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The Impact of Mock Code Blue Drills on Staff Confidence Levels in the Outpatient Setting a Quality Improvement Project in Abu Dhabi

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Abstract

Data shows sudden cardiac arrest is still one of the leading causes of death in Europe and the United States (Berdowski *et al*., 2010). Healthcare professionals must provide immediate and proper resuscitation, which directly impacts the patient likelihood of survival. Mock code drills play a pivotal role in healthcare education and training, by enhancing the participants' confidence levels. This increased confidence, in turn, contributes to improved clinical performance and patient outcomes. Within the hospital setting, resources and personnel are readily available in the event of a medical emergency, however in the outpatient setting the stakes may be higher due to lessened resources and manpower (Urman, Punwani and Shapiro, 2012). To date, there is very little research surrounding medical emergencies in the outpatient settings, this highlights the need for further investigation as cardiac arrest is a high risk low volume emergency that many healthcare professionals feel unprepared and ill equipped for (Monachino *et al*., 2019). This Quality Improvement (QI) project explored the impact of mock code blue drills on healthcare professional's confidence levels in the outpatient setting. Over three months, monthly code blue drills were conducted in two separate outpatient locations. Staff involved in this QI completed a pre and post drill survey consisting of nine statement with five-point Likert scaling assessing their confidence levels. Results in this QI showed an overall improvement in the confidence of clinical staff after taking part in mock code blue drills. There were limitations to this QI including a low response rate, small sample size, as well as external factors such as a faulty public announcement system impacting the drills. Future recommendations include increased frequency of drills, qualitative research to explore staff's perceptions and high-quality simulation equipment. Code blue drills should be completed every three months to safeguard patient safety and promote staff responsiveness in a true cardiac arrest event.

Keywords: Sudden cardiac arrest, Mock code drills, Healthcare professionals, Confidence levels, Quality Improvement (QI).

Chapter 1:

INTRODUCTION

In the ever-evolving landscape of healthcare, ensuring staff readiness for emergencies is crucial. The outpatient setting, once supposed as less vulnerable to acute critical incidents compared to inpatient locations, is now recognized as equally disposed to emergent events a requiring rapid and decisive action. Among acute medical emergencies, cardiac arrest is a potentially fatal event demanding a speedy response and interventions. A cardiac arrest is when the heart stops beating, leading to a loss of consciousness as blood stops circulating around the body. Ultimately death will occur if life-saving actions are not performed rapidly (Graham, McCoy and Schultz, 2015). The American Heart Association (2020) highlight that cardiac arrest remains a leading cause of death and morbidity in the United States and other countries worldwide (Merchant *et al*., 2020). In the outpatient setting, resources and opportunities for emergency training may be limited, thus assurance of staff alertness can be challenging. Minimal research around cardiac arrests in the outpatient setting exists, as they are often uncommon and frequently iatrogenic, highlighting a need for resuscitation training in these specific environments (Mitchell *et al*., 2020). Methods and tactics to improve healthcare staff confidence levels in managing medical emergencies in outpatient areas is limited and often inadequate (Scaramuzzo *et al*., 2014, p.62). Staff responding to a cardiac arrest experience a stressful situation that invokes uncertainty and fear in healthcare professionals (Castro, Cruz and Briones, 2014). Silverplats *et al*., (2022) claim that clinical staff attitude in particular, is seen as an essential component of competence. Competence alongside confidence, are among the robust predictors of the intent to perform compressions a key part of the chain of survival in cardiac arrest (Graham, McCoy and Schultz, 2015, p.34).

Healthcare professionals are licensed and hold a duty to deliver life-saving care in the event of a sudden cardiac arrest, however performance and confidence of staff is under researched.

In healthcare globally, the pursuit of achieving optimal patient care and safety remains a foundational goal. Quality improvement (hereafter referred to as QI) initiatives in healthcare are intended to improve patient care, enhance clinical outcomes, and foster a culture of best practice among healthcare providers (Institute of Medicine, 2001). A QI project serves as the chosen format for this dissertation due to its appropriateness for assessing the impact of mock code blue drills on staff confidence levels in the outpatient setting. Unlike traditional research methods that may focus on data collection and analysis, a QI offers a systematized framework for not only exploring the singularity, but also implementing tangible interventions aimed at improving outcomes. By utilizing a QI stance, this dissertation can engage with stakeholders collaboratively and include healthcare staff on the floor. Involvement of the real-life personnel in the process assists with identifying prospects for improvement and implementing evidence-based interventions. QI allows for constant monitoring and modification of interventions based on real-time feedback, thereby enabling continuous improvement in outpatient emergency preparedness and staff confidence levels (Jha and Agarwal, 2022). Ultimately, by implementing a QI perspective, this essay endeavours not only to explore the impact of mock code blue drills upon staff confidence, but also to contribute to actionable insights and sustainable enhancements in outpatient quality of care.

Abu Dhabi

The geographical location for this QI project is Abu Dhabi, the capital of the United Arab Emirates (hereafter referred to as UAE) situated on the Arabian Peninsula's coast. The city serves as the political and administrative hub of Abu Dhabi, one of the seven emirates in the UAE. Governed by a hereditary monarchy, Sheikh Khalifa bin Zayed Al Nahyan serves as both the ruler of Abu Dhabi and the President of the UAE (United Arab Emirates Ministry of Foreign Affairs & International Cooperation, 2022). The UAE was formally established on December 2, 1971 and is a known globally as a relatively young county celebrating its 53rd National Day in December 2023. Healthcare in the UAE has benefited from rapid economic growth and there has been a momentous rise in the number of healthcare facilities, professionals and levels of service use (Koornneef, Robben and Blair, 2017). The UAE has been involved in and is dedicated to a determined program of health system reforms to further improve health, healthcare facilities and measures to improve cost and quality challenges (Koornneef, Robben and Blair, 2017, pg.3). In 2007, health system reorganization occurred in the Emirate of Abu Dhabi and healthcare regulation in the Emirate of Abu Dhabi became the responsibility of one central, statutory agency, the Health Authority – Abu Dhabi (also known as HAAD) (Koornneef *et al*., 2012). The two selected outpatient facilities selected for this QI are based in the Western Region and Al Ain, both inside the emirate of Abu Dhabi.

Image 1: Map of the United Arab Emirates (Mohamed *et al*., 2020)

The healthcare sector in the Middle East and North Africa (hereafter referred to as MENA) region has seen extensive development over the past few years with improvement in the quality of health services and infrastructure. The Gulf Cooperation Council (hereafter referred to as GCC) consists of six countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE. Despite rapid economic growth, the GCC countries rank highest globally on risk factors for related to lifestyle ailments such as diabetes, cardiovascular conditions and obesity (Khoja *et al*., 2017). The mortality rate in GCC countries from these non-communicable diseases is one of the highest in the world as per Moradi-Lakeh *et al*., (2017). Cardiovascular diseases (hereafter referred to as CVD) have increasingly contributed to global mortality rates and are the number one cause of death globally (Al-Mawali, 2015). The survival rates from out of hospital cardiac arrest (hereafter referred to as OHCA) fluctuate considerably around the globe, with survival rates lesser in the MENA region in comparison to those in the Western Europe and North America (Batt, Al-Hajeri and Cummins, 2016, pg.1206).

Alqahtani *et al*., (2019) identified there is a lack of research existing regarding OHCA in the Middle East at large. This claim is supported by the work of Batt, Al-Hajeri and

Cummins (2016) who stress the need for further collaborative research surrounding OHCA in the MENA countries.

In 2019, a study by Alqahtani *et al*., was conducted in the UAE identifying characteristics of OHCA patients attended and treated by the National Ambulance crew. This study showed a gap in the chain of survival. Witnessed cardiac arrests were present in more than half of the cases, yet bystander chest compressions was only provided to merely half of them (53.2%). However, caution must be applied when reviewing this data as the National Ambulance is not the main emergency service provider in Abu Dhabi, thus limiting the representation of results. Similarly, report findings by Batt, Al-Hajeri and Cummins (2016) of OHCA patients and their outcomes in the Northern Emirates (including Sharjah, Ras-al-Khaimah, Umm Al-Quwain, Fujairah and Ajman) documented a low return of spontaneous circulation (hereafter referred to as ROSC), a key survival metric rate for patients.

Department of Health Abu Dhabi

As per The Department of Health (hereafter referred to as DOH, formerly known as HAAD) Abu Dhabi, all clinical healthcare staff in the outpatient setting must be trained and licensed to provide Basic Life Support (hereafter referred to as BLS). The Health Regulation Department (2017, p.8) within the DOH, Guidelines 8.2 states 'All healthcare professionals employed at outpatient healthcare facility shall be trained to BLS in accordance with an internationally recognized training program'. It is mandated by the DOH Abu Dhabi that all licensed clinicians are certified in BLS every two years in line with American Heart Association (hereafter referred to as AHA) Guidelines (Health Regulation Department, 2017). The DOH also mandate that licensed clinical staff must also undertake refresher courses annually to ensure their emergency response readiness and competency. It is important to note the frequency and type of training deemed as refresher is unspecific and varies across Abu Dhabi due to it's vagueness in the guidelines. In the context of this outpatient setting, as per the facility policy, code blue drills are conducted every quarter (three months) to test readiness and ensure skills are revitalized.

Outpatient Setting

This QI project aims to look at the impact of code blue drills on staff confidence in the outpatient setting. An OCHA can happen anywhere, at any time, however occurrence in a public location tends to offer better prognosis compared to in the home, due to the likelihood of being witnessed and life savings actions initiated (Kudenchuk *et al*., 2015). A study by Kragholm *et al*., (2017) found that when bystander resuscitation efforts were performed, there was associated significantly lower risk of brain damage or nursing home admission in comparison to no bystander resuscitation. When cardiac arrest occurs in an ambulatory clinical setting, patient survival may be more likely as there is more availability of health professionals and fewer delays (Kudenchuk *et al*., 2015, pg.97). However, caution should be applied as this study by Kudenchuk *et al*., (2015) lacks statistical power due to a small sample size.

Joint Commission Accreditation International

Joint Commission Accreditation International (hereafter referred to as JCI) is an independent, non-profit, charitable organization that offers accreditation to health care establishments all over the globe. JCI's mission is to improve and enhance the safety and quality of care worldwide (John Mason, 2022). The UAE has the most JCI accredited programs and establishments of any country in the Middle East, all of which claim the gold seal of approval (John Mason, 2022). This QI project is located in a JCI accredited healthcare facility which follows the Joint Commission International (2019).

Accreditation Standards for Ambulatory Care, 4th Edition. JCI Care of Patient's Chapter (COP.5) states that resuscitation services must be available throughout the ambulatory care organization.

Simulation

Mock code blue drills, which entail a simulated cardiac arrest scenario helps to prepare healthcare professionals for real life emergencies (Huseman, 2012).

Healthcare professionals' competence in handling critical but rare situations, like cardiac arrest, are compulsory to ensure patient safety (Castro, Cruz and Briones, 2014). Weersink *et al*., (2019) state in order to maintain healthcare professional's efficiency in resuscitation skills, this can only be accomplished through simulated environments. The early initiation of life support interventions and staff competence levels are key performance indicators, ultimately increasing the likelihood of patient survival from cardiac arrest (Sasson *et al*., 2010).

Skill Fade and Staff Confidence

Staff confidence in responding to emergency scenarios exhibits substantial variation, which can be detrimental to patient survival as hesitancy and inadequate decision-making can result in suboptimal resuscitation performance (Chen *et al*., 2020). There has been growing attention to the term skill fade in recent literature and themes such as clinical readiness and muscle memory have been investigated in multiple studies (Spooner *et al*., 2007). The work of Smith, Gilcreast and Pierce (2008) assessing nurses' chest compression technique at quarterly intervals after their training and found that while nurses recalled the theoretical information of BLS, their practical performance abilities had declined. Skill fade is a term used to describe when items of information in human memory such knowledge or skills, decay over time when it is not used (Bjork and Bjork, 1992). A systematic literature review by Vlasblom *et al*., (2020, p.1) recognizes that skill fade can have detrimental consequences in 'first responder, medical, military, and aviation context as people may get injured or die as a result of task performance of these professionals'. It is well known in QI there are many safety measures existing in aviation that are consistent with healthcare. However, Macrae and Stewart (2019) claim exhortations from other industries are not always helpful and can incite frustration and skepticism among healthcare professionals who are exposed to the unique challenges and everyday difficulties of attempting to improve healthcare. Hudson (2003) highlight the pressing need for healthcare actions to be proactive and generative, instead of responding to adverse events including cardiac arrest.

There is currently little research surrounding the impact of code blue drills on staff confidence levels, yet confidence is closely linked to performance during lifethreatening incidents (Abella *et al*., 2005). Cardiac arrests are rare events in outpatient settings, however without repeated experiences of similar patient scenarios, it is problematic for staff to build the competence and confidence needed to rapidly intervene for cardiac arrest victims (Saqe-Rockoff, Ciardiello and Schubert, 2019). Simulation drills aim to help staff build competence and confidence in various patient scenarios and have been shown to lead to advances in clinical performance, confidence, collaboration, and overall hospital preparedness (Starr *et al*., 2017). This aim of this QI is to assess the changes in confidence of clinical staff before and after participating a mock code blue drill.

Quality Improvement

QI can be defined as the 'combined and unceasing efforts of everyone to make the changes that will lead to better patient outcomes, better system performance and better professional development (Batalden and Davidoff, 2007, pg.7). This definition directly ties in with the aim of this QI project to in turn, improve a patient's likelihood of survival in the event of a cardiac arrest. QI methods are progressively deployed in healthcare to support the delivery of high-quality patient care and better patient outcomes (Reed *et al*., 2016). The Institute of Medicine (IOM, 2000) specified six precise requirements for quality in healthcare with associated aims for improvement built around them. These quality needs were coined the six dimensions of QI and include: safe, effective, patient-centred, timely, efficient and equitable care. In 2004, Gaba addressed a future vision of simulation in healthcare, stating this training can have indirect ways to improve patient safety with zero risk to patients. Simulation can facilitate recruitment and retention of skilled professionals, act as a lever for culture change, and overall advance quality and risk management activities (Gaba, 2004).

This chapter has introduced the QI project with some background context of mock code blue drills and the importance of staff confidence in readiness and response. The considerations to simulated drills and skill fade were conversed with the rationale provided for the challenge area and justifications for improvement.

Chapter two presents the background of this QI, critically reviewing the available literature and evidence surrounding staff confidence levels and mock code blue drills. The QI project problem will be defined the problem area and how it is situated in broader and local context. This chapter will provide a clear statement of the overall, purpose, aim, objectives and/or questions of the QI.

Chapter three will expand upon the method used for this QI and the processes followed which align to the Model for Improvement and PDSA cycle. This chapter will entail the number of participants and how they were recruited (including the inclusion and exclusion criteria), data collected of pre and post intervention surveys and how these findings were analysed.

Chapter four covers the reporting data collected, addressing the key findings gathered from this QI project.

Chapter five delivers a discussion and interpretation of the collected evidence and addresses both connections and contrasts from current literature. Challenges, restrictions and holes will also be discussed, as well as the revelations and developments.

Chapter six highlights the QI aim products and conclusions, with findings applied. The implications of the QI on practice and relevant recommendations for further developments.

Chapter 2: Background and Literature Review

This Chapter will further look at the background and literature review of mock code blue drills impacting staff confidence levels in the outpatient setting. The key objective of this QI is exploring further the importance of confidence of healthcare professionals, and the influence of simulated code blue drills. A comprehensive literature review was performed in order to synthesize evidence that addresses the QI aim assessing the impact of mock code blue drills simulations on staff confidence levels. A search stratagem with Population, Intervention, Comparator, and Outcome (hereafter referred to as PICO) mechanisms was used to identify and retrieve relevant literature.

Population: Healthcare professionals working in the outpatient setting

Intervention: Mock code blue drills

Comparator: Pre-intervention survey and post intervention survey comparisons

Outcome: Increased staff confidence levels in responding to cardiac arrests, as measured through self-assessment surveys.

A search of the Electronic Databases PubMed, Google Scholar, MEDLINE, CINAHL and PsycINFO was conducted using the following search terms: mock code blue, code blue drill, code blue, cardiac arrest simulation, healthcare professional confidence, outpatient, outpatient emergency, outpatient response, cardiopulmonary resuscitation and simulation.

Inclusion criteria

Studies included were relevant to the research question through searching key words, publication in peer-reviewed journals, and availability of full-text articles. No date limit was set on the search.

Exclusion Criteria: Articles not directly related to and not meeting the inclusion criteria were excluded.

Mock Code Blue Drills

Mock code drills are widely utilized in healthcare education and training to simulate emergency situations. These drills allow participants to exercise their clinical skills and enhance teamwork in a controlled environment (Williams *et al*., 2016). A key goal of any mock drill is the direct potential to influence participants' confidence levels, which can impact for their preparedness and performance in real-life clinical settings (Ackermann, Kenny and Walker, 2007). Huseman (2012) conducted a single-sample quasi-experimental study investigating the impact of mock code blue drills on response times to actual cardiac arrests. This research project performed unannounced drills over the space three months in acute care setting, results showed a 25% improvement in the mean response time from onset of loss of pulse to initiation of chest compressions after the mock code blue drills. However, the confidence levels of participants were not directly measured in the study, reiterating and recommending a further need for research and investigation. A study by Espey *et al*., (2016) evaluating a simulation-based curriculum on resident self-efficacy and graded performance in medical emergencies in the outpatient setting showed an improvement in doctor's competency levels. A total of thirty residents took part in the study, with results showing the performance scores improved significantly in all emergency scenarios, as well as in their communication skills.

Participation in mock code drills provides individuals with an opportunity to practice and improve their clinical skills, thus increasing their confidence in their ability to function as part of a high-performing team (Hunziker *et al*., 2011). Prince *et al*., (2014) conducted a QI project on code teams and discovered key factors to a better response includes organization, clear roles, and regular mock code drills. Prince *et al*., (2014) findings from their Clinical Practice Improvement project also showed that staff gained enhanced confidence in their role specific skills. However, their project adopts a retrospective design, relying on historical data gathered which is susceptible to biases, and causality between the restructuring and observed outcomes cannot be definitively established. A comparison study on doctor resuscitation skills in simulation versus real-world performance by Weersink *et al*., (2019) showed doctor's simulation performance may actually better reflect learner competence, as the real-life challenges and interruptions are not applicable. Caution must be applied to these findings due a small sample size of seventeen participants, which may have created a falsely stronger correlation, thus reducing the generalizability. It should also be considered that the controlled environment of a simulation may also give a heightened sense of performance and does not necessarily guarantee similar performance in a real incident (Gaba, 2004). The work of Huang *et al*., (2018) refutes this stance, as their work on clinical simulation based-training found that participants' positive stress coping abilities increase during such drills, thus improving real life reactions.

High stress experienced during a simulation was explored by Macdougall *et al*., (2013) and they found despite experiencing stressful scenarios, it did not negatively impact staff's self-perceptions of clinical confidence or knowledge. A QI project conducted by DeVita *et al*., (2010) supports the positive impact of simulation training on healthcare providers, as their findings found staff exhibited more assertiveness during actual emergency situations. It has been shown that nurses, both newly qualified and highly competent experienced nurses, respond with anxiety during a code (Williams *et al*., 2016). The implications of a lack of confidence in healthcare professionals can result in hesitation and suboptimal performance when faced with a real-life emergency (Manser Bruppacher, 2019). Enhancing nurse proficiencies and self-assurance levels plays a significant role during a code as claimed by Williams *et al*., (2016). Delac *et al*., (2013) state that nurses may display fear during actual cardiac arrest, however Ryzner and Kujath (2018) claim that participating in a code blue drills can ease staff apprehensions and enhance familiarity with the necessary resuscitation steps required.

Vlasblom *et al*., (2020) claim that skill proficiency is neither certain nor improved when the bare minimum of refresher training is provided. Notably, they stress the growing need of a further inclusion of refresher training such as mock code blue drills rehearsals. Enhanced staff confidence can lead to more efficient code blue responses, reduced healthcare costs, and increased staff satisfaction and morale (Hunziker *et al*., 2011). Studies have claimed that simulation-based training, such as code blue drills, leads to improved clinician confidence and competence (McGaghie *et al*., 2011). Clinical staff who are confident in their abilities tend to perform high-quality chest compressions, administer medications more effectively, and make timely decisions, leading to better patient survival rates (Anderson *et al*., 2019). Simulation training increases multiple evaluation measures that including 'self-efficacy (the degree of confidence in performing a procedure or providing patient care) and actual objective procedural competence' (Espey *et al*., 2017, pg.699.e1). This QI aims to explore confidence of the staff in the mock code blue drill in the outpatient setting.

Kudenchuk *et al*.,'s (2015) review of OHCA found that resuscitation outcomes were not significantly different between patients who sustained OHCA in an outpatient setting, compared to a non-medical public setting. This poses the question of the quality of resuscitation in outpatient settings where healthcare professionals and emergency equipment are readily available. BLS consists of cardiopulmonary resuscitation (hereafter referred to as CPR) and operation of an automated external defibrillator (hereafter referred to as AED), both of which are more easily learned and rapidly implemented (Kudenchuk *et al*., 2015, p.101).

Skill Fade

Achieving and maintaining proficiency in any skill—such as speaking a foreign language, playing a sport, require constant exercise and assessment of the skill. The interest surrounding skill fade is prevalent with research showing a decline in skills as early as six months after training (Nishiyama *et al*., 2014). Staff in the outpatient settings rarely face medical emergencies or cardiac arrests, however they must be readily available to respond to such events swiftly and capably. Yet, it is known when healthcare providers do not routinely use their resuscitation skills, they may forget critical steps and procedures (Wilkinson *et al*., 2021). This emerging phenomenon is known as skill fade; hrough time healthcare professionals' confidence and ability to respond effectively during code blue scenarios erodes (Hunziker *et al*., 2011). A systematic review of the retention of adult advanced life support knowledge and skills in healthcare providers by Yang *et al*., (2012) analyzed the current evidence for learning retention of resuscitation knowledge and skills in healthcare providers. A total of eleven articles were reviewed and findings showed that all the studies found evidence of decline in either life support knowledge or skills over time, with the majority documenting the loss of both. The available studies in this review suggested that knowledge and skills decay between six months and one year after training, with skills deteriorationing quicker than knowledge. However, caution must be applied with Yang *et al*.,'s (2012) study due to a small sample size decreasing the generalizability of findings. A systematic review by Yeung *et al*., (2020) exploring skill decay in resuscitation training aimed to gain insight to spaced learning vs massed learning improving educational and clinical outcomes. Spaced learning is defined as a learning technique in which practice periods for a specific task are separated by lengthy break periods, or lengthy periods of practicing varied activities, rather than occurring in a closer time frame (Yeung *et al*., 2020). Massed learning involves a sole period of learning technique in which practice trials occur in a closer time frame, either in a single prolonged session, or in meetings divided by shorter intervals (Yeung *et al*., 2020). A total of seventeen studies were included in the review, with fifteen out of seventeen studies reporting enhanced performance with the use of spaced learning. Nevertheless, overall certainty of the evidence was rated as 'very low for all outcomes primarily due to a very serious risk of bias' (Yeung *et al*., 2020, pg.2).

Self-Efficacy and Confidence

Self-efficacy is the degree of confidence healthcare professional's hold in performing a clinical procedure or providing patient care (Espey *et al*., 2017). Health psychology theorists recognize self-efficacy belief as being one of the most imperative psychological constructs for understanding and influencing the performance of healthcare professionals (Michie *et al*., 2005). Self-efficacy beliefs, defined as judgments of one's capability to organize and complete given types of performances, are deemed a main effect on decisions to participate in or avoid particular activities or settings (Bandura, 1997). Self-assessment is a complex process and any investigation that involves the evaluation of one's self is context-dependent and will be influenced by the many beliefs' individuals hold about themselves (Stewart *et al*., 2000). Links have been demonstrated between competence and confidence of personnel. Kruger and Dunning (1999) claim that incompetent individuals tend to overestimate their performance and have overinflated confidence, while the highly competent individuals tend to underestimate their performance thus lacking confidence. However, Stewart *et al*., (2000) study identified that terms like confidence and competence are complex and multifaceted, despite their frequent use. A self-assessment instrument has the potential to help this process, but measuring any aspect of one's self's performance is neither easy nor straight forward (Wylie, 1974). An exploratory study by Mansell, Harvey and Thomas (2020) explored the impact of simulation-based education on selfevaluated confidence of a total of ten non-respiratory physiotherapists. Despite a small sample size, through a thematic analysis it was discovered that staff identified themselves as being more confident in their clinical reasoning after taking part in simulation, as well as reduced anxiety. Improvement in self-evaluated confidence was also observed in a study by Mansell, Harvey and Thomas (2020), but this study did not consider the duration these improvements were sustained for. They stress the need for further investigation to establish the duration of improvements in confidence, in order to govern the required regularity of simulation training. Confidence can impact how quickly and effectively healthcare providers initiate life-saving interventions and communicate with their team. Insufficient confidence levels during cardiac arrests may lead to delayed interventions, indecisiveness initiating life-saving procedures, and ineffective communication among resus teams (Hunziker *et al*., 2011). Manifestations of low confidence have the potential to compromise patient safety and clinical outcomes, such as survival rates following cardiac arrest (Neumar *et al*., 2015).

Addressing the issue of variable staff confidence levels in code blue scenarios is imperative as healthcare organizations commit to providing safe, high-quality care and optimizing patient outcomes. Enhancing staff confidence in code blue scenarios is in accordance with industry best practices and regulatory standards for healthcare organizations (American Heart Association, 2020). The potential benefits of this QI project extend beyond staff confidence and impact patient outcomes.

Training Needs Analysis

A Training Needs Analysis (hereafter referred to as TNA) allows staff to address their identified learning needs, enhancing their competence ultimately leading to improved patient care and safety (Morton-Cooper & Palmer, 2000). The Education Department in the outpatient centers conducted the annual TNA in September 2023, which was then analyzed by the Education Lead (the author of this QI) whom then action itemed key findings. In the results, clinical staff identified code blue management as the second top learning priority (Appendix 1). This TNA data identified priority of training requested directly from the healthcare staff, this suggests staff are lacking confidence and self-assurance in code blue management and have expressed their wish to increase knowledge, skills and capabilities. A fishbone analysis (Appendix 2) was completed with input from the front line staff to better understand the learning need surrounding code blue management.

Project Aim Statement

The aim of this QI is to explore the impact of mock code blue drills on staff confidence levels in an outpatient centre in Abu Dhabi, over a three-month period. Confidence among healthcare professionals plays a critical role in the successful implementation of resuscitation efforts and is significantly influenced by participation in mock cardiac arrest drills. Confidence creates a sense of self-assurance and competence among clinicians, enabling them to perform effectively under highpressure situations such as cardiac arrest (Duvivier *et al*., 2011). Confident individuals are more likely to show assertiveness in decision-making, execute critical tasks with accuracy, and uphold composure amidst the bedlam often associated with cardiac arrests (Hunziker *et al*., 2010). Evidence has shown simulation-based education is the most effective educational training tool for improving human factors as well as confidence (Bennion and Mansell, 2021).

Chapter Three:

METHODOLOGY

Quality Improvement

"Health care harms patients too frequently and routinely fails to deliver its potential benefits. Indeed, between the health care that we now have and the health care which we could have lies not a gap but a chasm" (Institute of Medicine, 2001, pg.1). The ultimate goal of the QI processes is to introduce interventions to make iterative enhancements to a method, or a system and sustain change (Roberts-Turner and Shah, 2021). QI practices serve as the ideal approach for this project evaluating the impact of mock code blue drills on staff confidence due to the innate alignment with the objectives of iterative learning, continuous improvement, and patient focused care within healthcare settings. A vast amount of literature has been published to comprehend what quality care is and to find the most suitable criteria and tools for its measurement and improvement (McDermott *et al*., 2018).

Model for Improvement

In healthcare there are a number of approaches or models used to foster QI, efficiency, and test the effectiveness of a system or a process (Roberts-Turner and Shah, 2021). It has been claimed by Chen, VanderLaan and Heher (2021) that there is no one ultimate model of framework for QI and each one has advantages and disadvantages. When selecting a reliable model for QI, Roberts-Turner and Shah (2012) state that it is more important the QI process is trusted and full commitment is given when utilising tools. Various QI models exist such as Six Sigma, Lean Management and Total Quality Management, all offer valuable frameworks for reaching improvement goals. The Model for Improvement (hereafter referred to as MFI) stands out as particularly beneficial for several reasons. MFI offers advantages over other QI models in healthcare due to its simplicity, importance upon measurement, iterative approach to learning, and attention on frontline engagement (Langley, 2009). This iterative approach to improvement fosters a culture of continuous learning and innovation, empowering healthcare teams to address complex challenges and drive sustainable change. Through utilising a practical and adaptable framework for attaining improvement goals, the MFI enables healthcare establishments to drive meaningful change, improve patient outcomes, and optimize organizational performance (Langley *et al*., 2009). The MFI iterative approach to improvement nurtures a culture of continuous learning and innovation, empowering healthcare teams to address complex challenges and drive sustainable change. This dissertation will present a QI project that employs the MFI as a framework to determine the impact of mock code blue drills upon staff confidence levels, located the outpatient setting in Abu Dhabi.

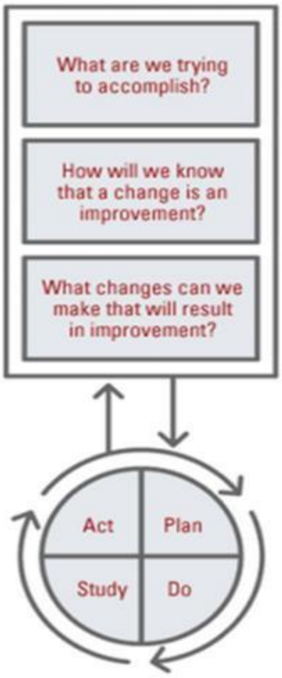


Image 2: Model for Improvement (Langley *et al*., 2009)

The MFI model has two parts: firstly, through answering three fundamental questions and conducting tests of change. By answering the three central questions, this establishes the MFI plan of action. The three questions that are compulsory to be answered are the following: '(1) What are we trying to accomplish? (2) How will we know that a change is an improvement? (3) What change can we make that will result in improvement?' (Roberts-Turner and Shah, 2021, pg.12).

The second stage of the MFI is implementing and testing the change through what is called the Plan-Do-Study-Act (hereafter referred to as PDSA) cycle. The action elements of the PDSA cycles can help put QI concepts into practice immediately (Chen, VanderLaan and Heher, 2021). PDSA is where the thoughts and aims become reality and the project is trailed by putting it into practice (Langley *et al*., 2009). Utilizing the MFI and generating a PDSA cycle will allow to assess whether the intervention works, identify any adjustments required and ultimately increases the chances of delivering and sustaining the desired improvement (Reed *et al*., 2016). However, the implied simplicity of the PDSA cycle has been criticized, where the real-life resources are often significantly underestimated and failure to properly utilise PSDA can lead to projects destined to fail (Reed *et al*., 2016). Yet, the MFI has been deemed versatile and has been widely adopted in healthcare settings for various improvement purposes (Adams, 2018). In 2013, a systematic review by Taylor *et al*., (2014) revealed that only two out of seventy-three projects reporting use of the PDSA cycle applied the PDSA method in accordance with the methodological recommendations. Reiterating the previous statement by Roberts-Turner and Shah (2012), the most important factor in QI process is trusting the selected model, and full commitment is given when employing tools.

MFI: Q1 What are we trying to accomplish?

Question one, "What are we trying to accomplish?" speaks to the end goal or aim that the quality improvement project seeks to achieve, in other words it begs the question of "Why are we here?" (Roberts-Turner and Shah, 2012, pg.12 and 13). Question one may appear to be a relatively easy question, but it is a highly specific and provides explicit particulars with precise intent for the QI project. This question forms the QI aim statement, articulating the specific goal or outcome that the QI seeks to achieve. Good aim statements are clear, concise and outcome orientated (Provost and Murray, 2011). The aim statement of this QI is to explore the impact of mock code blue drills on staff confidence levels in two out-patient centres in Abu Dhabi, over a three-month period.

MFI: Q2 How will we know that change is an improvement?

Question two poses the dialogue of considering “What does good look like?’’ and ‘’Where is the finish line of this QI?’’ (Roberts-Turner and Shah, 2012, pg 13). The purpose of this second question in the MFI is that ‘measuring here is for learning, not for judgment or comparison’ (Provost and Murray, 2011, pg.6). This QI will compare pre and post confidence scores gained from Likert 5-point scale surveys, this assessment will indicate the impact of the code blue drill upon staff confidence. An increase of scores will indicate an increase of confidence, as a drop will suggest a decrease in confidence of staff. A nine-statement online survey (Appendix 3) comprised of five-point Likert scaling, aimed to gather data on the drill participants confidence levels before, and after participating in a simulated code blue drill.

MFI: Q3 What changes can we make that will result in improvement?

Question Three requires creativity and innovation, assisting with development of tactics and solutions that should impact positively on the QI process (RobertsTurner and Shah, 2012). Chen, VanderLaan and Heher (2021) highlight that conducting a root cause analysis can be used to identify effective improvement ideas as doing so exposes the underlying contributing factors of a complex problem. To gain further insight to TNA results highlighting code blue management as the second highest training need in the TNA, a Fishbone Analysis was conducted by the Education Manager (the author of this QI) alongside clinical leaders in the outpatient centres. Also known as Ishikawa or Cause-and-Effect analysis, Fishbone is a visual tool used in QI to help identify and analyse the source reasons of a problem. Various contributing factors were identified (Appendix Two) that impacted code blue management in the selected setting, including a lack of standardized roles and responsibilities, infrequent training, zero equipment and poor communication amongst team members. Through performing regular code blue drills consisting of simulation equipment and a debrief following the drill, staff will be exposed and familiarized with the code blue skills. Conducting an analysis of pre and post confidence surveys, this QI intends to see an improvement in staff confidence.

MFI: Plan, Do, Study Act Cycle (PDSA)

The key concepts and solutions developed from the MFI three posed questions are then implemented in a cyclical fashion, which leads us to the second critical component that makes up the MFI (Roberts-Turner and Shah, 2012). Lucas and Nacer (2015, p21) claim that the ‘PDSA cycle is at the heart of the process of improvement’. The PSDA cycle provides a structure for iterative testing of changes to better the quality of systems and is now widely accepted in health care improvement (KatowaMukwato, 2021). While the PDSA method may appears simple it does not mean easy to implement, and applying the PDSA into clinical practice is challenging (Reed and Card 2016). To ensure achievement in QI endeavours, PDSA project ideas to as many involved personnel as possible as QI is innovative, and collaborative and therefore both successes and failures are expected as the process evolves (Chen, VanderLaan and Heher, 2021). In this QI, the Director of Clinical Operations and line managers of the outpatient centres were kept informed of the QI project intentions, timeline and outcomes. The leadership team were informed of the QI project to assist with support and minimal interruption to patient care as the drills occur during normal working hours.

PDSA Cycle: Plan

TNA data gathered within the facility determined that Code Blue Management was the second highest training priority as expressed by the clinical staff. A fishbone analysis (Appendix 2) explored the causes impacting the learning need highlighted by the clinical staff in the facility impacting resuscitation services. The aim of the QI is assessing the impact of monthly mock code blue drills on staff confidence levels in the outpatient setting. The intervention in this QI is conducting monthly mock code blue drills over a period of three months. To measure the confidence levels, a pre and post survey consisting of 9 statements with a 5-point Likert scale was developed to assess staff confidence levels. The survey consisted of nine statements developed from AHA 2020 Skills Testing Critical Skills Descriptors (Appendix 8). Participants selected form a Likert scale options ranging from "Strongly Disagree" to "Strongly Agree." The implementation plan of the QI was a schedule of monthly mock code blue drills at varying times throughout the shift. The purpose and importance of the drills was communicated all staff members and all clinical staff were provided with a Participant Information and Consent sheet. Prior to each drill, pre-surveys were distributed to the staff members and a post survey following each drill. The surveys were delivered electronically via Microsoft Forms and remained anonymous to ensure confidentiality of survey responses supporting honest feedback.

PDSA Do

PDSA cycles allow you to try out your interventions, specifically this section will look at the ‘Do’ of the system (Roberts- Turner and Shah, 2021). By conducting monthly mock code blue drills in two separate outpatient centres, pre-surveys were administered to all clinical staff prior to the dill. Staff were not informed of the day or time of the drill as realistically as possible to simulate actual code blue scenarios. After the drill, post-surveys from all participants via Microsoft Forms.

PDSA Cycle: Study

The Study element of the PDSA cycle begs the questions 'Did it work?' (Roberts-Turner and Shah, 2021, pg 266). Survey responses will be collated and subjected to statistical analysis to quantify changes in staff confidence levels. The pre and post-survey results will be compared to identify any statistically important alterations in staff reflection of their confidence. The data will be analysed to identify any trends and patterns, and scrutinized to differentiate areas of improvement or possible challenges. By quantifying changes in confidence levels over time and exploring potential moderators or mediators of these changes, valuable evidence generated proves effectiveness of the code blue drills on confidence. Findings gathered from the pre and post surveys were generated into bar graph formats to statistically compare scoring and trends identified. Statistical analysis of the scores comparing the percentages of confidence levels before and after the mock code blue drill were reviewed for trends and correlations. The overall impact of the mock code blue drills on staff confidence levels will be evaluated by looking at consolidated findings.

PDSA Cycle: Act

The final stage of the PDSA cycle is Act, in other words to do something with the plan based on what you learned, and if the project has favorable results, you can adopt the intervention (Roberts-Turner and Shah, 2021, pg 12). Based on survey results, adjustments will be made to the frequency, timing, or format of the drills to optimize effectiveness. Identified gaps in staff training or knowledge will be addressed through tailored interventions and additional training sessions. Any improvements in staff confidence levels resulting from the code blue drills is recognized and celebrated to influence a culture of continuous improvement. Findings from this project informs future QI initiatives, allowing for enhancement of the mock code blue drill processes and enrichment of overall emergency preparedness. Results and recommendations of the QI will be disseminated to such as the executive team and other stakeholders through formal channels to promote transparency and enable informed decisionmaking regarding emergency response protocols and trainings. Findings generated from this QI was presented to the Clinical Operations team to support frequent of mock code blue drills and use of simulation equipment to enhance staff confidence.

Ethics

The moral rights of humans in relation to reverence for the individual, the right to self-determination, and the right to make an informed decision were lectured in The Declaration of Helsinki (Millum, Wendler and Emanuel, 2013). These are a set of established expectations in research, and form the very core of ethics and consent guidance for conducting and publishing research studies (Rickham, 1964 cited in Lockwood and Sfetcu, 2020). Lynn *et al*., (2007) state that ethical issues arise in QI because the efforts to improve quality may unconsciously cause harm, waste resources, or affect some patients unfairly. Getting ethics wrong in QI can lead to significant clinical and legal implications, as a large-scale QI project on executing a checklist clearly demonstrated (Pronovost *et al*., 2006 cited by Lockwood and Sfetcu, 2020). Health care workers who participate in QI activities should also be able to have confidentiality, and the opportunity to opt out of QI projects (Lynn *et al*., 2007). In this QI, the clinical staff in the outpatient centres were provided with the Participant Information Sheet (hereafter referred to as PIS) and consent form (Appendix 4) prior to the simulated code blue drills. Agreement and permissions for this QI project were gained from the Director of Clinical outpatient centres to conduct the QI in the two outpatient facilities (Appendix 6). As the healthcare facility does not have its own.

Research Committee, consent was gained from a sister asset Institutional Review Board (referred to as IRB) whom approved the QI (Appendix 7). This QI project does not include any patient contact directly and there is no risk to patients due to the drills conducted in a safe, simulated manner**.** To maintain confidently in this QI, all pre and post surveys via Microsoft forms did not request any personal identifiers such as names, email addresses, or other sensitive information that could compromise participant secrecy. The survey (Appendix 3) began with a clear and comprehensive informed consent statement 'Thank you for taking part in this Quality Improvement Project as part of my Dissertation research. I appreciate your time, dedication and above all honesty in reflecting in your practice. Kindly read the Participant Information.

Sheet, sign the consent form and return to the author's email address prior to completing the survey'. The PIS (Appendix 4) details further information to the participants surrounding the purpose of the QI, how the data will be used, and assurance that their responses will remain confidential.

QI Locations

The QI was conducted out in two, small outpatient centres in Abu Dhabi, consisting of a mixture of clinical staff from roles such as nursing, medicine and radiography. Location one consisted of five staff from nursing and radiography roles, and six staff in the second outpatient centre from nursing and radiography and one physician (total eleven clinical staff were included in this QI).

Participants: Inclusion Criteria

The participants included clinical staff involved in the code blue response team in the outpatient centres who participated the mock code drill**.** Eligible participants included clinical staff licensed to provide BLS who completed and returned the PIS and consent form.

Participants: Exclusion Criteria

Any non-clinical or administrative staff were included in this study. Staff who did not complete the PIS/Consent form were not included in the results.

Participant Recruitment

All BLS certified clinical staff were recruited in this study. Staff were informed of the nature of the QI and provided with a PIS and consent form (Appendix 4). All staff who complete the PIS and consent form were included in this project.

Mock Code Blue Drills

Appendix 5 details the PDSA of the QI detailing further the actions of this QI. The mock code blue drills were conducted on a monthly basis over three months, with varying times and locations in the two outpatient centres. A pre-intervention survey (Appendix 3) was sent to the team no later than one week before the drill was conducted. Equipment involved a CPR mannequin, oxygen bag valve mask, training AED device and pads, a stop watch and facility emergency crash cart. The first responder was briefed a cardiac arrest scenario and instructed to react as if it were a real-life collapse. The scenario lasted a maximum of five minutes and completion of a facility document recording the mock drill was performed as per facility policy. A debrief after each drill was performed by the educator, participants in the drill provided a positive and negative reflection of the drill and any remediations and recommendations addressed. After the drill, the participants were provided with a post survey (Appendix 3) via Microsoft surveys to complete within three days of the drill re-assessing their confidence levels. Attendees were not informed in advance regarding the time or day of the drill, to replicate the learning experience, inducing a physical and psychological experience similar to the unpredictable nature of cardiac arrest (Clarke, ApesoaVarano and Barton, 2016).

Likert Scale Survey

Confidence self-assessment is a common and popular method of collecting quantifiable date from participants involved in simulation activities (Carter *et al*., 2016).

All participants involved in this QI were provided with an electronic survey via Microsoft Forms (Appendix 3). Both the pre and post surveys compromised of nine statements whereby participants using a Likert Scale were asked to rate their level of agreement on a scale (e.g., 1 = strongly disagree, 5 = strongly agree). Likert scale self-surveys have been a widely recognized method in psychological research and educational studies ensuring validity and reliability (Nunnally and Bernstein, 1994). However, Likert scales despite being widely utilized, have been criticized for being subjective. An 'egoistic bias' may occur as highlighted by Kovačić *et al*., (2014), as participants' tend to exaggerate their social and intellectual competence levels leading to unrealistically positive self-descriptions. Moreover, there is little within simulation-based education literature that has investigated the criterion validity of self-reported confidence and real-life competency. The use of Likert scaling to assess self-efficacy, shorterresponse measures 'may provide limited insights' and 'constrain the predictive power' of such findings (Karwowski, M. and Kaufman, 2017, p.11).

Measuring staff confidence in the code blue drill is imperative as confidence is a prevailing influence that impacts speedy, suitable and safe interventions in emergency situations (Abu Sharour *et al*., 2022). The pre and post intervention surveys were identical consisting same nine statements questions with a five-point Likert scaling (see Appendix 3). The surveys were created and utilizing electronically, the benefits of data collection online allowed for large amounts of data to be generated efficiently, economically and within a relatively short time frame (Regmi *et al*., 2016). Due to the busy nature of the healthcare setting, selection of an online survey was appropriate as it allowed the respondent can answer at a convenient time, they are also able take as much time as they need to respond. The selection of an online survey service has made online survey research much easier and faster (Nayak *et al*., 2019). To assess one's confidence, there are a number of rating scales that have been developed to measure an individual's response based on their attitude. A widely used 'psychometric tool in educational and social research is the Likert scale' (Joshi *et al*., 2015). Using a Likert scale in both pre and post surveys is a valuable method for academic research to assess changes or differences in respondents' attitudes, opinions, or perceptions before and after an intervention or experience. For example, in this QI participants are presented with statements like "I feel confident in my ability to perform CPR effectively" and are asked to rate their level of agreement on a scale (e.g., 1 = strongly disagree, 5 = strongly agree). However, the method of measuring any aspect of one's self or personal performance is not to be underestimated and is not easy or straightforward (Stewart *et al*., 2000). Confidence measures are popular within simulation-based education literature and self-reported questionnaires are convenient measures that readily allow quantification and statistical comparison (Carter *et al*., 2016).

Pre-Survey

One week prior to the code blue drill, a pre-survey (Appendix 3) was sent to all the locations clinical staff via email to collect a baseline of self-confidence. The nine statements were derived from the skills checklist used by the AHA BLS instructors during BLS training (Appendix 8). A pre and post questionnaire was selected as due to their simplicity, low response burden and ease of dispersion (Davis *et al*., 2018). By comparing pre- and post-intervention data, this QI proposes to assess the impact and effectiveness of the initiative.

Post-Survey

After the drill was conducted, the post-intervention survey (Appendix 3) was emailed to the mock code participants with one week to complete before the survey was closed.

Independent Variable

An independent variable causes something to happen in attempt to try to establish a cause that is statistically significant (Mat Roni *et al*., 2020). The independent variable of this QI is the mock code blue drills, a variable that is used to observe its effect upon the dependent variable of staff confidence. Mock code blue drills are pretend emergency situations designed to mimic real-life code blue situations in a clinical setting. These drills involve the presentation of a predefined emergency response protocol, often including actions such as initiating CPR, using medical equipment, and managing team efforts to achieve best practice towards patient survival.

Dependent Variable

A dependent variable is affected by the cause of the independent variable, it is what is trying to be measured and remains consistent throughout the research (Mat Roni *et al*., 2020). The dependent variable of this QI project is the confidence levels of staff that is being measured to assess the effects of the independent variable: mock code blue drills. In this project, the confidence levels of the staff are the focal point of observation and measurement. The aim of the QI is concerned in understanding how the mock code blue drills may influence or correlate with changes in staff confidence levels. Staff self-assessed their own confidence scoring on a five-point Likert scale on an electronic survey, pre and post intervention. These self-assessments aim to capture the subjective insights of clinical staff regarding their competence, readiness, and ease in dealing with a cardiac arrest. Before and after participating in a mock code blue drill, staff members are surveyed to rate their confidence levels in various aspects of emergency response, such as initiating CPR, using medical equipment, or feeling confident and ready for a real-life code blue.

Data Collection

Pre and post surveys (Appendix 3) were completed by the clinical staff as the QI data collection tool. This quasi-experimental study is a practical approach allowing for the assessment of variations in staff self-assessed confidence levels before and after partaking in mock code blue drills. The survey (Appendix 3) was identical for both pre and post testing, consisting of the same nine statements with a five-point scaling Likert scales ranging from strongly disagree to strongly agree. By creating quantitative data in this QI, such data is believed to be higher in objectivity as the behaviours are easily classified or quantified (Morgan, George A *et al*., 2006).

This QI follows a quasi-experimental design involving manipulation of an independent variable (participation in mock code blue drills) but lacks random assignment of participants (Morgan, George A. *et al*., 2006). This is common in realworld settings where full experimental control is not always feasible. Data collection in this QI includes participants that are already intact as it is not possible to change those assignments and randomize into experimental and control groups.

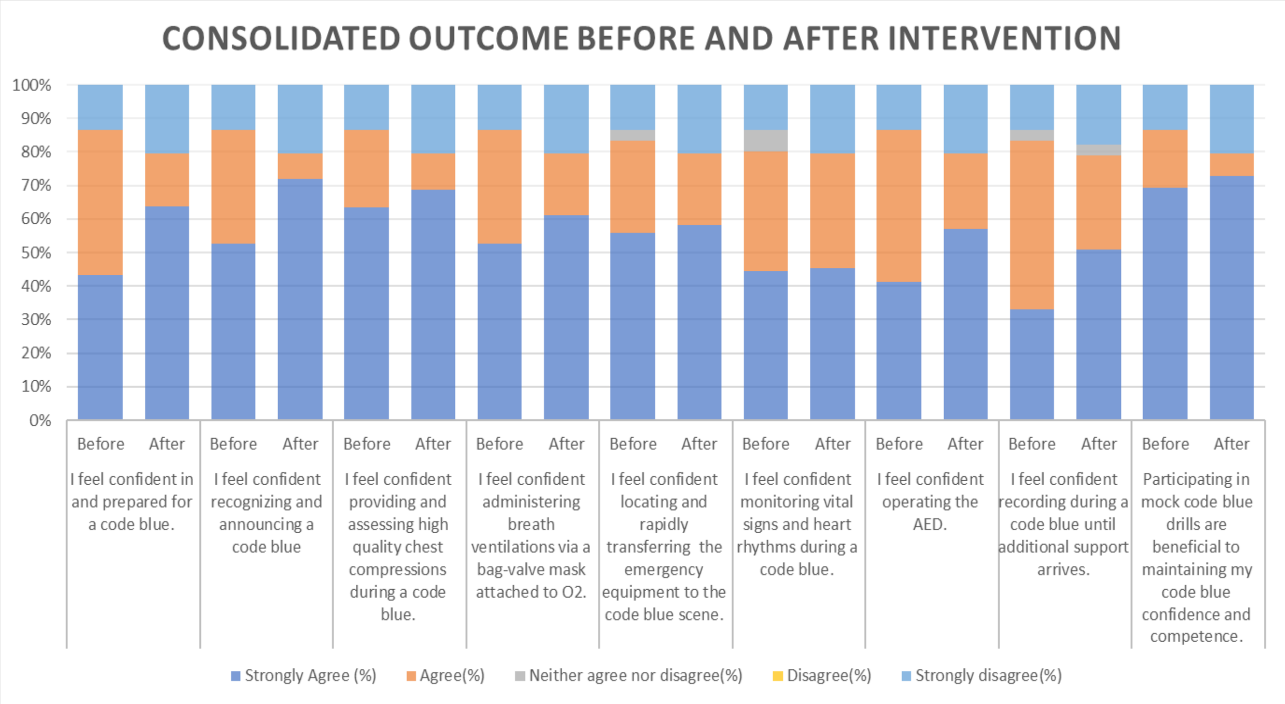
Chapter 4: Results

This chapter will present the results of the QI project aimed at assessing the impact of mock code blue drills on staff confidence levels. The project utilized pre and post mock code blue drill surveys consisting of nine statements rated on a five-point Likert scale to self-assessed confidence levels of participants (Appendix 3). The data collected provides valuable insights into the effectiveness of these drills in enhancing staff confidence, a critical factor in responding effectively to emergency situations in healthcare settings.

A total of six drills were conducted in total, three in each outpatient centre in Abu Dhabi, over the space of three months. There was a total of eleven clinical staff from nursing, medicine and radiography backgrounds included in this QI project results. In the drills, staff were assigned a role as part of the code blue emergency response team on duty for the shift: consisting of airway, compressor, defibrillator, medication/ intravenous access, team leader and recorder. Sometimes two code blue roles were assigned to one staff due to staffing restraints or other external factors.

A consolidated graph below (Table 1) displays the average scores of responses in all six pre and post mock code blue drills in two outpatient settings, overall indicating improvement. This section will look at the consolidated findings, followed by deeper analysis of each drill conducted. Overall, there is a notable 21% improvement in the statement "I feel confident in and prepared for a code blue," rising from 43% to 64%. Additionally, prior to the intervention, the confidence level in "I feel confident recognizing and announcing a code blue" was 53%, and after the intervention, it increased significantly to 72%. Furthermore, in the case of "I feel confident providing and assessing high-quality chest compressions during a code blue," there was an increase, albeit at a lower rate of 6%, going from 63% to 69%. The self-confidence scoring performing breath ventilations via a bag-valve mask attached to O2, showed an increase of strong agreement of 8%. Lastly, there was a 2% increase in confidence regarding "I feel confident locating and rapidly transferring the emergency equipment to the code blue scene" from the initial 53% to a final 61%.

Table 1: Consolidated Outcome Pre and Post Mock Code Blue Drills



In order to further look into the findings of this QI, each section below will review the results of each code blue drill and its impact on the staff's confidence level. Prior to each drill, staff were sent the pre- survey (Appendix 3) to self-assess their confidence levels, and after taking part in the drill the same survey was re-sent to be completed within three days.

Location One (Table 2) illustrates below the findings generated before and after the first code blue drill, all five staff completed the pre-survey (100% response rate) and four staff submitted their post survey feedback (80% response rate). Initially 20% of staff (one staff member) strongly agreed they felt confident in and prepared for a code blue, the post drill scores rose by 55%, with an overall 75% of participants selecting 'strongly agree' (3 respondents). This increase in self-reported confidence indicates a notable improvement in staff confidence levels after participating in a first drill. There was a 60% increase in confidence specific to performing chest compressions, with 100% of the attendees strongly agreeing post drill (four respondents). A 55% increase in confidence was observed in the performance of administering breath ventilations raising from 20% to 75% of staff selecting strongly agree (3 respondents).

The second drill in location one had 100% response rate pre- drill (5 respondents) and 80% completion rate post drill (4 respondents). Prior to participating in the second drill, Table 3 below visualizes 60% (3 respondents) of attendees strongly agreed they felt confident and prepared for a code drill compared to 20% prior to the first drill one month earlier (1 respondent). There was a reduction in staff confidence in recognizing and announcing a code blue, with one respondent dropping from strongly agree to agree. There was also a drop in the strength of staff confidence levels in regards to 'locating and rapidly transferring the emergency equipment to the code blue scene' (2 respondents).

Table 2: Outpatient Centre 1 Drill 1

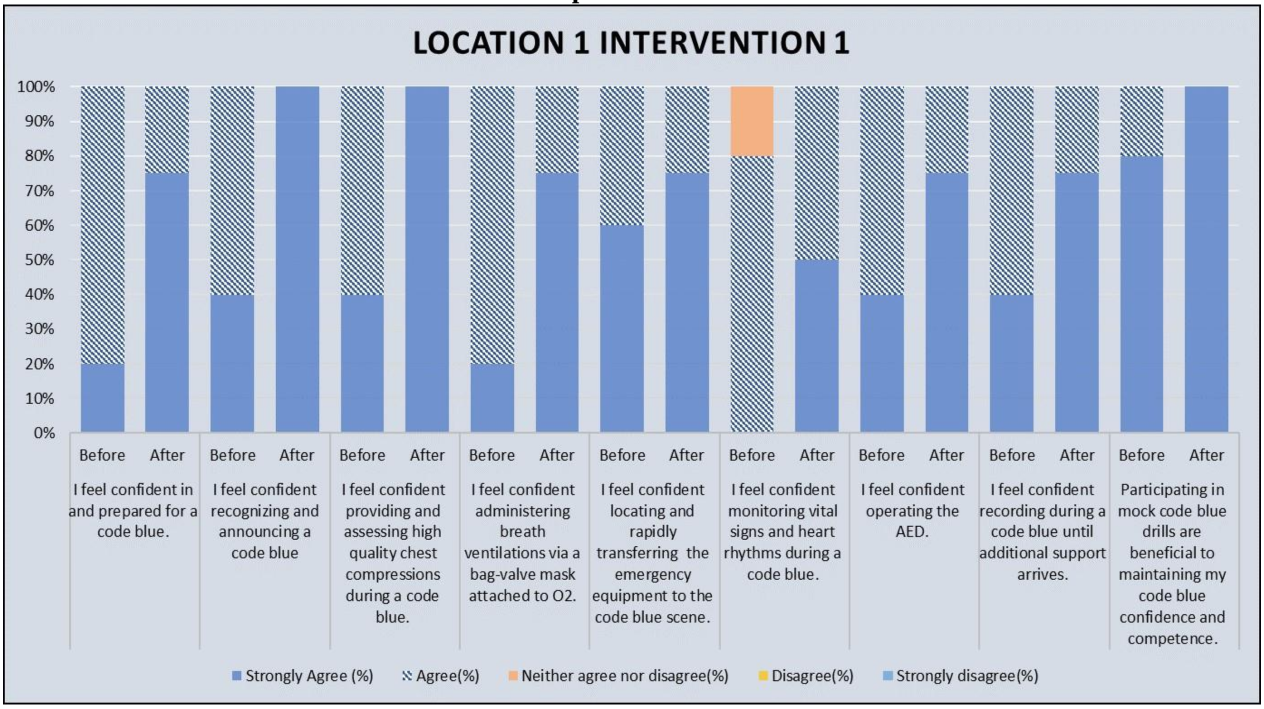
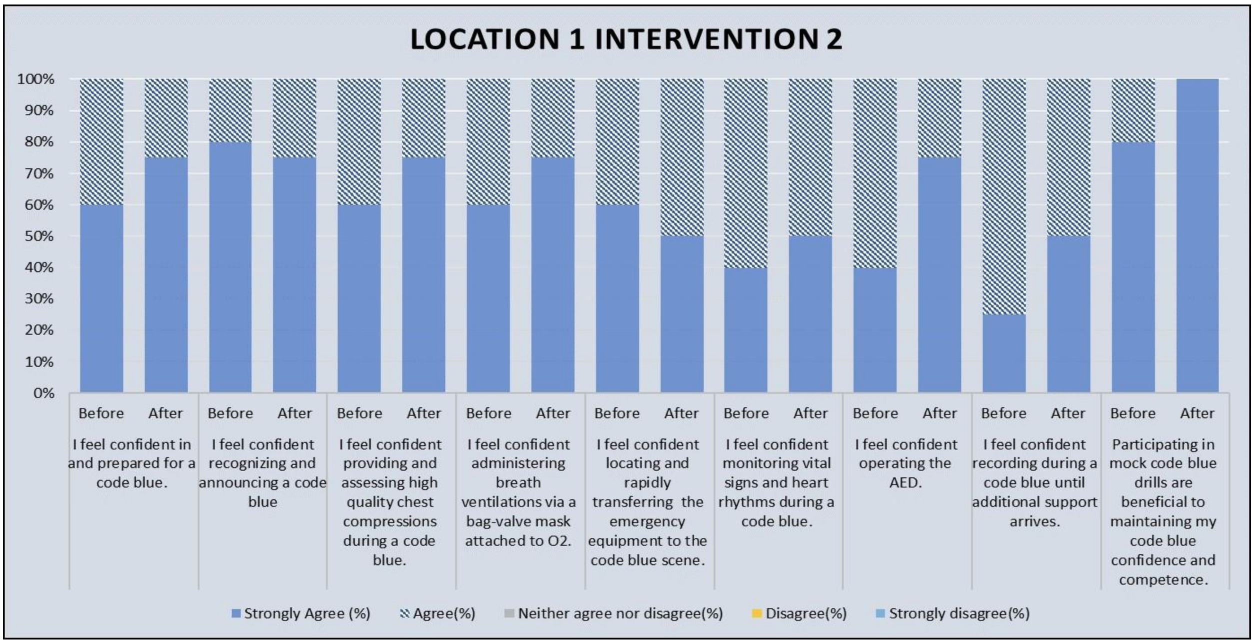


Table 3: Location 1 Drill 2



In the third and final drill at location one, all five respondents who took part complete the pre and post surveys (100% response rate). Table 4 below displays 100% of the participants (5 respondents) felt strongly confident before and after participating in a code blue drill. In comparison to the first drill pre-drill survey, only one staff member felt confident and prepared for a code blue showing an overall 80% increase in confidence. There was a decrease in level of confidence providing breath ventilations using a bag mask device, dropping from 75% to 60% for strongly agree (one respondent), however there was an increase in staff selecting ‘agree’ increasing from 25% to 40%. Staff confidence strength also decreased for ‘monitoring vital signs and heart rhythms as one respondent rated ‘agree’ vs feeling strong agreement predrill. However, responses specific to this practice did steadily increase over the three drills with zero staff reporting strongly agree prior to the first mock drill, and steadily increasing to 67% after three monthly drills.

Table 4: Location 1 Drill 3

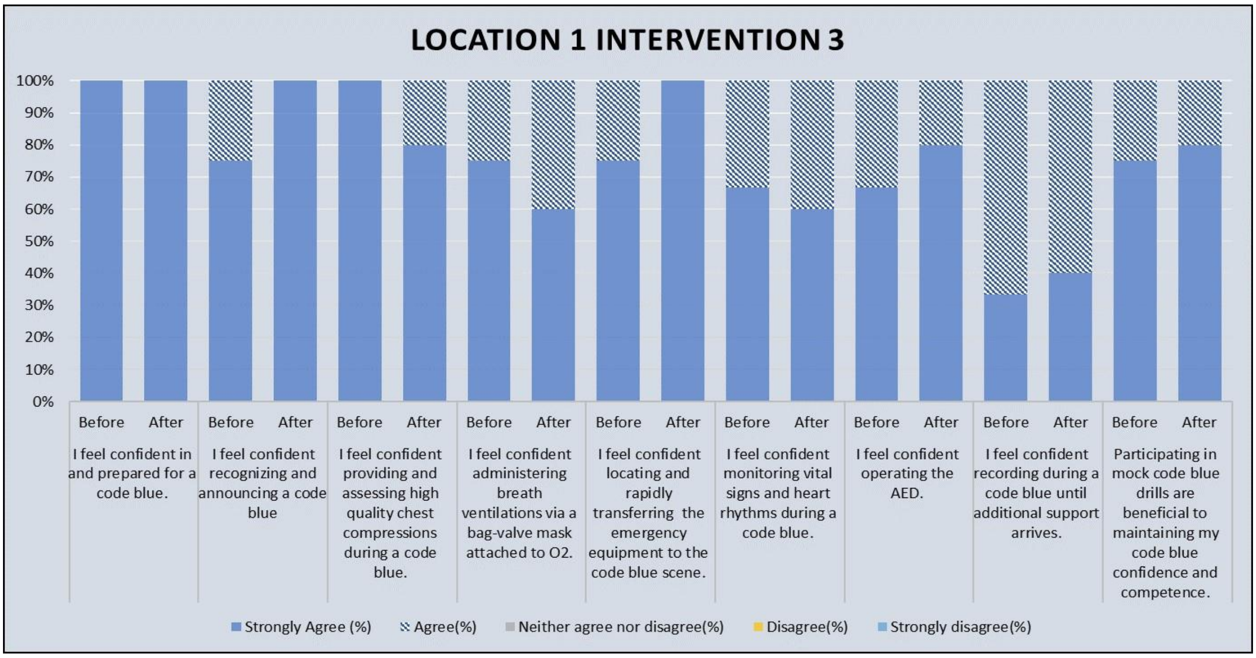


Table 5 displays the data pre and post mock code blue drill findings for the first one drill in the second outpatient centre location. All six staff who participated in the first code blue drill completed the pre-survey, however only four completed their post drill feedback. This response rate of 66.6% completing the post drill survey impacts the findings of feedback due to the lower response rate. There was a decrease in staff confidence levels feeling strongly confident and prepared for a code blue to agree by one respondent. Figure six visualizes an increase in feeling strong agreement in confidence of recognizing and announcing a code blue, providing and assessing high quality chest compressions, administering breath ventilations and locating and rapidly transferring the crash cart by one respondent in the team. While these improvements were observed, there was a 30% increase (one respondent) in strong disagreement from staff highlighting a decrease in confidence performing the same mentioned skills. There was a notable drop in the confidence of staff operating the AED, with a 30% increase (one respondent) in strong disagreement, and a 15% drop (one respondent) in both strongly agree and agree. After the first drill, 50% (two respondents) strongly disagreed with the statement ‘participating in mock code blue drills are beneficial to maintaining my code blue confidence and competence’. Unfortunately, only four out of six staff completed the post drill surveys thus limiting the generalisability and reliability of the findings.

Table 5: Location 2 Drill 1

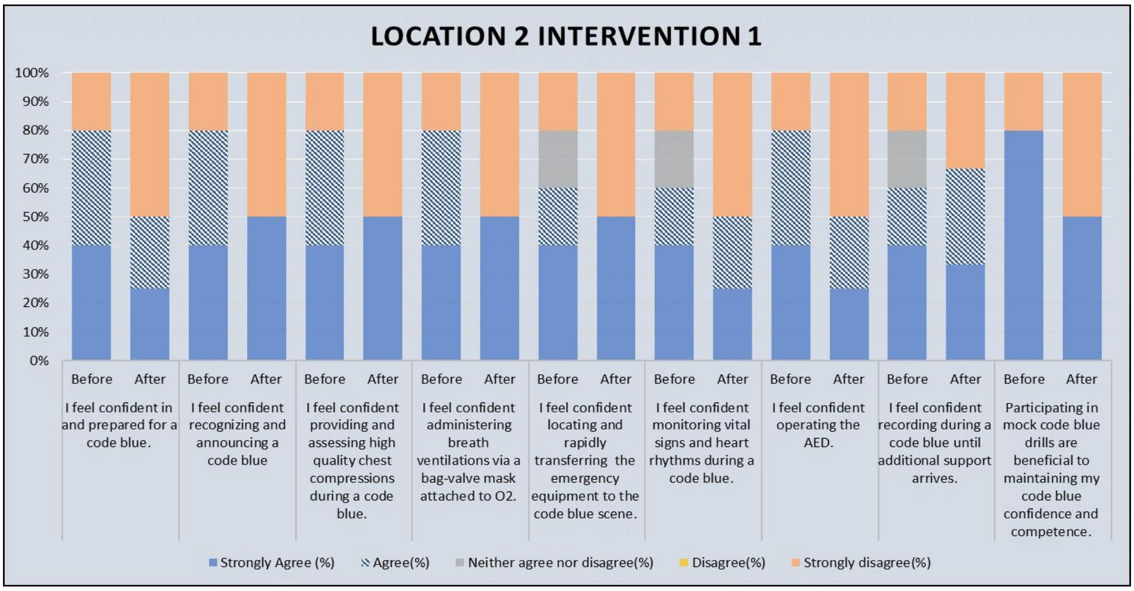
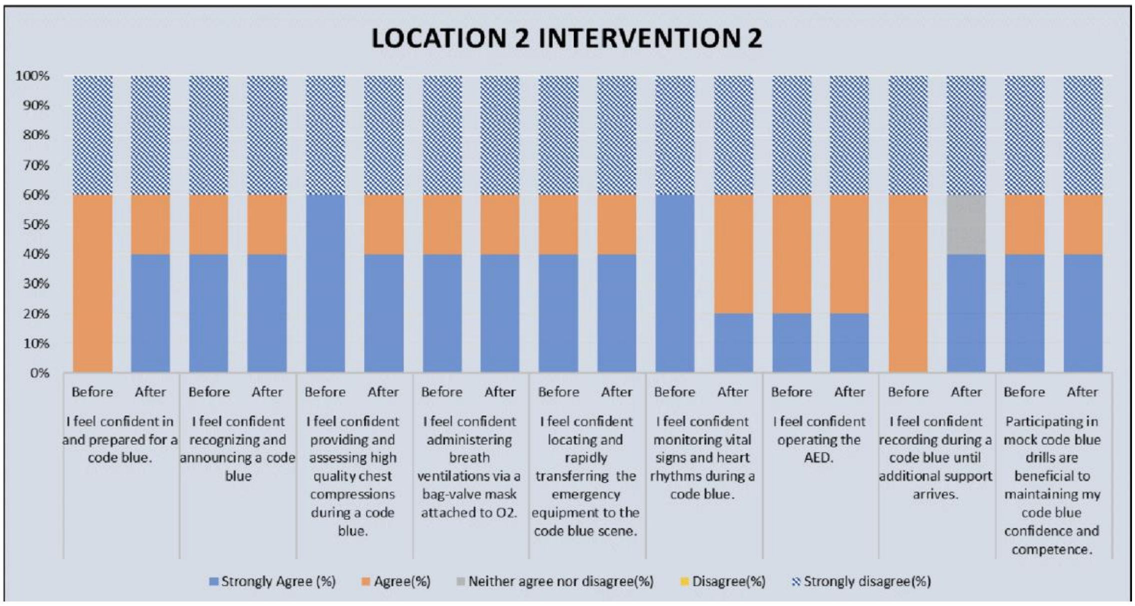


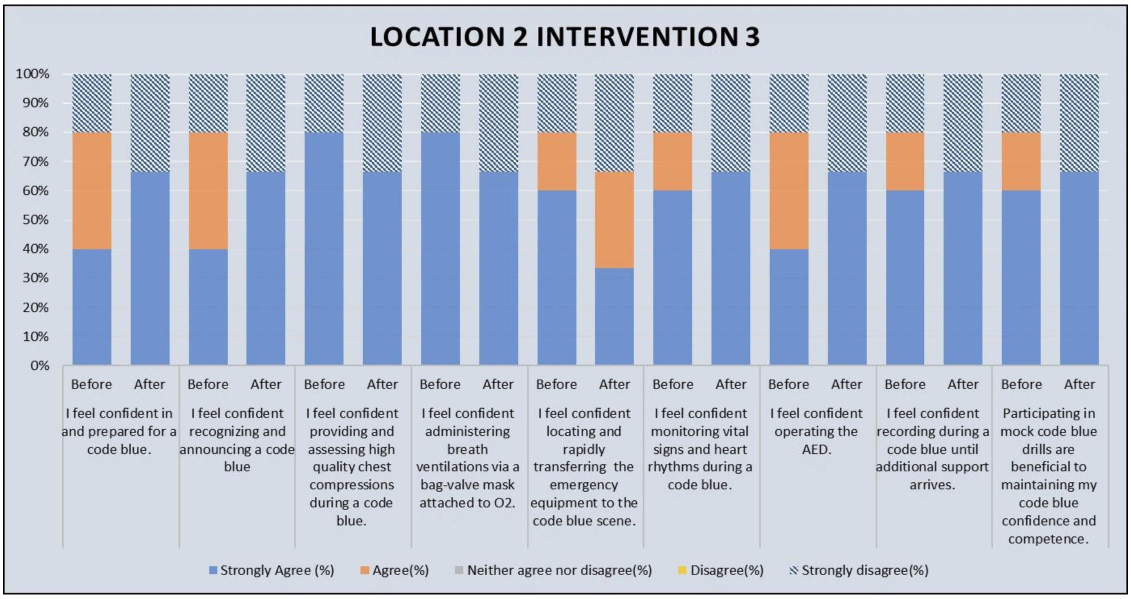
Table 6 below displays the pre and post data of the second drill conducted in location two. The pre-drill survey was completed by all six participants in the second drill, however one participant did not submit their post intervention response in the survey (response rate of 86%). There was a further 40% drop in staff confidence levels prior to the drill, with 60% (2 respondents) strongly disagreeing with the statement of feeling confident and prepared for a code blue. There was a 20% decrease in strong self-assessed confidence from staff providing and assessing high quality chest compressions as one respondent lowered to agree and two respondents remained unchanged selecting strongly disagree. Similarly, there was a 40% (two respondents) drop in confidence of monitoring vital signs and heart rhythms during a code blue after taking part in the drill. One respondent's confidence also dropped to strong disagreement the drill was 'beneficial to maintaining my code blue confidence and competence', However 40% of attendees (2 respondents) agreed the drill was beneficial to their confidence levels.

Table 6: Location 2 Drill 2



In the third and final drill in Location Two, a significant lower response rate occurred with five of the six staff completing their pre-intervention, and only 50% of participants completing their post drill surveys (3 respondents). A 22% increase (one respondent) was observed in Table 7 below in strong agreement from staff feeling confident and prepared for a code blue, however one respondent consistently strongly disagreed with all nine statements.

Table 7: Location 2 Drill 3



The consolidated findings below (Table 8) visualizes results from all pre and post surveys displaying a notable increase in strong agreement response from participants in five of nine statements. However, there was also an increase noted in strong disagreement form respondents, with one staff after each drill notably decreasing in confidence.

Table 8: Consolidated Outcome Before and After Intervention

Consolidated Outcome Before and After Intervention										
Indicators	Strongly Agree		Agree		Neither Agree/Disagree		Disagree		Strongly disagree	
	Before	After	Before	After	Before	After	Before	After	Before	After
I feel confident in and prepared for a code blue.	10	16	17	4	0	0	0	0	4	5
I feel confident recognizing and announcing a code blue	15	18	13	2	0	0	0	0	4	5
I feel confident providing and assessing high quality chest compressions during a code blue.	19	17	9	3	0	0	0	0	4	5
I feel confident administering breath ventilations via a bag-valve mask attached to O2.	16	16	11	4	1	0	0	0	4	5
I feel confident locating and rapidly transferring the emergency equipment to the code blue scene.	17	15	9	5	2	0	0	0	4	5
I feel confident monitoring vital signs and heart rhythms during a code blue.	13	11	12	9	3	0	0	0	4	5
I feel confident operating the AED.	11	14	16	5	1	0	0	0	4	5
I feel confident recording during a code blue until additional support arrives.	10	12	15	7	3	1	0	0	4	4
Participating in mock code blue drills are beneficial to maintaining my code blue confidence and competence.	21	19	7	2	0	0	0	0	4	5

Chapter Five:

INTERPRETATION AND DISCUSSION

This QI project intended to assess the impact of mock code blue drills on staff confidence levels in the outpatient setting. The overall aim of the project was to explore does the confidence of staff increase from participating in mock code blue drills regularly over a three-month period.

Further Training Needs

The consolidated findings (Figure 8) highlighted key areas for BLS resuscitation requiring further training by the identifying skills with lower confidence responses. For example, less than half of the respondents selected strongly agree in confidence monitoring vital and heart rhythms during a code blue. This opened the discussion and need for in-service and further education sessions to the clinical staff increasing their specific theory and practical skills. Specialised training may also allow for safe learning environment whereby staff would not be assessed based upon their performance.

Multi-site QI

Traditionally, QIs are conducted in a singular location, however there are various advantages associated with implementing them across multiple sites. In the view of a consolidated accumulation of the survey findings in two outpatient centres, an overall visualisation shows an improvement in the confidence levels of staff. Extending QI to more than one singular location enhances the generalizability of findings.

Frequency of Drills

Prior to the QI, code blue drills were conducted every three to four months in the outpatient settings as per the centre's policy. This QI created the discussion of increased frequency of drill training exposing the staff to simulation and refreshing their competencies. Wishing to minimize the impact on the normal day to day running's in the centres, this is a commonly faced barrier in conducting regular trainings and can be 'problematic for organizations in terms of matching work and training schedules and meeting the operational demands' (Vlasblo *et al*., 2020, p.2). To overcome this, the creation of a facility audit tool to score performance metrics was developed to determine the frequency of the drill based on the audit tool score.

Location Differences

While there was a consistent trend of increased confidence levels in location one, the staff responses in location two exhibited differing insights and results. Within location one, specialities consisted of nurses and radiographers, while the team in location two included the same roles, as well as a physician as team leader. The traditional notions of cardiac arrest teamwork whereby the assumption of physician team leader possesses both the clinical information and communication skills to effectively lead a resuscitation often 'serve to reinforce dysfunctional hierarchies and tensions between integration' (Clarke, Apesoa-Varano and Barton, 2016, p.2). The staff confidence levels were notably lesser in location two, despite a physician being present. The role of a team leader can be taken by any certified member of staff as per the facility's policy, and in location one this role was performed by a nurse, however in location two this was undertaken by the physician present. Riley *et al*., (2011) claim if a leader is defined as the formally assigned individual, such as the medical doctor present, then leadership transfer between the doctor and other members of the code team is not even recognized.

Literature demonstrates that human factors such as teamwork and leadership have a direct impact on compliance to resuscitation algorithms and the likelihood of survival (Hunziker *et al*., 2011). In location number one, 100% of the staff felt confident and ready for a code blue after taking part in three monthly drills, yet in location two only 67% of the staff strongly agreed and 33% of the staff strongly disagreed. However, this result was gathered from only 3 respondents who completed the third post drill survey in location 2, representing the confidence of only 50% of the staff involved. Clarke, Apesoa-Varano and Barton (2016, p.2) state the unpredictable nature of response to cardiac arrest creates tension between 'interdependence and the need for autonomous action within a diverse group of providers'. They also highlight that studies focusing on interventions and assessment of solely medical doctors suffer from a serious limitation in perspective, and fundamentally overlook the training needs and essential roles of other healthcare staff who must act even prior to the arrival of a code leader. To gain further insights, Clarke, Apesoa-Varano and Barton (2016) stress the need for the perspectives of each participant in a code blue team to be considered via qualitative studies, as each have their own knowledge, methods of communication, and views of themselves in relation to other healthcare professionals within a healthcare system.

Unvalidated Tool

The pre and post survey (Appendix 3) utilised in this QI was developed by the author and is not a validated tool, thus a considerable limitation in this project. Validation of measurement tools is vital in safeguarding the accuracy, consistency, and validity of the data gathered (Streiner, Norman and Cairney, 2015). When a QI tool is not validated, there is an increased risk of measurement error, bias, and misinterpretation of results, which can compromise the integrity of the QI and weaken the validity of results. Reed *et al*., (2024) state in most QI projects, surveys are usually developed at a more granular local level to back bespoke investigation, evaluation and improvement efforts, much of which is under developed and under researched. There are various challenges of developing validated surveys and significant effort and expertise is usually invested in areas of survey development in national surveys and by clinical specialist groups (Reed *et al*., 2024).

Sample Size

Due to the size of the outpatient centres, there are limited numbers of clinical staff, with only a total of eleven taking part in all six drills. The limited availability or participation of clinical staff results in a small sample size, reducing the statistical influence of the study. A smaller sample size can limit the generalizability of the findings and the ability to detect substantial effects (Faber and Fonseca, 2014). However, the PDSA cycle allows for a threshold of failure and conducting change at a small scale allows for learning from the failure, and trying again is all part of the QI process (Roberts-Turner and Shah, 2021).

Response Rate

While there is no reputable threshold for defining a high response rate, a rate of 80% or higher is considered outstanding (Booker, Austin and Balasubramanian, 2021). Location one had an overall response rate of 93.3% (28 out of 30 expected responses) and location two had an overall 80.5% response rate (29 out of 36 responses) from the code blue drill participants. There are multiple factors affecting location two's both performance and feedback, this centre faces higher volumes of patients, staffing issues and recent changes to the team. Efforts were made to encourage feedback by sending reminders via team huddles, email and during the code blue drill QR codes were provided to the staff for ease of access. There are other reasons as low response rates can occur in healthcare QI such as demanding work rotas, disruptions in routine practice, little motivation to participate in research and confidentiality concerns (VanGeest, Johnson and Welch, 2007).

External Influence

The staff in the drills may engage in additional emergency training outside of the drills or had previous experience with regular exposure to cardiac arrests thus influencing their confidence levels. For example in Location Two, three of the clinical staff attended their two yearly BLS certification training during the QI, renewing their skills and theory in cardiac arrest management. However, recognizing and governing for these external influences can be challenging.

Likert Scale

The Likert scale used to measure confidence levels in the pre and post surveys may not gather the full spectrum of staff perceptions. Participants may interpret and answer Likert scale questions differently, affecting the precision of the data gathered. There has been a lasting dispute regarding the level of measurement that is suitable to assume for data gained from Likert type response scales (Woltz *et al*., 2012). The scoring data may not adequately represent the actual capability that underlies the performance on a (pre- or post) test. In general, the relationship between raw scores and ability scores is not linear and created scores that do not represent equal changes of ability (Dimitrov and Rumrill, 2003). When assessing constructs such as selfconfidence or self-efficacy, it is likely that one's perception of prior events is more informative than the objective reality of prior incidences (Woltz *et al*., 2012). There are arguments on either side of this issue, dependent on the validity evidence that would be challenging to obtain but possibly no more challenging than the gathering of informative validity evidence for any measure or method of assessment (Woltz *et al*., 2012). Further exploration through open ended, qualitative feedback would benefit understanding the reasons for low confidence levels in the drills. Likert scaling is limited in its presentation as information can be distorted and lost problem 'due to its ordinal nature and closed format' (Li, 2013, pg.1610). Through further qualitative examination, researchers can uncover nuanced aspects of staff understandings during code blue drills, including feelings of anxiety, barriers to performance, and approaches for coping with high-stress scenarios (Hsieh & Shannon, 2005). Qualitative research enables the identification of contextual influences, such as organizational culture, team dynamics, and simulation planning, that may impact staff confidence levels (Dieckmann *et al*., 2007).

Resources

The constraints on resources, including a lack of simulation equipment, time and personnel, may affect the frequency and quality of mock code blue drills. Notably there was not always a functioning AED training device for the drills which may impact the intensity and effectiveness of the intervention. In Location Two, the public announcement speaker sounding the code blue alert overhead was experiencing issues with audio volumes throughout all three drills in this QI. This impacted the team's response times and promptness due to code announcement delay, affecting the clarity and communication delivery of the emergency drill. These issues are commonly faced in QI projects despite the undeniable link to reducing patient harm, reasons include a shortage of time, resources, understanding and confidence (Lucas and Nacer, 2015).

The results of this QI project investigating the impact of mock code blue drills on staff confidence levels have provided encouraging evidence of improvement, as demonstrated by changes in self-assessed confidence scores measured through Likert scales in pre- and post-surveys. These findings align with previous research claiming the efficacy of simulation-based training in enhancing healthcare professionals' readiness and confidence in rapid response situations (Hunziker *et al*., 2011). The observed improvements underscore the importance of regular and organized simulation training programs in strengthening staff competence and promptness in effectively managing cardiac arrest scenarios in the outpatient setting.

Chapter Six:
RECOMMENDATIONS AND CONCLUSION

Recommendations

Based on the positive impact observed on staff confidence levels in the outpatient setting, it is suggested to continue frequent mock code blue drills. These drills should be booked at intervals that allow for steady reiteration of skills and protocols. The below themes have been identified from this QI to further improve outpatient settings emergency cardiac arrest response, and ultimately, increase the likelihood of victim survival. Developing personalised training and education in-service sessions focuses on precise aspects recognised during the QI project as areas for improvement. These sessions should address not only clinical interventions but also communication strategies and team dynamics during code blue situations. This QI project encourages multidisciplinary participation in mock code blue drills to improve collaboration among various healthcare professionals working in outpatient settings. This can include nurses, physicians, allied health professionals, and administrative staff. From this QI, implementation of structured feedback and debriefing sessions following each mock code blue drill is recommended to facilitate reflective learning and continuous improvement. Through discussion staff are encouraged to openly communicate and give constructive feedback inspiring identification of strengths and areas for further development. Development of an audit tool and accurate documentation to evaluate mock code blue drills is suggested. Participant feedback, noted observations, and identified areas for improvement can optimize the effectiveness of future drills. Lastly, leadership involvement is central for allocating resources, fostering a culture of safety, and prioritizing staff training and development initiatives.

From these recommendations accumulated in this QI, fellow healthcare organizations can endure and further increase the helpful impact of mock code blue drills on staff confidence levels in the outpatient setting, ultimately enhancing patient safety and cardiac arrest outcomes.

Conclusion

This QI Project aimed to assess the impact of mock code blue drills on healthcare staff's confidence levels. By conducting monthly code blue drills in two outpatient centres, staff completed pre and post drill surveys self- assessing their confidence on a 5-point Likert scale. Results gathered from the surveys were then visualised into bar graphs and trends, correlations and findings were interpreted and discussed. Overall, there was an improvement in staff confidence in the consolidated findings, however there was substantial variations in each location which may have been impacted by roles, responsibilities, operational changes and other external influences. There was a total of eleven clinical staff who participated in the monthly drills in two outpatient centres. This QI project showed encouraging evidence of improvement, as demonstrated by changes in self-assessed confidence scores measured through Likert scaling in pre- and post-surveys. Moving forward, it is important to sustain the energy of these positive outcomes through constant training, education and drill frequency. By prioritizing staff training and development in emergency preparedness, healthcare facilities can mitigate the risks associated with cardiac arrest events in outpatient settings, ultimately improving patient outcomes and safety. Moreover, investing in simulation-based education not only strengthens individual competencies but also contributes to organizational resilience and readiness to respond to emergencies effectively (Feder *et al*., 2015). Therefore, sustaining and expanding simulation training initiatives should be considered a cornerstone of comprehensive quality improvement strategies aimed at enhancing patient care and safety in outpatient settings. From this QI, code blue drills are now performed as often as monthly after the findings of this project were presented to the executive team. Results gathered from this QI assisted with the creation and development an auditing tool based off timed performance and the overall score determining the frequency of drills. In the second location, the overhead speaker system faced issues with volume and staff complained they could not hear the initial emergency alert. This was issue was escalated to facilities for repair however remained unresolved for all drills conducted in the location impacting staff response and timely arrival of other team members. Resources in this QI were varied as the training AED device was present for some but not all code blue drills. High quality simulation equipment helps to replicate the real-life event and this lack of high-fidelity equipment is beneficial to the learner's experience. Additionally, introducing interdisciplinary collaboration and participation in simulation-based education can further improve staff engagement and performance during mock code blue drills (Sullivan *et al*., 2013). By prioritizing staff training and development in emergency attentiveness, healthcare organizations including outpatient settings can mitigate the risks associated with cardiac arrest events, ultimately improving patient outcomes and safety. Investing in simulation education such as code blue drills not only supports individual capabilities, but also contributes to organizational resilience and readiness to manage to emergencies successfully Tofil *et al*., (2014). Sustaining and expanding simulation training initiatives such as drills should be considered a cornerstone of wide-ranging QI strategies aimed at enhancing patient care and safety in outpatient settings.

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