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MASTER OF BUSINESS ADMINISTRATION
DISSERTATION

How Point-of-Care-Testing (POCT) Can Lower Operational Costs for Hospital Operations:

A Qualitative Study

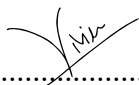
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ABSTRACT

This is a qualitative study that examines point-of-care testing (POCT) and its potential impact on hospital operational costs in Singapore, as perceived by healthcare professionals in the country who directly engage with this technology. Despite the extensive utilisation of POCT in hospital settings, limited attention has been directed toward comprehending its financial ramifications, especially from the vantage point of the frontline healthcare personnel. Consequently, this research aims to bridge this gap in knowledge by investigating the complex relationship between POCT and hospital operational costs.

Using a qualitative approach, this study seeks to understand the intricate nuances of healthcare professionals' lived experiences concerning POCT within their daily tasks. To accomplish this, semi-structured interviews were conducted with six healthcare professionals in Singapore. The gathered data were put into thematic analysis, allowing for a comprehensive exploration of the participants' perspectives.

The findings of this study are then organised into three distinct categories, providing insights into various facets of the POCT phenomenon. Firstly, the investigation probes into the tangible impact of POCT on the operational costs of hospitals. Secondly, the experiences of healthcare workers regarding the cost-effectiveness of POCT are investigated. Lastly, the study offers valuable recommendations aimed at enhancing the implementation of POCT to effectively mitigate operational costs. Conclusions were formed drawing on the practical implications for healthcare practitioners, along with suggestions for future research endeavors.

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CHAPTER 1: INTRODUCTION

1.1 Background and Context

Operational costs are an important consideration in the provision of care. Common operational costs include hospital beds, primary care, and intermediate and long-term care services, while in the operating room, Childers and Maggard-Gibbons (2018) stated that the expenditure usually covers direct costs, wages, and non-billable surgical supplies. In Singapore, while operational costs are typically covered by the government in the forms of financial incentives and financing health-care reforms, Singapore hospitals still encounter challenges in managing healthcare costs, especially as non-communicable diseases increase along with the ageing population (Tan et al., 2021). For instance, the healthcare system struggles as it deals with the number of patients with co-morbidities such as heart attack, diabetes, chronic lung disease and cancer (Cygańska, Kludacz-Alessandri and Pyke, 2023). Hence, it is essential to consider means of reducing the burden of operational costs.

One viable means of reducing the burden of operational costs is through streamlining common processes surrounding patient care. Point-of-care testing (POCT) is one of the methods that is gaining popularity among healthcare professionals because of its ability to generate fast results while being close to the patient (Nichols, 2020). POCT is defined as a bedside testing that analyses infectious diseases with a faster turnaround time and requires minimal samples. It differs from standard laboratory testing in that POCT is more flexible because it does not require a specimen to be sent to the laboratory. Further, it can be done in critical care units, operating rooms, or in the patient's home. Luppia et al. (2011) also notes that POCT can now be done in remote areas, nursing homes, and pharmacy. For instance, instead of having to visit a laboratory, POCT can be done in a variety of settings, saving the patient time and resources. Hence, using POCT can shorten the time between obtaining the sample and completing the analysis from the sample. Ultimately, this leads to a range of benefits, such as immediate care, and lower operational costs.

In Singapore, POCT is being applied to speed up and create accurate diagnoses to improve patient management. For instance, POCT is beneficial to those undergoing cardiac

surgery and trauma, as it can be used to assess a patient's haemostasis (Whiting et al., 2015). In outpatient settings, POCT can be used to direct influenza, as in the case of elderly patients in the outpatient clinics of Hong Kong (You, Tam and Lee, 2017). Aside from illnesses such as influenza and haemostasis, POCT can also be used to detect tuberculosis (TB). Lee et al. (2019) reports that POCT is more accurate in detecting TB in comparison to other TB diagnostic strategies. These examples show that POCT is a viable alternative to the standard procedure because it can reduce hospitalisations and mortality rate by 0.7% and 2.2%, respectively (Boere et al., 2021). Further, these show that POCT is an effective method that is not limited to a particular clinical measure since it can measure and detect various diseases.

The use of POCT benefits both the patient and the medical professional. As results are obtained faster, physicians can diagnose patients in a timely manner and provide the necessary treatment (Price et al., 2018). This means that infectious diseases can be dealt with faster, which implies prevention of worse health outcomes. Once diagnosis is presented, other lab tests that may be counterproductive is avoided. Moreover, the advancements in POCT further assists patients and hospitals since it increases the reach of medical services to rural areas (Shephard et al., 2020). Despite the huge distance from pathology testing sites, patient's medical needs can be met even when their home is isolated from medical institutions. The time and resources of the patient are saved because POCT removes the need to visit laboratories. On the other hand, POCT is beneficial to medical workers because it helps regulate the number of staff and improve the healthcare system. Employee shortage can be prevented since non-laboratory trained personnel can administer POCT (Shaw, 2016). At the same time, POCT empowers the personnel administering the testing, which is vital to the clinical decision of physicians (Shephard et al., 2020). Therefore, it is efficient to apply POCT in different healthcare settings since it makes the treatment process easier for the patient and practitioner.

In addition to that, POCT is advantageous with regards cost-effectivity compared to standard testing methods. Since POCT is done near the patient, further operational costs are minimised, as it makes testing more efficient and reduces needed personnel (Wool, 2018). Ho et al. (2020) stated that when POCT is used for screening, care is higher while the total costs per person is reduced. This shows that it is possible to receive quality care without paying for an expensive medical bill. Given that, several kinds of POCT were observed to be particularly cost-

effective. Molecular POCT, viscoelastic (VE) POCT, and Truenat POC are among the methods that proved to be cost-effective as these generally enhanced the life expectancy of patients and prevent prolonged hospitalisations (You, Tam and Lee, 2017; Whiting et al., 2015; Lee et al., 2019). Such illustrates that relying on POCT led to positive health outcomes despite the reduced medical costs. Having said that, it is cost-effective to use POCT as it lowers hospital costs and other expenses while maintaining quality care.

However, there are several limitations that concern professionals when using POCT in their practice. Since this method is still new to the field, organisations lack uniformity and unity. Hence, it remains challenging to implement POCT because the lack of standardised practices may only increase the workload of general practitioners (Lingervelder et al., 2021), as there may be additional protocols needed to ensure that the test results are valid. For instance, Junker, Schlebusch and Lupp (2010) pointed that integrating POCT in hospitals and primary care has its financial challenges due to the quality management it needs to undergo. Apart from this, Gentile et al. (2023) stated that using POCT along with antibiotics can be disadvantageous since reimbursement is not applicable while general practitioners may only suffer financially since they have to pay for the POC machines and maintain it. These show that using POCT may have cost-disadvantages and may lead to unintended additional expenses, both on the part of the healthcare provider, and the patient. Further, relying on unstandardised POCT protocols requires consideration because this is influential to treatment outcomes. For instance, accuracy of results from POCT is another factor that needs to be considered. POCT can be administered by non-laboratory trained personnel, which may be advantageous for hospitals without adequate staff. However, it also acts as a disadvantage regarding quality assurance (Shaw, 2020). Tests conducted outside formal institutions have a higher tendency to overlook policies, such as the repetition of testing. In this scenario, treatments given to patients can become inappropriate and pose as a risk issue. Apart from this, Wang et al. (2021) also pointed that there are still issues with the clinical sensitivity of some POCT equipment, especially since sample pretreatment is usually needed to accurately detect viruses. This difference with laboratory tests increases the tendency for inaccurate or unreliable results. This lack of quality assurance, along with the potential for added costs and expenses instead of reducing costs, acts as a barrier to the implementation of POCT.

Nonetheless, various research points to the numerous benefits of POCT adoption, one of this being its cost-effectiveness. On the part of hospitals and healthcare professionals, the cost-effectiveness of POCT is advantageous because it helps them reach a diagnosis faster and prevents worker shortage (Price et al., 2018; Shaw, 2016). Meanwhile, on the part of patients, especially those with co-morbidities, POCT presents a viable means of accessing convenient and efficient care (Wool, 2018). However, as has been pointed out, there are mixed and inconclusive findings about the POCT use and its impact on hospital costs. Hence, identifying how POCT can lower hospital costs remains an important topic to be explored.

1.2 Statement of the Problem Area

Access to healthcare is becoming more difficult as hospital operational costs increases. Shrank *et al.* (2021) mentioned in their study that changes in healthcare policies are necessary because health costs are negatively affecting the accessibility, affordability, and equity of the services. This shows the importance of lowering the operational costs in hospitals because higher fees makes it difficult for patients to experience quality care (Cunningham, 2008). Further, Shrank et al. (2021) emphasised that operational costs are an issue because, instead of improving, prices continue to grow at an inconvenient rate. Therefore, high medical costs remains a challenge for patients as healthcare becomes unaffordable.

Given that, the financial issue is especially alarming for people who are dealing with comorbidities or high resource patients (HRP) because they require extensive procedures and more resources. This implies that Singaporeans who are suffering with multiple illnesses may face issues accessing healthcare. Pritchard *et al.* (2016) stated that HRP are individuals who have higher medical expenses compared to the normal population. Because of the resources they need, these patients are left with high expenditures. Furthermore, it becomes more challenging for HRP who are from lower socioeconomic status, given their limited resources. Likewise, Soley-Bori *et al.* (2020) stated in their study that multimorbidity cases are associated with higher total costs that is composed of hospital costs, care transitions, primary care, dental, emergency department, and admissions. This shows that considering healthcare alternatives and changes are valuable to balance quality care with hospital costs.

In addition to that, Cunningham (2008) emphasised that higher costs negatively influences patients' trust on their physicians. Patients are more likely to doubt their physicians' medical decisions when face with higher hospital fees. For instance, higher costs observed in health insurance and healthcare hinder families from accessing patient care (Sinaiko et al., 2019). High medical bills act as a barrier for physicians to deliver patient centered care as patients' situations are overlooked. In fact, Sinaiko et al. (2019) stated that conversations about the costs of interventions are limited that it fails to address patient needs. Having less time allotted to cost-conversations makes healthcare less accessible and effective with the minimal awareness about price information. This suggests that patients may discontinue care because of expensive medical costs and physicians' poor decision aid.

With that, identifying solutions to address health cost issues are important to ensure that health services remain accessible and affordable. Thus, the study purports to assess the cost-effectiveness of POCT to help reduce the alarming medical costs of hospital operations.

1.3 Rationale of the Study

Studying how POCT can lower the costs of hospital operations is beneficial to patients and can advance the understanding about its cost-effectiveness. Given that, POCT has the potential to improve the healthcare system of Singaporean hospitals. Hospital costs have the tendency to become expensive that even patients with insurance find it difficult to pay for out-of-pocket payments (Sinaiko et al., 2019). Given that, it is important to explore how other methods can be of use to lower patient's medical cost. Better understanding of the financial advantages of POCT can encourage professionals to adopt the procedure. This may benefit the decision-making process of the practitioner and patient about interventions, as more efficient options become available. In addition to that, identifying the advantages of POCT can guide hospitals manage their procedures, preventing excessive expenditures. Thus, identifying how POCT benefits hospital bills is important because it helps assist medical decisions.

In addition, several issues are addressed by conducting the study as it provides further insight about the effect of POCT on patient outcomes, leading to better recommendations. In some clinical settings, POCT lowered the average in-hospital costs of patients with viral

respiratory tract infection while reducing the duration of hospital stay (Rahamat-Langendoen et al., 2019). In this case, not only did POCT display lower costs, but it also contributed to a shorter admission. Knowing that POCT can help with patients' recovery, hospitals can improve their patient management to produce efficient results. Furthermore, learning about its medical and financial advantages may influence health policies to change for the better. The study plays a significant part in the implementation of POCT because it is necessary for hospitals to coordinate with other institutions. Therefore, knowing about the patient outcomes of POCT is valuable because it serves as a guidance to hospitals. Appropriate recommendations can then be made, which is critical to the improvement of the system.

On the other hand, filling the gaps concerning healthcare professionals' output about the cost-effectiveness of POCT is beneficial to patient care. The study benefits patients as it provides them an opportunity to access a cost-effective treatment that potentially saves them money and time. Aside from being affordable, it is important to assure patients that POCT is a promising tool that detects diseases. Obtaining the feedback of medical workers is also crucial because of their expertise and experience. Having said that, conducting the study is important because it potentially helps patients coordinate with their physicians when deciding on a treatment that does not compromise quality care.

1.4 Research Objectives

The study intends to achieve the following goals:

- 1.To determine the current impact of POCT on hospital costs;
- 2.To analyse the cost-effectiveness of POCT through the experiences of healthcare workers; and
- 3.To propose recommendations on how to improve the implementation of POCT in terms of costs.

1.5 Research Questions

The following research questions are used as a guide to meet the objectives.

1. What is the current impact of POCT on hospital costs?

2. How do the experiences of healthcare workers explain the cost-effectiveness of POCT?
3. What are some of the recommendations that can help improve the implementation of POCT to reduce hospital costs?

1.6 Scope and Limitations of the Study

The research will primarily focus on the cost-effectiveness of POCT to examine how it can lower hospital costs. Experiences of healthcare professionals are used as a basis to explore practitioners' perspective on POCT. Specifically, data is gathered from medical doctors, professional nurses, staff nurses, nursing assistants, and medical staff who have a year of experience administering POCT in Singaporean hospitals. Given that, the study's results may not be applicable in other hospitals. Since the information provided are subjective in nature, the data may only represent a particular group. Furthermore, generalisability of results requires caution given that conducting the study in Singapore indicates cultural differences from other countries. POCT may also have varying effects on hospital costs because expenses are also affected by a country's health policies. That implies that the recommendations established from the study that aims to improve the implementation of POCT in terms of costs may only benefit certain hospitals. On the other hand, the study may not have covered all the interview questions necessary to obtain the needed information. Moreover, since time and participants are limited, data is based only on a few individuals. Regardless, appropriate policies can be considered as the study contributes to the existing literature about the cost-effectiveness of POCT.

1.7 Contents of Succeeding Chapters

Chapter 1 contains the introduction of the study, where its significance, the statement of the problem, and the objectives are explained. In Chapter 2, the literature review provides insight about existing studies that are relevant to the topic. Topics related to operational costs, POCT, and the advantages and disadvantages of the method are included. In addition, perspectives of patients and medical professionals about POCT are stated. For Chapter 3, the methodology utilised to conduct the study is explained in detail. This involves the research philosophy, research strategy, and data collection techniques used to gather information. Meanwhile, the rationale of using interviews, and purposive sampling method is also explained. Along with that,

Chapter 3 specifies the inclusion and exclusion criteria that are used for choosing participants. The validity and reliability of data are then stated to explain the applicability of the results.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter contains the dissertation's review of related literature that explored qualitatively the use of Point of Care Testing (POCT) within hospital operations. Through the examination of relevant literature, this chapter underscores the significance of the financial implications of POCT use in hospitals. Specifically, this literature review synthesised previously published studies and other types of literature that could give insights on the relationship between POCT's cost-effectiveness and its impact on hospitals. The aim is that through the comprehensive investigation of current literature, the experiential understanding and perceptions of healthcare workers about POCT would be revealed. Furthermore, upon conducting a thorough analysis of the existing literature, a research gap has been identified, highlighting the need for further investigation in this area---lack of qualitative study on the cost effectiveness of POCT use within hospital operations. The qualitative aspect of this review's critical assessment would eventually provide a better contextual understanding of how POCT use is intertwined with hospital operational costs; thereby, positively impacting resource allocations in healthcare.

2.2 Evolution and Adoption of POCT in Healthcare

Point of Care Testing or POCT is a type of diagnostic testing system that can quickly provide in vitro diagnostic results (procedures conducted on body samples of living organisms) at the patient's site instead of conducting it at a central laboratory location (Jung et al., 2015). It can also be done at the doctor's office, patient's home, and ambulance. The goal of POCT is to conduct laboratory testing close to the site of patient care. Another point that makes POCT different from the traditional laboratory process is that it can be performed by a non-laboratory trained staff (Shaw, 2016).

Tracing the emergence of POCT in healthcare, before its advent laboratory tests were conducted at a centralised facility, managing numerous samples, causing logistical challenges that resulted to delivery delays. The evolution of POCT has effectively addressed healthcare demands, capitalising on technological progress. Tan (2017) underscores that contemporary POCT technologies were formerly groundbreaking innovations. For instance, the now ubiquitous

tools such as pregnancy tests, pulse oximeters, and even recent COVID-19 antigen test kits exemplify accessible, user-friendly diagnostics accessible to a wide demographic (Tan, 2017). This shift signifies the transformative impact of technology on healthcare accessibility and outcomes.

To emphasise the widespread adoption of POC in global healthcare, its market reached \$29 billion in 2021 (Data Bridge Market Research, 2021), and a projected 10.5% growth to \$64.46 billion by 2029 is anticipated. While no precise figures exist for Singapore's POCT market, given its reputation for high-quality and efficient healthcare, it is likely that the country widely embraces POCT practices (Haseltine, 2013). This exemplifies how POCT's expanding global influence is mirrored in Singapore's healthcare landscape, fostering advanced and efficient patient-centred diagnostics and outcome

Because of the speed and convenience it offers compared to the traditional central laboratories, Florkowski et al. (2017) noted how POCT is being increasingly used over the past years. Primarily, in POCT, patients no longer have to wait for days to receive their test results. Meanwhile, in terms of clinical decision-making by physicians, Quinn et al. (2016) said that POCT helps in its quick resolution because when using traditional central laboratories, vital clinical decision-making may be delayed. Additionally, Pecoraro et al. (2017) explained that POCT provides prompt care for acute diseases. These are the reasons that there has been a growing demand for point of care diagnostic results.

2.3 POCT and Its Impacts on Reduced Operational Costs in Hospitals

Impact of POCT on hospital's operational costs have been studied extensively in literature. Upon examination, these studies reveal that cost benefits far outweigh the initial high investment on POCT devices and staff training. The cost advantages are seen on streamlined workflow and reduced turnaround time, resource optimisation and staffing efficiency, and enhanced patient management care/preventive or early intervention.

Firstly, POCT delivers streamlined workflows (Kim et al., 2020; Ryan et al., 2019), enhancing efficiency, as shown in cardiac rhythm management (Ryan et al., 2019), and reducing turnaround time, as exemplified in oncology (Gjolaj et al., 2014). Secondly, efficient POCT

diagnostics (Ferguson et al., 2016) optimise resources, benefiting cardiac care despite limitations. Staffing efficiency (Kost et al., 2013; Stime et al., 2018) is also evident in acute chest pain diagnosis, aiding low-resource hospitals, and expediting clinical management for STI, HIV, and TB patients. Thirdly, POCT has demonstrated its effectiveness in enhancing patient management and early disease detection, consequently improving resource allocation and utilisation. Plebani (2019) highlighted that POCT implementations have significantly reduced costs related to specimen transport and result distribution. Addressing delayed diagnoses, it is recognised that their impact extends beyond patients' quality of life to hospital finances. POCT devices aimed at diabetes complications avert blindness and amputation, which burden hospitals (Selvarajah et al., 2019). Additionally, more sensitive diagnostic platforms for conditions like ovarian cancer could diminish disease progression and related expensive treatments (Raamanathan, 2012). Rapid diagnoses also play a role in shortening hospital stays and freeing resources for others, consequently lowering operational costs and reducing complications

Although POCT offers numerous benefits, concerns regarding potential errors in POCT have surfaced which may actually worsen hospital operational costs. O'Kane et al. (2013) assessed the vulnerability of POCT to errors across various types of tests and found that errors were minimal, with little adverse impact in the analytical phase of testing. However, Cantero et al. (2015) emphasised the importance of quality error monitoring, particularly in the preanalytical phase, to mitigate errors in POCT tools. Thus, balancing these factors, the efficient resource allocation and reduced resource utilisation brought about by POCT substantiate its potential to enhance healthcare cost-effectiveness.

2.4 Qualitative Approaches to Studying POCT Costs

Utilising the qualitative research methods can be said to be useful when assessing the cost-effectiveness of Point of Care Testing (POCT). A qualitative approach offers a distinctive point of view so that researchers will be able to examine beyond the surface of the issue (Pathak et al., 2013) and investigate further into the lived experiences and nuanced perspectives of those who deal with POCT processes regularly, such as healthcare workers. Thus, this research justifies the selection of qualitative methods so that the complex relationships between POCT

and operational costs within hospitals can be captured, offering a more holistic insights into the matter.

There are numerous studies about POCT that have underpinned the qualitative research methods. Engel and Pai (2015) employed a survey of current literature, revealing that qualitative studies in the realm of POCT have the potential to enhance voluntary testing and counseling, a critical aspect in reducing healthcare costs because of preventive and early intervention. In their study, the use of qualitative research was able to address the intricate barriers such as the stigma and shame associated with undergoing HIV testing. Drain and Rousseau (2017) similarly concluded that POCT diagnostics extends beyond the laboratory work as it reaches patients in resource limited settings. The information-rich responses obtained from qualitative methods uncovered that POCT is especially valuable in remote areas where centralised laboratories are limited since there is no more need to transport samples (Walia, 2013). The abovementioned studies employed the methodologies of case studies and in-depth interviews, that unearthed nuanced insights into effective programmes and strategies that encouraged individuals to seek testing voluntarily, thus contributing to reduced hospital costs.

Butler et al. (2021), Dixon et al. (2021) and Goyder et al. (2020) provided additional qualitative perspectives on POCT and its impact on reduced costs through the lens of clinicians, specifically physicians and nurses, in the context of out-of-hours care. Semi-structured interviews employed in these studies illuminated key aspects of POCT utilisation. While the initial challenge of using POCT in a patient's home was noted, subsequent use and familiarity were observed to mitigate this obstacle; thereby helping the patient to save money on hospital stay and other expenses. In a similar qualitative Goyder et al. (2020), it highlighted the facilitation of swift decision-making and effective communication between clinicians, patients, and families through POCT adoption. These two mentioned studies revealed the discriminating approach used by doctors about POCT usage by carefully considering its appropriateness which then resulted to proper resource allocation. These results also resonate with the qualitative findings by Butler et al. (2021), who also employed semi-structured interviews, this time with mental health doctors. The insights garnered revealed a dual perspective: doctors value the usability and promptness of POCT devices and how they could potentially reduce healthcare costs. Yet, the doctors expressed concerns that POCT's integration in mental health contexts

might disrupt the therapeutic rapport established with patients. Another study made these concerns more specific by saying that disrupted therapeutic rapport may lead to increased costs because of elevated patient dissatisfaction, heightened likelihood of treatment non-compliance, and a surge in avoidable medical errors, ultimately necessitating additional interventions and resources (Chaudhry et al., 2013). This latter apprehension signals the importance of considering the complex socio-emotional dimensions surrounding POCT implementation. Ultimately, the use of qualitative research in assessing POCT costs provides an invaluable contribution in comprehending the multifaceted implications of POCT within healthcare settings.

2.5 Understanding the Lived Experiences of Healthcare Workers

Using a qualitative approach in this study allows for examining the lived experiences of healthcare workers. Understanding healthcare worker perspectives is crucial as they directly interact with patients, making their motivations significant as evidenced in McClung et al. (2017). Aligned with this, Javanparast et al.'s (2013) utilisation of a qualitative approach in gaining healthcare perspectives concurred that patient safety greatly outweighs financial incentives based on the respondents. McClung et al. (2017) added that healthcare workers even deemed that patient safety is a greater motivation than institutional policies and regulations. Recognising these priorities is essential for enhancing patient experience. Kane et al. (2021), meanwhile, emphasised understanding healthcare workers' role in health improvement.

The impact of patient-centred care on healthcare workers is profound, with evidence showing their prioritisation of patient safety and unique experiences in the industry. The emphasis on patient-centred care aligns with Balbale et al. (2015), who stress understanding healthcare employees' perspectives for quality improvement due to their role in care delivery. Epstein and Street (2013) define patient-centred care as involving patients in decision-making, fostering tailored health services and dignity. This approach is linked to improved patient and job satisfaction. Fix et al. (2018) and Luxford et al. (2013) noted increased job satisfaction, while Cliff (2013) and Nelson et al. (2014) reported improved patient satisfaction. Patient-centred care also yields a highly engaged workforce (Weinberg et al., 2013) and lowers employee turnover (Avgar et al., 2013; Luxford et al., 2013). Overall, knowing the lived experiences of healthcare

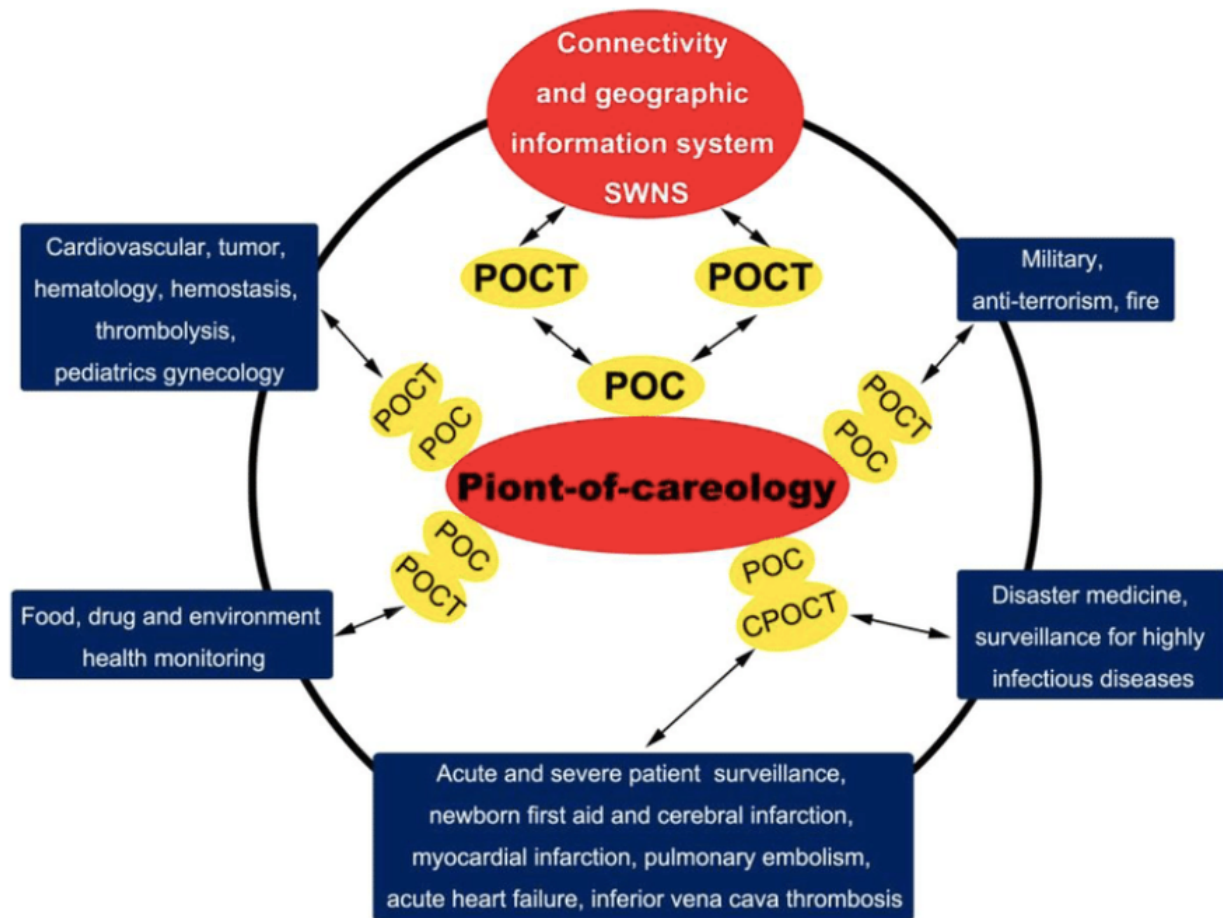
workers' role allows a better understanding of their role in patient-centred care, enhancing both care quality and the well-being of patients and staff.

On the other hand, examining the lived experiences of healthcare workers offers insights into their challenges and perspectives within the healthcare industry. This firsthand understanding points into operational complexities (Bjønness, 2020), patient interactions (Choi & Roulston, 2015), and broader healthcare system nuances (Coombs et al., 2022). For instance, Javanparast et al. (2013) revealed in their study on healthcare workers in rural Iran that high workload and lack of support systems are significant barriers to their effectiveness. Studies that consider insights of healthcare workers contribute to healthcare institutions developing strategies to address these challenges, improve work environments, and enhance overall healthcare quality. The mentioned studies in this section provide testaments on the significance of investigating the healthcare workers' lived experiences through qualitative approaches. Knowing their perspectives reveals their motivations, challenges, and the profound priority on patient-centred care which encapsulates the essence of POCT.

2.6 Point-of-Careology and POCT Implications

This study is rooted in the concept of point-of-careology, a response to the limitations of conventional laboratory tests in catering to the swiftly expanding global population's healthcare needs (Kost et al., 2014). This approach involves the immediate identification of disease markers for diagnosis and treatment at the location of necessity. Liu et al. (2019), in their study in China, mentioned how this concept, though being new in the field of medicine, has solidified health professionals in identifying further medical applications of POCT, as well as its economic benefits. With numerous instances showcasing the benefits of POCT during epidemics, emergencies, and disasters, the concept of point-of-careology was conceived to unify and systematise POCT resources. Thus, this concept is especially beneficial for disaster preparedness and public health (Zadran & Kost, 2019). It is a product of advancements in intelligent diagnostics, providing healthcare practitioners with the capability to deliver prompt and efficient care (Liu et al., 2019).

Figure 1



The provided illustration depicts the diverse practical uses of POCT. It is evident that these applications extend beyond medicine and health, encompassing domains such as the military, drug and environment sectors, anti-terrorism efforts, fire management, and disaster preparedness. At the core of this model lies the concept of point-of-careology, serving as the foundational principle that drives both the POCT framework and its multifaceted applications.

Building upon this comprehensive view of POCT applications, the ramifications of such versatility extend to the realm of cost-effective care. Examining the implications of POCT in this context can uncover how its multifaceted utility not only expands across various sectors but also how it is able to revolutionise the economics of healthcare delivery.

2.7 Examining Healthcare Workers' Perspectives on Cost Effectiveness

Cost-effective care delivery involves a critical assessment of the costs incurred against the achieved health outcomes from various health interventions (Hauck et al., 2019). Watson et al. (2018) elaborate that in the context of healthcare, cost-effectiveness pertains to the attainment of quality outcomes, particularly focusing on patient safety and overall quality care. Having said this, healthcare workers play a central role in driving cost-effective care delivery, a notion supported by extensive research.

For example, Jones (2012) underscores the significance of consultant nurses in ensuring cost-effective, quality patient care. This aligns with Pottle (2018) and Wilkes et al. (2015), who emphasise nurses' multifaceted roles in identifying patient needs (Pottle, 2018), securing appropriate funding (Pottle, 2018) and advocating for the establishment of consultant-nurse positions (Wilkes et al., 2015). Safriet also (2011) highlights the role of healthcare professionals in ensuring competence, contributing to cost-effective care delivery. However, Skopec et al.'s study (2019) made a reminder that healthcare workers' competence throughout a patient's life stages comes with a cost implication. Nonetheless, this cost is balanced by ensuring patient empowerment in making informed choices, along with healthcare workers being accountable for their actions.

From these studies, it can be deduced that cost-effective care delivery is not merely about considering finances, but more about ensuring quality outcomes and patient safety. On the part of healthcare workers, their role involves significant contribution to ensuring cost-effective care through recognising patient needs and performing competently at all times. Building on the insights into cost-effective care delivery and the pivotal role of healthcare workers, the focus of this review now shifts to the nuanced factors that shape their perceptions of cost effectiveness. This exploration would unveil the intricacies that influence their understanding of efficient resource allocation and its implications for patient care.

Exploring the factors that influence healthcare workers' perceptions of cost-effectiveness in hospital operations reveals a limited body of research. This is because studies tend to focus on cost-effectiveness within healthcare delivery, aiming for quality patient outcomes, as exemplified

by Rasti et al. (2015), Wang et al. (2022), and Mokhele et al. (2022). These studies, in examining cost-effectiveness's relation to patient care and safety, highlight the interplay between efficient resource allocation, enhanced patient care, and safety. This alignment underscores the potential for reduced operational costs by optimising hospital operations.

For instance, the commitment of organisations and society to invest in healthcare and prioritise health outcomes emerges as pivotal for cost-effectiveness, as evidenced in Khalaf et al.'s (2015) study. Similarly, healthcare worker training is emphasised as a factor. These factors link directly to reduced operational costs in hospitals.

Interviews done to the respondents in these mentioned studies reveal the perspective of healthcare workers, indicating that when both organisations and society invest in healthcare, it engenders a streamlined and efficient healthcare system. This efficient system reduces unnecessary expenditures (Khalaf et al., 2015) and resource wastage (Wang et al., 2022), consequently contributing to lowering operational costs for hospitals. Moreover, the impact of well-trained healthcare workers on cost reduction is undeniable (Mokhele et al., 2022). Their proficiency minimises medical errors, patient complications, and resource-intensive interventions. This proficiency translates into cost savings through improved patient outcomes, decreasing hospital stays, readmissions, and overall healthcare resource demands.

In parallel, Rasti et al. (2015) highlight the factor of device usability—easy learning, use, and availability. Although initial device cost may be a concern, this study underscores that prioritising user-friendliness and availability shifts focus from cost to utility. This approach is closely aligned with the pursuit of reduced operational costs in hospitals presented in the study by Lee-Lewandrowski & Lewandrowski (2013). By integrating intuitive and available devices into routines, healthcare workers enhance efficiency and productivity. The reduced need for troubleshooting and shorter training periods bolster overall productivity. This streamlined incorporation of devices translates to reduced expenses for hospitals and enhanced patient care.

Moreover, the emphasis on easy-to-learn devices corresponds to fewer errors, yielding better patient outcomes. This, in turn, according to Rasti et al. (2015) reduces hospital stays, leading to decreased resource utilisation and lowered costs. In essence, the intricate connection

between user-friendly devices, enhanced productivity, reduced errors, and improved patient outcomes aligns with the broader goal of achieving reduced operational costs in hospitals.

Overall, the dynamics between cost considerations and patient outcomes are evident through the perspectives of healthcare workers on cost effectiveness. As evidenced from the studies discussed in this section, cost-effective care delivery transcends mere financial considerations; it revolves around the pursuit of quality outcomes and patient safety. Though there are not enough studies that look into what the perspectives of healthcare workers are regarding reduced cost in hospital operations, the significance of healthcare professionals' competence, while entailing a cost implication, is balanced by the empowerment of patients and the accountability of healthcare workers. Underpinned by the concept of point-of-careology, it is evident that achieving cost-effective care necessitates a holistic approach, integrating financial prudence with patient-centered care. Factored garnered that impact the healthcare workers perspectives on cost-effectiveness (streamlined operations, reduced resource wastage, and improved patient outcomes) ultimately lead to reduced operational costs in hospitals.

2.8 Advantages and Challenges in Qualitative POCT Cost Studies

There are qualitative studies that look into the attitudes of healthcare workers, such as nurses, doctors, and clinicians, on the implementation of POCT within their clinical settings. However, in comparison to quantitative research that conducts statistical cost-benefit analyses of POCT's impact on hospital expenses, qualitative studies exploring this area remain relatively scarce.

The need for more qualitative studies in POCT cost analyses arises from their unique ability to illuminate the viewpoints of individuals directly involved in handling these devices. These studies provide insights not only into patient outcomes but also into the potential reduction of operational costs. For instance, Jones et al. (2013) and Foster et al. (2011) conducted systematic literature reviews, highlighting the value of qualitative studies in identifying barriers and facilitators for the broader adoption of POCT. This aligns with the conclusions drawn by Buss et al. (2019), who emphasised healthcare workers' perspectives in terms of how POCT could lead to reduced operational costs through enhanced diagnostic accuracy, targeted

treatment, self-management of chronic conditions, and improved clinician-patient communication.

Qualitative studies are especially powerful as they capture the opinions and experiences of those directly engaged with POCT, offering valuable insights into whether these technologies function as intended. This direct involvement can contribute to the hospital's cost-benefit equation by ensuring that the investments in POCT technology lead to tangible operational efficiencies (Foster et al., 2011). In essence, qualitative research bridges the gap between technical potential and real-world impact, enhancing the potential for cost-effectiveness within hospital operations.

Yet, it cannot be argued that qualitative POCT cost studies encounter challenges and limitations that influence the validity and applicability of their findings. One significant challenge is the potential for bias in data collection and interpretation. Responses to interview questions are inherently subjective, leading to varying views among respondents. For instance, in Eley et al.'s (2018) study, clinicians had differing opinions on the cost-effectiveness of POCT machines for managing lower respiratory tract infections. While some argued that POCT improves patient outcomes and reduces hospital stays and resource utilisation, others contended that dedicated staff is necessary, introducing additional expenses for device support and staff time, a sentiment echoed by Huddy et al. (2016). These differing perspectives underscore the challenge of respondent bias and subjectivity in qualitative POCT cost studies, making generalisation of opinions difficult.

Reimbursement, quality control, and training emerge as significant financial concerns. Both Eley et al. (2018) and Huddy et al. (2016) highlight that these challenges pose substantial obstacles to accurate assessment in qualitative studies. Moreover, the limitation of generalisability is evident in qualitative POCT cost studies. Hardy et al. (2017) conducted interviews with diverse clinicians, yielding a range of perspectives due to variations in their access to diagnostic tests. This diversity of viewpoints challenges the broad applicability of qualitative findings. Similarly, Jones et al. (2013) noted that the qualitative studies they reviewed had limited robustness due to the diverse perspectives and unique contexts presented by different respondents, emphasising the challenge of drawing broad conclusions in this realm.

2.9 Addressing the Research Gap

After conducting a comprehensive review of the existing literature related to the research topic, a distinct research gap has been identified. This underscores the significance and necessity of conducting the present study. Currently, there is limited existing literature concerning the economic viability of point-of-care testing (POCT). The majority of studies have concentrated on examining its precision and efficacy. The few existing research endeavors that have probed into the financial aspect have primarily centred around quantitative data. These studies have employed randomised controlled trials to assess the cost-effectiveness of POCT. Based on what has been assessed in this literature, there is a scarcity of qualitative investigations into the economic benefits of POCT. Our understanding of how POCT impacts hospital expenses, whether by reduction or augmentation, remains quite limited. The experiences and viewpoints of healthcare practitioners engaged in conducting POCT have seldom been explored by researchers. Even that healthcare professionals are at the forefront of utilising current POCT technologies and directly encountering both the advantages and challenges of integrating POCT into patient care, along with its implications for hospital operational expenses, this study strongly substantiates the requirement for conducting qualitative research on this subject. The insights provided by healthcare workers are crucial for unveiling the mechanisms through which POCT can contribute to reducing hospital operational costs.

Having identified a significant research gap through an extensive review of existing literature, which highlights the scarcity of qualitative investigations into the economic benefits of point-of-care testing (POCT), this study's objectives gain further relevance and importance.

As such, this research meets the following research objectives:

1. *Determine the Current Impact of POCT on Hospital Costs:* By addressing this objective, the study aims to shed light on the existing financial implications of POCT usage in hospital settings
2. *Analyse the Cost-Effectiveness of POCT through Healthcare Workers' Experiences:* This objective aligns with the identified research gap, as it seeks to capture qualitative insights

from healthcare workers, providing a comprehensive understanding of how POCT influences hospital expenses

3. *Propose Recommendations for Improving POCT Implementation in Terms of Costs:* By pursuing this objective, the study intends to contribute practical recommendations based on qualitative findings, aiding in the enhancement of POCT integration while considering its economic aspects

2.10 Chapter Summary

The literature review presented the current literature that relate to the qualitative method of exploration into the use of POCT within hospital operations. Specifically, the review examined how POCT use in hospitals can potentially reduce operational costs. Furthermore, this literature review garnered studies that have been able to obtain insights from healthcare workers regarding the link between POCT utilisation and cost-effectiveness. Ultimately, the aim was to present a more insightful experiential understanding and perceptions of healthcare workers about POCT. Additionally, a research gap has been identified, highlighting the need for further investigation in this area.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This study was conducted to examine the cost-effectiveness of POCT and determine whether POCT lowers operational costs of hospitals. It aims to analyse the impact of POCT on hospital expenses through the experiences of healthcare workers with POCT. Hence, this chapter discusses the research philosophy that the study adopted as guidance. It is explained why and how constructivism was considered an appropriate paradigm for the study. Meanwhile, the chapter also elaborates on the research strategy, data collection techniques, and data analysis methods used to examine the findings. Along with that, the criteria for choosing participants are stated as well as the sampling method used to obtain respondents. In the last part of the chapter, research procedures are specified while the validity and reliability of results are explained.

3.2 Research Philosophy

The study utilised constructivism as its research philosophy because this approach permits a thorough analysis of an occurrence (Denicolo, Long and Bradley-Cole, 2016). Constructivism, as a philosophy guiding research, allows researchers to analyse variables involved in the experiences of individuals. Abu-Alhaija (2019) explained that choosing a research philosophy is dependent on the research aims and objectives, as well as the inquires that the study intends to address. As research questions tackle healthcare workers' encounters with POCT, it important to take an approach that considers subjective responses. In comparison with the post positivism paradigm, Abu-Alhaija (2019) emphasised constructivism to be an ideal method since it practices subjective ontology. Thus, using a constructivist perspective is ideal since it helps understand the individual perceptions of health workers.

Adopting a constructivist paradigm is also suitable because it relates to qualitative studies, which is the research design being followed. In fact, constructivism aligns with the ontology, epistemology and methodology of a qualitative research design (Soraya, Kamal and Binti, 2019). Such implies that research methods used in a qualitative approach corresponds to the philosophical orientation of the constructivist paradigm. In relation to that, Bleiker et al. (2019) highlighted that research quality is highly determined by the consistency between the

philosophical approach and research procedures. It is then significant to have these two aligned because each framework is designed to serve a specific purpose. Having said that, choosing constructivism instead of other research paradigms is an effective way to ensure that the methods and framework help meet the research objectives of this study, which are to identify the impact of POCT on hospital costs, to analyse the cost-effectiveness of POCT, and to provide recommendations that help the implementation of POCT concerning costs.

Furthermore, applying a constructivist approach potentially improves healthcare practices, given that it explores and identifies possible issues faced by professionals. Burns et al. (2022) explained that this perspective covers both the Constructivist Grounded Theory (CGT) and Munhall's Interpretive Phenomenology. More importantly, the ontology of these methodologies proposes that there can be different beliefs while their epistemology accepts that knowledge is co-constructed and is continuously changing. Meanwhile, constructivism supports research questions that tackle the implications of people's lived experiences and their way of adapting to the situation (Burns et al., 2022). This is in line with the current study's research questions that talk about POCT's impact, health workers' perceptions, and methods to improve the financial effect of POCT. Therefore, the constructivism approach is appropriate to the current research because the research methods it allows explore different perspectives. Given that, it is applicable to exploring the experiences of medical professionals about POCT.

On the other hand, the constructivist approach faces the disadvantage of being prone to bias because of its subjective nature. Varpio et al. (2020) stated that generalisability and bias are issues that threaten the credibility of studies that use a subjective approach. In this case, results obtained from individual experiences must not be applied to the general population since a constructivist paradigm only aims to provide insight. Moreover, the researcher's predispositions about the topic may potentially contaminate actual findings. Since data gathered are co-constructed, subjectivities are already at play when data is presented (O'Brien et al., 2014). Such implies that findings are influenced by the researcher's interpretations even when data are gathered from participants. Thus, being aware of personal biases is critical when using a constructivist paradigm to maintain the research credibility.

Nevertheless, using constructivism as an approach remains ideal because it helps meet the research objectives. Through inquiries with medical professionals, constructivism helps determine the current impact of POCT on hospital costs because it accepts various answers. McWilliams (2015) stated how the use of the constructivist paradigm can create ever-changing solutions that counter anticipated events. Rather than sticking with a fixed principle, constructivism adapts to different contexts. This helps openly examine the responses of healthcare workers on the cost-effectiveness of POCT. Furthermore, generating recommendations can be done more efficiently since different perspectives are taken into consideration. Therefore, despite the subjectivity, constructivism is an appropriate paradigm that addresses the aims of the study because of its openness to various realities.

3.3 Research Strategy

The research approach is generally either qualitative or quantitative, although they can be combined in an approach known as mixed-method (Taherdoost, 2022). Qualitative research utilises various empirical data, such as case studies, from which researchers can make inferences undefinable by numerical values (Taherdoost, 2022), while quantitative research employs numerical values gleaned from observations and analyses those values using mathematical methods to find numerical representations for observable phenomena (Borstede and Scholz, 2021; Taherdoost, 2022). The qualitative method is most suitable for exploring open-ended questions answerable by themes and patterns that are not easily quantifiable (Tenny et al., 2022), but it can be limited by its tendency to use small sample sizes which can make qualitative research unsuitable for making generalisations (Mwita, 2022). On the other hand, quantitative research is beneficial for research that explores trends and behaviours across data sets to make generalisations representing a specific population, but its limitations mainly lie in the lack of in-depth explanations for reasons behind a population's behaviours (Goertzen, 2017; Taherdoost, 2022).

This research utilises the qualitative approach, which is suitable for generating hypotheses and answering exploratory research questions (Barroga and Matanguihan, 2022). This approach is the most appropriate for this study because it aims to better understand POCT's cost-effectiveness for which data is limited, thereby making this an exploratory study (Barroga and Matanguihan, 2022). Qualitative interviews were employed due to their flexibility in allowing the researcher to modify the questions and their sequence and to ask follow-up questions to probe into interviewees' responses, which consequently can enhance the data (Alamri, 2019). Conversely, qualitative interviews' data reliability can be compromised by social desirability bias (Alamri, 2019), or interviewees' tendency to respond in ways to make themselves appear more favourable (Vesely and Klöckner, 2020). However, this is addressed by wording the questions in a straightforward yet neutral manner to minimise biased responses, and therefore, qualitative interviews are still highly suitable for this study.

This research utilised cross-sectional time horizon, which allows for simultaneously measuring outcome and exposure variables in respondents at a given point in time to uncover associations between the variables (Setia, 2016; Wang and Cheng, 2020). Additionally, respondents are selected according to the study's criteria for inclusion and exclusion (Setia, 2016). The cross-sectional design is most appropriate for this study because it aims to evaluate POCT's current impact in terms of cost-effectiveness. On the other hand, a limitation of the cross-sectional design lies in the difficulty to make causal inferences due to the one-time measurement of exposure and outcome variables (Setia, 2016; Wang and Cheng, 2020). Nonetheless, this is addressed by asking respondents to give recommendations for improving POCT cost-effectiveness based on their experiences, which can be used for further studies.

3.4 Data Collection Techniques

Data collection for this research was done through semi-structured interviews composed of a combination of open- and closed-ended questions. According to Elhami and Khoshnevisan (2022), semi-structured interviews allow the researcher to have natural-flowing conversations with the respondents and gather relevant information from them in more detail. Additionally, the researcher can ask follow-up questions whenever necessary as the interview progresses, thereby allowing for more flexibility in data collection (Elhami and Khoshnevisan, 2022). Moreover, this format encourages respondents to more freely express their opinions and perspectives without straying from the topic of inquiry (Naz et al., 2022). In other words, semi-structured interviews combine flexibility and adaptability with the direction of the conversation being fully controlled by the researcher (Ruslin et al., 2022). With these considerations in mind, it has been determined that semi-structured interviews are the most suitable data collection technique to achieve the objectives of this study.

3.4.1 Sampling Strategy

For participant recruitment, this research utilised purposive sampling, defined by Etikan et al. (2015) as the deliberate, non-random selection of respondents based on specific qualities they possess that are related to the study's topic of inquiry. Purposive sampling was used by the researcher to select participants who are most suited to give relevant responses to the questions covered by this research. Consequently, the data gathered from the selected respondents would be more trustworthy and would help in better achieving the objectives of this research (Campbell et al., 2020). Moreover, this sampling strategy can increase the homogeneity of the sample, which can help achieve statistical significance more easily (Andrade, 2020). In addition, a homogenous sample based on the new information threshold of ≤ 5 percent can reach 80 percent

data saturation in as few as six to seven interviews (Guest et al., 2020). Data saturation is defined as the point at which gathering more data results in no new or additional nascent themes, insights, or issues (Saunders et al., 2017; Hennink and Kaiser, 2022). Thus, reaching data saturation would render additional data collection redundant, which signifies that a sufficient sample size has been obtained (Hennink and Kaiser, 2022).

This study's target population is healthcare workers – medical doctors, medical interns, medical specialists, staff nurses, professional nurses, and nursing assistants – who utilise POCT in Singapore hospitals. The inclusion criteria require participants to have at least one year of experience in administering POCT. On the other hand, exclusion criteria are those who fulfil the inclusion criteria but have not given their informed consent for participation. Of the total population, a sample size of six was utilised. This sample size is supported by Guest et al. (2020) who have determined that it can reach data saturation utilising the ≤ 5 percent new information threshold.

3.5 Research Procedures

As mentioned previously, semi-structured interviews with a mix of open- and closed-ended questions were conducted. The closed-ended questions are about the participants' demographic details related to their age and sex as well as their professional experience in healthcare and with the administration of POCT. For the open-ended questions, the researcher has developed an interview guide with a three-part structure. The first section's focus is on the participants' actual experiences with POCT. The second section asks participants to share their insights related to POCT's financial impact on hospitals. The final section seeks to obtain participants' recommendations on improving POCT's cost-effectiveness. The interviews were conducted in person at the participants' workplaces and were captured with an audio recording

device, for which the researcher sought the participants' consent. Each interview lasted from 30 minutes to one hour, and the interview sessions with all six participants were done within a week.

In compliance with the University's Research Ethics and Integrity Code of Practice, the researcher obtained informed consent from the respondents through forms they filled up and signed before the interviews themselves were conducted. Additionally, the researcher informed the respondents about the following: the purpose of the study, the extent of their participation, any potential associated risks, and the methods to mitigate and manage these risks. The researcher also ensured to inform the respondents that their responses would be kept confidential and anonymous and that their participation was completely voluntary, thereby giving respondents the option to withdraw anytime from the study.

3.6 Validity and Reliability

When research is undertaken, it is imperative that the data presented and the methods of obtaining it remain sound even after close scrutiny. Consequently, good research measures up in terms of validity and reliability, especially with regard to the methodology used for the study (Mohajan, 2017). In general, validity refers to the veracity of the findings presented, while reliability pertains to the findings' stability (Mohajan, 2017).

In qualitative research, validity refers to the suitability of the processes, instruments, and data (Leung, 2015). For research strategy, validity focuses on the chosen methodology in relation to its ability to answer the research question (Leung, 2015). In other words, the chosen methodology must lead to the discovery of findings within the appropriate context (Leung, 2015). For sampling, the appropriate method must be selected based on the research paradigm

and the distinctions between systematic, purposive, and theoretical sampling methods (Leung, 2015). One of the threats to qualitative research validity is “pre-understanding,” which pertains to the researcher’s own tendency towards subjectivity or personal prejudices (Palmer et al., 2022). To counter this, Coleman (2021) recommends mechanical recording – such as the use of devices to capture audio and/or video of interviews – which gives the researcher raw data to scrutinise instead of relying on researcher notes which may be biased. Additionally, transcribing recorded interviews verbatim can give the researcher a more in-depth perspective (Coleman, 2021). Another recommended method to mitigate the risk of pre-understanding is known as “member checking,” which the researcher can implement during interviews by paraphrasing participants’ responses and by asking follow-up questions for the researcher to check his or her understanding of the participants’ answers and to get additional information or clarification (Coleman, 2021). With regard to this study, validity is demonstrated through the use of purposive sampling so that the researcher could choose respondents who would be most suitable for responding to the questions set out by this study. To ensure the truthfulness of the data obtained, the researcher used an audio recording device to capture the participants’ interviews, each of which was then transcribed verbatim. Moreover, the researcher asked follow-up questions to elicit more detailed answers from the participants.

Reliability in quantitative research is measured by the ability for studies’ procedures and findings to undergo exact replication (Leung, 2015). However, there are no available statistical tests to measure reliability in qualitative studies (Coleman, 2021). As a result, reliability in the qualitative context is usually determined in terms of consistency (Leung, 2015), dependability, or confirmability (Coleman, 2021). In other words, reliability in qualitative research pertains to the soundness of the study conducted, especially in terms of the chosen methods and the ways they

were utilised (Rose and Johnson, 2020). Additionally, reliability examines the methodological process' consistency and stability over time as well as across researchers and/or the methods engaged (Rose and Johnson, 2020). A qualitative study's sense of reliability can be increased by the analytical processes' coherence; a clear, transparent, and detailed justification of the methods used and their implementation; and the consistency and clarity with which the study was conducted (Rose and Johnson, 2020; Coleman, 2021). The higher the reliability of a study, the more likely that other researchers can replicate a number of the study's research methods (Rose and Johnson, 2020). According to Coleman (2021), replicability refers to procedural trustworthiness which focuses on whether the observations presented in a study can be repeated despite contextual differences. In relation to the reliability of this particular study, the purposive sampling and the data collection methods used are straightforward and fairly simple to replicate. Additionally, Coleman (2021) asserts that procedural trustworthiness can be established by audio recordings as well as their full transcriptions when data collection is done through interviews. With this in mind, the audio recordings taken during this study's participant interviews and their verbatim transcriptions are an indication of procedural trustworthiness, thereby adding to the reliability of this research.

3.7 Data Analysis Procedures

The scrutiny of the data obtained from the interviews has been done through thematic analysis. This is a qualitative analysis method that involves identifying, analysing, and reporting repeated patterns of themes or meanings across a particular data set (Kiger and Varpio, 2020). Thematic analysis provides a systematic method for organising and analysing intricate data sets (Dawadi, 2020). As described by Braun and Clarke, thematic analysis has six phases: (1) data familiarisation, (2) initial code generation, (3) initial theme generation, (4) theme review, (5)

definition and naming of themes, and (6) report production (Campbell et al., 2021). According to Kiger and Varpio (2020), thematic analysis is highly flexible, making it suitable for use within a broad range of theoretical and epistemological frameworks and for application to various research questions and designs as well as sample sizes. Moreover, this method can be performed in both inductive and deductive analyses (Dawadi, 2020). When used inductively, the researcher codes the data without placing them within an already existing coding frame, thereby allowing the themes to appear through the data itself (Dawadi, 2020). In short, the themes are deeply rooted in the data obtained by the researcher instead of being driven by the researcher's theoretical interest in the issue being examined (Dawadi, 2020). The deductive approach of thematic analysis, on the other hand, usually begins with the researcher analysing themes that have been identified in the process of conducting a literature review (Dawadi, 2020). Thematic analysis performed deductively entails analysing the data in relation to the researcher's theoretical interest in the subject being investigated (Dawadi, 2020).

For this study, the researcher began the analytical process by transcribing the interviews' audio recordings. The transcripts were read and re-read line by line along with the recordings to ensure that the participants' responses were accurately captured. Once all the transcripts were deemed accurate, the researcher assigned a participant code to each respondent and organised their demographic details in a table. For each interview question, the researcher scrutinised the transcripts and identified the patterns that were common across all the participants' responses. The researcher derived the principal themes from these recurring patterns augmented by pertinent details from the participants' responses. From there, the researcher extracted distinct insights related to each principal theme based on the analysis of the data. Since the themes were derived from the data itself, the thematic analysis for this study was done inductively (Dawadi,

2020). The principal themes and key insights were systematically arranged in tabular format which aided the researcher in writing the report on the study's findings in response to the research objectives. Additionally, relevant literature that either supports or contradicts these findings has been integrated in the analysis.

CHAPTER 4: DATA ANALYSIS

4.1 Introduction

This section examines the themes derived from the thematic analysis conducted by the researcher. To commence, a summary of the respondents' profiles has been compiled and presented in a tabular format. Furthermore, the principal themes and distinct insights extracted from the data analysis have been systematically arranged in another table. Essentially, this segment expounds upon the study's discoveries and integrates pertinent literature that either corroborates or challenges these findings.

4.2 Respondents' Demographic Profiles

Table 1

Demographic Details of the Respondents

Participant Code	Age Range	Sex	Current Position as a Healthcare Worker	Total Number of Years Working (Range)	Total Number of Years Administering POCT to Patients (Range)	Type of Primary Care Facility	Specialisation (if any)
R1	25-35 years old	Male	Emergency staff nurse	1-5 years	2-5 years	hospital	Did not specify
R2	36-45 years old	Male	ICU nurse	11-20 years	2-5 years	hospital	Did not specify
R3	36-45 years old	Female	Obstetrician/gynecologist	11-20 years	6-10 years	Hospital	Obstetrics and gynecology
R4	46-55 years old	Female	Pulmonologist	11-20 years	More than 10 years	Hospital	Did not specify
R5	25-35 years old	Male	Medical technologist	1-5 years	2-5 years	Hospital	Did not specify
R6	46-55 years old	Female		More than 20 years	6-10 years	Nurse manager	Did not specify

As shown in Table 1, a total of six (6) respondents participated in this study. The previously established inclusion and exclusion criteria were utilised to obtain the demographic details of the six participants. Participant codes (R1 to R6) were assigned to each of the participants to protect their privacy and ensure their anonymity. Furthermore, the table presents a snapshot of the demographic details of the study's respondents, who are healthcare professionals engaged in point-of-care testing (POCT). The table provides information on participant codes, age ranges, genders, current positions within the healthcare field, total years of professional experience, total years of administering POCT to patients, types of primary care facilities, and any specific specialisations held.

The respondents encompass a range of ages and genders, with varying roles such as emergency staff nurse, ICU nurse, obstetrician/gynecologist, pulmonologist, medical technologist, and nurse manager. Their years of experience in healthcare range from one to more than 20 years, with a subset of years dedicated specifically to administering POCT. The primary care facilities where they work was mainly in hospitals, while only one mentioned a specific specialisation, which was in obstetrics and gynecology.

This demographic overview highlights the diverse backgrounds and roles of the healthcare workers participating in the study. Such insights into the participants' characteristics can aid in understanding the potential influences of their professional experiences and roles on their perspectives regarding the implementation and impact of POCT in healthcare settings.

4.3 Themes

Table 2

Major Themes Identified from the Participants' Answers to the Interview Questions

Research Question	Major Themes	Specific Takeaways
RQ1: What is the current impact of POCT on hospital costs?	• Reduced operational costs ○ enhanced resource allocation ○ enhanced efficiency ○ reduced operational costs in the central lab ○ Improves patient throughput	• Enhanced resource allocation ○ reduced bed utilisation ○ lowered operational and resource utilisation costs because of reduced extended hospital stay • Enhanced efficiency ○ faster diagnostics ○ faster decision-making ○ fewer resources being hogged up • Reduced operational costs in the central lab ○ reduced operational hours ○ number of people being tested in the central lab is reduced ○ no need for tight scheduling in the central lab • Improves patient throughput

- minimising delays caused by waiting for lab results
- reduced patient wait times
- faster decision-making resulting to timely interventions
- patient flow is smoother
- patients can move through the system faster

RQ2: How do the experiences of healthcare workers explain the cost-effectiveness of POCT?

- POCT is integrated with healthcare workers' roles and responsibilities
- Comparison with the traditional testing methods
- Impacts of POCT on healthcare workers' job
- Challenges with using POCT

- POCT is integrated with healthcare workers' roles and responsibilities
 - quickly performing essential tests
 - quicker informed decision-making
- Comparison with the traditional testing methods
 - more efficient
 - more immediate results
 - ensures timely patient care
- Impacts of POCT on healthcare workers' job
 - improved, expedited workflow
 - enhanced patient interaction
 - overall job satisfaction

- prompt answers to patient questions
- Challenges with using POCT
 - regular device maintenance and updates
 - regular calibration
 - technical glitches
 - technical complexity and probability for error for untrained staff

RQ3: What are some of the recommendations that can help improve the implementation of POCT to reduce hospital costs?

- Strategies to further enhance POCT's cost-effectiveness
- Specific areas in the hospital where POCT can potentially help in cost reduction
- Collaborations and partnerships
- Balance between high initial investment and long-term cost savings

- Strategies to further enhance POCT's cost-effectiveness
 - regular maintenance and calibration of devices
 - staff training
 - adding more tests to the POCT menu
- Specific areas in the hospital where POCT can potentially help in cost reduction
 - emergency rooms
 - critical care areas like the ICU
 - obstetrics and gynecology
 - outpatient clinics
- Collaborations and partnerships
 - getting everyone involved/playing their part
 - laying down the rules

- regular feedback session for improvement
 - effective communication and joint decision-making between healthcare professionals and hospital management
 - data integration
- Balance between high initial investment and long-term cost savings
 - invest in reliable devices
 - POCT purchase must meet current demands

4.3.1 Impact of POCT on hospital's operational costs

Part Two of the interview focused on investigating the effects of POCT on hospital operational costs. Analysis of responses from the six participants revealed a prevailing theme: POCT use leads to a substantial reduction in hospitals' operational expenditures.

Theme 1: Reduced operational costs

Primarily, the use of POCT resulted in decreased operational expenses through two key avenues. Firstly, hospital bed usage was minimised (R1, R2, R3) as a consequence of swift and accurate diagnostics, leading to shorter patient stays. Secondly, the costs associated with extended hospital stays were notably lowered due to the timely insights provided by POCT (R2, R3, R5).

Furthermore, the incorporation of POCT into hospital practices brought about heightened operational efficiency. This was evident in the rapid diagnostic process, which facilitated quicker decision-making and necessitated fewer resources. Participant R3's response underscored this.

“When we swiftly obtain POCT results for conditions like urinary tract infections (UTIs) or bacterial vaginosis, it allows us to initiate treatment promptly. This can prevent complications and potential hospital admissions.”

The third aspect, as specified by participant R5, pertained to the central laboratory. The implementation of POCT led to reduced operational hours and a smaller influx of individuals requiring testing in the central lab. Consequently, the need for stringent scheduling within the central lab environment was alleviated, contributing to additional cost savings.

Finally, respondents unanimously agree that POCT enhances patient throughput, expediting and streamlining the journey from admission to discharge. This consensus stems from its ability to minimise result-related delays, decrease patient waiting durations, accelerate decision-making for prompt interventions, and facilitate swifter overall patient progression through the system.

4.3.2 Experiences of healthcare workers on POCT cost-effectiveness

Part Three of the interview probed into the experiences of the healthcare workers which explain their views on the cost effectiveness of POCT. Four major themes are uncovered from the respondent's relaying of their experiences (Themes 3, 4, 5, and 6).

Theme 3: POCT is integrated with healthcare workers' roles and responsibilities

The insights gathered from respondents emphasise the seamless integration of POCT into the roles and responsibilities of healthcare workers. These professionals perform crucial tests rapidly, spanning: glucose levels, cardiac markers, troponin testing, blood gas analysis (as cited by R1, an emergency nurse); ABGs or arterial blood tests (per R4, a pulmonologist); cardiac marker testing, rapid strep testing, and electrolyte testing (from R2, an ICU nurse); glucose testing for gestational diabetes, urine dipstick tests for infections, rapid streptococcal tests (based on R3's answers, an obstetrician/gynecologist); and glucose monitoring, coagulation studies, and rapid infectious disease tests (according to R5, a medical technologist). Particularly noteworthy is R6's perspective; although no longer directly engaged in POCT as a nurse manager, she orchestrates its implementation in her nursing department.

“While I may not directly administer POCT myself nowadays, I play a crucial role in ensuring that our nursing staff is well-trained and equipped to carry out point-of-care testing. I trained them in using POCT. I oversee the integration of POCT into our department's protocols, ensuring seamless coordination between testing, patient care, and documentation.”

The speedier informed decision-making resulting from POCT is another highlight. Healthcare workers uniformly regard POCT as indispensable, aiding them in fulfilling their responsibilities effectively. As R3 emphasises, it has become integral to delivering timely patient care, with all respondents having adeptly transitioned to its use. In summary, these firsthand accounts underscore POCT's organic assimilation into healthcare workflows, bolstering care quality and expediting decision-making across the board.

Theme 4: Comparison with the traditional testing methods

Respondents were asked how they compare POCT with the traditional methods of testing in terms of efficiency and time savings. Overall, the respondents agree that compared to traditional methods, POCT proves notably more efficient, eliminating the need to wait for laboratory results (R1). This efficiency is particularly crucial in time-sensitive scenarios, as acknowledged by R3. Moreover, POCT, in contrast with the traditional testing methods in central laboratories, provides swift patient management benefits, as highlighted by R6, and the immediate results ensure timely patient care, according to R2).

Theme 5: Impacts of POCT on healthcare workers' job

The impact of POCT on healthcare workers' roles is significant and multifaceted. It has led to improved and expedited workflows (R1 and R2), a notable enhancement in patient interaction, and a redefined dynamic in decision-making. Healthcare professionals can promptly inform patients about their medical conditions based on swift test results. As articulated by R6,

“...it's been a game-changer. When we can get results faster, we can make decisions faster. Patients appreciate that we're on the ball, and it keeps everyone's spirits up. Plus, knowing we're giving top-notch care thanks to POCT is pretty satisfying.

However, R5 observes that the extensive use of POCT has led some patients to expect instant results, disregarding the complexity of certain tests like genetics and allergies that require microbiology culture and cannot be expedited like POCT. Nevertheless, the overall job satisfaction has surged, according to many of the respondents. The swift insights from POCT empower healthcare workers to respond promptly to patient queries and foster informed discussions. According to R3,

“POCT has really influenced my interactions with patients. It allows us to have informed discussions right then and there, which makes a big difference in their understanding and decisions. As for my job satisfaction, seeing immediate results that guide our care plans is definitely rewarding.”

In summary, POCT's impact on healthcare workers encompasses streamlined workflows, improved patient engagement, and more informed decision-making that encourages the participation of patients. . Thus, these impacts allow for enhanced patient satisfaction and more gratifying work experiences, underscoring the transformative effect of POCT on healthcare professionals' roles.

Theme 6: Challenges with using POCT

Despite its benefits, POCT presents challenges. From the experiences of the respondents, these problems are demanding which include: ensuring regular device maintenance and updates (noted by R1-R5), regular calibration (R1, R2, R5); and technical glitches which can hinder smooth operations (R1). Moreover, complexity risks errors among untrained staff (R6), and hesitation from some doctors to shift from central lab testing (R5) leads to underutilised machines initially, as stated by R5,

“They'd still tell their patients to go to the central lab even if a POCT machine can be used immediately. So, for the first years, some machines are rarely used or are just sitting. They were just a waste.”

4.3.3 Recommendations of healthcare workers to improve POCT implementation in reducing operational costs

The last part of the interview (Part 4) examined the healthcare workers' perspectives on the recommended strategies and best practices, uncovering major themes (Themes 7, 8, 9, and 10) that hospitals can implement in maximising POCT utilisation for operational cost reduction.

Theme 7: Strategies to further enhance POCT's cost-effectiveness

When asked what strategies and practices they can recommend to amplify the cost-effectiveness POCT, the respondents provided valuable insights grounded on their experiences as healthcare professionals. Most respondents mention prioritising regular maintenance and calibration of devices as an essential strategy to ensure POCT's continuous cost-effectiveness. R1 underscores this, highlighting that preventive measures “...prevent downtime and costly repairs”. R4 goes further, mentioning that their department hired diagnostic software

professionals to train staff in basic check-ups and maintenance. Ultimately, R5 stresses “A device is only as good as it is maintained and updated.”

Effective staff training emerges is another vital approach. R2 and R3 emphasise the importance of staff competence for accurate results, preventing the need for retesting. Meanwhile, expanding the POCT menu with additional tests, as R4 suggests, maximises the hospital’s POCT investment. However, R6 provides a crucial perspective in contrast to R4’s suggestion, emphasising alignment between the acquired POCT technology and patient demand. R6 argued,

“...the hospital should ensure that the POCT they obtain could meet the patient demands so they can prevent possible instances of machines just sitting idly.”

Overall, responses gathered point to how POCT resources must match patient needs to prevent instances of underutilisation that must consist of the combination of regular and timely device care, robust staff training, strategic test selection, and alignment with patient needs. Respondents attest that this combination can collectively optimise the cost-effectiveness of POCT implementation within healthcare settings.

Theme 8: Specific areas in the hospital where POCT can potentially help in cost reduction

Respondents’ perspectives converge on the potential of POCT to drive cost reduction in hospital settings, with a specific focus on areas necessitating swift decision-making. Emergency rooms (R1, R2) and critical care units, including the ICU (R1, R4, R5), emerge as key domains where POCT’s rapid results can enhance patient management and resource utilisation.

Notably, R3 and R6 introduce distinctive viewpoints that deviate from the common consensus. R3 highlights the value of POCT in preoperative assessment within operating rooms, streamlining patient readiness for surgeries. R3 explains,

“POCT is advantageous in preoperative assessment. It’s all about making sure our patients are good to go before surgeries, and that’s a big deal. With POCT, we get those results in a jiffy,

and that means we're in the know. We can confidently decide whether to move forward with procedures or not. It cuts down on those nail-biting last-minute cancellations or annoying delays. Our operating rooms run smoother, and our hardworking healthcare team is utilised just right."

R6, in contrast, underscores the significance of POCT in outpatient clinics,

"It's important because the quick test results mean that the patient is given the plan of whether to be admitted or not. It saves a lot of time, effort, and, of course, both on the part of the patient and the hospital."

In summary, while the consensus emphasises emergency and critical care settings, R3 and R6 broaden the discussion by highlighting the benefits of POCT in operating rooms and outpatient clinics, respectively. These varied perspectives collectively underline POCT's potential to enhance cost-effectiveness across diverse areas of the hospital, contributing to streamlined operations, informed decisions, and improved patient experience.

Theme 9: Collaborations and partnerships

Collaborations and partnerships are universally acknowledged by respondents as essential for optimising the financial impact of POCT while upholding patient care quality. Strategies for fostering such collaborations vary among respondents, aiming to maximise POCT's cost-reduction potential in hospital operations. Based on their answers, these collaborations and partnerships must involve the main players of clinical staff, laboratory personnel, and administrators. Strategies they recommended are: getting all stakeholders involved (R5, R6); establishing clear guidelines (R5); implementing regular feedback sessions (R1); promoting effective communication and decision-making between healthcare professionals and hospital management (R2); integrating data effectively (R3); and fostering shared understanding and teamwork (R4). All these recommended strategies collectively form a multifaceted framework for achieving heightened collaboration and harnessing the benefits of POCT for financial efficiency in healthcare settings.

Theme 10: Balance between high initial investment and long-term cost savings

Respondents stress the significance of striking a balance between the substantial upfront investment required for POCT technology and its potential long-term cost benefits. This balancing act involves various considerations.

R1 and R2 underline the necessity of conducting thorough cost-benefit analyses before hospitals invest in POCT. The consensus is that investing in reliable POCT devices can yield substantial returns over time. This stems from the cost reductions facilitated by quicker diagnostics and targeted patient care.

Meanwhile, R4 emphasises a critical aspect of this balance---aligning the purchased POCT machines with the hospital's actual needs. The alignment ensures that the investment corresponds directly to the institution's requirements. Initially hesitant about investing in POCT, R4 shares the evolution of their perspective.

“At first, I was hesitant to agree with the board about purchasing POCT machines. I thought they weren't needed, especially with the high costs but I must admit that they were good investments. So you have to be sure whether the POCT machine you're going to get is really needed or could meet the demand in the hospital. If it's just an accessory that would make your hospital, just because you have it, then it's no longer an investment but an additional expense.”

This sentiment resonates with R6, who also emphasises the need for POCT purchases to be in line with current demands. Both highlight the importance of evaluating whether a POCT machine is a necessary addition or merely an accessory that could potentially strain resources.

4.4 Chapter Summary

In summary, this chapter comprehensively discussed the ten key themes uncovered from conducting thematic analysis of the qualitative data from the respondents' answers to the interview questions. The said major themes are categorised based on how they could answer the research questions and how they could meet the research objectives. The first set of themes

are aligned with how the healthcare workers view POCT utilisation in reducing hospital operational costs and overall cost effectiveness. The next group of themes, meanwhile, point to what the healthcare workers think of their professional experiences in POCT's contribution to operational cost reduction. Lastly, the final set of themes is composed of the recommended strategies and best practices that the healthcare workers believe can further improve POCT's involvement in hospital's operational cost reduction.

CHAPTER 5: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises and concludes the whole study. To be specific, this chapter provides the discussion of the answers to each of the research question based on the findings analysed in the previous chapter. Furthermore, this chapter contains the recommendations for both practice and future practice.

5.2 Discussion

5.2.1 Research Question 1: What is the current impact of POCT on hospital costs?

The findings from the respondents' insights align closely with previously collected literature regarding the impact of Point-of-Care Testing (POCT) on hospital operational costs. Both the current literature and the participants' experiences underscore the overarching theme that the cost benefits of POCT far outweigh the initial investments, contributing to streamlined workflows, optimised resource allocation, and enhanced patient management.

Research findings highlight the benefits of POCT in terms of streamlined workflows and reduced turnaround times, which align with the current literature. As demonstrated by R1 and R2, the utilisation of POCT technology has resulted in more efficient diagnostic processes, exemplified by the enhanced efficiency in testing management (Ryan et al., 2019) and reduced turnaround times (Gjolaj et al., 2014). Similarly, the findings from the interviews emphasise that timely POCT results enable prompt initiation of treatment for many conditions, such as gynecological and pulmonary concerns, averting complications and hospital admissions, as cited by R3.

Furthermore, findings also show highlight the role of POCT in optimising resource allocation and utilisation, particularly in acute care settings. The participants' answer strengthens this view this supporting the data from current literature that mention how POCT helps in low-resource hospitals (Kost et al., 2013) and the expeditious clinical management of various diseases (Stime et al., 2018). These viewpoints from the respondents showcase how POCT use brings emphasis to resource optimisation and resource-efficient patient care.

Furthermore, impact of POCT on hospital operational costs can also be seen on cost reduction potential through improved patient management and early disease detection, leading to enhanced resource allocation. This is echoed in the participants' insights, with R5 emphasising that POCT implementation has led to significant reductions in costs related to specimen transport and result distribution. These findings underscore how efficient patient management achieved through timely POCT results can have substantial financial implications for hospital.

However, it is also important to acknowledge that though current literature and data analysis emphasise the potential for cost savings through POCT, potential concerns have also been identified. For one, literature briefly touches on the possibility of errors in POCT that could impact operational costs (Cantero et al., 2015). Similarly, the participants' perspectives, highlight the importance of quality error monitoring to mitigate any errors that might arise from POCT tool.

Overall, participants' insights are aligned with the current literature, underscoring the positive impact of POCT on hospital operational costs. It can be deduced that POCT has a pivotal role to play in streamlining workflows, optimising resource allocation, and enhancing patient management, ultimately contributing to cost reduction. While some concerns about potential errors exist, the overwhelming consensus from the data analysis is that the integration of POCT has brought about significant financial benefits to healthcare institutions.

5.2.2 Research Question 2: How do the experiences of healthcare workers explain the cost-effectiveness of POCT?

The findings of this study provide insightful perspectives that align with and expand upon the existing literature regarding the impact of POCT on hospital operational costs. The qualitative approach employed in this study allowed for a nuanced exploration of the lived experiences and perspectives of healthcare workers, shedding light on the multifaceted dynamics associated with the integration of POCT within hospital operations.

Current literature emphasised the significance of understanding healthcare worker perspectives, as they are directly engaged in patient care and play a pivotal role in driving patient-centered and cost-effective care delivery (McClung et al., 2017; Javanparast et al., 2013).

This alignment between patient-centered care and cost-effectiveness was found to be consistent with the experiences of the healthcare workers in this study. The respondents' perspectives indicated a prevailing theme of reduced operational costs stemming from the integration of POCT into their roles. This alignment reflects the findings in the literature, showcasing how swift and accurate diagnostics offered by POCT lead to shorter patient stays, thus minimising bed usage and associated costs.

Furthermore, the notion of patient-centered care was evident in the respondents' viewpoints, echoing the literature's emphasis on involving patients in decision-making and fostering tailored health services. The findings highlighted that POCT facilitates patient-centered care by enabling informed discussions with patients based on swift test results. This aligns with the literature's assertion that patient-centered care improves patient and job satisfaction, ultimately contributing to reduced operational costs through enhanced patient outcomes and lowered turnover rate (Fix et al., 2018; Luxford et al., 2013).

Also, the qualitative approach also revealed the challenges associated with POCT implementation, consistent with the literature's acknowledgment of potential errors and technical complexities (O'Kane et al., 2013). Healthcare workers' insights indicated the need for regular device maintenance, calibration, and overcoming technical glitches, all of which align with the current literature's emphasis on the importance of ensuring device usability and reliability to achieve cost-effectiveness (Rasti et al., 2015).

To summarise, the findings from the healthcare workers' experiences corroborated the literature's assertions that integrating POCT into hospital operations leads to reduced operational costs through streamlined workflows, improved patient interactions, and enhanced decision-making. The alignment between the lived experiences of healthcare workers and the literature underscores the relevance of qualitative approaches in studying the impact of POCT on hospital costs. These findings not only contribute to the existing body of knowledge but also emphasise the importance of considering the intricate interplay between patient-centered care, operational efficiency, and cost-effectiveness within the context of POCT implementation in healthcare settings.

5.2.3 Research Question 3: What are some of the recommendations that can help improve the implementation of POCT to reduce hospital costs?

The recommendations provided by healthcare workers to enhance the implementation of POCT for the purpose of reducing hospital costs are grounded in their practical experiences and insights. These recommendations stem from their understanding of the potential benefits of POCT, as well as the challenges and complexities associated with its integration. The findings from the interviews align with existing literature, shedding light on effective strategies for optimising the cost-effectiveness of POCT implementation within healthcare setting.

Firstly, the respondents emphasise the significance of regular maintenance and calibration of devices as a foundational strategy to ensure continuous cost-effectiveness of POCT. This aligns with prior research that highlights the preventive aspect of device care to prevent downtime and costly repairs (Kim et al., 2020). Effective staff training emerges as another vital approach, which resonates with the literature's emphasis on staff competence for accurate results (Ryan et al., 2019). Additionally, the expansion of the POCT menu with relevant tests is recommended by some respondents, provided it aligns with patient needs. This notion concurs with Plebani's (2019) suggestion that POCT should be matched with patient demands to optimise resource utilisation.

Secondly, healthcare workers concur on the potential of POCT to drive cost reduction, with an emphasis on areas requiring swift decision-making, such as emergency rooms and critical care units. This aligns with previous studies that highlight the rapidity of POCT results as advantageous in time-sensitive scenarios (Gjolaj et al., 2014). The unique perspectives of using POCT in preoperative assessment within operating rooms and outpatient clinics broaden the discussion, underscoring the potential applicability of POCT in diverse hospital domains. This resonates with the concept of point-of-careology, where POCT's versatile applications extend beyond traditional healthcare settings (Liu et al., 2019).

Thirdly, collaborations and partnerships are recognised as essential for optimising the financial impact of POCT while maintaining patient care quality. Strategies recommended by respondents align with the literature's emphasis on effective communication and teamwork

among healthcare professionals, laboratory personnel, and administrators (Luxford et al., 2013). The proposed framework for fostering collaboration and partnerships among stakeholders underscores the necessity of a coordinated effort to harness the benefits of POCT for financial efficiency.

Lastly, healthcare workers stress the importance of striking a balance between the substantial upfront investment required for POCT technology and its potential long-term cost benefits. This mirrors the literature's emphasis on conducting thorough cost-benefit analyses before investing in POCT devices (Kim et al., 2020). The perspectives of aligning POCT purchases with actual hospital needs underscore the critical decision-making process in determining whether the investment aligns with the institution's requirements, minimising unnecessary expenses.

To conclude, healthcare workers' recommendations for improving the implementation of POCT to reduce hospital costs are closely aligned with existing literature. These insights collectively emphasise strategies such as regular maintenance, staff training, strategic test selection, collaboration among stakeholders, and a balanced approach to investment. The alignment between the findings and the literature supports the notion that the successful implementation of POCT for cost reduction requires a comprehensive and coordinated approach that considers technical, operational, and strategic aspects. Through the incorporation of these recommendations, healthcare institutions can harness the full potential of POCT to enhance both patient care and cost-effectiveness.

5.3 Conclusions

This research study probed into the cost-effectiveness of Point-of-Care Testing (POCT), specifically focusing on how it reduces operational costs within the context of hospitals in Singapore. Through a combination of comprehensive literature review and semi-structured interviews with six healthcare professionals in Singapore, the study sought to address the central research question. Employing qualitative research methodology enabled the collection of information-rich and in-depth responses from healthcare professionals who possess firsthand experience with POCT's impact on hospital operational costs.

The identified research gap in qualitative investigations regarding the economic benefits of POCT within the context of Singapore justified the pursuit of this study. With specific objectives in mind, the research aimed to: (1) determine the present impact of POCT on hospital costs; (2) analyse the cost-effectiveness of POCT through healthcare workers' experiential insights; and (3) provide recommendations for enhancing the implementation of POCT while considering cost-related aspect.

By carefully and comprehensively analysing the gathered findings and juxtaposing them with existing literature, the research successfully addressed these objectives. Primarily, it shed light on the financial implications of utilising POCT in hospital settings, offering valuable insights into the current impact of POCT on hospital costs. Additionally, the study captured qualitative perspectives from healthcare workers, yielding a comprehensive understanding of the multifaceted ways in which POCT influences hospital expenses.

Most notably, the research was able to generate practical recommendations based on the qualitative insights obtained. These recommendations serve as actionable strategies for optimising the integration of POCT, while simultaneously considering the economic dimensions. Ultimately, the study's multifaceted approach, combining literature review and qualitative interviews, provided a holistic perspective on the cost-effectiveness of POCT in hospital operations.

5.4 Recommendations

5.4.1 Recommendations for practice

Based on findings drawn from the insights of the Singaporean six health professionals interviewed, the key recommendations are as follows:

- *Conduct cost-benefit analysis:* Before a hospital invests in POCT technology, a cost-benefit analysis must be conducted first. Doing this can help in determining the long-term cost benefits and savings of POCT to the hospital, allowing for informed decisions before procurement.
- *Prioritise the regular maintenance and calibration of POCT devices:* Hospitals in Singapore that already utilise POCT technology in their daily operations must ensure that

regular maintenance and calibration of POCT devices are in place. Establishing these types of protocols can ensure that the devices are always producing accurate results, at the same time, preventing costly downtime and repairs.

- *Invest in staff training:* Staff that directly handle the use of POCT must undergo regular and adequate training. Based on the findings of this research, competent staff produces competent POCT results that ultimately reduces costly retesting. Moreover, trained staff can perform on their own the basic check-ups and maintenance, contributing to other operational cost reductions.
- *Align POCT investment with patient demands:* Before procuring POCT technology, hospitals in Singapore should carefully assess first their current patient needs. Doing this can ensure that the POCT machines they purchase align with these patient demands; hence, preventing underutilisation of devices and resource wastage. A better return of investment can be obtained if the POCT machines actually address patient needs.

5.4.2 Recommendations for future research

The current findings also brought out several potential recommended topics that future research can focus on.

- *Longitudinal studies:* Doing longitudinal studies allow researchers to examine the long-term impact of POCT use on hospital operational costs. These types of research can track the changing trends in cost benefits and patient outcomes, potentially showing the sustained financial benefits of POCT use.
- *Comparative analysis:* Comparative analysis can explore the financial differences between hospitals that integrate POCT in their operations and hospital who have not yet explored POCT technology. Doing this comparison can reveal differences in cost savings, patient outcomes, and operational efficiencies.
- *POCT error analysis:* This research has addressed that errors can happen when using POCT devices; hence, future research can examine how error rates impact operational costs in hospitals.

REFERENCES

- Abu-Alhaija, A.S. (2019) From epistemology to structural equation modeling: an essential guide in understanding the principles of research philosophy in selecting the appropriate methodology, *Australian Journal of Basic and Applied Sciences*, vol. 13, no. 9. doi:<https://doi.org/10.22587/ajbas.2019.13.9.12>.
- Alamri, W. A. (2019) Effectiveness of qualitative research methods: interviews and diaries. *International Journal of English and Cultural Studies*, vol. 2, no.1 Available Internet: <https://doi.org/10.11114/ijecs.v2i1.4302> [Accessed 24th August 2023]
- Andrade, C. (2020) The inconvenient truth about convenience and purposive samples. *Indian Journal of Psychological Medicine*, vol.43, no.1 Available Internet: <https://doi.org/10.1177/0253717620977000> [Accessed 25th August 2023]
- Asenahabi, B. (2019) Basics of research design: A guide to selecting appropriate research design, *International Journal of Contemporary Applied Researches*, [online] vol. 6, no. 5, pp.76–89. Available at: <http://ijcar.net/assets/pdf/Vol6-No5-May2019/07.-Basics-of-Research-Design-A-Guide-to-selecting-appropriate-research-design.pdf>.
- Avgar, A. C., Givan, R. K., & Liu, M. (2011) Patient-centered but employee delivered: Patient care innovation, turnover intentions, and organizational outcomes in hospitals, *ILR Review*, vol. 64, no. 3, pp. 423-440.
- Balbale, S. N., Turcios, S., & LaVela, S. L. (2015) Health care employee perceptions of patient-centered care, *Qualitative Health Research*, 25(3), 417-425.
- Barroga, E. and Matanguihan, G. J. (2022) A practical guide to writing quantitative and qualitative research questions and hypotheses in scholarly articles. *Journal of Korean Medical Science*, vol.37, no.16 Available Internet: <https://doi.org/10.3346%2Fjkms.2022.37.e121> [Accessed 24th August 2023]

- Bleiker, J., Morgan-Trimmer, S., Knapp, K. and Hopkins, S. (2019) Navigating the maze: Qualitative research methodologies and their philosophical foundations, *Radiography*, vol. 25, no. 2), pp.S4–S8.
- Boere, T.M., van Buul, L.W., Hopstaken, R.M., van Tulder, M.W., Twisk, J.W.M.R., Verheij, T.J.M. and Hertogh, C.M.P.M. (2021) Effect of C reactive protein point-of-care testing on antibiotic prescribing for lower respiratory tract infections in nursing home residents: Cluster randomised controlled trial, *BMJ*, p.n2198. doi:<https://doi.org/10.1136/bmj.n2198>.
- Borgstede, M. and Scholz, M. (2021) Quantitative and qualitative approaches to generalization and replication - a representationalist view. *Frontiers in Psychology*, vol.12 Available Internet: <https://doi.org/10.3389/fpsyg.2021.605191> [Accessed 24th August 2023]
- Burns, M., Bally, J., Burles, M., Holtslander, L. and Peacock, S. (2022) Constructivist grounded theory or interpretive phenomenology? Methodological choices within specific study contexts, *International Journal of Qualitative Methods*, [online] vol. 21, p.160940692210777. doi:<https://doi.org/10.1177/16094069221077758>.
- Butler, J., de Cassan, S., Turner, P., Lennox, B., Hayward, G., & Glogowska, M. (2021) Mental healthcare clinician engagement with point of care testing; a qualitative study, *BMC Psychiatry*, vol. 21, pp. 1-8.
- Bjønness, S., Viksveen, P., Johannessen, J. O., & Storm, M. (2020) User participation and shared decision-making in adolescent mental healthcare: a qualitative study of healthcare professionals' perspectives, *Child and adolescent psychiatry and mental health*, vol. 14, no. 1, pp. 1-9.
- Buss, V. H., Deeks, L. S., Shield, A., Kosari, S., & Naunton, M. (2019) Analytical quality and effectiveness of point-of-care testing in community pharmacies: a systematic literature review, *Research in Social and Administrative Pharmacy*, vol.15, no. 5, pp. 483-495.
- Campbell, K. A., Orr, E., Durepos, P., Nguyen, L., Li, L., Whitmore, C., Gehrke, P., Graham, L. and Jack, S. M. (2021) Reflexive thematic analysis for applied qualitative health research.

The Qualitative Report, vol. 26, no. 6 Available Internet: <https://doi.org/10.46743/2160-3715/2021.5010>

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D. and Walker, K. (2020) Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, vol. 25, no. 8 Available Internet: <https://doi.org/10.1177%2F1744987120927206> [Accessed 25th August 2023]

Cantero, M., Redondo, M., Martín, E., Callejón, G., & Hortas, M. L. (2015) Use of quality indicators to compare point-of-care testing errors in a neonatal unit and errors in a STAT central laboratory, *Clinical Chemistry and Laboratory Medicine (CCLM)*, vol. 53, no. 2, pp. 239-247.

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E., & Shekelle, P. G. (2006) Systematic review: impact of health information technology on quality, efficiency, and costs of medical care, *Annals of Internal Medicine*, vol. 144, no. 10, pp. 742-752.

Childers, C.P. and Maggard-Gibbons, M. (2018) Understanding costs of care in the operating room, *JAMA Surgery* [online]. vol. 153, no. 4, p. e176233.

Choi, M., & Roulston, K. (2015) Learning transfer in practice: A qualitative study of medical professionals' perspectives, *Human Resource Development Quarterly*, vol. 26, no. 3, pp. 249-273.

Cliff, B. (2012). Excellence in patient satisfaction within a patient-centered culture *Journal of Healthcare Management*, vol. 57, no. 3, pp. 157-159.

Coleman, P. (2021) Validity and reliability within qualitative research in the caring sciences. *International Journal of Caring Sciences*, vol. 14, no. 3 Available Internet: https://www.researchgate.net/publication/357876752_Special_Article_Validity_and_Reliability_within_Qualitative_Research_in_the_Caring_Sciences

- Coombs, N. C., Campbell, D. G., & Caringi, J. (2022). A qualitative study of rural healthcare providers' views of social, cultural, and programmatic barriers to healthcare access. *BMC Health Services Research*, 22(1), pp. 1-16.
- Cunningham, P.J. (2008) High medical cost burdens, patient trust, and perceived quality of care, *Journal of General Internal Medicine* [online] vol. 4, no. 3, pp. 415–420. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2642571/>.
- Cygańska, M., Kludacz-Alessandri, M. and Pyke, C. (2023) Healthcare costs and health status: insights from the SHARE Survey, *International Journal of Environmental Research and Public Health*, vol. 20, no. 2), p.1418. doi:<https://doi.org/10.3390/ijerph20021418>.
- Dawadi, S. (2020) Thematic analysis approach: a step by step guide for ELT research practitioners. *Journal of NELTA (Nepal English Language Teachers' Association)*, vol. 25, no. 1-2 Available Internet: <https://files.eric.ed.gov/fulltext/ED612353.pdf>
- Denicolo, P., Long, T. and Bradley-Cole, K. (2016) *Constructivist Approaches and Research Methods : a Practical Guide to Exploring Personal Meanings*. London: Sage Publications.
- Dixon, S., Glogowska, M., Garland, S., Hunt, H., Lasserson, D., & Hayward, G. (2021) Clinician perspectives on having point of care tests made available to them during out of hours home visiting, *BMC Family Practice*, vol. 22, pp. 1-8.
- Drain, P. K., & Rousseau, C. (2017) Point-of-care diagnostics: extending the laboratory network to reach the last mile, *Current Opinion in HIV and AIDS*, vol. 12, no. 2, p. 175.
- Eley, C. V., Sharma, A., Lecky, D. M., Lee, H., & McNulty, C. A. M. (2018) Qualitative study to explore the views of general practice staff on the use of point-of-care C reactive protein testing for the management of lower respiratory tract infections in routine general practice in England, *BMJOpen*, vol. 8, no. 10, e023925.
- Elhami, A. and Khoshnevisan, B. (2022) Conducting an interview in qualitative research: the modus operandi. *MEXTESOL Journal*, vol. 46, no. 1 Available Internet: <https://files.eric.ed.gov/fulltext/EJ1333875.pdf> [Accessed 25th August 2023]

- Engel, N. and Pant Pai, N. (2015) Qualitative research on point-of-care testing strategies and programs for HIV, *Expert Review of Molecular Diagnostics*, vol. 15, no. 1, pp. 71-75.
- Epstein, R. M., & Street, R. L. (2013) The values and value of patient-centered care, *The Annals of Family Medicine*, vol. 9, no. 2, pp. 100-103.
- Etikan, I., Musa, S. A. and Alkassim, R. S. (2015) Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, vol. 5, no. 1 Available Internet: <https://doi.org/10.11648/j.ajtas.20160501.11> [Accessed 24th August 2023]
- Ferguson, W. J., Kemp, K., & Kost, G. (2016) Using a geographic information system to enhance patient access to point-of-care diagnostics in a limited-resource setting, *International Journal of Health Geographics*, vol. 15, pp. 1-12.
- Fix, G. M., VanDeusen Lukas, C., Bolton, R. E., Hill, J. N., Mueller, N., LaVela, S. L., & Bokhour, B. G. (2018) Patient-centred care is a way of doing things: How healthcare employees conceptualize patient-centred care, *Health Expectations*, vol. 21, no. 1, pp. 300-307.
- Florkowski, C., Don-Wauchope, A., Gimenez, N., Rodriguez-Capote, K., Wils, J., & Zemlin, A. (2017) Point-of-care testing (POCT) and evidence-based laboratory medicine (EBLM)—does it leverage any advantage in clinical decision making?, *Critical Reviews in Clinical Laboratory Sciences*, vol. 54, no. 7-8, pp. 471-494.
- Foster, K., Despotis, G., & Scott, M. G. (2011) Point-of-care testing: cost issues and impact on hospital operations. *Clinics in Laboratory Medicine*, vol. 21, no. 2, pp. 269-284.
- Gentile, I., Schiano Moriello, N., Hopstaken, R., Llor, C., Melbye, H. and Senn, O. (2023) The role of CRP POC testing in the fight against antibiotic overuse in European primary care. Recommendations from a European expert panel, *Diagnostics*, vol. 13, no. 2, p.320. doi:<https://doi.org/10.3390/diagnostics13020320>.

Gjolaj, L. N., Gari, G. A., Olier-Pino, A. I., Garcia, J. D., & Fernandez, G. L. (2014). Decreasing laboratory turnaround time and patient wait time by implementing process improvement methodologies in an outpatient oncology infusion unit, *Journal of Oncology Practice*, vol. 10, no. 6, 380-382.

Global Point-of-Care Testing (POCT) Market – Industry Trends and Forecast to 2029 (2021). Data Bridge Market Research [online]. Available at: <https://www.databridgemarketresearch.com/reports/point-care-testing-poct-market> [Accessed on 10 August 2023].

Goertzen, M. J. (2017) Chapter 3 Introduction to quantitative research and data. *Library Technology Reports*, vol. 53, no. 4 Available Internet: <https://doi.org/10.5860/ltr.53n4> [Accessed 24th August 2023]

Goyder, C., San Tan, P., Verbakel, J., Ananthakumar, T., Lee, J. J., Hayward, G., & Van Den Bruel, A. (2020) Impact of point-of-care panel tests in ambulatory care: a systematic review and meta-analysis, *BMJ Open*, vol. 10, no. 2, e032132.

Guest, G., Namey, E. and Chen, M. (2020) A simple method to assess and report thematic saturation in qualitative research. *PLOS ONE*, vol. 15, no. 5 Available Internet: <https://doi.org/10.1371/journal.pone.0232076> [Accessed 25th August 2023]

Hardy, V., Thompson, M., Keppel, G. A., Alto, W., Dirac, M. A., Neher, J., & Cole, A. (2017). Qualitative study of primary care clinicians' views on point-of-care testing for C-reactive protein for acute respiratory tract infections in family medicine. *BMJ Open*, 7(1), e012503.

Haseltine, W.A. (2013) *Affordable excellence: the Singapore healthcare story: how to create and manage sustainable healthcare systems*, New York: Brookings Institution Press.

Hauck, K., Morton, A., Chalkidou, K., Chi, Y. L., Culyer, A., Levin, C., & Smith, P. C. (2019) How can we evaluate the cost-effectiveness of health system strengthening? A typology and illustrations, *Social Science & Medicine*, vol. 220, pp. 141-149.

- Hennink, M. and Kaiser, B. N. (2022) Sample sizes for saturation in qualitative research: a systematic review of empirical tests. *Social Science & Medicine*, vol. 292 Available Internet: <https://doi.org/10.1016/j.socscimed.2021.114523> [Accessed 25th August 2023]
- Ho, E., Michielsen, P., Van Damme, P., Ieven, M., Veldhuijzen, I. and Vanwolleghem, T. (2020) Point-of-Care Tests for Hepatitis B are associated with a higher linkage to care and lower cost compared to venepuncture sampling during outreach screenings in an Asian migrant population, *Annals of Global Health*, vol. 86, no. 1. doi:<https://doi.org/10.5334/aogh.2848>.
- Johannesson, P. and Perjons, E. (2014) Research strategies and methods. An introduction to design science, [online] pp.39–73. doi:https://doi.org/10.1007/978-3-319-10632-8_3.
- Junker, R., Schlebusch, H. and Lupp, P.B. (2010) Point-of-Care Testing in hospitals and primary care, *Deutsches Aerzteblatt Online* [online] vol. 107, no. 33. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2936038/>.
- Huddy, J. R., Ni, M. Z., Barlow, J., Majeed, A., & Hanna, G. B. (2016) Point-of-care C reactive protein for the diagnosis of lower respiratory tract infection in NHS primary care: a qualitative study of barriers and facilitators to adoption, *BMJ Open*, vol. 6. no. 3, p. e009959.
- Javanparast, S., Baum, F., Labonte, R., & Sanders, D. (2013) Community health workers' perspectives on their contribution to rural health and well-being in Iran, *American Journal of Public Health*, vol. 101, no. 12, pp. 2287-2292.
- Jones, P. (2012) Consultant nurses and their potential impact upon health care delivery, *Clinical Medicine*, vol. 2, no. 1, p. 39.
- Jones, C. H., Howick, J., Roberts, N. W., Price, C. P., Heneghan, C., Plüddemann, A., & Thompson, M. (2013) Primary care clinicians' attitudes towards point-of-care blood testing: a systematic review of qualitative studies, *BMC Family Practice*, vol. 14, pp. 1-9.

- Jung, W., Han, J., Choi, J.W. and Ahn, C.H. (2015) Point-of-care testing (POCT) diagnostic systems using microfluidic lab-on-a-chip technologies, *Microelectronic Engineering*, vol. 132, pp. 46-57.
- Kane, S., Radkar, A., Gadgil, M., & McPake, B. (2021) Community health workers as influential health system actors and not ‘just another pair of hands’, *International Journal of Health Policy and Management*, vol. 10, no. 8, p. 465.
- Khalaf, I. A., Abu-Moghli, F. A., Callister, L. C., Mahadeen, A. I., Kaawa, K., & Zomot, A. F. (2015) Jordanian health care providers' perceptions of post-partum health care. *International Nursing Review*, vol. 56, no. 4, pp. 442-449.
- Kiger, M. E. and Varpio, L. (2020) Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical Teacher*, vol. 42, no. 8 Available Internet: <https://doi.org/10.1080/0142159X.2020.1755030>
- Kim, J. H., Lee, J. Y., Kwon, J. H., Cho, H. R., Lee, J. S., & Ryu, J. M. (2020) Point-of-care ultrasound could streamline the emergency department workflow of clinically nonspecific intussusception, *Pediatric Emergency Care*, vol. 36, no. 2, pp. e90-e95.
- Kost, G. J., Katip, P., Kulrattanamaneepon, S., & Gentile, N. (2013) Point-of-care testing value proposition for disaster preparedness in small-world networks: Post-tsunami Phang Nga Province, coastal Thailand, *Point of Care*, vol. 12, no. 1, pp. 9-22.
- Lee, D.J., Kumarasamy, N., Resch, S.C., Sivaramakrishnan, G.N., Mayer, K.H., Tripathy, S., Paltiel, A.D., Freedberg, K.A. and Reddy, K.P. (2019) Rapid, point-of-care diagnosis of tuberculosis with novel Truenat assay: Cost-effectiveness analysis for India’s public sector. Subbian, S., ed. *PLOS ONE* [online]. vol. 14, no. 7, p. e0218890.
- Lee-Lewandrowski, E., & Lewandrowski, K. (2013) Perspectives on cost and outcomes for point-of-care testing, *Clinics in Laboratory Medicine*, vol. 29, np. 3, pp. 479-489.

- Leung, L. (2015) Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care*, vol. 4, no. 3 Available Internet: <https://doi.org/10.4103%2F2249-4863.161306>
- Lingervelder, D., Koffijberg, H., Emery, J.D., Fennessy, P., Price, C.P., van Marwijk, H., Eide, T.B., Sandberg, S., Cals, J.W.L., Derksen, J.T.M., Kusters, R. and IJzerman, M.J. (2021) How to realize the benefits of Point-of-Care Testing at the general practice: A comparison of four high-income countries, *International Journal of Health Policy and Management*, vol. 11, no. 10. doi:<https://doi.org/10.34172/ijhpm.2021.143>.
- Liu, X., Zhu, X., Kost, G.J., Liu, J., Huang, J. and Liu, X. (2019) The creation of point-of-careology, *Point of Care*, vol. 18, no. 3, pp. 77-84.
- Luppa, P.B., Müller, C., Schlichtiger, A. and Schlebusch, H. (2011) Point-of-care Testing (POCT): Current techniques and future perspectives, *TrAC Trends in Analytical Chemistry*, [online] vol. 30, no. 6, pp.887–898. doi:<https://doi.org/10.1016/j.trac.2011.01.019>.
- Luxford, K., Safran, D. G., & Delbanco, T. (2013) Promoting patient-centered care: a qualitative study of facilitators and barriers in healthcare organizations with a reputation for improving the patient experience, *International Journal for Quality in Health Care*, vol. 23, no. 5, pp. 510-515.
- McClung, L., Obasi, C., Knobloch, M. J., & Safdar, N. (2017) Health care worker perspectives of their motivation to reduce health care–associated infections, *American Journal of Infection Control*, vol. 45, no. 10, pp. 1064-1068.
- McWilliams, S.A. (2015). Cultivating constructivism: Inspiring intuition and promoting process and pragmatism, *Journal of Constructivist Psychology*, vol. 29, no. 1, pp.1–29. doi:<https://doi.org/10.1080/10720537.2014.980871>.
- Mokhele, T., Manyapelolo, T., Sifunda, S., Dukhi, N., Sewpaul, R., Naidoo, I., & Reddy, P. (2022) Factors Influencing Healthcare Workers' Perception of South African Health System Capability for Managing COVID-19 Pandemic, *The Open Public Health Journal*, vol. 15, no. 1, pp. 1-5.

- Mohajan, H. K. (2017) Two criteria for good measurements in research: validity and reliability. *Annals of Spiru Haret University*, vol. 17, no. 4 Available Internet: https://mpa.ub.uni-muenchen.de/83458/1/MPRA_paper_83458.pdf
- Mwita, K. M. (2022) Strengths and weaknesses of qualitative research in social science studies. *International Journal of Research in Business and SOcial Science*, vol. 11, no. 6 Available Internet: <http://dx.doi.org/10.20525/ijrbs.v11i6.1920> [Accessed 24th August 2023]
- Naz., N., Gulab, F. and Aslam, M. (2022) Development of qualitative semi-structured interview guide for case study research. *Competitive Social Sciences Research Journal*, vol. 3, no. 2 Available Internet: <https://cssrjournal.com/index.php/cssrjournal/article/view/170/72> [Accessed 25th August 2023]
- Nelson, K. M., Helfrich, C., Sun, H., Hebert, P. L., Liu, C. F., Dolan, E., & Fihn, S. D. (2014) Implementation of the patient-centered medical home in the Veterans Health Administration: associations with patient satisfaction, quality of care, staff burnout, and hospital and emergency department use, *JAMA Internal Medicine*, vol. 174, no. 8, pp. 1350-1358.
- Nichols, J.H. (2020) Point-of-care Testing. *Contemporary Practice in Clinical Chemistry* [online]. pp. 323–336.
- O'Brien, B.C., Harris, I.B., Beckman, T.J., Reed, D.A. and Cook, D.A. (2014) Standards for reporting qualitative research, *Academic Medicine*, [online] vol. 89, no. 9, pp.1245–1251. doi:<https://doi.org/10.1097/acm.0000000000000388>.
- O'Kane, M. J., McManus, P., McGowan, N., & Lynch, P. M. (2011) Quality error rates in point-of-care testing, *Clinical chemistry*, vol. 57, np. 9, pp. 1267-1271.
- Owusu-Edusei, K., Gift, T.L. and Ballard, R.C. (2011) Cost-rffectiveness of a dual non-treponemal/treponemal syphilis Point-of-Care Test to prevent adverse ptegnancy outcomes in Sub-Saharan Africa, *Sexually Transmitted Diseases*, vol. 38, no. 11, pp.997–1003. doi:<https://doi.org/10.1097/olq.0b013e3182260987>.

- Palmer, L., Nyström, M., Lindberg, E. and Karlsson, K. (2022) Pre-understanding - a threat to validity in qualitative caring science research? *International Journal for Human Caring*, vol. 26, no. 4 Available Internet: <https://doi.org/10.20467/IJHC-2021-0013>
- Paradis, E., Brien, B.O., Nimmon, L., Bandiera, G. and Martimianakis, M.A. (Tina) (2018) Design: Selection of data collection methods, *Journal of Graduate Medical Education*, [online] vol. 8, no. 2), pp.263–264. doi:<https://doi.org/10.4300/JGME-D-16-00098.1>.
- Pathak, V., Jena, B., & Kalra, S. (2013) Qualitative research, *Perspectives in Clinical Research*, vol. 4. no. 3, p. 192.
- Pecoraro, V., Germagnoli, L. and Banfi, G. (2014) Point-of-care testing: where is the evidence? A systematic survey, *Clinical Chemistry and Laboratory Medicine (CCLM)*, vol. 52 no. 3, pp. 313-324.
- Plebani, M. (2019) Does POCT reduce the risk of error in laboratory testing?, *Clinica Chimica Acta*, vol. 404, no. 1, pp. 59-64.
- Price, C.P., Smith, I. and Van den Bruel, A. (2018) Improving the quality of point-of-care testing, *Family Practice* vol. 35, no. 4, pp. 358-364.
- Pritchard, D., Petrilla, A., Hallinan, S., Taylor, D.H., Schabert, V.F. and Dubois, R.W. (2016) What contributes most to high health care costs? Health care spending in high resource patients, *Journal of Managed Care & Specialty Pharmacy* [online]. vol. 22, no. 2, pp. 102–109.
- Quinn, A.D., Dixon, D. and Meenan, B.J. (2016) Barriers to hospital-based clinical adoption of point-of-care testing (POCT): a systematic narrative review, *Critical Reviews in Clinical Laboratory Sciences*, vol. 53, no. 1, pp. 1-12.
- Raamanathan, A., Simmons, G. W., Christodoulides, N., Floriano, P. N., Furnaga, W. B., Redding, S. W., & McDevitt, J. T. (2012) Programmable bio-nano-chip systems for serum CA125 quantification: toward ovarian cancer diagnostics at the point-of-care, *Cancer Prevention Research*, vol. 5, no. 5, pp. 706-716.

- Rahamat-Langendoen, J., Groenewoud, H., Kuijpers, J., Melchers, W.J.G. and van der Wilt, G.J. (2019) Impact of molecular point-of-care testing on clinical management and in-hospital costs of patients suspected of influenza or RSV infection: a modeling study, *Journal of Medical Virology*, [online] vol. 91, no. 8), pp.1408–1414.
doi:<https://doi.org/10.1002/jmv.25479>.
- Rasti, R., Nanjebe, D., Karlström, J., Muchunguzi, C., Mwanga-Amumpaire, J., Gantelius, J., & Alfven, T. (2017) Health care workers' perceptions of point-of-care testing in a low-income country—A qualitative study in Southwestern Uganda. *PLoS One*, vol. 12, no. 7, p. e0182005.
- Rose, J. and Johnson, C. W. (2020) Contextualizing reliability and validity in qualitative research: toward more rigorous and trustworthy qualitative social science in leisure research. *Journal of Leisure Research*, vol. 51, no. 4 Available Internet: <http://dx.doi.org/10.1080/00222216.2020.1722042>
- Ruslin, R., Mashuri, S., Rasak, M. S. A., Alhabsyi, F. and Syam, H. (2022) Semi-structured interview: a methodological reflection on the development of a qualitative research instrument in educational studies. *Journal of Research & Method in Education*, vol. 12, no. 1 Available Internet: <http://dx.doi.org/10.9790/7388-1201052229> [Accessed 25th August 2023]
- Ryan, P., Valencia, J., Cuevas, G., Troya, J., Ramon, C., Rodríguez, A., & Resino, S. (2021) HCV screening based on dried blood samples and linkage to care in people who use drugs: a prospective study, *International Journal of Drug Policy*, vol. 92, 103134.
- Safriet, B. J. (2011) Federal options for maximizing the value of advanced practice nurses in providing quality, cost-effective health care. *The future of nursing: leading change, advancing health*. Washington, DC: Institute of Medicine, pp. 443-75.
- Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H. and Jinks, C. (2017) Saturation in qualitative research: exploring its conceptualization and

- operationalization. *Quality & Quantity*, vol. 52, no. 4 Available Internet: <https://doi.org/10.1007%2Fs11135-017-0574-8> [Accessed 25th August 2023]
- Selvarajah, D., Kar, D., Khunti, K., Davies, M. J., Scott, A. R., Walker, J., & Tesfaye, S. (2019) Diabetic peripheral neuropathy: advances in diagnosis and strategies for screening and early intervention, *The Lancet Diabetes & Endocrinology*, vol. 7, no. 12, pp. 938-948.
- Setia, M. S. (2016) Methodology series module 3: cross-sectional studies. *Indian Journal of Dermatology*, vol. 61, no. 3 Available Internet: <https://doi.org/10.4103%2F0019-5154.182410> [Accessed 24th August 2023]
- Shaw, J.L.V. (2020) Point-of-Care Testing: the good, the bad, and the laboratory oversight, *The Journal of Applied Laboratory Medicine* [online]. vol. 6 , no. 4), pp. 1090–1093.
- Shaw, J. L. (2016) Practical challenges related to point of care testing, *Practical laboratory medicine*, vol. 4, pp. 22-29.
- Shephard, M., Shephard, A., Matthews, S. and Andrewartha, K. (2020) The benefits and challenges of Point-of-Care Testing in rural and remote primary care settings in Australia, *Archives of Pathology & Laboratory Medicine*, vol. 144, no. 11), pp.1372–1380. doi:<https://doi.org/10.5858/arpa.2020-0105-ra>.
- Shrank, W.H., DeParle, N.-A., Gottlieb, S., Jain, S.H., Orszag, P., Powers, B.W. and Wilensky, G.R. (2021) Health costs and financing: Challenges and strategies for a new administration, *Health Affairs* [online]. vol. 40, no. 2, pp. 235–242.
- Shrivastava, S., Trung, T.Q. and Lee, N.-E. (2020) Recent progress, challenges, and prospects of fully integrated mobile and wearable point-of-care testing systems for self-testing, *Chemical Society Reviews* [online]. vol. 49, no. 6, pp. 1812–1866.
- Sinaiko, A., Szumigalski, K., Eastman, D. and Chien, A. (2019) Delivery of patient centered care in the U.S. health care system: What Is standing in its way? [online] Robert Wood Johnson Foundation. Available at: https://academyhealth.org/sites/default/files/deliverypatientcenteredcare_august2019.pdf.

- Skopec, M., Issa, H., & Harris, M. (2019) Delivering cost effective healthcare through reverse innovation. *BMJ*, p. 367.
- Soley-Bori, M., Ashworth, M., Bisquera, A., Dodhia, H., Lynch, R., Wang, Y. and Fox-Rushby, J. (2020) Impact of multimorbidity on healthcare costs and utilisation: a systematic review of the UK literature. *British Journal of General Practice* [online]. 71 (702), pp. e39–e46. Available from: <https://bjgp.org/content/71/702/e39>.
- Soraya, S., Kamal, A. and Binti, L. (2019) Research paradigm and the philosophical foundations of a qualitative study, *PEOPLE: International Journal of Social Sciences*, [online] vol. 4, no. 3, pp.1386–1394. doi:<https://doi.org/10.20319/pijss.2019.43.13861394>.
- Taherdoost, H. (2022) What are different research approaches? Comprehensive review of qualitative, quantitative, and mixed method research, their applications, types, and limitations. *Journal of Management Science & Engineering Research*, vol. 5, no. 1 Available Internet: <https://doi.org/10.30564/jmser.v5i1.4538> [Accessed 24th August 2023]
- Tan, C.C. *et al.* (2021) Singapore’s health-care system: key features, challenges, and shifts, *The Lancet*, vol. 398, no. 10305, pp. 1091–1104. Available at: [https://doi.org/10.1016/s0140-6736\(21\)00252-x](https://doi.org/10.1016/s0140-6736(21)00252-x).
- Tan, Q., Hildon, Z.J., Singh, S., Jing, J., Thein, T.L., Coker, R., Vrijhoef, H.J. and Leo, Y.S. (2017) Comparing patient and healthcare worker experiences during a dengue outbreak in Singapore: understanding the patient journey and the introduction of a point-of-care test (POCT) toward better care delivery, *BMC Infectious Diseases*, vol. 17, no. 1, pp. 1-16.
- Teebagy, S., Wang, Z., Dunlap, D., Saleeba, C., DiMezza, D., Crain, J., Lilly, C.M., Buchholz, B., McManus, D.D. and Hafer, N. (2022) Understanding healthcare professionals’ perspectives on Point-of-Care Testing, *Diagnostics* (Basel, Switzerland), [online] vol. 12, no. 2, p.533. doi:<https://doi.org/10.3390/diagnostics12020533>.
- Tenny, S., Brannan, J. M. and Brannan, G. D. (2022) Qualitative study StatPearls Available Internet: <https://www.ncbi.nlm.nih.gov/books/NBK470395/> [Accessed 24th August 2023]

- Varpio, L., O'Brien, B., Rees, C.E., Monrouxe, L., Ajjawi, R. and Paradis, E. (2020) The applicability of generalisability and bias to health professions education's research, *Medical Education*, vol. 55, no. 2. doi:<https://doi.org/10.1111/medu.14348>.
- Vesely, S. and Klöckner, C. A. (2020) Social desirability in environmental psychology research: three meta-analyses. *Frontiers in Psychology*, vol. 11 Available Internet: <https://doi.org/10.3389/fpsyg.2020.01395> [Accessed 24th August 2023]
- Walia, K. (2013) Point of care investigations in pediatric care to improve health care in rural areas, *The Indian Journal of Pediatrics*, vol. 80, pp. 576-584.
- Wang, C., Liu, M., Wang, Z., Li, S., Deng, Y. and He, N. (2021) Point-of-care diagnostics for infectious diseases: from methods to devices, *Nano Today*, [online] vol. 37, p.101092. doi:<https://doi.org/10.1016/j.nantod.2021.101092>.
- Wang, H., Luo, P., Wu, Y., & Zeng, X. (2022) Factors and optimizations of healthcare workers' perception in alternative care facilities, *Frontiers in Public Health*, vol. 10, p. 891503.
- Wang, X. and Cheng, Z. (2020) Cross-sectional studies: strengths, weaknesses, and recommendations. *CHEST*, vol. 158, no. 1 Available Internet: <https://doi.org/10.1016/j.chest.2020.03.012> [Accessed 24th August 2023]
- Watson, S. I., Sahota, H., Taylor, C. A., Chen, Y. F., & Lilford, R. J. (2018) Cost-effectiveness of health care service delivery interventions in low and middle income countries: a systematic review, *Global Health Research and Policy*, vol. 3, no. 1, pp. 1-14.
- Weinberg, D. B., Avgar, A. C., Sugrue, N. M., & Cooney-Miner, D. (2013) The importance of a high-performance work environment in hospitals, *Health Services Research*, vol. 48, no. 1, pp. 319-332.
- Whiting, P. et al. (2015) Viscoelastic point-of-care testing to assist with the diagnosis, management and monitoring of haemostasis: A systematic review and cost-effectiveness analysis, *Health Technology Assessment* [online]. vol. 19 (58), pp. 1–228.

- Wilkes, L., Luck, L., & O’Baugh, J. (2015) The role of a clinical nurse consultant in an Australian Health District: a quantitative survey, *BMC Nursing*, vol. 14, no. 1, pp. 1-7.
- Wool, G.D. (2018) Benefits and pitfalls of Point-of-Care coagulation testing for anticoagulation management, *American Journal of Clinical Pathology*, vol. 151, no. 1, pp.1–17.
doi:<https://doi.org/10.1093/ajcp/aqy087>.
- You, J.H.S., Tam, L. and Lee, N.L.S. (2017) Cost-effectiveness of molecular point-of-care testing for influenza viruses in elderly patients at ambulatory care setting. Qiu, C., ed. *PLoS ONE* [online]. vol. 12 , no. 7a, p. e0182091.
- Zadran, A., & Kost, G. J. (2019) Enabling rapid intervention and isolation for patients with highly infectious diseases at points of need, *Journal of Hospital Management and Health Policy*, vol. 4, pp. 1-7.

APPENDIX: INTERVIEW QUESTIONS AND TRANSCRIPTS

Respondent #1

Part 1: Demographic Details

- Please indicate your age.
 - ☒ 25-35 years old
 - ☐ 36- 45 years old
 - ☐ 46-55 years old
 - ☐ 56-65 years old
 - ☐ 66 years old above
- Please specify your sex.
 - ☒ Male
 - ☐ Female
- Please state your current job position? emergency staff nurse
- How many years have you worked in healthcare overall?
 - ☒ 1-5 years
 - ☐ 6-10 years
 - ☐ 11-20 years
 - ☐ more than 20 years
- How long have you been administering point of care testing (POCT) to patients? Please check the most appropriate box.
 - ☐ at least one year
 - ☒ 2-5 years
 - ☐ 6-10 years
 - ☐ more than 10 years
- What type of primary care facility do you work in?
 - ☒ hospital
 - ☐ clinic
 - ☐ urgent/special care center

_____ other (please specify _____)

- Specialisation if applicable: _____

Part 2: Health Workers' POCT Experience

1. Can you describe your role and responsibilities as a healthcare worker and how POCT is integrated into your daily tasks?

As an emergency staff nurse, my role involves rapid assessment and initial care of patients in critical conditions. POCT is integrated into my daily tasks by allowing me to quickly perform essential tests like glucose levels, cardiac markers, and blood gas analysis directly at the patient's bedside.

2. What specific POCT procedures or tests have you been involved in?

I've been involved in administering POCT procedures for glucose monitoring, troponin testing, and blood gas analysis.

Follow up question: How do they compare to traditional testing methods in terms of efficiency and time savings?

These tests are notably more efficient than traditional methods, providing immediate results without the need to send samples to the central laboratory.

3. How has your experience with POCT influenced your workflow, patient interactions, and overall job satisfaction?

POCT has improved my workflow by expediting diagnostic processes and enabling prompt intervention. It has enhanced patient interactions as I can discuss results and treatment options in real-time, improving overall job satisfaction.

4. Can you share any challenges or advantages you've encountered while using POCT from a healthcare worker's perspective?

Challenges include device maintenance and occasional technical glitches. Advantages include faster decision-making and reduced patient wait times for results.

Part 3: POCT's Impact on Hospital Operation Costs

1. From your observations and experiences, how do you believe the adoption of POCT has affected the overall operational costs of the hospital?

The adoption of POCT has positively influenced operational costs by streamlining patient care and reducing the need for extensive laboratory processing. This has the potential to lower overall cost.

2. Can you provide examples of cost savings or cost increases that can be attributed to the implementation of POCT in different areas of hospital operations?

POCT implementation has led to cost savings by reducing the time patients spend in the emergency department, optimising bed utilisation, and enhancing resource allocation.

3. In your view, how has POCT influenced patient throughput, bed utilisation, and resource allocation within the hospital setting?

In my view, POCT has improved patient throughput by minimising delays caused by waiting for lab results. Bed utilisation has been optimised and resources can be allocated more efficiently based on real-time test results.

4. Have there been any unexpected financial implications or adjustments required due to the integration of POCT into hospital operations?

I think that even though the integration of POCT has shown promising benefits, some adjustments were needed in terms of training and initial setup, which had financial implications. But the long-term benefits outweigh these initial challenges.

Part 4: Improving POCT Cost-Effectiveness: Recommendations

1. Based on your understanding and experience, what strategies or practices could be implemented to further enhance the cost-effectiveness of POCT in a hospital environment?

To enhance the cost-effectiveness of POCT, there must be regular maintenance and calibration of devices. Those should be emphasised to prevent downtime and costly repairs.

2. Are there specific areas or departments within the hospital where POCT could have a greater potential for cost reduction?

POCT could significantly reduce costs in departments like the emergency room and critical care units; these are where quick decision-making is crucial.

Follow up question: If so, how could these opportunities be realised?

To optimise potential? Ensuring adequate training for staff in these areas.

3. What collaborations or partnerships do you think could contribute to optimising the financial impact of POCT while maintaining quality patient care?

Collaborations between clinical staff, laboratory personnel, and hospital administrators can optimise POCT's financial impact. Regular feedback sessions can identify any area for improvement.

4. In your opinion, what balance should be struck between the upfront investment in POCT technology and the potential long-term cost savings it offers?

Striking a balance between upfront investment in POCT technology and long-term savings requires a comprehensive cost-benefit analysis. I'll give an example---investing in reliable devices that offer accurate and rapid results can lead to substantial cost savings over time.

Respondent #2

Part 1: Demographic Details

- Please indicate your age.
☐ 25-35 years old
☒ 36- 45 years old
☐ 46-55 years old
☐ 56-65 years old
☐ 66 years old above
- Please specify your sex.
☒ Male
☐ Female
- Please state your current job position? ICU nurse
- How many years have you worked in healthcare overall?
☐ 1-5 years
☐ 6-10 years
☒ 11-20 years
☐ more than 20 years
- How long have you been administering point of care testing (POCT) to patients? Please check the most appropriate box.
☐ at least one year
☒ 2-5 years
☐ 6-10 years
☐ more than 10 years
- What type of primary care facility do you work in?
☒ hospital
☐ clinic
☐ urgent/special care center
☐ other (please specify _____)
- Specialisation if applicable: _____

Part 2: Health Workers' POCT Experience

1. Can you describe your role and responsibilities as a healthcare worker and how POCT is integrated into your daily tasks?

My role is to provide immediate care to patients in critical conditions. I administer various medical procedures to rapidly assess and initiate treatment. POCT is seamlessly integrated into my daily tasks, enabling swift diagnostics and timely interventions.

2. What specific POCT procedures or tests have you been involved in?

I've been actively involved in performing POCT procedures such as cardiac marker testing, rapid strep testing, and electrolyte testing. These procedures offer rapid results, allowing for quick decision-making in urgent cases.

Follow up question: How do they compare to traditional testing methods in terms of efficiency and time savings?

In terms of efficiency and time savings, POCT significantly outperforms traditional laboratory methods, ensuring timely patient care.

3. How has your experience with POCT influenced your workflow, patient interactions, and overall job satisfaction?

My experience with POCT has revolutionised my workflow, enhancing patient interactions. Real-time test results enable immediate treatment adjustments, improving patient outcomes. The ability to provide prompt answers to patients' questions and their families fosters trust and positively impacts their experiences.

4. Can you share any challenges or advantages you've encountered while using POCT from a healthcare worker's perspective?

For me, the advantages of using POCT are evident in its speed and accuracy, because it enables rapid diagnosis and interventions. Yet, there are challenges, of course. These include ensuring proper device maintenance and calibration to ensure reliable results. Additionally,

seamless integration of POCT data into electronic health records can present technical complexity.

Part 3: POCT's Impact on Hospital Operation Costs

1. From your observations and experiences, how do you believe the adoption of POCT has affected the overall operational costs of the hospital?

From my observations and experiences, the adoption of POCT has had a positive impact on the overall operational costs of the hospital. Quicker diagnostics and timely interventions through POCT have contributed to reduced patient wait times and potentially lowered costs associated with extended hospital stay.

2. Can you provide examples of cost savings or cost increases that can be attributed to the implementation of POCT in different areas of hospital operations?

POCT implementation in the emergency department has led to significant cost savings. Rapid diagnoses through POCT have resulted in faster decision-making, enabling timely interventions and streamlined patient care.

3. In your view, how has POCT influenced patient throughput, bed utilisation, and resource allocation within the hospital setting?

In my view, POCT has positively influenced patient throughput by expediting diagnostics, thereby optimizing bed utilisation and enhancing resource allocation. This real-time approach to patient care improves efficiency throughout the hospital setting.

4. Have there been any unexpected financial implications or adjustments required due to the integration of POCT into hospital operations?

I must admit that there were initial adjustments related to equipment acquisition and maintenance, but the long-term benefits of reduced patient stays and improved outcomes have far outweighed these challenges. So yeah, I believe that POCT leads to improved cost-effectiveness.

Part 4: Improving POCT Cost-Effectiveness: Recommendations

1. Based on your understanding and experience, what strategies or practices could be implemented to further enhance the cost-effectiveness of POCT in a hospital environment?

I believe that ongoing training for POCT operators is crucial, as well as ensuring competence among operators to maintain result accuracy and reduces the need for retesting.

2. Are there specific areas or departments within the hospital where POCT could have a greater potential for cost reduction?

I think among these critical care areas, the emergency department holds the most potential for substantial cost reduction through optimised POCT use.

Follow up question: If so, how could these opportunities be realised?

Tailored training and streamlined processes in these departments can maximise POCT's impact.

3. What collaborations or partnerships do you think could contribute to optimising the financial impact of POCT while maintaining quality patient care?

From my experience and observation, collaborative efforts between doctors, hospital staff, laboratory personnel, and the management are essential for optimising the financial impact of POCT while maintaining patient care quality. Effective communication and joint decision-making ensure efficient device management and continuous improvement.

4. In your opinion, what balance should be struck between the upfront investment in POCT technology and the potential long-term cost savings it offers?

As for me, striking a balance between upfront investment in POCT technology and long-term cost savings necessitates a thorough cost-benefit analysis. We need to prioritise reliable

and accurate POCT technology. The initial investment may be high but I believe that this can lead to significant cost savings over time.

Respondent #3

- Please indicate your age.
 - ☐ 25-35 years old
 - ☒ 36- 45 years old
 - ☐ 46-55 years old
 - ☐ 56-65 years old
 - ☐ 66 years old above
- Please specify your sex.
 - ☐ Male
 - ☒ Female
- Please state your current job position? OB/Gynecologist
- How many years have you worked in healthcare overall?
 - ☐ 1-5 years
 - ☐ 6-10 years
 - ☒ 11-20 years
 - ☐ more than 20 years
- How long have you been administering point of care testing (POCT) to patients? Please check the most appropriate box.
 - ☐ at least one year
 - ☐ 2-5 years
 - ☒ 6-10 years
 - ☐ more than 10 years
- What type of primary care facility do you work in?
 - ☒ hospital
 - ☐ clinic
 - ☐ urgent/special care center
 - ☐ other (please specify _____)

- Specialisation if applicable: obstetrics and gynecology

Part 1: Health Workers' POCT Experience

1. Can you describe your role and responsibilities as a healthcare worker and how POCT is integrated into your daily tasks?

Well, I've been an OB/Gyn for over a decade now. My days are usually filled with a mix of prenatal and gynecological care for women. When it comes to Point of Care Testing (POCT), it's become an integral part of how we provide timely care to our patients.

2. What specific POCT procedures or tests have you been involved in?

In my role, I've administered various POCT procedures like glucose testing for gestational diabetes, urine dipstick tests for infections, and even rapid streptococcal tests for certain gynecological concerns.

Follow up question: How do they compare to traditional testing methods in terms of efficiency and time savings?

Comparing them to traditional methods, POCT's efficiency shines through, especially in time-sensitive situations.

3. How has your experience with POCT influenced your workflow, patient interactions, and overall job satisfaction?

POCT has really influenced my interactions with patients. It allows us to have informed discussions right then and there, which makes a big difference in their understanding and decisions. As for my job satisfaction, seeing immediate results that guide our care plans is definitely rewarding.

4. Can you share any challenges or advantages you've encountered while using POCT from a healthcare worker's perspective?

Challenges wise, ensuring proper equipment maintenance can be a bit of a juggling act. Initial costs are also expensive. However, the advantages far outweigh them – quick answers, immediate interventions, and improved patient engagement.

Part 2: POCT's Impact on Hospital Operation Costs

1. From your observations and experiences, how do you believe the adoption of POCT has affected the overall operational costs of the hospital?

Well, the use of POCT has helped in improving the overall operational costs of utilisation. Because of quick decision-making, there's reduced patient stay. The same advantage is seen in how we allocate and utilise hospital resources. I can say that POCT helps in saving operational costs.

2. Can you provide examples of cost savings or cost increases that can be attributed to the implementation of POCT in different areas of hospital operations?

Obviously, there is pregnancy testing. Another area where we've seen significant savings is through immediate diagnoses. When we swiftly obtain POCT results for conditions like urinary tract infections (UTIs) or bacterial vaginosis, it allows us to initiate treatment promptly. This can prevent complications and potential hospital admissions.

3. In your view, how has POCT influenced patient throughput, bed utilisation, and resource allocation within the hospital setting?

In terms of patient throughput, POCT's fast results mean we can manage cases promptly, helping optimise bed allocation. Resource allocation, too, has improved as we can focus on areas needing attention without unnecessary delays.

4. Have there been any unexpected financial implications or adjustments required due to the integration of POCT into hospital operations?

We did need to adjust some budgeting due to initial equipment costs and training of some staff in using them, but the long-term benefits – reduced stays and improved patient outcomes – justify the investment.

Part 3: Improving POCT Cost-Effectiveness: Recommendations

1. Based on your understanding and experience, what strategies or practices could be implemented to further enhance the cost-effectiveness of POCT in a hospital environment?

Further enhancing cost-effectiveness involves consistent training for POCT operators. Ensuring everyone is skilled guarantees accurate results, so that tests will not be done over and over again.

2. Are there specific areas or departments within the hospital where POCT could have a greater potential for cost reduction?

In my department of course. Obstetrics and gynecology departments could harness POCT's potential for cost reduction. POCT is advantageous in preoperative assessment. It's all about making sure our patients are good to go before surgeries, and that's a big deal. With POCT, we get those results in a jiffy, and that means we're in the know. We can confidently decide whether to move forward with procedures or not. It cuts down on those nail-biting last-minute cancellations or annoying delays. Our operating rooms run smoother, and our hardworking healthcare team is utilised just right.

Follow up question: If so, how could these opportunities be realised?

(There was no need to ask these question as the interviewee has been comprehensive in her previous answer.)

3. What collaborations or partnerships do you think could contribute to optimising the financial impact of POCT while maintaining quality patient care?

Collaborations between departments, like working closely with the laboratory team, could help optimise POCT's financial impact. Efficient device management and data integration are crucial for cost-effectiveness.

4. In your opinion, what balance should be struck between the upfront investment in POCT technology and the potential long-term cost savings it offers?

It's a balancing act, really. Investing upfront in reliable POCT technology pays off in the long run with reduced costs due to faster diagnostics and more targeted patient care

Respondent #4

Part 1: Demographic Details

- Please indicate your age.
 - ☐ 25-35 years old
 - ☐ 36- 45 years old
 - ☒ 46-55 years old
 - ☐ 56-65 years old
 - ☐ 66 years old above
- Please specify your sex.
 - ☐ Male
 - ☒ Female
- Please state your current job position? pulmonologist
- How many years have you worked in healthcare overall?
 - ☐ 1-5 years
 - ☐ 6-10 years
 - ☒ 11-20 years
 - ☐ more than 20 years

- How long have you been administering point of care testing (POCT) to patients? Please check the most appropriate box.
☐ at least one year
☐ 2-5 years
☐ 6-10 years
☒ more than 10 years
- What type of primary care facility do you work in?
☒ hospital
☐ clinic
☐ urgent/special care center
☐ other (please specify _____)
- Specialisation if applicable: _____

Part 2: Health Workers' POCT Experience

1. Can you describe your role and responsibilities as a healthcare worker and how POCT is integrated into your daily tasks?

I'm a pulmonologist, so my work revolves around diagnosing and treating all things related to the lungs. POCT has become a trusty assistant of mine. Think of it as having a mini lab right by my side. When I suspect a respiratory issue, I can do quick tests like rapid flu checks.

2. What specific POCT procedures or tests have you been involved in?

I do ABGs or arterial blood tests. I use them when checking how well someone is breathing.

Follow up question: How do they compare to traditional testing methods in terms of efficiency and time savings?

Compared to traditional lab tests...POCT is like getting instant results from your favorite food delivery app. Quick, efficient, and no waiting around.

3. How has your experience with POCT influenced your workflow, patient interactions, and overall job satisfaction?

Oh, it's been a game-changer, no doubt. My workflow's gone from 'wait and see' to 'know and act.' Patients appreciate the quick answers, and it gives us a chance to have more meaningful chats. When you can explain things on the spot, it makes a real connection, and it gives a whole new meaning to job satisfaction.

4. Can you share any challenges or advantages you've encountered while using POCT from a healthcare worker's perspective?

Every rose has its thorns, right? Training and quality control for POCT devices can be a handful...but it's worth it. On the bright side, there are benefits. We're talking about being in the know pronto, making informed decisions, and getting ahead of potential complications. So yeah, the advantages tip the scale big time.

Part 3: POCT's Impact on Hospital Operation Costs

1. From your observations and experiences, how do you believe the adoption of POCT has affected the overall operational costs of the hospital?

POCT has been a real big help for us, especially for cost optimisation. I'm also a member of this hospital's board so I know how POCT has benefitted this organisation. Faster diagnostics mean shorter hospital stays and fewer resources hogged up.

2. Can you provide examples of cost savings or cost increases that can be attributed to the implementation of POCT in different areas of hospital operations?

Take my clinic for instance. POCT gives us the scoop on patients' oxygen levels in an instant. That precision fine-tuning means less complications, shorter stays, and some serious cost savings.

3. In your view, how has POCT influenced patient throughput, bed utilisation, and resource allocation within the hospital setting?

It's like having a speed-pass. Quicker diagnoses mean faster decisions. That means patients, and us as well, move through like a well-oiled machine. We free up hospital beds and allocate the right resources for those who need them the most.

4. Have there been any unexpected financial implications or adjustments required due to the integration of POCT into hospital operations?

Sure, there's training and maintenance to consider, but when you see the improved patient care and resource management, POCT is like a smart investment.

Part 4: Improving POCT Cost-Effectiveness: Recommendations

1. Based on your understanding and experience, what strategies or practices could be implemented to further enhance the cost-effectiveness of POCT in a hospital environment?

Cost hike up when there aren't rigorous training and quality checks because without those, these POCT devices would just constantly break down. As such, we've teamed up with diagnostic pros, the software kind, to know when to have these devices checked-up and to do simple maintenance on our own.

2. Are there specific areas or departments within the hospital where POCT could have a greater potential for cost reduction?

I think every department needs them but emergencies and critical care zones are the front-runners. Speedy diagnoses directly impact patient outcomes and hospital resources. Most of all, it saves lives.

Follow up question: If so, how could these opportunities be realised?

To make the most of it, it's all about streamlining the process, adding more tests to the POCT menu.

3. What collaborations or partnerships do you think could contribute to optimising the financial impact of POCT while maintaining quality patient care?

It's always about teamwork. Make sure that everyone who uses the POCT machines know how to handle them well and understand the vital role these equipment in our daily work. Once they get to know these important details, everything would be smooth sailing because everyone is on the same path.

4. In your opinion, what balance should be struck between the upfront investment in POCT technology and the potential long-term cost savings it offers?

At first, I was hesitant to agree with the board about purchasing POCT machines. I thought they weren't needed, especially with the high costs but I must admit that they were good investments. So you have to be sure whether the POCT machine you're going to get is really needed or could meet the demand in the hospital. If it's just an accessory that would make your hospital, just because you have it, then it's no longer an investment but an additional expense

Respondent #5

Part 1: Demographic Details

- Please indicate your age.
 - ☒ 25-35 years old
 - ☐ 36- 45 years old
 - ☐ 46-55 years old
 - ☐ 56-65 years old
 - ☐ 66 years old above
- Please specify your sex.
 - ☒ Male
 - ☐ Female

- Please state your current job position? medical technologist
- How many years have you worked in healthcare overall?
 - ☒ 1-5 years
 - ☐ 6-10 years
 - ☐ 11-20 years
 - ☐ more than 20 years
- How long have you been administering point of care testing (POCT) to patients? Please check the most appropriate box.
 - ☐ at least one year
 - ☒ 2-5 years
 - ☐ 6-10 years
 - ☐ more than 10 years
- What type of primary care facility do you work in?
 - ☒ hospital
 - ☐ clinic
 - ☐ urgent/special care center
 - ☐ other (please specify _____)
- Specialisation if applicable: _____

Part 2: Health Workers' POCT Experience

1. Can you describe your role and responsibilities as a healthcare worker and how POCT is integrated into your daily tasks?

My role as a medical technologist involves performing various diagnostic tests and analyses to support patient care. I am often called to a patient's bedside to conduct tests so that the patient no longer needs to come to the hospital's main laboratory.

2. What specific POCT procedures or tests have you been involved in?

Almost all of kinds of POCT tests that would need rapid results. I've been involved in conducting POCT procedures like glucose monitoring, coagulation studies, and rapid infectious disease tests.

Follow up question: How do they compare to traditional testing methods in terms of efficiency and time savings?

These procedures are notably quicker than traditional methods, saving valuable time and ensuring prompt patient management.

3. How has your experience with POCT influenced your workflow, patient interactions, and overall job satisfaction?

POCT has brought a positive shift in my workflow. I can swiftly generate test results, enabling more timely treatment decisions. Of course, not all laboratory tests can be done spontaneously, such as allergy testing, genetic testings, and anything that involves complex testing and microbiology culture. Some patients expect that even those things can be done now instantaneously so we have to explain to them what are involved in POCT and what are not. Generally, they do understand which positively impacts our interaction with them. Overall, it contributes to my job satisfaction, not only because it alleviates my work tasks but I see the similar satisfaction from patients.

4. Can you share any challenges or advantages you've encountered while using POCT from a healthcare worker's perspective?

One challenge is ensuring the proper calibration and maintenance of POCT devices to maintain accuracy. Remember, these are still electrical machines, powered by computers. They may be accurate but they need maintenance and updates. On the flip side, the advantages include reduced patient anxiety due to quicker results and enhanced patient engagement in their care

Part 3: POCT's Impact on Hospital Operation Costs

1. From your observations and experiences, how do you believe the adoption of POCT has affected the overall operational costs of the hospital?

The number of people in the central lab is reduced. Before, they had to schedule people who go to the lab so it won't be crowded but the implementation of POCT has reduced this crowd. Thus, the central lab does not need to open too early or close too late just to accommodate the huge number of people. It significantly reduced operational costs.

2. Can you provide examples of cost savings or cost increases that can be attributed to the implementation of POCT in different areas of hospital operations?

I think the departments that benefit a lot from POCT, cost-wise are those that handle critical care. Think about the NICU (Neonatal Intensive Care Unit). Utilising POCT allows for rapid assessment of crucial parameters in newborns, enabling timely interventions and tailored care plans. This swift decision-making can prevent unnecessary transfers or interventions, ensuring that fragile infants receive the right treatment at the right time.

3. In your view, how has POCT influenced patient throughput, bed utilisation, and resource allocation within the hospital setting?

POCT has certainly improved patient throughput. Quick results mean faster decision-making, which translates to quicker patient discharges and better utilisation of hospital resources. However, there are technical issues that also affect the areas mentioned. For example, if a POCT machine suddenly breaks down, the initial plan for patient care is discarded and a new one has to be devised, impacting resource allocation. That's why ensuring it's really important that the devices are functioning well.

4. Have there been any unexpected financial implications or adjustments required due to the integration of POCT into hospital operations?

I think any initial integration has financial implications. Of course, the staff has to be trained. The initial payment of these machines are also included. Some doctors are also hesitant to have the machines used for their patients, especially the older physicians who are really

traditional in their approach. They'd still tell their patients to go to the central lab even if a POCT machine can be used immediately. So for the first years, some machines are rarely used or are just sitting. They were just a waste.

Part 4: Improving POCT Cost-Effectiveness: Recommendations

1. Based on your understanding and experience, what strategies or practices could be implemented to further enhance the cost-effectiveness of POCT in a hospital environment?

Quality controls must always be implemented. A device is only as good as it is maintained and updated. Moreover, the hospital should ensure that the POCT they obtain could meet the patient demands so they can prevent possible instances of machines just sitting idly.

2. Are there specific areas or departments within the hospital where POCT could have a greater potential for cost reduction?

In critical care units, like the ICU, POCT could significantly reduce costs by enabling swift adjustments to patient treatment plans based on real-time results, as well as reducing patients wrongly assessed because of delayed lab results.

Follow up question: If so, how could these opportunities be realised?

(Follow up- question was not asked as the previous answer was deemed sufficient.)

3. What collaborations or partnerships do you think could contribute to optimising the financial impact of POCT while maintaining quality patient care?

In my experience, success is always about collaboration between the people involved. So this means collaborations between medical technologists, clinicians, and hospital administrators. This ensures that the technology is aligned with patient care goals while maintaining financial efficiency.

4. In your opinion, what balance should be struck between the upfront investment in POCT technology and the potential long-term cost savings it offers?

Striking the right balance involves a comprehensive cost-benefit analysis. While there's an upfront investment, the potential for long-term cost makes it a worthy endeavor. However, as I've mentioned, the hospital management should also look into the costs of maintenance and software updates.

Respondent #6

Part 1: Demographic Details

- Please indicate your age.
 - ☐ 25-35 years old
 - ☐ 36- 45 years old
 - ☒ 46-55 years old
 - ☐ 56-65 years old
 - ☐ 66 years old above
- Please specify your sex.
 - ☐ Male
 - ☒ Female
- Please state your current job position? nurse manager
- How many years have you worked in healthcare overall?
 - ☐ 1-5 years
 - ☐ 6-10 years
 - ☐ 11-20 years
 - ☒ more than 20 years
- How long have you been administering point of care testing (POCT) to patients? Please check the most appropriate box.
 - ☐ at least one year

☐ 2-5 years

☒ 6-10 years

☐ more than 10 years

- What type of primary care facility do you work in?

☒ hospital

☐ clinic

☐ urgent/special care center

☐ other (please specify _____)

- Specialisation if applicable: _____

Part 2: Health Workers' POCT Experience

1. Can you describe your role and responsibilities as a healthcare worker and how POCT is integrated into your daily tasks?

As the nurse manager, I oversee the operations and coordination within the nursing department. While I may not directly administer POCT myself nowadays, I play a crucial role in ensuring that our nursing staff is well-trained and equipped to carry out point-of-care testing. I trained them in using POCT. I oversee the integration of POCT into our department's protocols, ensuring seamless coordination between testing, patient care, and documentation.

2. What specific POCT procedures or tests have you been involved in?

Well, I'm not on the frontline anymore doing tests (I used to before I was promoted to being manager) but I'm right there supporting my team. We've got glucose tests, pregnancy tests, and rapid strep tests in our toolkit.

Follow up question: How do they compare to traditional testing methods in terms of efficiency and time savings?

They provide quick results – way faster than waiting for results to come back from a distant lab.

3. How has your experience with POCT influenced your workflow, patient interactions, and overall job satisfaction?

Oh, it's been a game-changer. When we can get results faster, we can make decisions faster. Patients appreciate that we're on the ball, and it keeps everyone's spirits up. Plus, knowing we're giving top-notch care thanks to POCT is pretty satisfying.

4. Can you share any challenges or advantages you've encountered while using POCT from a healthcare worker's perspective?

The advantage is clear – lightning-fast results! But there's also the challenge of keeping the POCT machines in tip-top shape and making sure our team stays sharp with the training. Since non-laboratory staff can use them, there's always the probability of error if they're not supervised correctly so as a nurse manager, I make sure that only trained staff can use them or there's someone there to supervise them.

Part 3: POCT's Impact on Hospital Operation Costs

1. From your observations and experiences, how do you believe the adoption of POCT has affected the overall operational costs of the hospital?

It's like a puzzle piece that fits just right. While there's some initial investment, the quicker patient discharges and smoother operations mean we're not wasting resources or keeping beds occupied longer than needed.

2. Can you provide examples of cost savings or cost increases that can be attributed to the implementation of POCT in different areas of hospital operations?

I think it's in the emergency department because they're the ones doing the admission of patients. Based on my experience, POCT has slashed waiting times, nipping unnecessary admissions in the bud. But hey, there's that upfront cost of getting the gear and keeping things in check.

3. In your view, how has POCT influenced patient throughput, bed utilisation, and resource allocation within the hospital setting?

The patient flow is much smoother. Quicker test results mean patients can move through the system faster. That means beds aren't sitting around twiddling their thumbs, and our staff can focus where they're needed most.

4. Have there been any unexpected financial implications or adjustments required due to the integration of POCT into hospital operations?

We've got to keep a close eye on training, quality checks, and making sure our POCT gadgets are in tip-top shape. It's a balancing act to make sure the benefits outweigh any unexpected hiccups.

Part 4: Improving POCT Cost-Effectiveness: Recommendations

1. Based on your understanding and experience, what strategies or practices could be implemented to further enhance the cost-effectiveness of POCT in a hospital environment?

Staff training and quality checks are always the key.

2. Are there specific areas or departments within the hospital where POCT could have a greater potential for cost reduction?

Aside from the ER, I think POCT is most beneficial in outpatient clinics. It's important because the quick test results mean that the patient is given the plan of whether to be admitted or not. It saves a lot of time, effort, and, of course, both on the part of the patient and the hospital.

Follow up question: If so, how could these opportunities be realised?

Smoother integration, making sure everyone's a POCT pro, and having a solid plan to handle the upfront costs can really make those potential savings a reality.

3. What collaborations or partnerships do you think could contribute to optimising the financial impact of POCT while maintaining quality patient care?

Getting nurses, lab pros, and even the hospital bigwigs together to lay down some clear rules and ensure quality is golden. It's about everyone playing their part to keep the POCT ship sailing smoothly

4. In your opinion, what balance should be struck between the upfront investment in POCT technology and the potential long-term cost savings it offers?

We need to dig into our needs, what our patients need, and the resources we've got. Sure, there's an upfront investment, but when we tally up quicker discharges, better resource use, and happier patients, it's like money in the bank for the long haul.