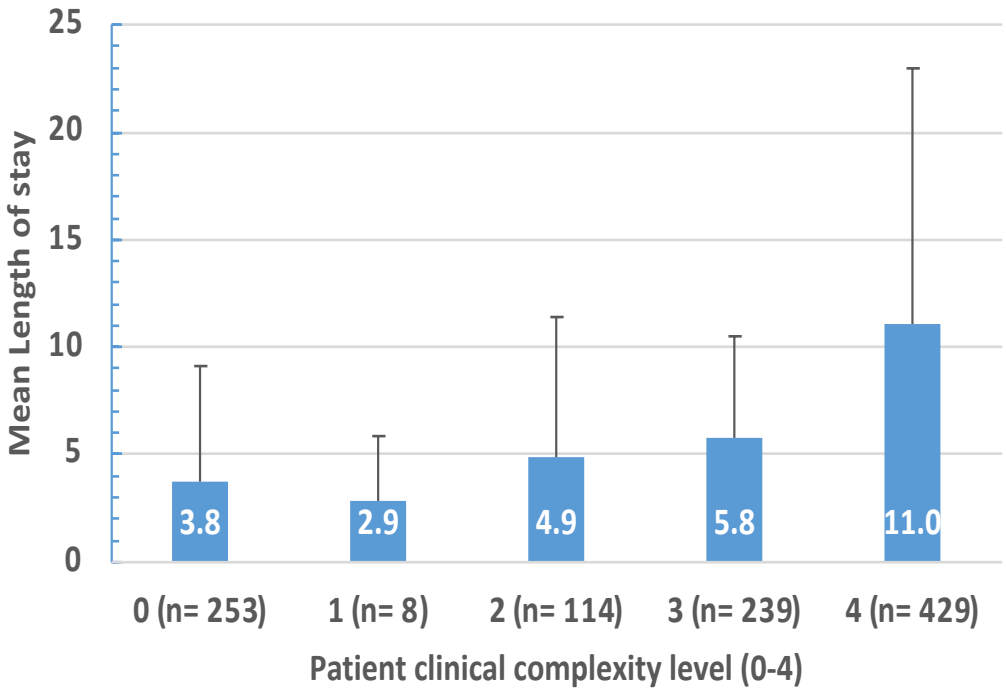

Figure 3: Mean Mortality by Length-of-stay (error bar=1SD)

The higher the PCCL value, the greater the complexity of the patient's condition. Generally, as the PCCL increased, the hospital length-of-stay increased. It is

interesting to note and perhaps not surprising, that most PaR patients had PCCL scores of 3 or 4 (19.7% and 35.4%, respectively or 55.1% in total). Patients with values of 3 or 4 have significant complexities associated with their condition and are at higher risk of instability and deterioration.

5.4.2 Relationship between PaR characteristics and mortality

Mortality describes the process of being subject to death. This is influenced by socioeconomic status, presence of comorbidities, cultural characteristics and a multitude of other factors. As a result of the univariate analysis, there were three independent variables identified to be statistically significant at the five (and ten percent) percent level: ethnicity; PCCL; and hospital length-of-stay (as illustrated in Table 6).

Table 6: Univariate analysis on mortality

Independent variable	F value	P value
Ethnicity	**3.079**	**0.080 ****
Month	0.062	0.803
Specialty	0.032	0.859
Age	0.173	0.678
Patient clinical complexity level	**5.397**	**0.020 ***
Length-of-stay	**23.687**	**<0.0001 ***

Note. * Significant at the 5% level
**Significant at the 10% level

A multivariate analysis was undertaken, including those factors identified as statistically significant and Table 7 presents the final findings of the model.

Table 7: Multivariate analysis on mortality

Independent variable	F value	P value
PCCL	**14.756**	**<0.0001***
Hospital length-of-stay	**33.267**	**<0.0001***
Ethnicity	1.828	0.177

Note. * Significant at the 5% level

Patients who have a PCCL code of four (catastrophically comorbid) are much more likely to be subject to die than those of any other PCCL code, especially those of zero to one. Figure 4 illustrates the relationship, with the percentage surviving decreasing as PCCL increases; almost one in four of PaR patients who have a PCCL value of 4 die during the hospital stay.

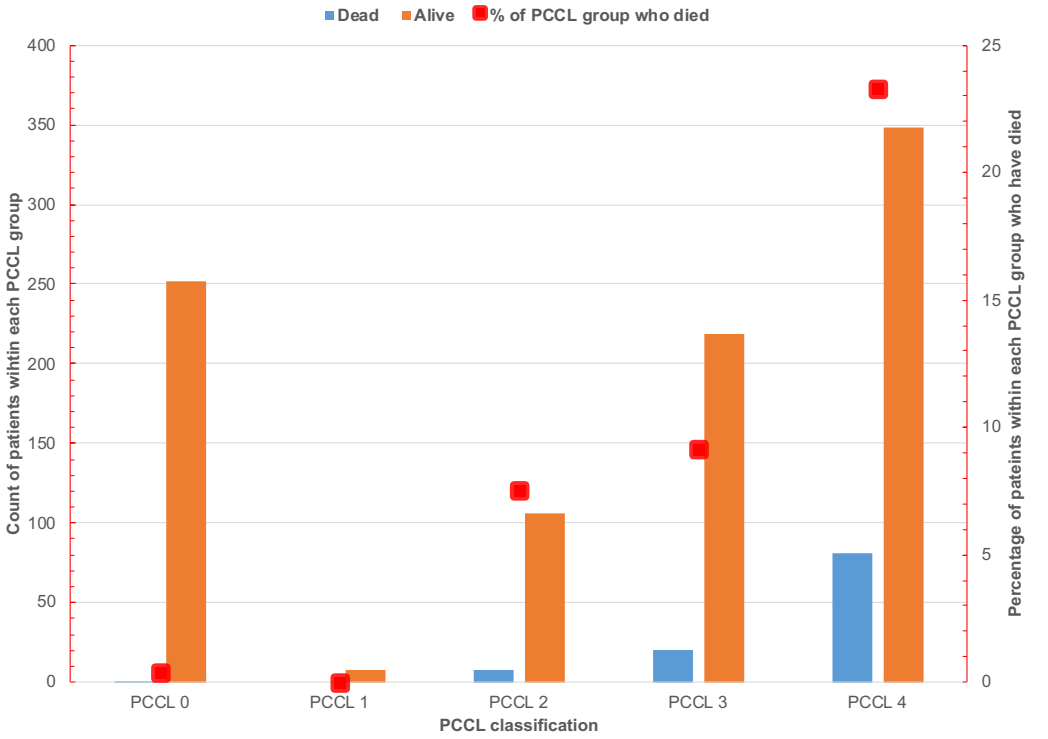

Figure 4: PCCL and mortality

Length of hospital stay is paradoxically shorter for those patients who die during their hospital length-of-stay, which is evident in Figure 5. Patients who did not survive had a shorter length in all categories.

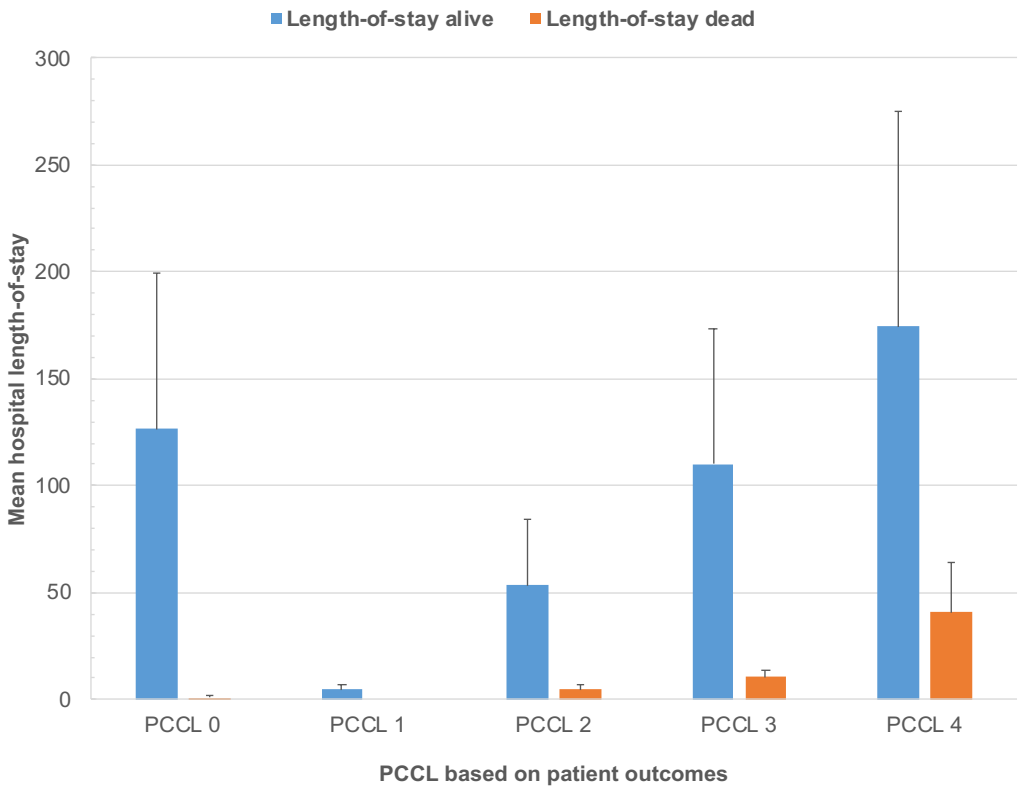

Figure 5: Mortality compared against patient clinical complexity level and length-of-stay (error bar = 1 SD)

5.5 Findings summary

In summary, this section has detailed the qualitative and quantitative findings from this mixed methods study, aimed to understand the views and attitudes of users and providers of the PaR service within Waikato District Health Board. From a qualitative perspective, many factors influence the effectiveness of staff when responding to deteriorating patients. Influential factors include experience and exposure to deteriorating patients, a broad range or lack of education availability, appropriate escalation pathways for all staff, having suitable seniors and leaders around to guide those with less experience and allowing patients and families a safe space to escalate any concerns, overcoming barriers that healthcare professionals are subject to, such as workload and short staffing, in order to provide the best quality of care and having those technical and non-technical skills, in order to investigate and execute assessments and escalating those concerns when needed.

Chapter VI: Discussion

To steal ideas from one person, would be plagiarism, to steal ideas from many is called research

Nishan Panwar

6.1 Introduction

Patients who are critically ill with acute illness are not always located within an intensive care or high dependency unit. Often, deteriorating patients are managed within the emergency department or wards (Jevon et al., 2012). Evidence suggests that early recognition and timely management improve patient outcomes, as well as reduce admission into critical care services.(Jevon et al., 2012). Further, it is well recognised that signs of deterioration are evident sometime before deterioration transpires. A review of the literature found that through the utilisation of tools such as the early warning scale and implementation of acute care teams, the afferent and efferent pathway used to manage deterioration has improved significantly compared to historical data. However, those who deteriorate and are seen by acute care teams often face health disparities. The impact that disparities have on health means that those subjected to socioeconomic disposition and comorbidities are more likely to have an increased hospital stay, morbidity and mortality. Within Waikato, a high domicile of Māori is seen within this population compared to the rest of Aotearoa-New Zealand. A significant portion of these people live in deprived areas where Māori are significantly over-represented as healthcare consumers.

Since implementing acute care teams, little research has highlighted the value and contribution these services make within the hospital system and towards patient outcomes. However, current research focuses on the qualitative perspectives of people in this service and who refer to this service. This has shown significant support in the value that a team of highly experienced senior registered nurses is readily available if support or guidance is needed. This final chapter is organised into three parts, the first addresses the following research questions: (1) What are the characteristics of patients who are referred to the Patient-at-Risk service, and what is

the relationship with hospital length-of-stay and mortality; (2) What are the views of ward-based healthcare professionals in relation to the PaR service; and (3) What are the views of the registered nurses within the PaR service in relation to the service they deliver? Part two will describe the theoretical contributions this research has made and the third section discusses the limitations, conclusions, practice implications and future research opportunities.

6.1.1 Triangulation of data

Triangulation assists the researcher to understand the complex nature of healthcare by integrating several methods of data collection from qualitative and quantitative methodologies. This reveals the different perspectives of the participants' reality. Within this research, data triangulation was obtained by evaluating the rich descriptive narratives and analysis of the numerical data. In addition, understanding the staff's perception of the Patient-at-Risk (PaR) service allows the data to become meaningful.

Part 1: Research questions

This section addresses the research questions upon which the research was founded. Data gathering stemmed from two phases. Phase one utilised a quantitative perspective that analysed data from the PaR records and hospital datasets to identify the characteristics of those referred to the PaR service. Phase two consisted of a qualitative stage, that was completed through semi-structured interviews gathering the perspectives of senior nurses within PaR and a mix of senior and junior nurses from the wards.

6.2 What are the characteristics of patients who are referred to the Patient-at-Risk service, and what is the relationship with hospital length-of-stay and mortality?

The parsimonious modelling resulted in one independent variable being identified as statistically correlated with PaR referrals and this was Patient Clinical Complexity Level (PCCL). Perhaps not a surprising result as a high majority of people admitted to hospital, are of older age with comorbidities.

Within this research, it became evident that the presence of PCCL had a large impact in the way healthcare professionals provide care. From a qualitative perspective, patients who have greater complexities are more likely to experience morbidity, mortality and greater length-of-stay. Therefore, nurses who have greater experience, education and skills can promptly identify and escalate care when patients are deteriorating. From a quantitative perspective, those who have a PCCL code of three or four make up a large portion of patients who are referred to the PaR service. Therefore, the conclusion is made that those who have greater complexities and comorbidities are more likely to be referred to an acute care teams for deterioration.

The literature supports that people who have complexities can be identified by the presence of comorbidities they may have. Patients who belong to European or Māori ethnic groups and middle to older adulthood are more likely to be seen by the PaR

service. People with comorbidities are more likely to present to the hospital, experience avoidable admissions, adverse events and are more at risk of deterioration, increased length-of-stay and in-hospital mortality. The more complex care becomes, the greater the demand is on the healthcare system.

Hospital length-of-stay is affected by and influences a multitude of factors within healthcare. Within this research, the patient clinical complexity level was found to be a significant variable that influences the length-of-stay and affects mortality. Firstly, length-of-stay is greatly affected by patient clinical complexity level (PCCL), which depicts a scale from zero to four that considers a patient's episode and comorbidities. For example, those with a score of zero to one had a smaller stay than someone catastrophically comorbid, whose length-of-stay varied considerably from 10 days to 50 days. Further supporting existing knowledge around the length-of-stay and PCCL. Additionally, length-of-stay is a significant factor in mortality. It was found that with mortality, the highest death rate was observed with the shortest length-of-stay, equivalent to the onset of the acute illness. When showing the length-of-stay, mortality and the patient clinical complexity level, those who are more complex are the most common cause of death, especially on the continuum of the length-of-stay. Overall, those with a greater PCCL score within this research were the most common group to be seen by the PaR service, have a greater length-of-stay and are more likely to be subject to mortality than those who do not.

6.3 What are the views of ward-based healthcare professionals in relation to the Patient-at-Risk service?

When developing the research questions around evaluating the effectiveness of the PaR service, it was important to identify the perspectives of those that refer to and utilise this service. This question provided valuable insight into how staff perceive this service and demonstrated the support and education that the PaR service provides to all. Experience and exposure were one of the most significant findings of this research. For junior staff working in wards, their knowledge is continually evolving as they learning from others, and when there is a lack of senior staff available on the wards,

junior staff are greatly comforted by having a designated team of experts available, whether to ask questions, throw ideas around or come and provide clinical oversight and guidance. Education was highlighted during this process or, in this case, the lack of it. Education is the foundation utilised in conjunction with practical and assessment skills. When education becomes a barrier for unsure staff, a referral to the PaR service is made (Tilley & Spencer, 2020). Perspectives from ward-based staff support that the PaR service is often called to help if an education gap is highlighted.

A highlight, especially for junior nurses, was that those within the PaR service have technical and non-technical skills. Technical skills include the ability to perform assessments on patients whilst encouraging staff members to do so. Non-technical skills such as communication, escalation and critical thinking are incredibly invaluable. Mentioned by junior and senior nurses is the ability of the PaR nurses to communicate escalation in a powerful way that is meaningful to the medical staff to prompt early review.

Existing literature supports this ideology that the PaR service provides relief for all staff. Junior nurses work alongside PaR with deteriorating patients to learn assessment skills, identifying deterioration and appropriate treatment pathways, while for senior nurses who are occupied with other tasks, the PaR service support juniors where the seniors are not able to and additionally, is an extra pair of hands to those that are deteriorating. The PaR service are senior expert clinicians familiar with the algorithm of deterioration and know the appropriate tests and treatment pathways to undertake whilst supporting and educating those who work on the wards.

Experience and exposure were the most significant themes identified in the qualitative interviews. From a junior nurse's perspective, experience and exposure are continually a work of progress to build that tool kit of knowledge that senior nurses have. Senior nurses within PaR and those in wards agreed that the knowledge used at a senior level is built upon over time through various amounts of education and repetitive exposure to scenarios. Experience with deteriorating patients is something that not all nurses are exposed to. For example, some people may go years or their whole careers without being exposed to deterioration, while others experience it daily. This dictates the way

that healthcare members recognise and respond to deterioration. Senior nurses can navigate any challenge while guiding those who need help through various amounts of experience and exposure.

Education goes hand in hand with experience and exposure. The education currently available to staff has been identified as a gap. A gap in the knowledge of the nurses, a gap in the inability to identify physiological decompensation on the early warning score and a gap in the escalation processes for the PaR service and medical staff. People who participated in this research highlighted a demand for more education. Education can be delivered through online modules, simulations and in-services. In the Waikato Hospital, the education available is a four-hour online module around deteriorating patients; from this research, nurses would prefer to have a range of educational tools available, such as simulation-based training, interactive study days and in-services. Accessing education allows nurses to upskill and keep up to date with evidence-based practice and adapt to all learning needs. Practical in a sense where education can be tailored specifically to the common things seen in that specific area.

6.4 What are the views of registered nurses within the Patient-at-Risk service, in relation to the service they deliver?

The expanding number of patients presenting to the hospital with complex comorbidities means that the response systems within the hospital must keep up to date. The PaR service has evolved from clinical support nurses primarily task focused, to clinical resource nurses who are specialist generalists with a broad range of knowledge to help in any situation. Similar to the views of the ward-based participants, the themes arising from the PaR team members themselves included 'experience and exposure' as an aspect that were recognised as important. With extensive intensive care and / or emergency care background, those within the PaR service provide a high level of experience and expertise around acute and chronic illnesses, providing guidance and knowledge to the staff referring to the PaR service. In addition, a few times a year, the PaR service organises or arranges a medical doctor to provide education based on learning needs identified within the service. Providing valuable

learning utilised over time and passed on to those working on the wards. When it comes to education, the PaR service has an abundant wealth of knowledge that can provide clinical expertise to those that need it.

Existing literature supports that acute care teams are highly valued for the support and clinical guidance provided to staff. It is reported that junior staff can rely on senior nurses who are experts within that field, whilst senior staff rely on having extra pair of hands available to perform tasks when a patient is deteriorating. Due to the familiarisation with deteriorating patient algorithms from years of experience, the PaR service reflects confidence and competence in communicating concerns up the hierarchy. Extant literature suggests that acute care teams can improve patient outcomes, length-of-stay and reduce mortality, whilst other literature negates this. Perhaps this is due to the team composition as some teams are nurse or doctor-led or comprised of multidisciplinary team members. Additionally, the experience and education level of those within the team vary; therefore, the outcomes are dictated from this.

Within this study, the perceived value of the PaR service from the views of the referrers and indeed the PaR team members themselves relates very clearly to education and support. Perhaps therefore, the inconclusive nature of the findings around to acute care teams relate more to a mismatch in the anticipated outcomes of such a service. If acute care teams are viewed primarily as a mechanism for education and support, it would redefine the outcomes for evaluations. Overall, the perspective of the PaR service supports a high level of satisfaction with the service provided. Whether providing education to staff unfamiliar with the process or supporting and escalating concerns around a deteriorating patient, the PaR service does this well.

Part 2: The true value of the Patient-at-Risk service

6.5 Ascertaining the purpose of the Patient-at-Risk service

One of the main questions that prompted this project was does this service exist to improve patient outcomes or does this exist to help support staff. This is a question that is multifactorial in aetiology and the end of this chapter will help to understand this better. Across the country and the world, acute care teams are utilised differently. What is meant by this, is that in Waikato, there is a nurse-led Patient-at-Risk service, however, in Auckland and Wellington, there is a nurse-led Patient-at-Risk service and a doctor-led medical emergency team. Globally there is an accumulation of acute care teams that are either nurse-led, doctor-led or a combination of multidisciplinary team members. Therefore, investigating whether acute care teams improve patient outcomes become challenging as each unique team has a skillset like no other. However, research worldwide has suggested the same thing regardless of who or what is in the acute care teams. The support and guidance that acute care teams give staff are far more valuable.

From this research, the value and status that acute care teams have by supporting and guiding staff are found throughout the literature and because of the qualitative findings. To understand this issue, it must be highlighted around the barriers faced by those working within the wards. A theme that came through from the literature and the qualitative interviews was the fact that there is significant stress around the healthcare system, which has a domino effect that one does not exist without the other. What is meant by this, is that there is considerable staffing shortages; staff are having to pick up shifts, work double shifts, or work with fewer nurses on the floor. Staff shortages create a heavy workload for those that remain on the floor. Heavy patient loads mean that nurses cannot provide the best quality of care and patients who are acutely unwell do not get the monitoring, assessments and treatments needed in order to recover well.

6.5.1 The PaR team, supporting novice registered nurses

Senior nurse shortages are a global phenomenon (Durie, 2004) and due to this, junior staff members must often step into more senior roles without necessarily having prior knowledge or experience. Further, the situation is exacerbated through the absence of support and guidance through clinical coaching, which would generally be available through the knowledge of the senior nurse. With senior staff shortages, having expert clinicians within the PaR service has meant that junior staff members feel safe knowing that extra help is available to build competence and confidence within practice when there is a knowledge deficit or a deteriorating patient.

Patricia Benner describes the novice to expert model that depicts novice nurses at the beginning, knowing little about the situation unfolding with limited experience and exposure compared to an expert nurse that identifies the situation earlier with enough experience and exposure to understand the key components that need to be completed (Benner, 1984a; Benner et al., 2009; J. C. Christensen, 1988). Seen similarly within this research, junior nurses are at the beginning of the journey with minimal experience and knowledge and senior nurses within PaR and on the wards are the experts that recognise, respond and provide advice around the deterioration unfolding.

Over the last two years, a mass number of staff members have been off sick due to the global pandemic. This has created a significant effect on the way staffing is done. For one instance, a shortage of international nurses means that the hiring process has slowed down and those seniors in healthcare got sicker for longer and spent more time recovering. Placing a burden on a system that is already jumping from one crisis to the next. For numerous years there has been significant stress on the healthcare systems nationally and internationally. Hospitals around the world are struggling to meet the population demand as evolution depicts people are living longer and are more likely to present with complex comorbidities that require an intricate balance to stop further deterioration. As a result, initiatives have been implemented as a safety net. For example, patient and family-led escalation and acute care teams.

In the literature surrounding the deteriorating patient, a lot of work done in the last century aimed to improve patient outcomes. Many initiatives have arisen and while some have not remained, others work well. One of the many initiatives includes the early warning score that has been around since 2012 and reports trends in physiological vital signs. The early warning score (EWS) was introduced around a decade ago to improve the detection of physiological decompensation through monitoring of trends in vital signs against the illness and a patient's baseline.

Through this, significant research has been done to evaluate the effectiveness of the EWS. Similar trends found that, on one hand, the EWS has affected how nurses assess deterioration and help reinforce and empower findings to a medical doctor. At the same time, research suggests that EWS hinders the ability to think critically; when untoward signs are noticed, the ability to navigate and assess the issue has been identified. While there are some clear benefits and drawbacks to the EWS. Outcomes of assessments are dictated by a nurse's level of experience and exposure mixed with the education made available.

Although there is a great deal of literature around this overseas, patient and family-led escalation is in its early phases within Aotearoa-New Zealand. Main concerns surround the utilisation as a complaint-based service rather than actual treatment-based concerns. Although within this study, a strong qualitative voice acknowledged that while this is the case, the benefits outweigh the barriers if this changes one person's life. Furthermore, within Waikato, the PaR service used to respond primarily to these calls, however, once it had been established that it was used as a complaints-based service, work went ahead to have a third party available to filter through the calls and refer the clinical issues forward to the PaR service.

Lastly, acute care teams are an increasingly popular initiative in identifying and responding to deterioration that has significantly impacted how staff escalate concerns. A team of expert clinicians, whether nurses, doctors, or those in-between, that utilise a gold mine of experience, exposure and education. A team that empowers others to think critically about assessments, treatment and escalation pathways and act as strong advocates in developing staff's knowledge and confidence to speak out when feeling

unsafe. These are the most common initiatives that exist currently to aid in the detection of deterioration. The early warning scale allows for the detection of trends against a patient's baseline, while patient and family-led escalation and the PaR team are both services that can be activated by concerned parties that support escalation to medical doctors. But what are the common characteristics of those utilising these services.

6.5.2 Double jeopardy, the risk of being Māori and acutely unwell

Demographics within Aotearoa-New Zealand support that the growing burden of disease versus the inability of the healthcare system to manage, proves that it is jumping from crisis to the next crisis. The prevalence of comorbidities within Aotearoa-New Zealand and throughout the world is increasing as time goes on. It is affected by multiple factors, such as risk-taking behaviour, socioeconomic disposition and exposure to environmental pathogens, which are either within human control or outside, placing greater risk of developing comorbidities. Over time, research and statistics have supported that those who identify as Māori or Pacific Island are at greater risk of developing comorbidities. Caused by susceptibility to socioeconomic disposition, such as exposure to cold, mouldy housing, lack of transport and food. Socioeconomic disposition impacts the way people experience life. Unfortunately, this is not unique to the population in Aotearoa- New Zealand and is observed globally with indigenous populations all over the world.

With comorbid complexities in place, hospital outcomes differ significantly. Due to the complex nature of medicine, human nature and the cross-over between disease states, establishing the correct treatment pathways often takes more time, increasing hospital costs, length-of-stay, morbidity and mortality. Quantitative data within this research looked at the characteristics of those referred to the PaR service. As a result, it was identified that the population primarily referred are the European and Māori ethnicity and a small amount of Asian, Pacific Island and other. When looking at the overall population within the Waikato region, a large majority of the population compared to the rest of Aotearoa-New Zealand is European and Māori and in addition, a small minority are Asian, Pacific Island and others. Demonstrating that although the throughput is high for Europeans and Māori, the population

demonstrates a higher cluster of both within the Waikato and rationalises the throughput. Albeit hospital presentations are mainly from those of Māori ethnicities.

6.5.3 The competent nurse

An experienced registered nurse has a solid foundation of knowledge, with sufficient experience and exposure to be familiar with the algorithm of deterioration. An equilibrium of both means that nurses can safely recognise and respond to deterioration. Escalation pathways are unique to each hospital nationally and globally. However, within Waikato, the early warning score details an escalation pathway that the nursing staff follows. Escalation severity is based on the level of physiological decompensation identified by the nurse's assessment skills. Common escalation channels first dictate to the shift coordinator, medical doctors, the Patient-at-Risk service and if cardiac arrest ensues, the cardiac arrest team. Early escalation to the PaR service is theorised by literature to improve the mortality of patients and this research supports that when unsuccessful escalation to medical doctor's result, often the PaR service act as strong advocates, facilitating communication.

A multitude of barriers is identified in this crucial moment from existing literature and the qualitative findings of this research. Following a patient's journey, the first step in identifying deterioration comes from deviation of a patient's baseline, which the family typically notices through out of character behaviour, a nursing assessment, or physiological decompensation on the early warning scale. Often with the early warning scale and as mentioned in the literature review, escalation using this tool means that nurses must critically think about the trends in vital signs, which is often impacted by short staffing and heavy workloads. In addition, when escalating to the medical team, often barriers around the availability of medical doctors are noted due to heavy workloads and prioritising patients, leaving nurses to feel unheard. Overall, creating frustration that contributes to stress and burnout. Alternatively, tools such as the early warning scale and the PaR service empower nurses, whether that be senior or junior staff, to validate and support the findings and, in addition, it enforces escalation to the medical doctors.

6.5.4 The hidden role of the PaR team

Overall, in reviewing the literature surrounding acute care teams, it has become apparent that there is a great deal of conflicting literature. Acute care teams are theorised to improve patient outcomes by reducing mortality and length-of-stay. Some literature supports this, while others argue that it makes no difference. However, the factor that stood out the most is that all acute care teams, nationally or internationally, are constructed with different healthcare members with different experiences. Therefore, it is hard to evaluate the consistency of the service if it differs everywhere; perhaps just looking at how that one team serves the population will help to understand the difference made within that community.

This research discovered that support from the PaR service, a nurse-led service was significant for the nursing staff, the largest health workforce. This creates the question of whether this should be a nurse-led resource. It has become apparent that the service the PaR team offer nurses and doctors alike is incredibly invaluable. A team of senior clinicians, experts in nursing who can solve any problem from extensive experience and knowledge, as a collective group or referring on to experts that have that knowledge, whilst teaching and imparting knowledge to anyone who needs it.

This brings back the question, is this a service set up to support nurses or to prevent death? In my opinion, initially, acute care teams were put into place to improve patient outcomes, however, as time has progressed, the value has shown that it creates a support network around those junior staff who need it and provides an extra pair of hands to the senior staff. A wrap around service, a safety net for people to rely on, or a local superhero that flies in and fixes things. Indeed, in the words of a participant from the current research,

> *If one gets it right for nurses, you can get it right for the patients.*

Part 3: Limitations, conclusions, and implications

This section details the limitations, conclusions, future implications for practice and provides areas of recommendation for future research. Limitations exist when undertaking research and the researcher must be aware of such in order to prevent the occurrence and be acknowledged as part of the research.

6.6 Study limitations

6.6.1 Qualitative

Research limitations are unavoidable, especially when looking at data and its presentation. A significant research limitation that exists when looking at qualitative research is biases. Bias is a natural part of the world and being aware of such bias helps to reduce the occurrence of it appearing through the research. When research bias occurs, the investigation is taken off course and deviates from the true nature of the findings. Therefore, conveying the true message through the data were vitally important and minimises preconceptions. The researcher had no interaction or contact with the PaR service previously, allowing no historical experience to impact the nature of this research. Interview participants were selected randomly by going into wards and informing random staff about this research and those interested were included.

Interviews were held in quiet private locations to minimise disruptions and participants were anonymised, so participants felt able to discuss issues and provide honest feedback. A limitation that could have existed is the inability to clarify information post interview; however, during the interview process, the researcher clarified any confusion for data saturation and ensured that the findings represented the themes found in the interviews. Power dynamics in research are inevitable as hierarchical and heterogenous relationships exist between the researcher and participants. Therefore, the researcher must be aware of relationship power dynamics to ensure that the findings' accuracy is not get disrupted by this (Schneider et al.).

A common limitation when looking into qualitative research is quantitative data's lack of rigidity and objectivity (Dempsey & Dempsey, 2000). True mixed methods research will reduce this limitation, as quantitative data support qualitative data; however, this research utilised qualitative perspectives to measure the effectiveness whilst looking at the quantitative data around those referred to the PaR service, a limitation occurs around the quantitative perspective. Although limitations exist, the value of interviewing provides the research with more in-depth and narrative rich data, providing a holistic perspective and an accurate representation from healthcare professionals. In addition, it enables the researcher to gain a deeper insight into the reality faced by participants.

6.6.2 Quantitative

For quantitative research, a few variables help to decipher the validity and reliability of the research. For example, randomisation, control and variable manipulation, which help to prove the relationship variables to determine if it is casual (LoBiondo-Wood & Harber, 2017). To avoid bias and invalid results, objectivity must be adhered to. Internal and external factors can contribute to invalidity, including sample size, maturation, or mortality. However, with these limitations in light, the researcher can minimise the likelihood of this occurring. Data were gathered from an existing hospital database and the PaR records were obtained by hand. The sample size is determined for all patients from 01 August 2020 to 31 August 2021 and only looked at descriptive statistics of patient variables and deterioration; therefore, the likelihood of bias is low. Within this research, the data in question were not randomised, lack control and variable manipulation. As a portion of the data were gathered manually, a limitation around the accuracy of data collection must be considered.

6.7 Study conclusions

It is difficult to evaluate the effectiveness of acute care teams as the composition of the teams differs worldwide and it is resource and time intensive to thoroughly investigate from a qualitative and quantitative perspective. Conflicting evidence is found in the literature that, on the one hand, supports that length-of-stay, morbidity

and mortality are improved through the implementation of acute care teams, whilst other research negates this. As significant attention goes towards implementing strategies to improve patient outcomes, importance must be placed on evaluating such initiatives to ensure that it impacts the way healthcare is delivered. Significant work has gone towards improving patient outcomes as the hospital throughput observes patients much older with more complex comorbidities, where they would have died historically. A theme found in the literature and this research supports that indigenous populations and those living in areas of socioeconomic disposition experience a higher likelihood of developing comorbidities, which is the primary reason patients are admitted to hospital, experience an increased length-of-stay and are more likely subject to morbidity and mortality.

A strong theme found within the literature and as a result of the interviews exhibits that whilst conflicting evidence was found around the effectiveness in the area of question, the qualitative perspective of acute care teams heavily indicated improved feelings of safety among staff. The PaR service clearly empowered nurses to escalate care when concerned and provided education to those who needed it.

6.8 Implications for practice

This study's results can influence and make recommendations for nursing practice. Firstly, it was identified that staff want more variety of education available to them, such as simulation-based learning and in-service education focusing on the learning needs within that department. Patient and family-led escalation is an evolving initiative, though it is being used as a complaints-based service. Currently, more education needs to be had with not only patients and families within the hospital but for staff detailing the initiative as identified within the qualitative interviews; some staff had little to no information about this initiative other than seeing posters around.

This research supports current literature on the health disparities and inequities faced by indigenous populations, from socioeconomic disposition and through the development of comorbidities. It also identifies that the throughput of Aotearoa- New Zealand Māori is greater in acute hospitals and is more likely to experience mortality.

6.9 Future research

Adding to existing literature, this research explored the perspectives of acute care teams from those within this service and those who utilise this service. In addition, quantitative statistics were explored that identified those most at risk of deterioration are identified by ethnicity and comorbidities resulting, from socioeconomic disposition. Previous literature has focused on similar aspects and has come to similar conclusions and this research investigated the Waikato hospital PaR service. Findings from this research act as a foundation for further research that must be conducted on a much larger scale. It should capture a larger sample population of the PaR service referrals over a more extended period, as well as identify those that were seen by the PaR, comparing against the outcomes of those whom PaR did not see, to test whether statistically a difference is seen. Future research would gain benefit from mixed methods research that evaluates data from quantitative statistics and qualitative perspectives that captures data from the entirety of people who utilise PaR, such as multidisciplinary team members that range in different specialties such as medical, surgical and paediatrics to represent the population the PaR captures accordingly.

Appendices

Appendix 1: University of Waikato Ethics approval

Appendix 2: Waikato District Health Board Ethics sign off

Appendix 1: University of Waikato Ethics Approval

The University of Waikato
Private Bag 3105
Gate 1, Knighton Road
Hamilton, New Zealand

Human Research Ethics Committee
Roger Moltzen
Telephone: +64021658119
Email:humanethics@waikato.ac.nz

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

14 July 2021

Rangi Harrison
Te Huataki Waiora School of Health
DHECS
By Email: rangi.harrison@waikatodhb.health.nz

Dear Rangi

HREC(Health)2021#39 : When things go wrong: An exploration of the effectiveness of Waikato District Health Board (DHB) Patient at Risk (PaR) service from the perspective of healthcare professionals

Thank you for your responses to the Committee feedback.

We are now pleased to provide formal approval for your project but ask you to change 'Principle Researcher' to 'Principal Researcher' on the PIS.

Please contact the committee by email (humanethics@waikato.ac.nz) if you wish to make changes to your project as it unfolds, quoting your application number with your future correspondence. Any minor changes or additions to the approved research activities can be handled outside the monthly application cycle.

We wish you all the best with your research.

Regards,

Emeritus Professor Roger Moltzen MNZM
Chairperson
University of Waikato Human Research Ethics Committee

Appendix 2: Waikato District Health Board Ethics sign off

Register your Research

Waikato District Health Board

As Director / Executive Director, by signing this I confirm:

- All costs incurred by Waikato DHB Unit/Service in regard to the research project are included in an approved research budget (including those costs which will be incurred by contributing units, eg laboratory). For studies involving researcher time only, the researcher has the time to undertake the study.
- Research is not commenced until all required approvals have been obtained.

Surgical & Critical Care	Director	David Nicholson	29/9/202
Hospital & Community	Executive Director	Chris Lowry	15/10/21
Medicine & OPR	Operations Director	Graham Guy	Graham Guy 14/10/21
Te Puna Oranga	Māori Research Review Ctte	Nina Scott	*See attached letter*

Please return to the Research Office (via Sarah Brodnax, Level 2 Hockin) along with required documents as identified in the checklist for final approval.

Office use only:
Quality & Patient Safety, Waikato DHB

It is the responsibility of the Director of Quality & Patient Safety to ensure that the research approval process has been followed, that required internal and external approvals are evident and that the research project fits within the strategic direction of Waikato DHB.

Signature: Margaret Fisher **Date:** 29/10/21

Name: MARGARET FISHER **Position:** CMO

RD021102 Patient At Risk Eval (Harrison).docx

Register your Research

Waikato District Health Board

Clinical Support Services Sign-offs

CROSS OUT/ADD SIGN-OFFS APPLICABLE TO THIS PROJECT

SIGNATORIES DECLARATION: We agree that appropriate resources are available in our service to support this project

Clinical Support Service	Name	Signature	Date signed
~~DHB Pharmacy~~	~~Rajan Ragupathy~~ ~~OR Alice Chang~~		
~~DHB Pharmacy~~	~~Marinda van Zyl Green~~ ~~OR Jan Goddard~~		
~~Laboratory~~	~~Kay Stockman~~		
~~Radiology~~	~~Glenn Coltman~~		
~~Medical Records~~	~~Denise Jon~~		

Department/Service Sign-off

Dept/Service /Org	Role	Name	Signature	Date signed

As Nurse Director, by signing this I confirm

- I have discussed the research project and resource implication for this department with the principal investigator and that the Principal Investigator has discussed these resource implications with any affected services / staff members.
- All researchers/students from the department involved in the research project have the skills, training and experience necessary to undertake their role.
- I support the research project being conducted; and confirm there are suitable and adequate facilities and resources for the research project to be conducted at this site.

Surgical & Anaesthetics	Nurse Director	Kim Holt	

RD021102 Patient At Risk Eval (Harrison).docx

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