Summer 8-7-2021

Improving Progressive Care Nurses' Confidence and Performance During In-Hospital Cardiac Arrest (IHCA): A Continuous Quality Improvement Initiative

Katelyn Barley

Improving Progressive Care Nurses' Confidence and Performance During In-Hospital Cardiac Arrest (IHCA): A Continuous Quality Improvement Initiative

Katelyn A. Barley

Duquesne University School of Nursing

Abstract

The literature is clear regarding the benefits of high-quality cardiopulmonary resuscitation (CPR) in relation to patient outcomes. The American Heart Association (AHA) guidelines recommend immediate initiation of chest compressions and defibrillation as soon as possible to increase the chance of survival from cardiac arrest. The development of automatic external defibrillators (AEDs) have increased the survival rates of out-of-hospital cardiac arrest, however rates of survival from in-hospital cardiac arrest (IHCA) have not improved over the past several decades despite an increase in resuscitation research.

This project was to develop a system of quality improvement related to patient outcomes from IHCA. The aims included improving both performance and confidence of progressive care nurses when participating in an IHCA event. The retrospective data was collected and analyzed to determine gaps in performance data. The Emergency Response Confidence Tool (ERCT) was used to survey progressive care nurses' confidence in participating in IHCA. The gaps in confidence were also analyzed to make recommendations for quality improvement.

Keywords: in-hospital cardiac arrest (IHCA), confidence, performance, quality improvement, resuscitation effectiveness, progressive care, nurses

Improving Progressive Care Nurses' Confidence and Performance During In-Hospital Cardiac Arrest (IHCA): A Continuous Quality Improvement Initiative

Nationally, survival rates of cardiac arrest in the hospital range between 10-20% (Herbers & Heaser, 2016; Morton et al., 2019; Nallamothu et al., 2018) and are impacted by both the confidence and skills of the nurses who must intervene immediately to negate signs and symptoms of deterioration. Because delays in initiation of chest compressions can be detrimental to a patient, nurses must have both confidence and skills to intervene immediately (Barbash & Kahn, 2015). New graduate nurses express patient deterioration events are high anxiety (McPhee, 2018). Additionally, medical-surgical nurses are the most frequent health care professionals to identify signs and symptoms of deterioration and/or initiate life-saving interventions (Hart et al., 2014).

This project addressed the need for continuous monitoring and improvement of quality metrics and health care outcomes related to in-hospital cardiac arrest (IHCA). Cardiac arrest is a low-frequency, high-risk skill that requires knowledge and skill to save a patient life. Non-critical care nurses have expressed lack of confidence and general discomfort in treating patients in a life-threatening situation such as IHCA. This project evaluated IHCA process and outcome measures from two progressive care units as well as surveyed the nurses regarding their confidence in participating in IHCA situations.

Literature Review

Sudden, unexpected cardiac arrest is a leading cause of morbidity and mortality in the inpatient hospital setting (Davis et al., 2015). Despite the advancements made related to resuscitation science, including medications, technological advances, and other potential therapies, the survival rate remains low. Delays in recognition, intervention, or even absence of

action can result in a negative impact on patient care (Crowe et al., 2018). According to Barbash & Kahn (2015), improvements in resuscitation outcomes "require not just advances in the understanding of bedside physiology … but also advances in the organization of resuscitation care" (p. 165). This project utilized the implementation of evidence-based practice (EBP) to improve IHCA patient outcomes.

Literature Review Framework

According to White et al. (2016), "nurses routinely need to question their practice and look for alternative methods to improve the process of care" (p. 4). The framework for implementing EBP in this project was the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model) (Iowa Model Collaborative, 2017). This model serves as a guide for nurses to implement research findings to improve patient care (Titler et al., 2001). Figure 1 is a visual representation of this model. This model allows the identification of triggers to activate quality improvement initiatives and meaningful change.

An area of clinical inquiry is established and then addressed through synthesis and application of research findings. For this project, the trigger was lack of adequate skills and confidence in managing IHCA on the progressive care units. Additional triggers include national initiatives such as the *Get with the Guidelines: Resuscitation* database supported by the American Heart Association (2018). After identifying triggers, the next step in the Iowa Model is to appraise and synthesize a body of evidence related to the clinical problem. If there is sufficient evidence, the researcher and a team can then design and plot a practice change, integrate, and sustain the practice change, and finally disseminate results (Iowa Model Collaborative, 2017).

A literature review was conducted using the databases CINAHL & Pubmed with 51 total articles that met search criteria. Search terms included in-hospital cardiac arrest, nursing, and

confidence. Articles included were all based on in-hospital cardiac arrest as opposed to out of hospital, as well as having a nursing focus rather than an Intensivist or physician focus. Articles published prior to 2015 were eliminated. 15 articles remained, including one randomized controlled trial served as level I evidence. Four level II and three level III articles consisting of pilot and descriptive studies were also included. One clinical practice guideline published by the American Heart Association served as an important piece of evidence in this project. Finally, five level V pieces of evidence were included and one level A/B qualitative study.

Synthesis of the Literature

According to Barbash & Kahn (2015), "efforts to reduce mortality and improve functional status after critical illness, regardless of cause, rest on effective resuscitation based on sound physiologic principles" (p. 166). High-quality cardiopulmonary resuscitation (CPR) is the most important lifesaving intervention for a patient in cardiac arrest (AHA, 2020). CPR restores circulation between 40-60% of the time (Sullivan et al., 2015). Sullivan (2015) found that "immediate initiation of quality compressions improves the effectiveness of arrest medications and defibrillation" (p. 7). If CPR is begun in the first minute of cardiac arrest, survival improves significantly. Because delays in initiation of chest compressions can be detrimental to a patient, nurses must have both confidence and skills to intervene immediately (Barbash & Kahn, 2015). The rapid recognition of pulselessness and immediate chest compression initiation is paramount in increasing the chances of patient survival.

For victims of witnessed or captured ventricular fibrillation (VF) or pulseless ventricular tachycardia (pVT) arrests, early CPR and rapid defibrillation significantly increases the chance for survival to hospital discharge (AHA, 2015). Every minute in a shockable rhythm results in rates of survival declining 7-10% per minute (Nallamothu et al., 2018). Defibrillation occurring

within 90 seconds to 2 minutes is also associated with improved survival to discharge (Sullivan, 2015). Additional interventions such as medications and advanced airways are associated with an increased rate of return of spontaneous circulation (ROSC) but have not shown to increase the chance of survival to hospital discharge (AHA, 2015).

The American Heart Association *Guidelines for CPR and ECC* (2020) indicate that "effective education is an essential contributor to improved survival outcomes from cardiac arrest" (p. S551). The *Guidelines* (AHA, 2020) emphasize point-of-care tools such as the IHCA Chain of Survival to help reinforce the importance of early recognition, high-quality CPR, and early defibrillation (Figure 2). The most recent update to the AHA guidelines (2020) emphasize the use of deliberate practice interventions, booster training between recertifications, in situ training, and use of virtual reality and gamified learning to enhance training.

Dudzik (2019) defines Resuscitation Quality Improvement (RQI) as "a competency-based approach that emphasizes skill mastery through low-dose, high-frequency training" (p. 2). Quality improvement also involves monitoring of processes and patient outcomes to measure the effects of an education intervention. Starks et al. (2018) found that duration of participation in a IHCA registry was independently associated with improvement in performance. Nallamothu et al. (2018) studied the differences between high, medium, and low-performing hospitals that participate in AHA's *Get with the Guidelines – Resuscitation* registry. Facilities that recorded higher survival rates from IHCA had strong team design, team composition and roles, communication and leadership, and training education (Nallamothu et al., 2018). The recommendation of Subbe et al. (2019) states hospitals with rapid response teams should track all IHCA events in their non-ICU wards.

Conceptual Model

To further establish the importance of CPR quality, Barbash & Kahn (2015) developed *A Conceptual Model for Effective Resuscitation* consisting of three limbs: afferent, efferent, and feedback (Barbash & Kahn, 2015). The conceptual model is further delineated in Figure 3. Barbash & Kahn (2015) explain the key principles of their model, including:

1. In-hospital shock and death is predicted by a time period of physiologic deterioration that could be recognized by appropriate monitoring;
2. Rapid response teams and code teams can initiate treatments that improve patient outcomes, either by early response, effective resuscitation practices, or both; and
3. Interdisciplinary, multicomponent quality improvement based on feedback and education can improve the performance of monitoring systems and resuscitation teams (p. 166).

This project is focused on the feedback limb, which is developing a quality improvement in resuscitation system that contains multiple components. The first component is comprised of data collection on the process of care and the creation of a database to broadly measure resuscitation effectiveness (Barbash & Kahn, 2015). Gaps in care can be identified through the analysis of both the process and outcome data. Barbash & Kahn (2015) also recommend formal feedback devices, such as surveys of resuscitation providers using a reliable and valid tool, or semi-structured interviews. Lastly, the authors recommend that once quality deficiencies have been identified, interventions should be developed to target them with the goal of improving both the processes and the outcomes of care (Barbash & Kahn, 2015). Permission was received from the corresponding author of this model for use in this project and manuscript (J. Kahn, personal communication, April 9, 2021).

Evaluation Framework

This project utilized the W.K. Kellogg Foundation (WKKF) *Step-by-Step Guide to Evaluation* (2017) as a framework to guide evaluation. WKKF (2017) defines the purpose of evaluation is to "facilitate learning and improve your strategy, initiative, or program" (p. 14). The evaluation consists of collecting evidence (or data) and summarizing it to form conclusions about the quality and effectiveness of the program. The model suggests using interviews, written surveys, focus groups, observation, or numerical data to collect information related to a project. Determining effectiveness of programs is a branch of evidence-based practice that allows organization to measure and demonstrate the success of their processes.

Description of Project

This project was completed at a small, private, urban hospital, containing approximately 208 total beds, with 2 units designated as "progressive care", representing 62 beds. All progressive care unit beds are telemetry capable, with one of the two units containing bedside monitoring systems. The approximately 75 registered nurses employed on these two units are required to be Advanced Cardiac Life Support (ACLS) certified within one year of hire. The patient population consists of a myriad of diagnoses, including neurological, cardiac, and medical issues. This project was approved by both the University and facility Institutional Review Board. There were no ethical considerations or conflicts of interest in implementing this project.

Purpose

The purpose of this project is to conduct a program evaluation of the current cardiac arrest practices at the project facility. Patient outcomes from in hospital cardiac arrest (IHCA) were analyzed and opportunities for improvement in progressive care nursing staff's response

were identified. AHA guidelines (2018) have identified benchmarks for time to call for help, time to compression initiation, and time to defibrillation to provide the most evidence-based care. This data was used to evaluate gaps in performance and areas for improvement. The project also evaluated nurse's confidence related to in IHCA and made recommendations for training improvement.

Aims & Objectives

The following aims and objectives were identified to successfully complete this project:

1. To evaluate the need for a continuous quality improvement initiative in IHCA performance within the project facility.
    a. Conduct retrospective analysis of IHCA events over the past 2 years.
    b. Analyze trends in the data including process measures related to the IHCA events.
2. To improve the confidence of progressive care nurses during IHCA.
    a. Survey nurses using the Emergency Response Confidence Tool (Arnold et al., 2009) program on their baseline comfort with code situations/IHCA.
    b. Analyze the results for areas for improvement.
3. To establish a system to evaluate and re-evaluate performance of progressive care nurses during IHCA.
    a. Support the development and implementation of a mock code experience while establishing performance measures based on American Heart Association (AHA) guidelines.
    b. Recommend the implementation of repeated interventions to determine change in performance measures.

4. To evaluate the literature regarding the effectiveness of a mock code program on patient outcomes through continuous quality improvement.
    a. Continue to collect data on performance measures during IHCA.

Methodology

This project evaluates the many different measures that contribute to IHCA patient outcomes, including the performance of staff members administering care during the event, the processes in which the facility conducts resuscitation, and nurse factors such as confidence that contribute to the success of the resuscitation. The review of the literature is clear in support of increasing awareness of IHCA outcomes through quality improvement. The literature suggests performance monitoring and interventions to improve a facility's response to IHCA events to improve patient outcomes. The evaluation design is based on the W. K. Kellogg Foundation's *Step-by-Step Guide to Evaluation* (2017). The WKKF (2017) defines three separate types of evaluation: performance monitoring, process evaluation, and outcome evaluation. This evaluation touches on all three types of evaluation, from the monitoring of the current IHCA performance and confidence level of nurses, to facility processes related to policies and procedures, and ultimate patient outcomes related to IHCA.

An important part of any program evaluation strategy is the development of a logic model. The logic model serves as a planning tool to use as a benchmark for comparing findings to their intended outcomes. The logic model of the facility's IHCA process is pictured in Figure 4.

Performance & Outcome Measures

The first two performance measure evaluated were time to call for help and time to compression initiation. These measures are represented by time in seconds. The AHA guidelines

(2020) state the rescuer should check for a pulse for no longer than 10 seconds before intervening. The primary nurse's responsibility is to determine the patient's unresponsiveness and activate the IHCA process immediately. The most important intervention when a patient is experiencing pulselessness is to begin compressions (AHA, 2020). Return of spontaneous circulation (ROSC) is most likely when compressions are begun immediately, and defibrillation (if indicated) is completed within 90 seconds to two minutes. Therefore, the third performance measure collected was time to defibrillation. IHCA events that require defibrillation include pulseless ventricular tachycardia or ventricular fibrillation, which is not always present in IHCA events. Finally, patient disposition was collected as an outcome measure. A successful IHCA results in ROSC, while an unsuccessful resuscitation results in patient death.

Process Measures

An additional component to this program evaluation was a review of the current facility policies and procedures related to IHCA. Policy #601-045-97 was obtained from the facility to gain a baseline of the intended chain of events during an IHCA. On-campus interviews with key stakeholders were conducted to supplement the policy data. A process map was developed to assess for gaps in adherence and effectiveness of the policy and to use as a comparison to IHCA data collected.

Confidence Level of Bedside Nurses

Due to the frequency of IHCA events on the units, it is prudent to evaluate more formally the confidence of the bedside nurses. According to Arnold et al. (2009), "confidence can enhance or impede performance… assessing confidence is a way to establish construct validity of a performance measure" (p. e36). To evaluate measures related to confidence, an electronic survey was developed based on the Emergency Response Confidence Tool (ERCT) (Arnold et al.,

2009). Permission was obtained for tool replication and dissemination from the corresponding author (personal communication, J. Arnold, February 12, 2021). The original tool is presented in Figure 5.

The ERCT was developed to assess individual participants' confidence in responding to an emergency (Arnold et al., 2009). The tool was originally indicated for use in simulation exercises related to a cardiac arrest. The participants are asked to self-rate their confidence in their ability to complete 17 items as a percentage. The participant responds to each item as 0-100% confident, with 0% representing "not confident", 20-30% representing "moderately confident", and 90-100% representing "confident".

Arnold and colleagues (2009) designed a study to evaluate the construct validity of this instrument using the "known groups" technique. Group 1 had >10 years ICU experience; group 2 had <13 months ICU experience but had a formal ICU internship program; group 3 has 2-8 years of medical-surgical experience, but no ICU training or experience. Statistically significant differences were found between groups 1 and 3 and between groups 2 and 3, which supports construct validity of this tool.

The tool was also tested for reliability using the Spearman correlation coefficient. This statistical measure represents test-retest reliability, which was moderately high (r_s = .87) indicating stability of the items. For internal consistency, the tool scored a Chronbach's alpha of 0.92 for the entire set of items (Arnold et al., 2009).

Implementation & Data Collection

In combination with the established stakeholders, this evaluation began in Fall 2020. The literature review was completed and the impetus for the project was shared with the progressive care nurse educator and unit directors. Institutional Review Board (IRB) exemption was obtained

from both the University and the facility. Data collection began in March 2021, starting with a chart review of all IHCA cases from January 2019 – March 2021. A mixed methods confidence survey was also completed in March 2021. Additional data collection related to process measures was completed in the Spring of 2021. Data management plan elements are described in Table 1.

IHCA Performance & Outcome Measures Data Collection

To evaluate the patient outcome measures related to IHCA performance, a retrospective analysis was completed evaluating 12 IHCA events on the two progressive care units from January 2019 – March 2021. Code documentation is completed on a paper *Code Blue Flow Sheet* (Figure 6) and kept in the paper chart. This form is then uploaded into the electronic health record after patient discharge. This data was examined as well as the electronic health records of the patients who experienced an IHCA for evaluation.

To evaluate the measures "time to call for help" and "time to compression initiation", data was collected from the *Code Blue Flow Sheet*. Unfortunately, "time to call for help" was unable to be abstracted due to the nature of the facility's documentation. The "est. time of code" and "time CPR started" are both documented on the paper flowsheet, therefore time to compression initiation was derived from the difference in times measured in minutes and seconds. Whether or not the arrest was observed was also collected. For an unobserved arrest, the "est. time of code" and "time CPR started" are identical, therefore time to compression initiation cannot be evaluated.

When these rhythms were recorded, the time to defibrillation was collected by measuring the time between "est. time of code" and the time recorded for "cardiac intervention – defibrillate/cardiovert". The presenting rhythm as well as amount of time between rhythm/pulse checks was also collected to add context to this performance measure. For these process

measures, any information located in the narrative notes of the electronic health record was also reviewed to provide corroboration.

Patient disposition was the outcome measure evaluated in this project. The disposition of the patient is also documented on the *Code Blue Flow Sheet*, as "successful" or "unsuccessful". If the IHCA is successful, this implies return of spontaneous circulation (ROSC) was achieved, and the documentation includes the disposition unit and time. "Successful" resuscitations also require the documentation of whether the patient was neurologically awake, responsive, or unresponsive. If the IHCA is unsuccessful, the patient expires, and the final disposition is noted as such. The disposition was also corroborated by review of the electronic health record and narrative notes written by both providers and nursing. Of note, upon review of the electronic health record, patients may have since passed away, but not due to the IHCA event being analyzed. If the patient had ultimately expired since the IHCA event, that was noted in data collection as well.

Process Measures Collection

On the progressive care unit, two other pieces of documentation are not a part of the permanent medical record but are recorded and collected by the facility. The nursing unit managers keep copies of the paperwork related to the IHCA event, which includes two additional forms: *Response Evaluation: Cardiopulmonary Resuscitation* (Figure 7) and *Code Blue Debriefing Form* (Figure 8). These two forms are not a part of the medical record. The data from these two forms serves as a qualitative supplement to the *Code Blue Flow Sheet*.

The *Response Evaluation: Cardiopulmonary Resuscitation* form states the data collected is used "for QI purposes only". The broad categories of evaluation measured on this form include personnel, equipment, CPR technique, IV access and drugs, and defibrillation/cardioversion. The

nurse documenter post-IHCA is directed to indicate a yes/no answer to statements such as, “Prompt arrival of code team”, “Cardiac compressions at 100/minute”, and “Prompt recognition and treatment of arrhythmias”. These statements closely correlate with the objectives of this project; therefore, this additional data was abstracted to enrich what was already collected from the *Code Blue Flow Sheet*.

The *Code Blue Debriefing Form* also contains numerous yes/no statements for the nurse recorder to answer, including “Was there an appropriate number of staff?” and “Was a clear code leader established?”. This data was added to the assessment of IHCA events to provide context and to meet the objectives of this evaluation. This form allowed for narrative recording of reactions and a debrief of the IHCA event by asking the open-ended questions, “What went well?”, and “What could have been improved upon in this patient’s care?”. This data was analyzed using a qualitative evaluation of themes.

Review of process measures was also conducted through a policy and procedure review. Corroboration of these findings was found through interviews with key stakeholders, including the progressive care and intensive care unit educators. A joint effort in completing a review of the facility policy and combining anecdotal information from the stakeholder interviews influenced the development of a process map. The development and appraisal of the process map was shared with the key stakeholders and agreed upon between them and the evaluator.

Confidence Level of Bedside Nurses Data Collection

The Emergency Response Confidence Tool (ERCT) was adapted as a survey for electronic dissemination to all staff nurses employed on the progressive care units in March 2021. The survey software Qualtrics was utilized as a simple hyperlink to be included in an email. The survey included a “consent for participation” page that outlined the purpose of the

project and the procedure for collecting survey data. Participants were assured of their confidentiality of the data collected by the survey distributor. Participants were asked to agree to the terms of participation in the project via an "I agree" statement.

Demographic information was also collected via the electronic survey. Participants were asked to identify their age, gender, years of RN experience, and how many months since participation in an IHCA event. These results were kept separately from the confidence item data collected. The confidence items in the survey were written as the "slider" question type, which allows the participant to guide the cursor to the exact percentage (0-100%) of confidence they self-identify as for each item.

Three additional, optional qualitative measurements were added to the survey to enrich data collection of confidence measures. The participants were asked, "What are the factors contributing to your confidence in managing cardiac arrest?", "What are the barriers contributing to your confidence in managing cardiac arrest?", and "What advice would you give a new nurse on the unit to gain confidence in managing cardiac arrest?". These questions were chosen to gain a deeper understanding of both the factors that enhance confidence and the barriers that inhibit confidence.

DNP Project Findings

IHCA Performance & Outcome Measures Evaluation

To meet Aim #1 of this project, IHCA events from the past two years were evaluated and analyzed for trends in the data. Twelve events occurred in the previous two years within the progressive care units at the project facility. The performance measures collected were time to call for help, time to compression initiation, and time to defibrillation from the electronic health record. However, time to call for help was unable to be abstracted because the data was not

present in the EHR. The goal for time to call for help is less than 10 seconds. Half of the IHCA events were documented as "observed" while half were documented as "unobserved" (Figure 9). In the unobserved events, there was no documentation of the length of time between when the patient was discovered to be in distress or pulseless and the time the health care worker or nurse called for help. An 83% majority of IHCA on these two units occurred on the off shifts, or between 3pm – 7am (Figure 10). This data suggests interventions to improve nurses' performance be targeted towards those who work off shifts.

The second performance measure, time to compression initiation, was identified using the *Code Blue Flow Sheet*. 83% of IHCA event documentation had an identical time documented for "est. time of code" and "time CPR started", therefore the time to compression initiation was zero seconds, or immediately. In two events, the length of time between "est. time of code" and "time CPR started" was one minute and three minutes, respectively. The four events where a value for time to compression initiation could be abstracted ranged from one to three minutes. Of the six events that were documented as an "observed" arrest, 33% had compressions begun immediately, or within 10 seconds.

Of the 12 IHCA events reviewed, five events required defibrillation (Figure 11). Only patients who sustain a pulseless ventricular tachycardia or ventricular fibrillation arrest are recommended to be defibrillated (AHA, 2020). There was increased variation in the performance measure time to defibrillation. The times ranged from two minutes to 20 minutes between "est. time of code" or rhythm recognition and "cardiac intervention – defibrillate/cardiovert", with an average of 7.6 minutes. These results are presented in Figure 12. Only two out of the five events met the benchmark for less than two minutes. This measure showed the largest gap in performance and is the priority recommendation to begin improvement.

For the outcome measure of disposition, 75% of the IHCA cases reviewed resulted in "ROSC", or "return of spontaneous circulation". Three IHCA events ended in patient expiration (Figure 13). Upon further review of the medical records of the IHCA victims, five more patients were ultimately deceased after they suffered an IHCA. Because of the retrospective nature of this review, it was found that eight out of 12 patients were ultimately deceased at time of data collection. The adjusted outcome measure of patient survival of these 12 events is 20%, which is aligned with the national average.

Overall, the progressive care unit's performance in recognition of a deteriorating patient, calling for help, and beginning compressions was strong. The biggest area of uncertainty when measuring "time to call for help" is the fact that half of the IHCA events were unobserved. There is no way to know how much time elapsed between the nurse recognizing the patient was in distress or pulseless and when the nurse called for help. Any amount of time the patient is without a pulse, there is a lack of circulation to the brain and other organs causing hypoxia. A patient's best chance for survival occurs when compressions are begun immediately to maintain circulation to vital organs.

For patients who experience a pVT or VF IHCA event, the literature suggests defibrillation is the most important intervention that contributes to obtaining ROSC. This measure was the most variable of the retrospective review and only met the benchmark of less than two minutes twice out of five events. Three out of the five events resulted in ROSC while two patients expired on the progressive care unit. However, all five of these patients were ultimately deceased at the time of the retrospective review. Evaluating this performance measure allowed for the facility to pinpoint the area of IHCA care that needs the most education and improvement for these units.

IHCA Process Measures Evaluation

The process evaluation portion of this project meets Aim #1 related to establishing a baseline of performance related to IHCA on these two units. 9 out of 12 events contained documentation on the "debriefing sheets": *Code Blue Debriefing Form* and the *Response Evaluation: Cardiopulmonary Resuscitation*. Quantitative data in the form of dichotomous responses to common processes related to IHCA events was collected as well as qualitative data in the form of free-text responses from staff members on these forms.

The most common barriers to IHCA processes during the analyzed events was personnel. 66% of events with debriefing data stipulated "too many" people in the room during the IHCA event. 44% of events had no clear code leader. 3 events had barriers to supplies required to resuscitate the patient, including the unavailability of a nonrebreather mask and two issues related to the intraosseous (IO) drill. In one event, the IO drill was missing, and in another event, the IO drill was nonfunctional. 2 out of 9 events had documented a negative response to "cardiac rhythm determined quickly". The results obtained from the debriefing sheets is presented in Figure 19.

The qualitative data obtained from the debriefing sheets was collected in open text boxes with prompts "What went well" and "What could be improved". A thematic analysis was completed to obtain the most common responses to these prompts. The themes that emerged contributing to "what went well" included teamwork, roles established quickly, communication with patient's family, rapid initiation of CPR, and newer staff taking initiative. The themes abstracted from the prompt "What could be improved" included not a clear code leader, attitude of code leader, rhythm not established quickly, no clock in the room, and too many pauses. This

qualitative data brings a deeper understanding to the program evaluation by highlighting areas that could be improved and ultimately result in better patient outcome from an IHCA event.

In the final examination of IHCA processes at the facility, a process map was completed detailing the policy and procedure of the facility and interviews with key stakeholders, the progressive care and ICU educators. This map is presented in Figure 20. The progressive care RN is responsible for identifying clinical deterioration in a patient and calling for help when the patient is in a lethal rhythm or is pulseless. One the RN calls for help, either a nursing support technician (NST) or unit secretary dials “9999” on a house phone to alert the code team. The operator announces the location of the emergency through the overhead paging system and sends additional beep pages to the ICU intensivist physician, the ICU charge RN, respiratory therapy, the nursing supervisor, security, pastoral care, and the medical admitting officer (MAO, a physician).

Once the code team is activated, the primary RN and unit staff are to begin compressions, bring the code cart into the patient room, and apply the defibrillator pads. The progressive care units utilize one manufacturer of defibrillators, however the pads stocked in the code cart are a different manufacturer. This discrepancy requires the nurse to use an adaptor attached to the defibrillator cable to plug in the defibrillator pads. Additionally, staff who have responded to the code event are preparing medications, removing the headboard, placing a backboard, and connecting the Ambu bag to oxygen and ventilating the patient. These tasks should be completed by the time the code team arrives. The primary RN is to provide an SBAR-type report to the code team upon their arrival. The clinical scenario then continues, and a disposition is reached – either ROSC or expiration, and most likely transfer to a higher level of care.

Confidence Level of Bedside Nurses Results

Aim #2 of this project asked nurses to rate their ability to perform interventions related to IHCA on a 0-100% scale. The survey link was sent to 75 eligible participants and 28 responses (*n*=28) were received, representing a 37% response rate. The demographics of the survey respondents are represented in Tables 2-4, including age, years of experience, and months since last IHCA. The demographic information was listed as optional during administration of the survey, therefore *n*=21 for demographics. About 75% of the respondents were under 40 years of age. Most respondents cited greater than 5 years of nursing experience and had not experienced an IHCA event in over 6 months. While the nurses are experienced, the low-frequency, high-stakes skill of IHCA only occurs about once every 60 days. The amount of time elapsed between IHCA events causes skill and even confidence to deteriorate.

Of the 17 survey items, 12 of the survey items were relevant to this evaluation. These were evaluated and divided into three subthemes: (1) the first 10 seconds, (2) rhythm interpretation, and (3) using electricity. Overall, respondents felt >80% confident in their abilities to establish unresponsiveness, establish pulselessness, call for help, and assess airway, breathing, and circulation (ABCs). The results of the first 10 seconds are found in Figure 14. Rhythm interpretation (Figure 15) was also scored highly by respondents. All respondents were at least 90% confident in recognizing normal sinus rhythm (NSR), ventricular fibrillation (VF) and asystole. Only two respondents were less than 80% confident in recognizing ventricular tachycardia (VT). These confidence survey results suggest recognition of a deteriorating patient and rhythm recognition are not an issue of confidence for these nurses.

The third subtheme, using electricity, is represented in Figure 16. Respondents were overwhelmingly less confident in following ACLS algorithms and either defibrillating, pacing,

or cardioverting a client. Over half of the respondents were less than 60% confident in their ability to pace or cardiovert a client. Only a third (38%) of respondents stated they were at least 90% confident in their ability to defibrillate. However, 29% of respondents stated they were <60% confident in performing defibrillation. Defibrillation is a skill taught in both Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS). These confidence results are concerning as competence in this skill is an expectation of the progressive care nurses. They have been trained in two different CPR courses using both an automated external defibrillator (AED) and the manual defibrillator located on the unit.

The qualitative portion of the confidence survey assesses respondents' perceived factors and barriers contributing to their confidence during IHCA events. The most cited factor contributing to confidence was experience. Other factors contributing to confidence mentioned were a strong code leader and experience during the ACLS course. These results are pictured in Figure 17. 69% of respondents also cited that lack of experience was the biggest barrier to confidence in IHCA. Other barriers included stress, unfamiliarity with the code cart, the personalities of the code leader, and lack of confidence in general. These results are shown in Figure 18.

The literature suggests nurses that are more confident in their ability to initiate life-saving interventions during an IHCA event do so more effectively. These qualitative results suggest experience is the number one facilitator and barrier to confidence. Considering there were only five IHCA events over two years that required defibrillation, these results coincide with the lack of confidence in defibrillation. Providing nurses more experience in working with the defibrillator and practicing the events of an IHCA requiring defibrillation is suggested to improve bedside nurse confidence.

Recommendations

Aim #3 of this project recommends the establishment of a continuous quality improvement initiative to evaluate outcomes related to IHCA at the facility. Recommendations from AHA (2020) include the use of data registries to improve system performance. Facilities should collect point-of-care data and report outcomes of patients who suffer IHCA. Initially it is important to collect both process and outcome data within the facility. There are multiple data repositories at the local and national level that serve as databases for facilities to demonstrate improvement in IHCA outcomes.

The facility can first begin by collecting IHCA data as soon as possible after an event. Currently, the facility uses paper documentation, and the record is scanned into the EHR after patient discharge. To effectively abstract IHCA data, it is recommended to use electronic documentation as it is more precise and simpler to monitor on an ongoing basis. Peace et al. (2014) supports that paper code documentation is notoriously unreliable and time sources are often inaccurate. To establish a continuous quality improvement initiative, documenting IHCA events electronically allows for leadership to properly abstract time-sensitive performance measures.

Two products are available from the defibrillator manufacturer as well as the electronic health record vendor. The defibrillator manufacturer provides a mobile application for subscription by the facility. The program mitigates many of the factors that contribute to paper-based documentation inconsistencies, including misspelled words, incorrect medication doses, lack of experience of the recorder, and inconsistent times on wristwatches, monitors, or wall clocks. The documentation on the mobile app is then linked to the associated defibrillator record and timelines are merged, providing a complete record of the IHCA event (Zoll, 2021).

The electronic health record vendor provides a flowsheet that includes functions to document cardiac arrest start, staff called and present, quick observations, cardiac arrest documentation, and one step medications (Epic Quick Start Guide, 2020). The benefit of using a standardized flowsheet to document IHCA events will allow data to be aggregated for analytical use. The electronic health record vendor has artificial intelligence and analytical processes to quickly retrieve metrics like "time to defibrillation", rather than manual abstraction through chart review of scanned paper documentation.

To meet Aim #4 of this project, a mock code program utilizing mid- to high- fidelity simulation equipment has been recommended to be implemented at the project facility. The literature supports the use of mock codes to improve IHCA quality. Herbers & Heaser (2016) found a 12% improvement in response times for assessing and calling for help and a 52% decrease in time taken to initiate compressions through their mock code pilot study. Sullivan et al. (2015) completed a randomized controlled trial examining the time intervals of mock codes and found that for mock codes 2-3 months apart (compared to 6 month and 2 years), there was a significant decrease in time to initiation of chest compressions. This trial also stipulated that the short, repeated training sessions as opposed to every six months or two years improved time to defibrillation (Sullivan et al., 2015). Morton et al. (2019) found a high-fidelity simulation (HFS) mock code intervention resulted in a statistically significant decrease in time to defibrillation. Mock codes are an effective way to work to improve the quality of the bedside nurse's response.

Implementing a measurable mock code program at this facility is both feasible and sustainable. The nurse educator of the progressive care unit and critical care unit both already conduct ongoing competency monitoring for skills related to IHCA care, including defibrillation. The implementation of in situ mock codes on the progressive care units is recommended on a

quarterly basis to increase nurse's familiarity with the IHCA processes and equipment at more frequent intervals. The literature suggests mock codes can improve both confidence and performance. The individualized recommendation for this facility centers around the use of electricity, especially defibrillation, which this evaluation showed were lacking.

Project Summary

This program evaluation solidified the areas for improvement related to IHCA performance, confidence, and processes in the project facility. This project found the greatest opportunity for improvement in the use of electricity. The data from the confidence survey corroborated the lack of experience and practice in defibrillating, cardioverting, or pacing patients outside of the critical care unit. The evidence indicates immediate initiation of chest compressions and prompt defibrillation are the key interventions that contribute to return of spontaneous circulation during a cardiac arrest. Data from this program evaluation supports the incorporation of a continuous quality improvement initiative to further measure performance and patient outcomes from IHCA. Electronic documentation is recommended to enable data collection of performance measures in IHCA cases. To facilitate performance improvement, the literature supports the implementation of mock codes to allow hands-on experience and maintain competency.

Strengths

Strengths of this program evaluation include the comprehensive review of all three types of measures: performance, outcome, and process. This method allows for a thorough review and multiple contributions from stakeholders. Additional strengths of this evaluation include the feasibility of the recommendations to improve IHCA in the facility. The electronic health record already utilized by the project facility has the ability for nurses to document IHCA events live

and for data abstraction to monitor performance measures. The implementation of mock codes would require the CPR supplies owned by the facility to be available for use on the progressive care units on a quarterly basis, and for the educator to be available to facilitate the scenario. Before the implementation of electronic documentation, competency training using the EHR would be needed.

Barriers & Limitations

The greatest barrier in completing the program evaluation of the IHCA processes in the facility was the documentation. Documentation during the live IHCA event is completed on paper, and then uploaded into the electronic medical record after patient discharge. The scanned copy of the documentation was not always clear or legible. The additional debriefing paperwork was not consistently completed or filed appropriately.

Additionally, access to the facility was limited during the COVID-19 pandemic and the feasibility of performing mock codes was limited by social distancing and nurses needed in patient care areas due to upgrading to surge capacity. The facility previously had a committee that met bi-monthly to discuss IHCA in the facility, but unfortunately the physician leader passed away during the completion of the project. The code committee had yet to resume meetings and the DNP student was unable to obtain additional process data from these stakeholders.

Generalizability

The findings of this program evaluation are significant to the facility assessed but are not necessarily generalizable to other facilities. The evaluation of 12 IHCA events was large enough to deduce a trend that is specific to this facility but would not be applicable to a different project site. The results of the confidence survey collected 21 responses and the responses received are

specific to this nurse population and facility. The recommendations of this project are based on the evidence in the literature and could be also implemented in similar facilities.

Conclusion

Overall, nurses on these progressive care units show specialized skill in caring for highly acute patients. The incidence of IHCA varies but can be averaged to about one event every two months. Using the program evaluation methodology to evaluate the nurses' performance and confidence, the patient outcomes, and the current facility processes was beneficial to the facility to determine the opportunity for improvement. The basis of quality improvement is to determine a method of measurement to indicate whether there has been improvement (IHI, 2021). In other words, what is not measured cannot be improved. To sustain a continuous quality improvement initiative, electronic documentation of performance measures would be a simplified way of tracking data. Data should be compared to national benchmarks from the *Get with the Guidelines – Resuscitation* national database. Once the data is easily tracked, the implementation of a mock code program to improve performance is feasible and recommended. Taking the initiative to improve the nurse's IHCA performance, confidence in interventions, and processes will ultimately lead to improved patient outcomes for the community they serve.

References

American Heart Association (AHA) (2020). American Heart Association Guidelines: for CPR and ECC. *Circulation 142*(16) Supplement 2.

American Heart Association (2015). Web-based integrated guidelines for cardiopulmonary resuscitation and emergency cardiovascular care – Part 7: Advanced cardiac life support, Section 5: Management of cardiac arrest. ECCguidelines.heart.org

American Heart Association (AHA) (2018). Get with the guidelines – Resuscitation overview. https://www.heart.org/en/professional/quality-improvement/get-with-the-guidelines/get-with-the-guidelines-resuscitation/get-with-the-guidelines-resuscitation-overview

Arnold, J. J., Johnson, L. M., Tucker, S. J., Malec, J. F., Henrickson, S. E., & Dunn, W. F. (2009). Evaluation tools in simulation learning: Performance and self-efficacy in emergency response. *Clinical Simulation in Nursing, 5*(1). https://doi.org/0.1016/j.ecns.2008.10.003

Barbash, I. J. & Kahn, J. M. (2015). Organizational approaches to improving resuscitation effectiveness. *Critical Care Clinics, 31*(1). https://doi.org/10.1016/j.ccc.2014.08.008

Crowe, S., Ewart, L., & Derman, S. (2018). The impact of simulation based education on nursing confidence, knowledge, and patient outcomes on general medicine units. *Nurse Education in Practice, 29*(2018). https://doi.org/10.1016/j.nepr.2017.11.017

Davis, D. P., Graham, P. G., Husa, R. D., Lawrence, B., Minokadeh, A., Altieri, K., & Sell, R. E. (2015). A performance improvement-based resuscitation programme reduces arrest incidence an increases survival from in-hospital cardiac arrest. *Resuscitation, 92*(2015). https://doi.org/10.1016/j.resuscitation.2015.04.008

Dudzik, L. R., Heard, D. G., Griffin, R. E., Vercellino, M., Hunt, A., Cates, A., & Rebholz, M.

(2019). Implementation of a low-dose, high-frequency cardiac resuscitation quality improvement program in a community hospital. *The Joint Commission Journal on Quality and Patient Safety*. https://doi.org/10.1016/j.jcjq.2019.08.010

Epic Quick Start Guide (2020). https://www.myehospital.org/sites/default/files/ED%202704%20QS%201.0%20Resuscitation%20Narrator%20-%20Code%20Documentation.pdf

Gordon, C. J. & Buckley, T. (2009). The effect of high-fidelity simulation training on medical-surgical graduate nurses' perceived ability to respond to patient clinical emergencies. *The Journal of Continuing Education in Nursing, 40*(11). https://doi.org/10.3928/00220124-20091023-06

Hart, P. L., Spiva, L., Baio, P., Huff, B., Whitfield, D., Law, T., Wells, T., & Mendoza, I. G. (2014). Medical-surgical nurses' perceived self-confidence and leadership abilities as first responders in acute patient deterioration events. *Journal of Clinical Nursing, 23*. https://doi.org/10.1111/jocn.12523

Herbers, M. D., & Heaser, J. A (2016). Implementing an in situ mock code quality improvement program. *American Journal of Critical Care, 25*(5). https://doi.org/10.4037/ajcc2016583

Institute for Healthcare Improvement (IHI) (2021). How to improve. http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx

McPhee, K. (2018). Deliberate practice mock codes for new graduate nurses. *Journal for Nurses in Professional Development, 34*(6). https://doi.org/10.1097/NND.0000000000000494

Morton, S. B., Powers, K., Jordan, K., & Hatley, A. The effect of high-fidelity simulation on

medical-surgical nurses' mock code performance and self-confidence. *MEDSURG Nursing, 28*(3), 177-182. www.amsn.org/journalCNE

Nallamothu, B. K., Guetterman, T. C., Kellenberg, J. E., Lehrich, J. L., Kronick, S. L., Krein, S. L., Iwashyna, T. J., Saint, S., & Chan, P. S. (2018). How to resuscitation teams at top-performing hospitals for in-hospital cardiac arrest succeed? *Circulation, 2018*(138), 154-163. https://doi.org/10.1161/CIRCULATIONAHA.118.033674

Peace, J. M., Yuen, T. C., Borak, M. H., & Edelson, D. P. (2014). Tablet-based cardiac arrest documentation: A pilot study. *Resuscitation, 85*(2). https://doi.org/10.1016/j.resuscitation.2013.10.013

Starks, M. A., Dai, D., Nichol, G., Al-Khatib, S. M., Chan, P., Bradley, S. M., Peterson, E. D. (2018). The association of duration of participation in get with the guidelines – resuscitation with quality of care for in-hospital cardiac arrest. *American Heart Journal, 204*(2018). https://doi.org/10.1016/j.ahj.2018.04.018

Subbe, C. P., Bannard-Smith, J., Bunch, J., Champunot, R., DeVita, M. A., Durham, L., Edelson, D. P., Gonzales, I., Hancock, C., Haniffa, R., Hartin, J., Haskell, H., Hogan, H., Jones, D. A., Kalkman, C. J., Lighthall, G. K., Malycha, J., Ni, M. Z., Phillips, A. V., Rubulotta, F., So, R. K., & Welch, J. (2019). Quality metrics for the evaluation of rapid response systems: Proceedings from the third international consensus conference on Rapid Response Systems. *Resuscitation, 141*(2019). https://doi.org/10.1016/j.resuscitation.2019.05.012

Sullivan, N. J., Duval-Arnould, J., Twilley, M., Smith, S. P., Aksamit, D., Boone-Guercio, P., Jeffries, P. R., & Hunt, E. A. (2014). Simulation exercise to improve retention of cardiopulmonary resuscitation priorities for in-hospital cardiac arrests: A randomized

controlled trial. *Resuscitation 86*, 6-13. https://doi.org/10.1016/j.resuscitation.2014.10.021

The Iowa Model Collaborative (2017). Iowa Model of Evidence Based Practice: Revisions and Validation. *Worldviews on Evidence-Based Nursing, 14*(3). https://doi.org/10.1111/wvn.12223

The Kellogg Foundation (2004). W. K. Kellogg Foundation Evaluation Handbook. https://www.wkkf.org/~/media/62EF77BD5792454B807085B1AD044FE7.ashx

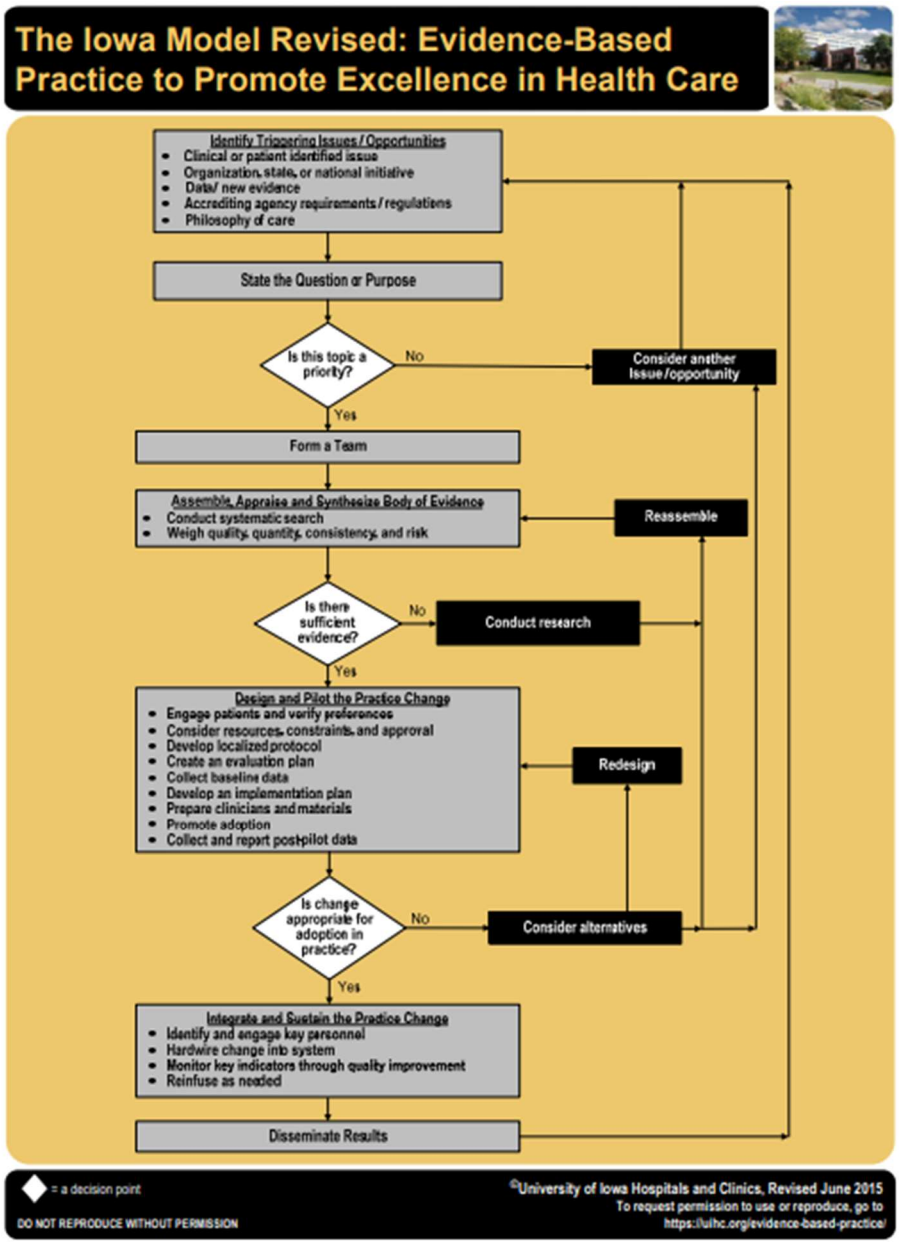
Titler, M. G., Kleiber, C., Steelman, V. J., Rakel, B. A., Budreau, G., Everett, L. Q., Buckwalter, K. C., Tripp-Reimer, T., & Goode, C. J. (2001). The Iowa Model for Evidence Based Practice to Promote Quality Care. *Critical Care Nursing Clinics of North America, 13*(4).

White, K. M., Dudley-Brown, S., & Terhaar, M. F. (2016). *Translation of evidence into nursing and health care* (2nd ed.). Springer Publishing Company.

Zoll (2021). RescueNet CaseReview and CodeWriter for hospital. https://www.zoll.com/products/data/hospital/rescuenet-casereview-codewriter-for-hospital

Figure 1.

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care (Iowa Model Collaborative, 2017).



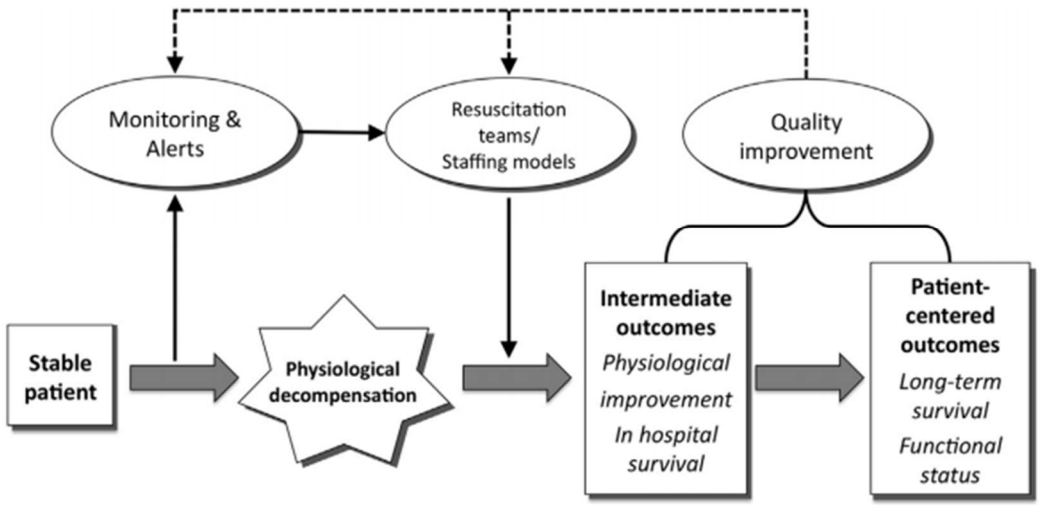
Note: Used/reprinted with permission from the University of Iowa Hospitals and Clinics, copyright 2015. For permission to use or reproduce, please contact the University of Iowa Hospitals and Clinics at 319-384-9098.

Figure 2.

AHA Chain of Survival for adult IHCA.

Figure 3.

The Conceptual Model for Effective Resuscitation (Barbash & Kahn, 2015).



\

Figure 4.

Logic Model

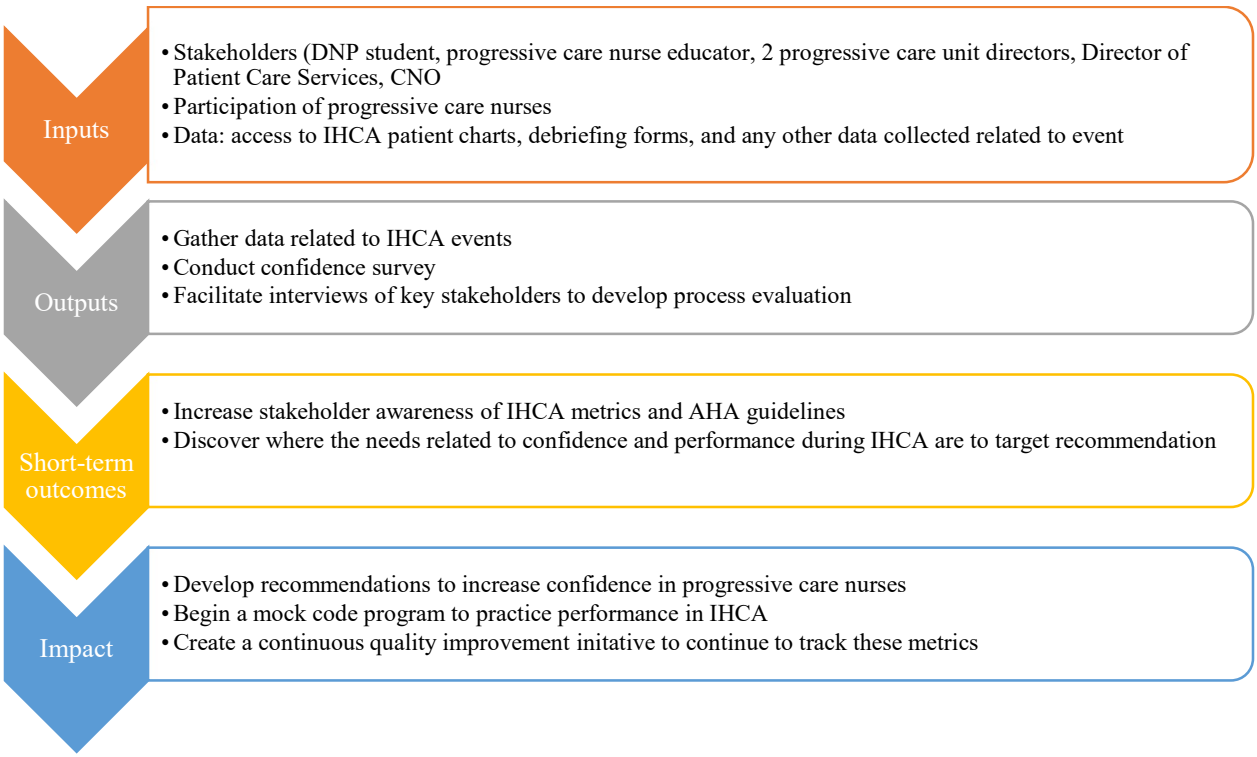


Figure 5.

Emergency Response Confidence Tool (ERCT) (Arnold et al., 2009).

Table 4 Emergency Response Confidence Tool

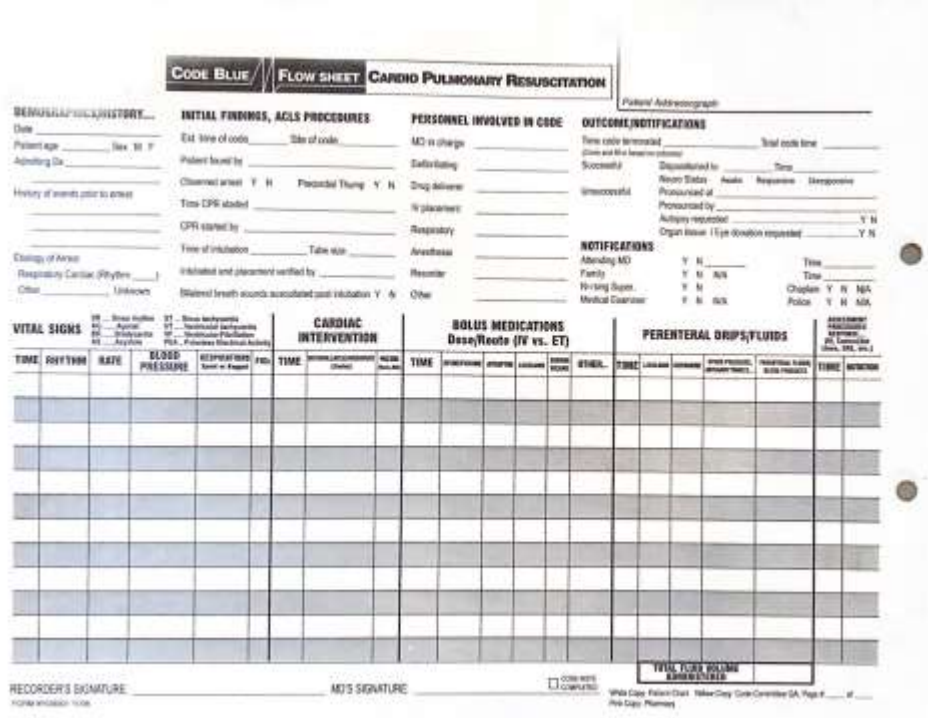
Using the percentage scale, please complete the questions listed below. Select a percentage (%) that accurately reflects your confidence in your ability to do the items listed in the questions. If your percentage is 59%, write that exact number in the blank next to the question. Your responses will be kept confidential.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Not Confident Moderately Confident Confident

	% CONFIDENT
Example: Ability to do give report to physician	98 %
1. Establish unresponsiveness in a hospitalized patient	_____%
2. Establish pulselessness in a hospitalized patient	_____%
3. Call for help	_____%
4. Assess airway, breathing, circulation	_____%
5. Identify normal sinus rhythm on a cardiac monitor	_____%
6. Identify ventricular tachycardia on a cardiac monitor	_____%
7. Identify ventricular fibrillation on a cardiac monitor	_____%
8. Identify asystole on a cardiac monitor	_____%
9. Initiate CPR	_____%
10. Perform mouth to mask ventilation	_____%
11. Perform bag mask ventilation	_____%
12. Follow ACLS guidelines for cardiac arrhythmias	_____%
13. Defibrillate a patient	_____%
14. Cardiovert a patient	_____%
15. Transcutaneous pace a patient	_____%
16. Establish a leadership role in a code-45 situation	_____%
17. Identify 3 possible causes of asystole	_____%

Figure 6.

Hospital facility Code Blue Flow Sheet.


CODE BLUE / FLOW SHEET CARDIO PULMONARY RESUSCITATION

Patient Addressograph

INITIAL FINDINGS, ACLS PROCEDURES

PERSONNEL INVOLVED IN CODE

OUTCOME/NOTIFICATIONS

NOTIFICATIONS

VITAL SIGNS

CARDIAC INTERVENTION

BOLUS MEDICATIONS Dose/Route (IV vs. ET)

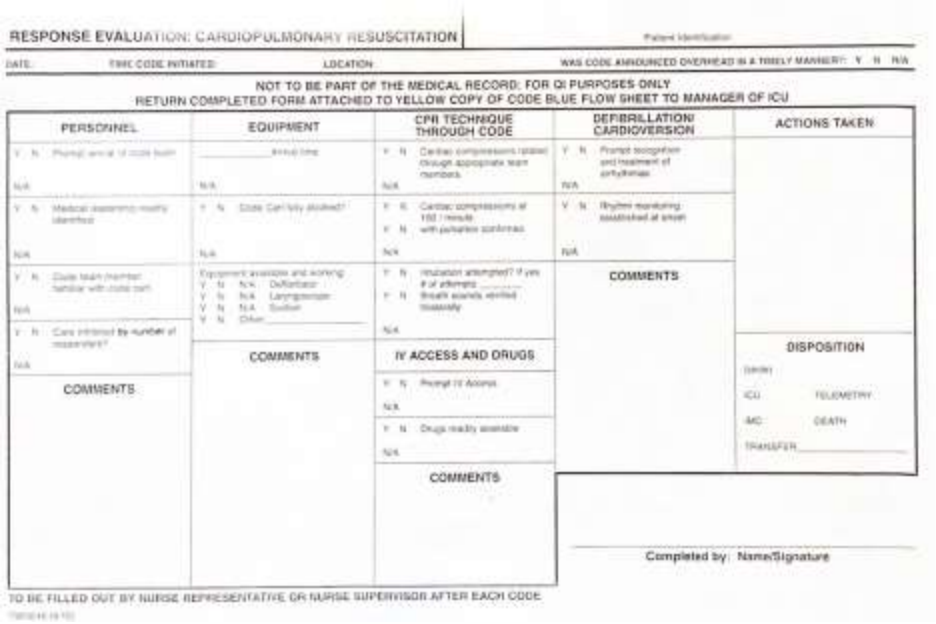
PERENTERAL DRIPS/FLUIDS

TIME | RHYTHM | RATE | BLOOD PRESSURE | RESPIRATIONS | FIO2 | TIME | TIME | TIME | TIME | TIME

RECORDER'S SIGNATURE MD'S SIGNATURE

Figure 7.

Hospital facility Response Evaluation: Cardiopulmonary Resuscitation.


RESPONSE EVALUATION: CARDIOPULMONARY RESUSCITATION

Patient Identification

DATE: TIME CODE INITIATED: LOCATION: WAS CODE ANNOUNCED OVERHEAD IN A TIMELY MANNER?: Y N N/A

NOT TO BE PART OF THE MEDICAL RECORD: FOR QI PURPOSES ONLY

RETURN COMPLETED FORM ATTACHED TO YELLOW COPY OF CODE BLUE FLOW SHEET TO MANAGER OF ICU

PERSONNEL | EQUIPMENT | CPR TECHNIQUE THROUGH CODE | DEFIBRILLATION/ CARDIOVERSION | ACTIONS TAKEN

COMMENTS | COMMENTS | IV ACCESS AND DRUGS | COMMENTS | DISPOSITION

ICU TELEMETRY

IMC DEATH

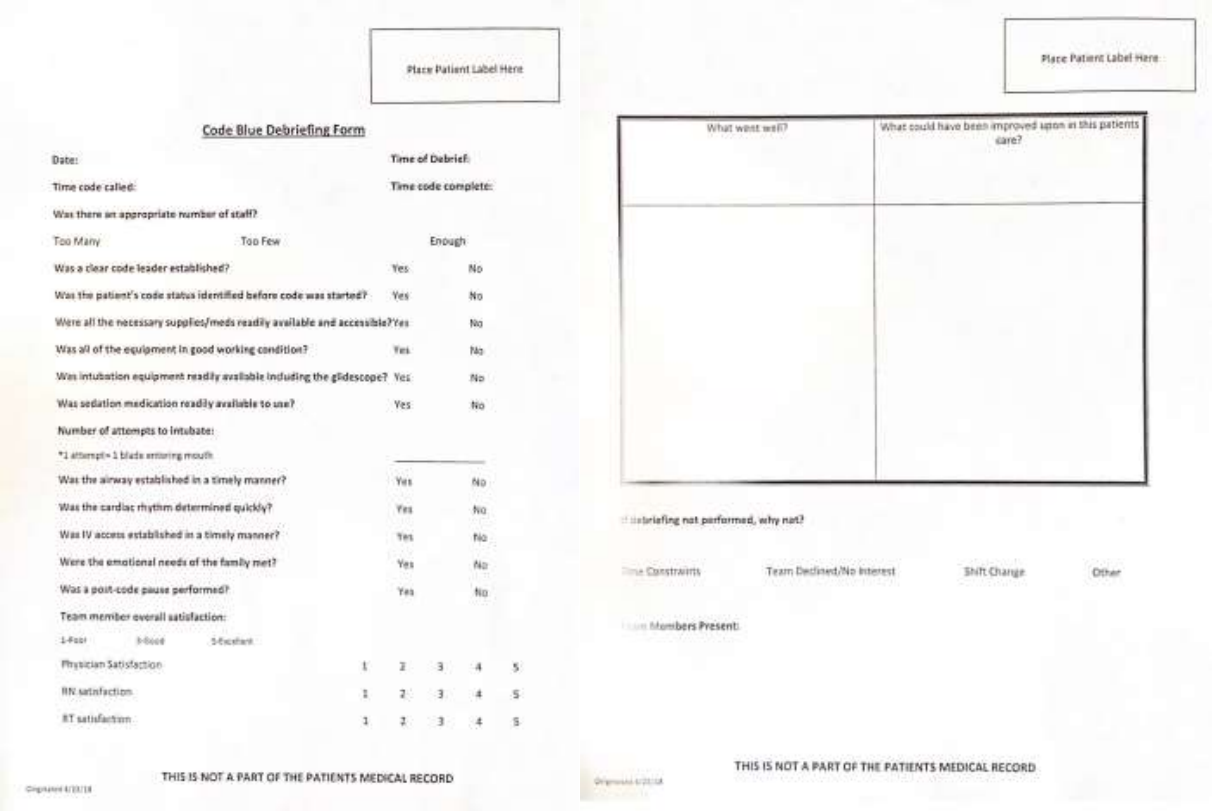
TRANSFER

Completed by: Name/Signature

TO BE FILLED OUT BY NURSE REPRESENTATIVE OR NURSE SUPERVISOR AFTER EACH CODE

Figure 8.

Hospital Facility Code Blue Debriefing Form.



Place Patient Label Here

Code Blue Debriefing Form

Date: Time of Debrief:

Time code called: Time code complete:

Was there an appropriate number of staff?

Too Many Too Few Enough

Was a clear code leader established? Yes No

Was the patient's code status identified before code was started? Yes No

Were all the necessary supplies/meds readily available and accessible? Yes No

Was all of the equipment in good working condition? Yes No

Was intubation equipment readily available including the glidescope? Yes No

Was sedation medication readily available to use? Yes No

Number of attempts to intubate:

*1 attempt= 1 blade entering mouth

Was the airway established in a timely manner? Yes No

Was the cardiac rhythm determined quickly? Yes No

Was IV access established in a timely manner? Yes No

Were the emotional needs of the family met? Yes No

Was a post-code pause performed? Yes No

Team member overall satisfaction:

1-Poor 3-Good 5-Excellent

Physician Satisfaction	1	2	3	4	5
RN satisfaction	1	2	3	4	5
RT satisfaction	1	2	3	4	5

THIS IS NOT A PART OF THE PATIENTS MEDICAL RECORD

Place Patient Label Here

What went well?	What could have been improved upon in this patients care?

Debriefing not performed, why not?

Time Constraints Team Declined/No Interest Shift Change Other

Team Members Present:

THIS IS NOT A PART OF THE PATIENTS MEDICAL RECORD

Figure 9.

Observed vs. Unobserved IHCA events

Figure 10.

Time of day of IHCA events

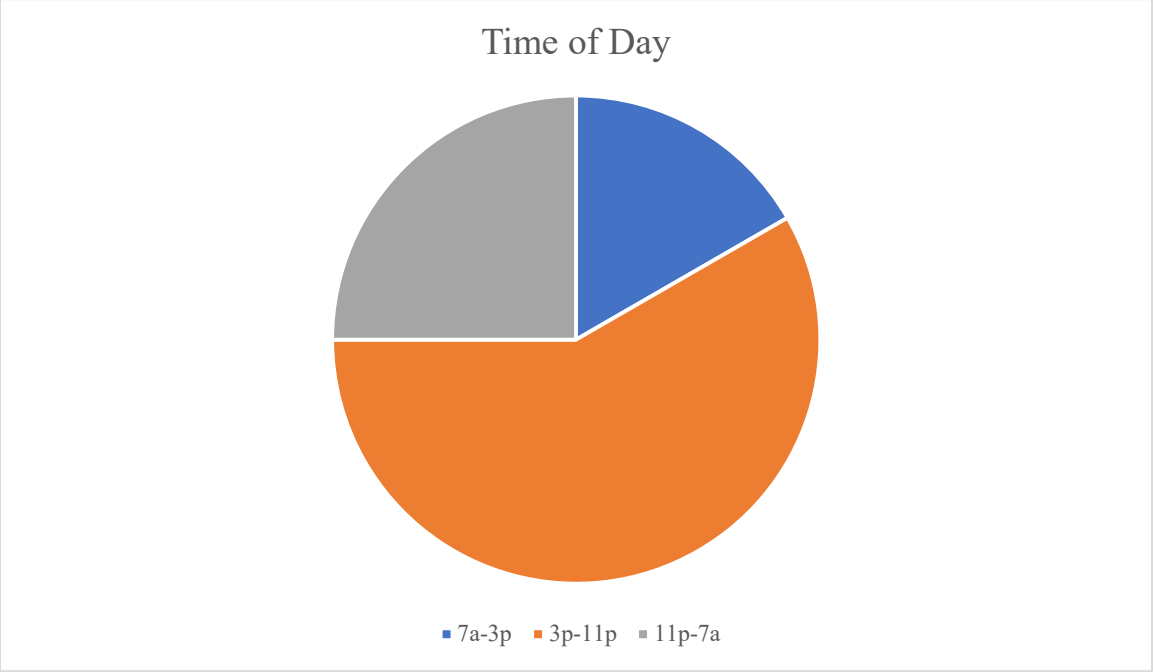


Figure 11.

IHCA events requiring defibrillation

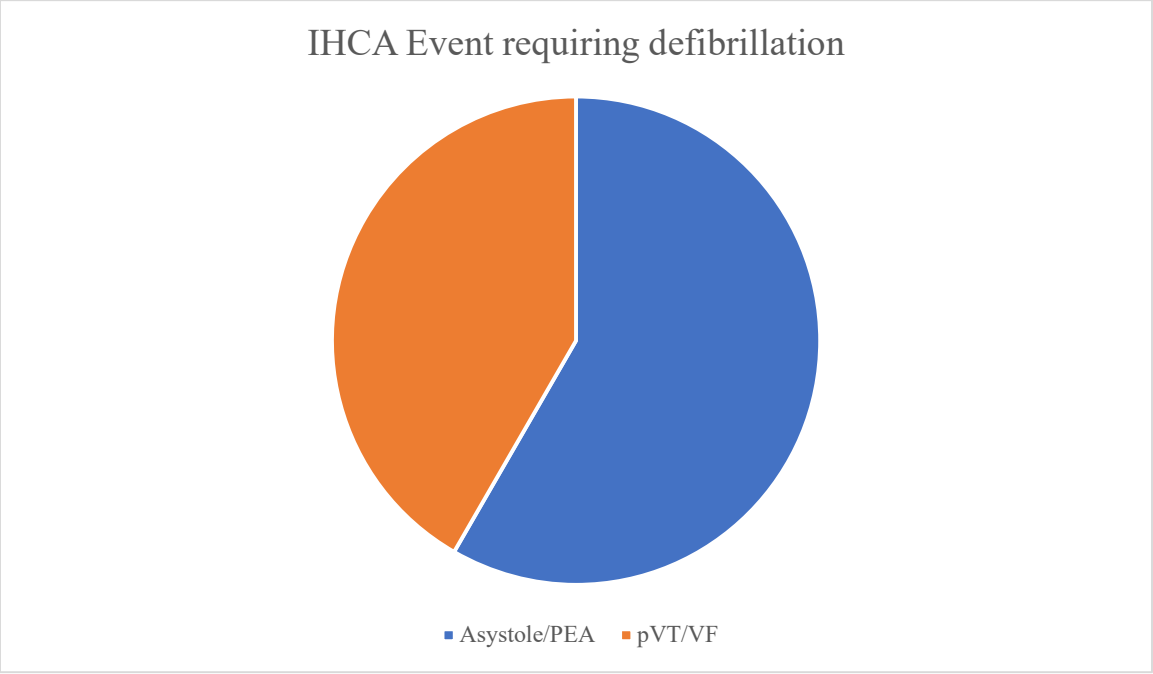


Figure 12.

IHCA events requiring defibrillation

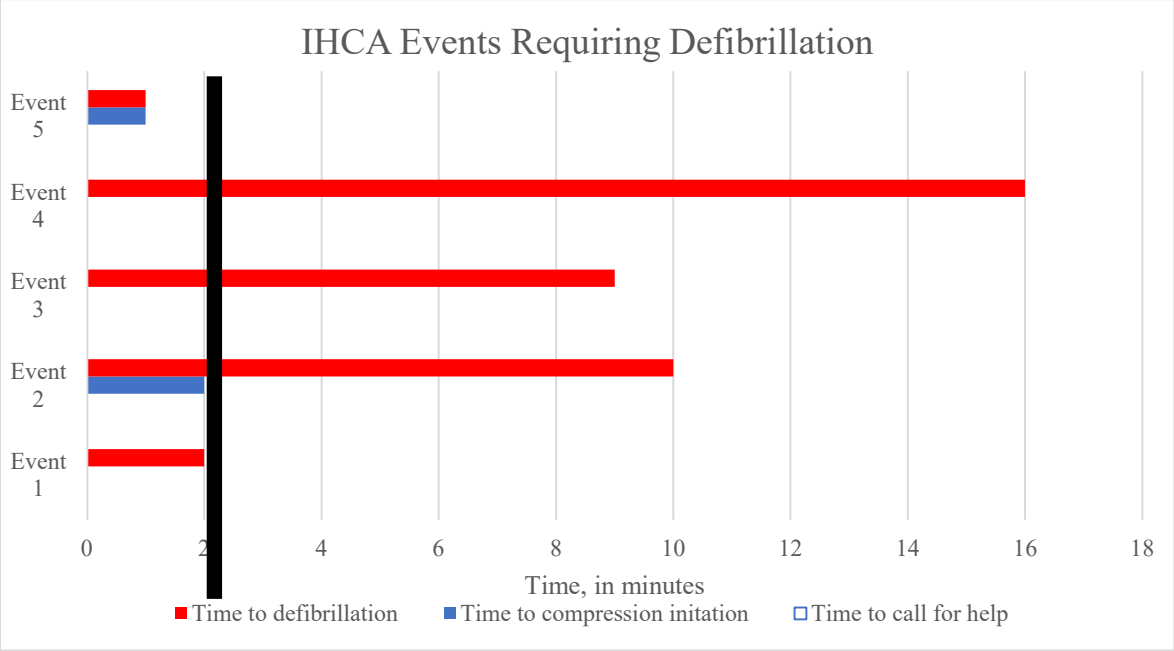


Figure 13.

IHCA event patient disposition.

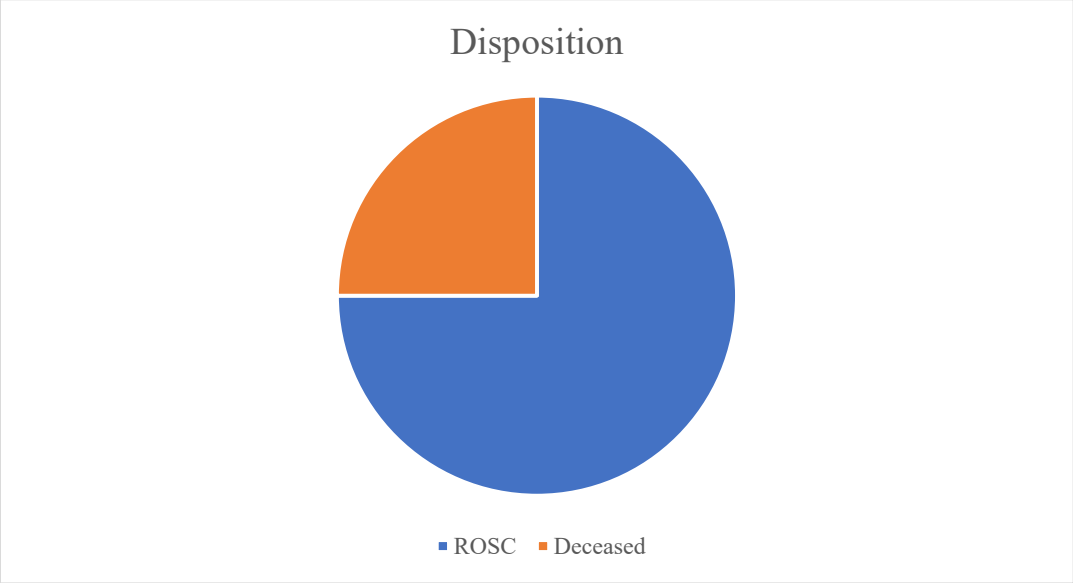


Figure 14.

Results from ERCT survey: The first 10 seconds

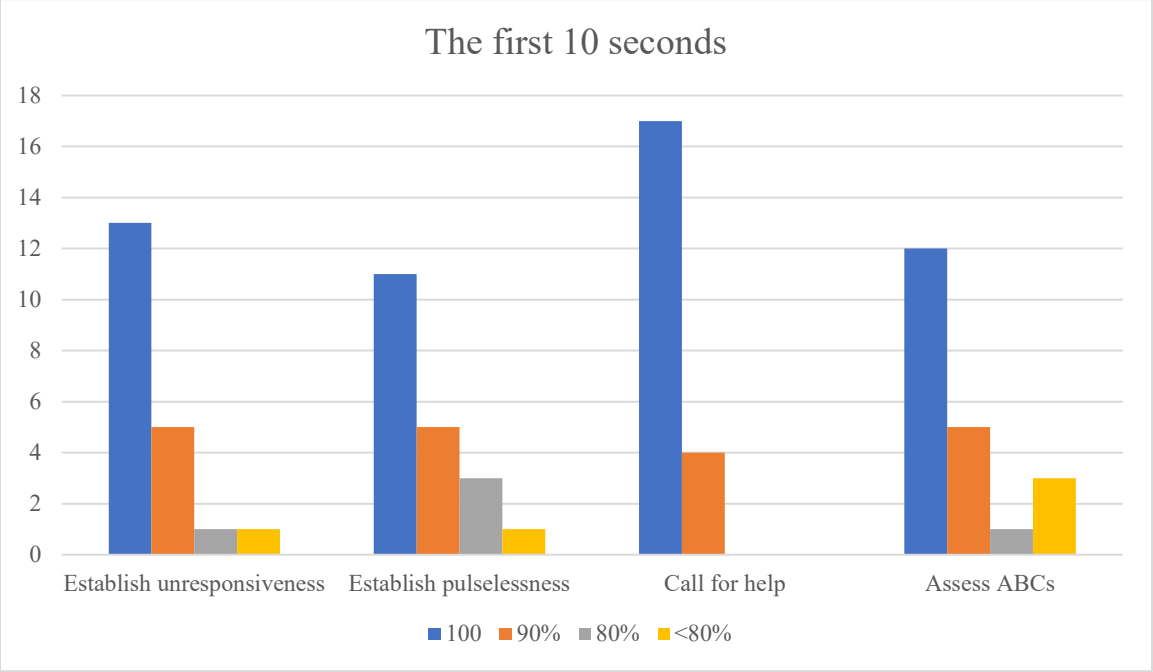


Figure 15.

Results from ERCT survey: Rhythm interpretation

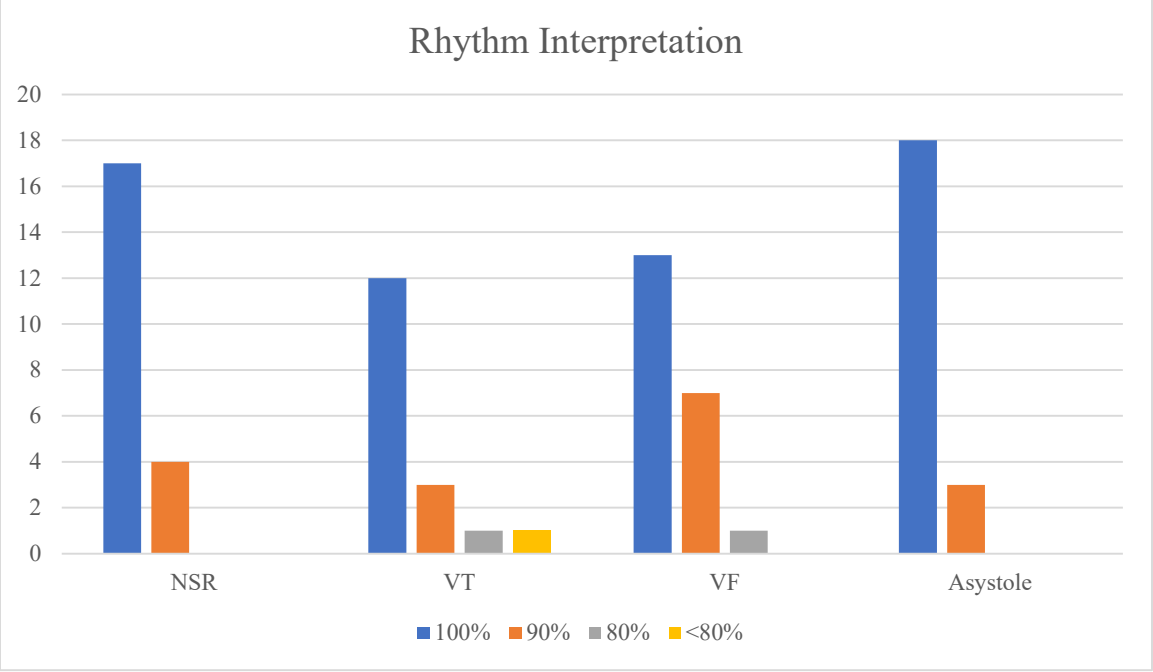


Figure 16.

Results from ERCT survey: Using electricity

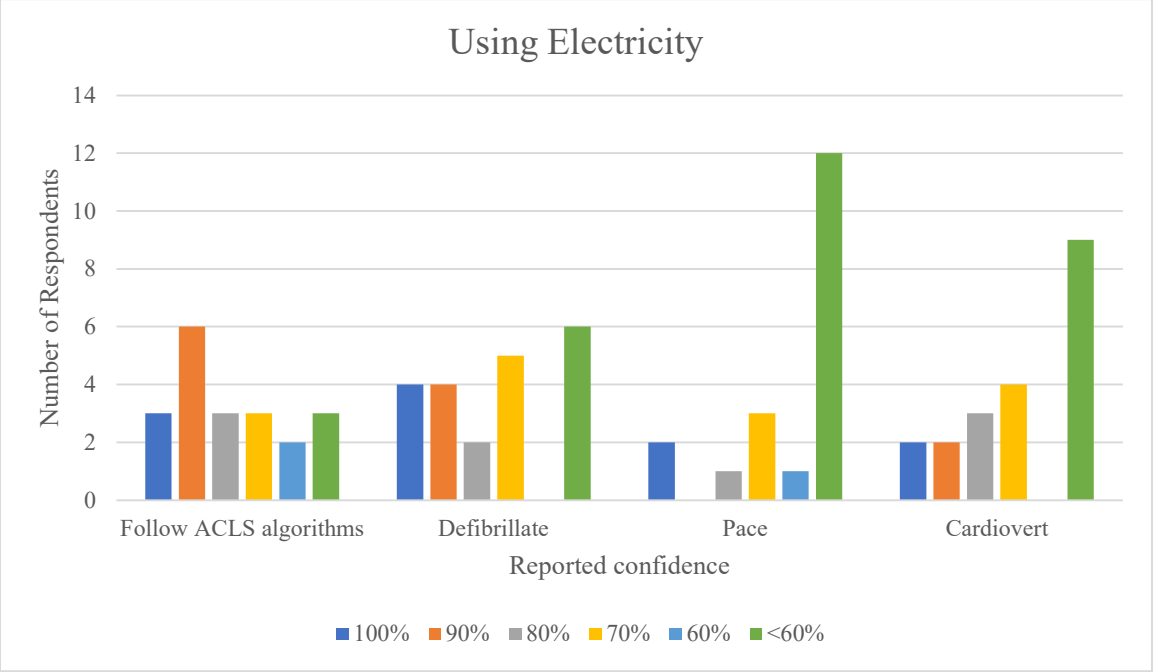


Figure 17.

Results from ERCT survey: Factors contributing to confidence

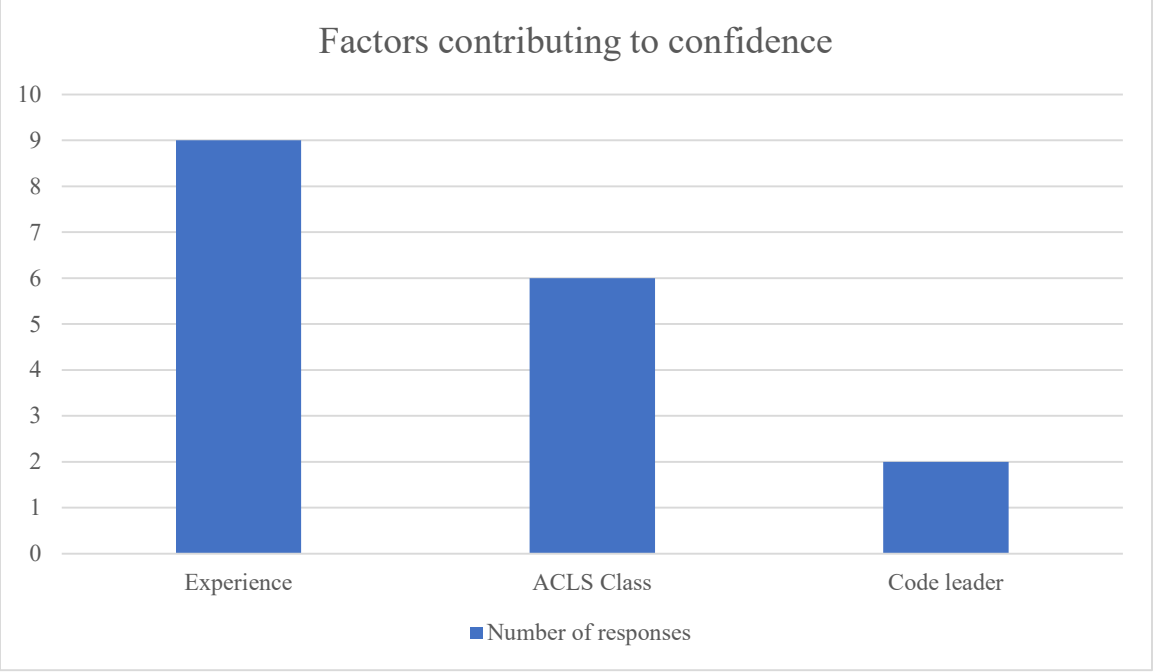


Figure 18.

Results from ERCT survey: Barriers to confidence

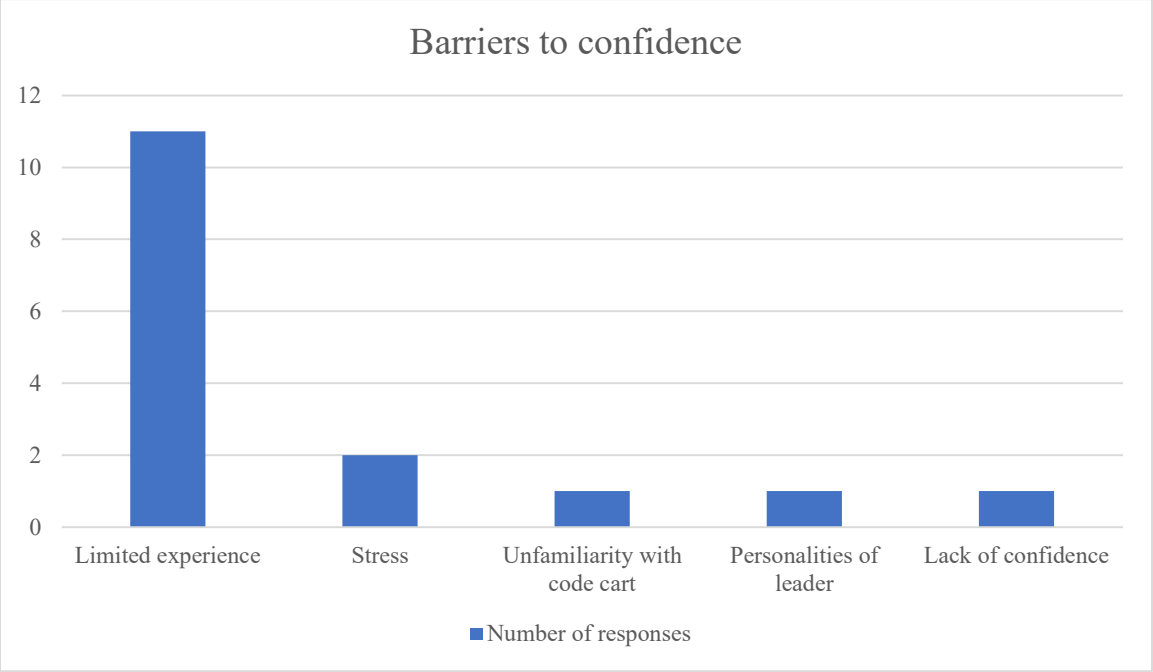


Figure 19.

Process Results – Debriefing Sheets

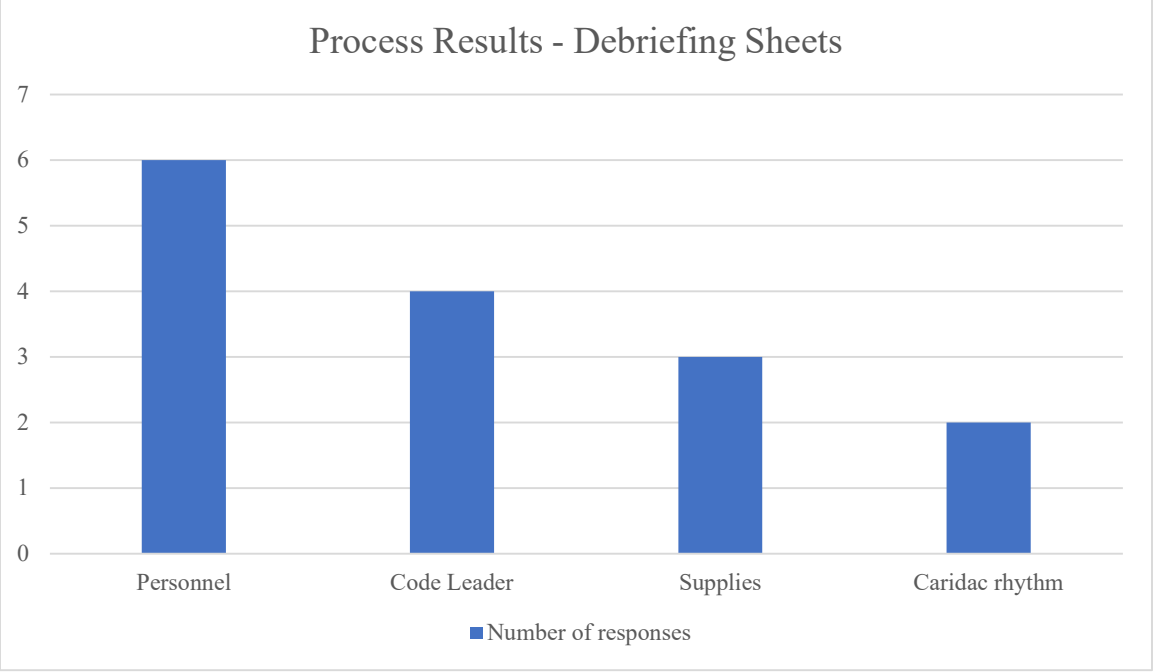


Figure 20.

Process map

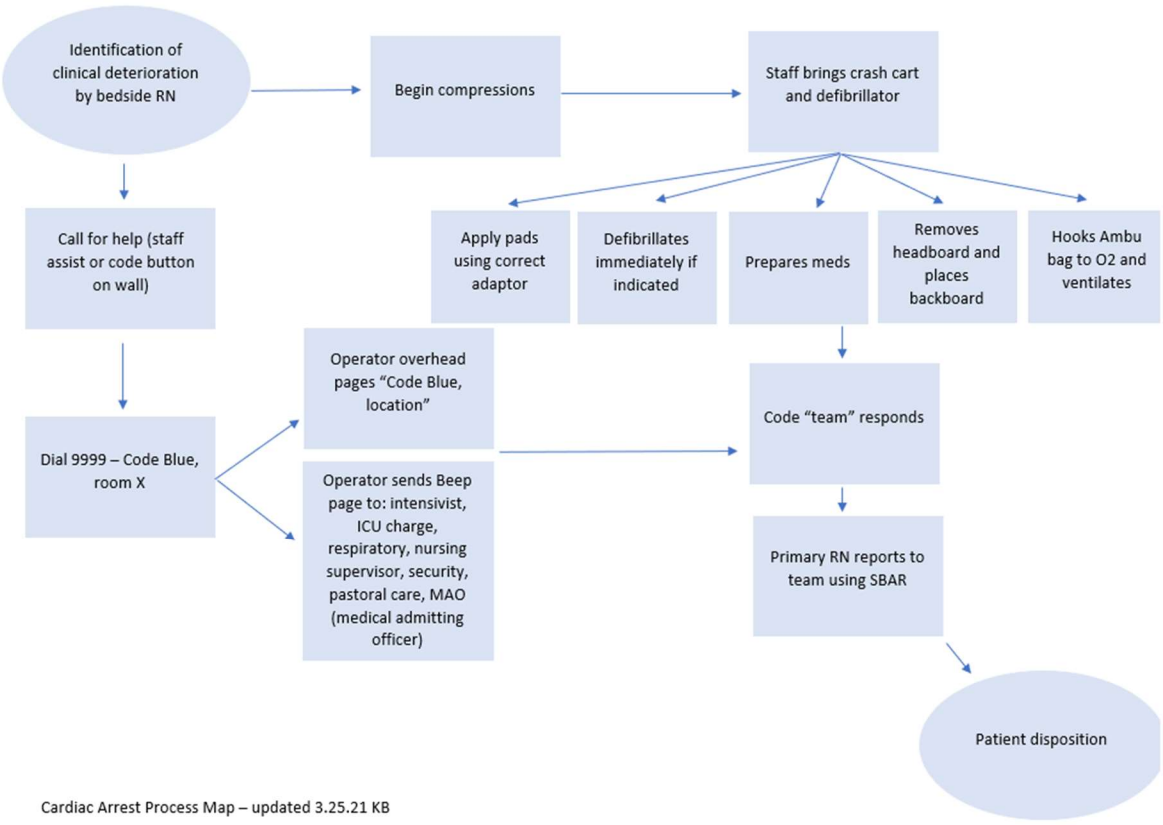


Table 1.

Data management plan elements

Measures	Data collection	Data analysis
Performance: • Time to call for help • Time to compression initiation • Time to defibrillation • Patient disposition	*Code Blue Flow Sheet* Retrospective chart review	Descriptive statistics
Confidence: • The first ten seconds • Rhythm interpretation • Using electricity • Demographics • Qualitative: Factors/barriers	ERCT survey tool	Descriptive statistics Thematic analysis
Process: • Personnel • Equipment • Qualitative review of IHCA events • Policy analysis	*Response Evaluation: Cardiopulmonary Resuscitation* *Code Blue Debriefing Form* Stakeholder interviews Facility policy analysis	Thematic analysis Process map creation

Table 2.

Age of ERCT survey respondents

Age	**Responses (*n*=21)**	**Result**
20-30	10	47%
31-40	6	29%
41-50	1	5%
51-60	3	14%
61+	1	5%

Table 3.

Years of experience of ERCT survey respondents

Years of experience	**Responses (*n*=21)**	**Result**
<1 year	5	24%
1-2 years	1	5%
3-4 years	3	14%
>5 years	12	57%

Table 4.

Months since last IHCA of ERCT survey respondents

Months since last IHCA	Responses (*n*=21)	Result
<1 month	3	14%
1-3 months	3	14%
3-6 months	2	10%
>6 months	13	62%