A Cardiac Arrest Quality Improvement Initiative Utilizing Get With The Guidelines – Resuscitation Registry and Post-Arrest Debriefing

Rosanna Lee Chapman
Henrico, VA

BSN, Grand Valley State University, 2007
MSN, University of Virginia, 2015

A Capstone Presented to the Graduate Faculty of the
University of Virginia in Candidacy for the Degree of
Doctor of Nursing Practice

University of Virginia
School of Nursing
May, 2016

Beth Quatrara, DNP, RN, CMSRN, ACNS-BC, chair

Kathryn Reid, PhD, APRN, FNP-BC, CNL, member

Kimberly Nelson, DNP, RN-BC, ACNS-BC, CHFN, CCPC, member

Abstract

Despite decades of utilization and multiple technological advances, outcomes from cardiopulmonary resuscitation (CPR) remain poor, with only approximately 20% of adults surviving to discharge. Survival from cardiac arrest is directly associated with the quality of CPR delivered. The American Heart Association (AHA) and Institute of Medicine (IOM) recommend continuous quality improvement initiatives to monitor and improve the quality of CPR and cardiac arrest outcomes.

Project Purpose: The overall purpose of this project was to describe and evaluate the implementation of a continuous quality improvement project targeting cardiac arrest outcomes utilizing the AHA Get With The Guidelines-Resuscitation (GWTG-R) registry with post-arrest debriefing.

Method: A Plan-Do-Check-Act quality improvement method was utilized to collect and analyze baseline cardiac arrest data for the project year on select cardiac nursing units at an academic medical center in the Southeastern United States. An interprofessional cold post-arrest debriefing was held for any cardiac arrest that occurred during a 3 month project period. Cardiac arrest data was abstracted from patient electronic medical records. Evaluation of the cold post-arrest debriefing intervention was completed via staff survey.

Results and Discussion: Utilization of the AHA GWTG-R registry organized the cardiac arrest data collected. Analysis showed several missed opportunities to receive GWTG-R "recognition measures" for achieving guideline benchmarks during the project year. The analysis also revealed trends in the incidence of cardiac arrest at specific time periods that could potentially become the target of future interventions. The post-arrest debriefing survey revealed that the

majority of staff regarded the intervention as very or extremely beneficial for influencing their personal behaviors, teaching them something new, and learning about medical center comparison data. The survey also indicated that staff were likely to recommend the debriefing to others. The organization and trending of cardiac arrest data using GWTG-R and the high acceptability of post-arrest debriefing shows promise for continued use of these interventions as continuous quality improvement initiatives for improvement of cardiac arrest outcomes.

Key words: Get With The Guidelines, post-arrest debriefing, quality improvement, cardiopulmonary resuscitation

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Introduction and Project Purpose

Problem and Background

Improving quality of care is becoming an increasingly important focus in the United States and improving cardiopulmonary resuscitation outcomes are not an exception (Sutton, Nadkarni, & Abella, 2012). Despite decades of utilization and multiple technological advances, outcomes from cardiopulmonary resuscitation (CPR) remain poor, with only approximately 20% of adults surviving to discharge after an in-patient cardiac arrest (Bradley et al., 2012; Sutton, Nadkarni, & Abella, 2012; American Heart Association [AHA], 2013; Morrison, et al., 2013). With greater than 200,000 adults experiencing an in-hospital cardiac arrest (IHCA) in the United States each year, this results in a large number of opportunities for improved care and outcomes (Bradley et al., 2012; Wolfe et al., 2014; Morrison et al., 2013; Crowe et al., 2015). The AHA is at the forefront of collecting the best evidence to improve cardiac arrest outcomes, and publishes recommendations every 5 years with updates. Although many hospitals require staff resuscitation training through the AHA, research shows that guidelines are not always followed, there is a lack of uniform reporting of outcomes, and utilization of interventions vary greatly between hospitals (Perkins et al., 2011; Soar, Edelson, & Perkins, 2011; Sutton, Nadkarni, & Abella, 2012; Abella, 2013; Morrison et al., 2013; Edelson et al., 2014; Wolfe et al., 2014). To improve these processes, the AHA and the Institute of Medicine (IOM) recommend continuous quality improvement initiatives. (Institute of Medicine, 2015; Kronick et al., 2015).

Survival from cardiac arrest is directly impacted by the quality of CPR delivered (Edelson et al., 2008; Perkins et al., 2011; Sutton, Nadkarni, &Abella, 2012; Abella, 2013; Morrison et al., 2013; Wolfe et al., 2014; Couper et al., 2015; Crowe et al., 2015). Guidelines for quality resuscitation care are updated every five years by the AHA, but research shows that healthcare providers rarely incorporate the changes directly into practice effectively (Sutton, Nadkarni, & Abella, 2012; Wolfe et al., 2014; Morrison et al., 2013; Crowe et al., 2015). Poor adherence to guidelines worsens outcomes for the return of spontaneous circulation (ROSC), survival to discharge, and neurological outcomes (Soar, Edelson, & Perkins, 2011). Current guideline care for adults include a focus on compression depth between 5-6 cm, a compression rate between 100-120 per minute, time away from compressions less than 10 seconds, no over-ventilation, and full chest recoil in-between compressions (Abella, 2013; Morrison et al., 2013; Hazinski et al., 2015). Cardiac arrest mortality rates fluctuate by hospital, time of day, and day of the week, and these findings point to differing levels of quality care and opportunities for improvement in process and system interventions (Sutton, Nadkarni, and Abella, 2012; Abella, 2013; Morrison et al., 2013; Edelson et al., 2014; Kronick et al., 2015).

In addition to guidelines on CPR performance, the AHA also publishes recommendations for suggested care of the in-patient cardiac arrest patient with the aim of optimizing outcomes (Morrison et al., 2013). An AHA consensus recommendation published in 2013 included many key concepts that were further endorsed by a recent IOM report and the most recent AHA 2015 guidelines. The consensus recommendation covered the current barriers to incidence and outcome monitoring, best practices for care of the arrest patient pre-arrest, intra-arrest, and post-arrest, and also, a call for a culture change to modify healthcare behaviors surrounding cardiac

arrests (Morrison et al., 2013). Morrison et al. (2013) and the IOM (2015) both described the current struggle to collect cardiac arrest incidence and the inability to truly compare different hospitals' data due to variability in how hospitals define an arrest event and report it. Recommendations to target these problems in the consensus document included using standardized definitions, collecting data on all IHCA, and public reporting of IHCA to identify areas for quality improvement and added motivation for guideline adherence (Morison et al., 2013). The IOM and AHA further expounded on this by strongly endorsing continuous quality improvement measures that collect and measure the cardiac arrest processes and outcomes, compare data to check for opportunities, provide feedback on performance, and develop strategies and interventions to improve those processes and outcomes (Institute of Medicine, 2015; Kronick et al., 2015).

A cardiac arrest quality improvement initiative mentioned in the 2013 consensus recommendations and endorsed by the AHA is the Get With The Guidelines- Resuscitation registry. Registries are systems that measure data to improve processes and outcomes (Bradley et al., 2012). Goldberger and Nichol (2013) state that improvements in processes are unlikely to be maintained without evidence that outcomes were improved. Objective data from registries can help to provide that needed evidence. Get With The Guidelines – Resuscitation (GWTG-R), formerly known as National Registry of Cardiopulmonary Resuscitation, is a registry developed by the AHA that can be used as a quality improvement measure for hospitals to monitor and review their IHCA by abstracting the data from documentation records (Bradley et al., 2012).

The registry data can help hospitals to assess risks factors and opportunities for improvement in cardiac arrest processes and outcomes, while also monitoring the effectiveness

of interventions (Goldberger & Nichol, 2013). GWTG-R also functions as a database of IHCA events, with aggregated data used for cardiac arrest research (Goldberger & Nichol, 2013). Participating hospital systems can compare their performance to hospitals with similar characteristics in the GWTG-R registry as a strategy to set benchmarking goals ("Get With The Guidelines- Resuscitation General Information", n.d.).

Using data from the registry, Bradley et al., (2012), analyzed if duration of participation in GWTG-R improved IHCA outcomes for the participating hospitals. The authors found that duration of participation was associated with improved event survival (odds ratio 1.02, $p = 0.046$), but not survival to discharge (odds ratio 1.02, $p = 0.18$). Another study by Giotra et al. (2012) showed increased survival to discharge and decreased neurological disability with registry participation. That study's data showed an 8.6% absolute improvement in risk-adjusted survival from 2000 to 2009, which accounted for an estimated 17,200 additional patients surviving (Giotra et al., 2012). Utilizing the GWTG-R registry for quality improvement of cardiac arrest outcomes shows a potential for addressing standardized definitions of events, national reporting of events and outcomes, evaluation of intervention effectiveness, and improving cardiac arrest outcomes.

During a system-wide gap analysis, it was found that the project medical center had established access to GWTG-R, but it had not been utilized in multiple years and there were no staff with current certification in data abstraction. Without certified data abstractors, the project hospital was not able to enter or analyze any of the system's cardiac arrest data using the registry. The recognition of this gap identified a starting point to address quality improvement of cardiac arrest outcomes at the project hospital.

Additional best-practice intervention recommendations from the 2013 AHA consensus were broken down into pre-, intra- and post-arrest care, which included system, process, and equipment research data (Morrison et al., 2013). Pre-arrest care includes structures that organizations incorporate to help prevent cardiac arrests and/or improve outcomes if arrest occurs, such as staff education and rapid response teams (Morrison et al., 2013). Intra-arrest care comprises interventions that occur during CPR: optimizing compressions, ventilations, and defibrillation (Morrison et al., 2013). Post-arrest care is for patients that have an initial ROSC, with a focus on stabilization and preserving neurologic function (Morrison et al., 2013). Interventions for the pre-, intra-, and post-arrest have varying levels of support, from statistically significant results to expert opinion. However, implementation of best-practices with a continuous quality improvement program that address all phases of arrest care is recommended to decrease mortality rate and improve outcomes for cardiac arrest patients (Morrison et al., 2013; Abella, 2013; Kronick et al., 2015).

An intervention that spans all three phases of care, and has gained national momentum, is post-arrest debriefing. Debriefing facilitates discussion amongst the healthcare team to address both optimal and suboptimal performances to improve behaviors and outcomes (Kessler, Cheng, & Mullan, 2015). During World War II, debriefing post-event was first used by the military after battle as a method to gather information and strategize, and has since found its way into healthcare in both simulation training and post-arrest to discuss events and improve quality outcomes (Edelson et al., 2008; Bhanji et al., 2010; Perkins et al., 2011; Sutton, Nadkarni, & Abella, 2012; Zebuhr et al., 2012; Couper & Perkins, 2013).

Post-event/post-arrest debriefing occurs at some point after the cardiac arrest, and includes information from the event for discussion with staff, to increase best practices with the goal to optimize performance by addressing opportunities for improvement and often addresses staff's emotional responses to the arrest (Morrison et al., 2013; Couper & Perkins, 2013; Zebuhr et al., 2012). In the 2010 guidelines by the AHA, debriefing was recommended, by expert consensus, as an intervention to improve subsequent cardiac arrest performance (Bhanji et al., 2010). The use of debriefings post-arrest was endorsed again by the AHA in the 2015 guidelines and by the IOM in their recent report (Institute of Medicine, 2015; Kronick et al., 2015). A team debriefing is indicated "when total performance is greater than the sum of differentiated individual performances", which is a concept that applies to in-hospital cardiac arrests and hospital resuscitation teams (Salas et al., 2008, p. 525). Despite the support for debriefings, a study using survey data from 2011, identified that only 34% of responding hospitals utilize post-arrest debriefing (Edelson et al., 2014). As more hospitals implement continuous quality improvement initiatives for cardiac arrest outcomes and further research is published on post-arrest debriefing, it is likely that post-arrest debriefing will become a more common intervention.

Cardiac arrest outcomes, and the quality improvement initiatives aimed to improve them, have many different variables interacting and impacting each other. The AHA publishes detailed process and system recommendations to improve cardiac arrest outcomes, and yet utilization of those recommendations has proven to be poor and national outcomes have remained stagnant (Edelson et al., 2008; Perkins et al., 2011; Bradley et al., 2012; Sutton, Nadkarni, & Abella, 2012; AHA, 2013; Abella, 2013; Morrison et al., 2013; Wolfe et al., 2014; Institute of Medicine,

2015; Kronick et al., 2015). The current statistics on arrest outcomes and the research data on best-practice utilization show that there is room for improvement. A continuous quality improvement initiative tailored to the unique nursing units to identify that hospital's weaknesses through data collection, comparison of the data, and dissemination of information back to staff through post-arrest debriefings, could potentially show great impact on that hospital's cardiac arrest outcomes and help guide other hospitals on the same path.

Purpose of the Project

The overall purpose of this project was to describe and evaluate the implementation of a continuous quality improvement project targeting cardiac arrest outcomes employing the GWTG-R registry and post-arrest debriefing.

Conceptual Framework

To help guide this project, a conceptual framework developed by Avedis Donabedian, to assess the quality of healthcare, was used as a resource. This conceptual framework assesses the quality of health services by evaluating three components: structure, process, and outcome (Donabedian, 1988). Structure refers to the resources of the setting, such as staff, facility, and organizational properties (Donabedian, 1992). The process is all parts of the care delivered, including lab tests, physical examinations, medications given, interventions implemented, etc. This is followed by the outcomes, which are patient outcomes of interest, such as mortality, patient satisfaction, or quality of life, and are a result of the health services provided from the process and structure (Donabedian, 1988). These components are viewed in a linear fashion with the structure influencing the process, which then impacts the patient outcomes.

When analyzed, the outcomes can be used to inform subsequent improvements of the structure and/or process as needed to close the loop and make the linear process circular. When examined as a whole, one can get a comprehensive view of quality of care (Holly, 2014). This framework is useful for projects aiming to improve cardiac arrest outcomes to determine if structure improvements such as staff education and certification, staff utilization, data collection, or code team structure improvements are needed; or if process changes for CPR care, charting methods, or cardiac arrest interventions may need to be adopted to improve morbidity and mortality after cardiac arrest (see Figure A1).

The recent guideline update published by the AHA used a very similar model for their systems of care model for continuous quality improvement (see figure A2). In the guideline report, the systems of care model included the three components of structure, process, and outcomes, but also included a "system" piece that is represented between the process and the outcomes in the figure, but is actually the integration of structure and process together (Kronick et al., 2015). The influence of Donabedian's model is readily apparent in the AHA's system of care model, and helps to support the use of this conceptual model when targeting cardiac arrest quality. Implementing a quality improvement project with GWTG-R data abstraction adjusts the healthcare structure and post-arrest debriefing becomes part of the process. The results from such a project are the outcomes.

Literature Review

The recent publications by the AHA and IOM both endorse the use of debriefings post-arrest to improve processes and outcomes (Institute of Medicine, 2015; Kronick et al., 2015). Prior to the end of 2015, the AHA consensus statement in 2013 was the most recent comprehensive guidelines for IHCA. The consensus statement included recommendations for hospitals systems to employ post-arrest debriefing catered to the culture and structure of each unique institution, however, there was no guidance for when and how a debriefing should best be implemented (Morrison, et al., 2013). The consensus statement also provided limited data on how much debriefing impacts team performance and outcomes (Morrison, et al., 2013). Therefore, a review of the literature was performed to identify the most recent studies on post-arrest debriefings with a focus on the degree of impact outcomes and the most effective methods. This review was based on the PICO question, do post-arrest debriefings improve process and patient/system outcomes when compared to standard care for in-hospital cardiac arrest patients? Process outcomes of interest were CPR standards based on current guidelines. Patient/system outcomes considered were ROSC rates, survival to discharge, and a good neurologic status on discharge.

Search Strategy

The literature reviewed in this paper was identified through database searches of OVID Medline, CINAHL, Pubmed, and the Cochrane Library. OVID Medline was searched with the major focus MeSH headings of cardiopulmonary resuscitation (methods)/cardiopulmonary resuscitation (standards) AND the keyword “debriefing”. Results were limited by the English language, human studies, and articles from 2011 – “current” to attempt to locate articles that

were recent enough to have not been included in the 2013 AHA consensus statement. This yielded 19 articles, with two duplicates, leaving 17 articles for further review. CINAHL was also searched with the major headings of cardiopulmonary resuscitation standards and methods with the keyword "debriefing", and limited by English and no older than the year 2011. That search found 11 articles, with nine duplicates from OVID Medline, and two articles for further review. Pubmed was searched using the keywords of "cardiopulmonary resuscitation" and "debriefing", and was also limited by human studies, English language, and no older than the year 2011. This search found 34 articles, of which 28 were duplicates from the OVID Medline results, and six for further review. The keyword of "cardiopulmonary resuscitation" yielded two Cochrane reviews. The titles of the 27 articles were reviewed with relevance to in-patient post-arrest debriefing. An additional 16 articles were eliminated, and the abstracts of the remaining 11 were reviewed for relevance. After abstract review, eight articles were selected and read in entirety. Two of these articles were rejected; one for being an on-going study with no results and the other for having only out-of-hospital arrest data with little description of the intervention. An ancestry review of article references was also conducted with no additional articles included. The databases were searched again with the above search criteria at the end of the year to collect all studies for 2015, and an additional two studies were identified. The eight remaining articles are summarized below.

Summary of Literature review

This review showed that there is limited published research on the topic of post-arrest debriefing after IHCA. Of the eight articles included in the literature review, four of them were review articles, one a prospective before-and-after study, one a prospective two-phase cohort

study, one was a mixed-methods pilot study reporting subjective survey data, and the last study was a quasi-experimental follow-up to the pilot study. The review articles covered both pediatric and adult populations and contained information on some out-of-hospital arrest data and simulation studies in addition to the IHCA data of interest. The two "prospective" studies had only adult populations. The pilot and follow-up studies were pediatric populations. A way to separate the debriefing interventions mentioned in the articles is by timing of the intervention: either immediately after the event, or a delayed debriefing later in time.

Hot Debriefing. A "hot debriefing" is a debriefing (usually interprofessional) that occurs either immediately or shortly after the event when the event is still readily in the resuscitation teams' mind (Couper & Perkins, 2013). These hot debriefings generally only include the staff that participated in the IHCA efforts, and cover their subjective experience and thoughts for improvement – often addressing both skills and emotions (Couper & Perkins, 2013; Crowe et al., 2015; Kronick et al., 2015). Couper and Perkins (2013) concluded that hot debriefings were more useful for performance improvement feedback and addressing process errors, such as missing supplies or poor communication. This type of debriefing for performance improvement is much like simulation training debriefing, which has shown to improve CPR quality and process measures (Sutton, Nadkarni, & Abella, 2012). Soar, Edelson, and Perkins (2011) and Abella (2013) made small references to debriefing that would be considered hot debriefing, but neither was specific, and like Couper and Perkins (2013), did not report on outcome changes after hot debriefings.

Crowe et al., (2015), did report outcomes, however, their intervention involved a bundle inclusive of a monitor that provides real-time audiovisual CPR feedback, a training session with

staff, and immediate post-arrest debriefings. The authors did not state the number of staff that attended debriefings, but did describe that they attempted to reach all staff that were present at the cardiac arrest and the CPR data from the monitor was reviewed with them. The outcomes of interest with this study were process outcomes of CPR quality metrics including compression data and timeliness of defibrillation. The study saw statistically significant improvement between phase 1 (before intervention) and phase 2 (after intervention) with chest compression depth ($p=<0.001$), percent of compression depth within guidelines ($p=0.001$), and mean chest compression release velocity ($p=0.001$) (Crowe et al., 2015). There was no statistical significance with the percent of chest compression fraction (time during compressions divided by total time of event), mean compression rate, or pre-shock pause time, however, all of the phase 1 levels were already within the benchmark aims of the measure (Crowe et al., 2015). Crowe et al., was not able to show any statistical differences in rates of ROSC or survival-to-hospital discharge, but the study was not powered to detect those outcomes (2015). The study by Crowe et al. (2015) lends the greatest amount of data on hot debriefings, which agrees with the conclusions of Couper and Perkins (2012), suggesting that hot debriefings are suitable to target process outcomes.

Cold Debriefing. "Cold debriefings" are debriefings that are conducted after some time has passed since the resuscitation effort. Cold debriefing involves reviewing objective data, such as the patient record and/or quantitative defibrillator data from the cardiac arrest as available (Zebuhr, et al., 2012; Couper & Perkins, 2013). Cold debriefing is usually an interprofessional event that is not limited only to staff present at the resuscitation, which gives cold debriefing the potential to educate and affect more staff (Couper & Perkins, 2013; Kronick et al., 2015).

Six of the eight articles in this review included information on cold debriefings with further data on outcomes from debriefings. The review articles by Sutton, Nadkarni, and Abella (2012), Soar, Edelson, and Perkins (2011), and Couper and Perkins (2013), all reported outcome data on the same 2008 study by Edelson that showed significant increased ROSC (p=0.03) when weekly debriefings were implemented, despite the study intervention targeting only physicians and not the full interprofessional team. The Edelson (2008) study used defibrillators that provided real-time feedback and also allowed the information to be downloaded for review in the debriefing.

The review by Couper and Perkins (2013) had additional data from cold debriefing intervention studies. The summarized results demonstrated limited statistical data, but identified improvements of chest compression flow fraction (percent of time with active compressions during a resuscitation attempt) in three separate studies with a p-value reported for one of the studies (p=0.007) (Couper & Perkins, 2013). That study also showed statistical improvement in the time delay before defibrillation (p=0.006), but none of the three studies presented significant improvement in patient outcomes. Couper and Perkins's (2013) review included information from studies that used defibrillator data, video recording, and written feedback to staff. They also reported that trends in debriefing interventions appeared to favor weekly debriefings and objective data from video or defibrillators.

Zebuhr et al. (2012) also tested an intervention classified as cold debriefing, but this pilot study was a feasibility study reporting staff subjective survey responses on the usefulness of the debriefing. This study utilized defibrillators that provided real-time feedback, recorded audio of the event, and allowed download of the data for analyzing as quantitative data in the post-arrest

debriefing which occurred one to five weeks after a cardiac arrest. The multi-disciplinary staff in the study were highly supportive of the debriefing intervention, with median survey ratings of "very useful" for all categories, and staff requesting more frequent debriefings in a free text section (Zebuhr et al., 2012). Wolfe et al. (2014) conducted a follow-up to the Zebuhr et al. (2012) study which showed improved resuscitation quality adherence to guidelines ($p<0.02$) and improved neurological outcomes post-arrest after debriefing intervention ($p=0.036$). This study was implemented during the release of the AHA 2010 guidelines, which is a potential confounder of results because guidelines are updated to provide the best outcomes, and the improved outcomes seen in this study may have been impacted by the new guidelines instead of the study intervention alone.

The most recent study including a cold debriefing was a two-phase prospective cohort study by Couper, et al. (2015). This study included three different hospitals and focused on primary outcome of ROSC and secondary outcomes of survival-to-discharge and CPR process outcomes. No intervention was conducted in phase 1 of the study, but in phase 2, hospital 1 received real-time audiovisual feedback during cardiac arrests, hospital 2 received the real-time feedback and post-arrest debriefings, and hospital 3 received no intervention. The debriefings were conducted weekly, following the previous format Edelson used in the 2008 study, lasted approximately 45 minutes, were interprofessional, and provided free lunch for attendees (Couper et al., 2015). Defibrillator data was reviewed from the feedback devices during the debriefings. The results from this study did not show statistically significant improvement in the process or patient outcomes compared to the control in either group ($p=0.17$) (Couper et al., 2015). Couper et al., (2015) attributed this partially to the fact that the control hospital showed large

improvements from phase 1 to phase 2, which was thought to be cross contamination from staff working at multiple facilities. With a secondary analysis as a before-after comparison instead of between groups comparison, Couper et al., (2015) did find significant improvement in ROSC ($p=0.03$), chest compression rate ($p=0.002$), and chest compression depth ($p=0.05$). This study contributed to the evidence of the impact cold debriefings can have on process and outcome measures.

Discussion and Implications

The literature contains few published studies on the impact of in-patient post-arrest debriefings on process and patient outcomes. Hot, immediate debriefings were more suited to process/procedure evaluation/error correction. Some of the advantages of hot debriefing are the likelihood of including the entire code team, less recall bias, and the potential of being able to more readily address room and supply issues, if the debriefing occurs in the same room as the event (Kessler, Cheng, & Mullan, 2015; Kronick et al., 2015).

The cold debriefings provided further statistical evidence of benefit for impacting cardiac arrest outcomes. The studies found in this review primarily focused on cold debriefings which shows a trend towards adopting this method of debriefing. Cold debriefings can include more quantitative feedback data, information on pre-arrest patient status, and post-resuscitative outcomes to help educate and affect staff (Couper & Perkins, 2013). The recent AHA guidelines mentioned that the data collected needs to be disseminated to the staff to address progress towards goals and increase feelings of accountability (Kronick et al., 2015). Cold debriefings also have the advantage of reaching more staff members, getting more input and providing more educational opportunities, however, it can be a challenge to obtain staff attendance and more

resources (Kessler, Cheng, & Mullan, 2015; Kronick et al., 2015). The addition of more objective outcome data in cold debriefings can provide a more easily accepted feedback method to staff and potentially have a greater impact to improve outcomes (Salas et al., 2008).

Although the current research has not yet demonstrated statistical significance for post-arrest debriefings to improve all outcome measures, it does show reasonable clinical benefit. When a fairly simple intervention such as post-arrest debriefing has even a slight potential to improve CPR processes and patient outcomes, it is a sensible option for hospitals to consider. It also can readily fit with quality improvement initiatives as a way to provide feedback to staff on benchmark data and strategies to improve outcomes (Institute of Medicine, 2015). Continued support for debriefings form the AHA and IOM will likely encourage future studies on this intervention and give further insight to implementation best practices.

Implications for Project

This review of the literature supports the use of cold debriefing for targeting team performance in IHCA and a more probable improvement in outcomes measures than hot debriefing. Best practices for the post-arrest debriefing are unknown currently, but studies have shown improvements with a variety of quantitative data measurements, and the AHA consensus statement recommends debriefings customized to the individual hospital to target their specific needs (Morrison et al., 2013). Objective data analysis using GWTG-R could both supplement the quantitative data in post-arrest debriefing and help determine the impact of the debriefing on process and outcome measures, which allows for evaluation of continuous quality improvement in cardiac arrest outcomes.

Methods

This project contributes to the developing knowledge base concerning the implications of participating with the Get With The Guidelines - Resuscitation registry and post-arrest debriefing interventions for cardiac arrest quality improvement.

Project Purpose

The overall purpose of this project was to describe and evaluate the implementation of a continuous quality improvement project targeting cardiac arrest outcomes utilizing the GWTG-R registry and post-arrest debriefing.

Project Objectives

The project objectives included: (a) a comparison of current year hospital process and outcomes data to national guidelines using AHA Get With The Guidelines – Resuscitation registry, (b) the implementation of a post-arrest debriefing intervention based upon GWTG-R data to both review recent cardiac arrests and educate staff, (c) an evaluation of a post-arrest debriefing intervention.

Definition of Terms

For the purpose of this project, the definition of key terms are as follows:

In-hospital cardiac arrest (IHCA): A cardiac arrest that occurs on hospital grounds and resuscitation measures of chest compressions and/or defibrillation are initiated by hospital staff (Morrison et al., 2013).

Post-arrest debriefing: A delayed post-event, multi-disciplinary group discussion led by a facilitator, which is held following an IHCA to review the event, analyze the data collected during the IHCA, and discuss implications for improving future IHCA resuscitation events.

Project Design

This project implemented a cardiac arrest quality improvement project using the quality improvement method of Plan-Do-Check-Act (PDCA) to describe and evaluate the impact of post-arrest debriefing.

Setting

The project hospital was an academic medical center with approximately 600 inpatient beds located in the southeastern United States. The project was conducted in the inpatient cardiac area, which included both cardiac medicine and cardiac surgery patients in telemetry medical/surgical units, progressive care units, and intensive care units. The cardiac conditions serviced at this medical center include a range of clinical situations, such as myocardial infarctions, heart failure, new transplants, and patients using left ventricular assist devices.

Four of the 5 cardiac units agreed to participate in the quality improvement post-arrest debriefing project. Cardiac "Unit A" was comprised of general cardiac and telemetry patients. Cardiac "Unit B", was a cardiac unit with a mix of telemetry patients and some intermediate level care beds. Cardiac "Unit C" was two separate wings of a combined cardiothoracic surgical intensive care unit. Cardiac "Unit D" was an intensive care unit which did not give permission for a post-arrest debriefing to be performed. Cardiac "Unit E" was a telemetry and stepdown unit for cardiothoracic surgery patients.

Sample

Patient medical records. Data for the entire project year was abstracted from patient medical records of all adult IHCA on the cardiac specific units during the three month project surveillance period. New cases were located when documentation was completed in a "code

narrator" in the electronic medical record (EMR), which created a new entry in a code report document accessible to the data abstractor. New cardiac arrests that occurred during the project window were added and updated in the GWTG-R registry as data became available. This included documentation in the electronic medical record only, as any potential paper documentation was not available for review. Charts with incomplete information were included.

During the project year timeframe, 47 patient medical records required data abstraction into the GWTG-R registry for cardiac arrests. Due to several patients suffering more than one cardiac arrest event, 59 cardiac arrest events were added to the database registry. However, two of the patients with multiple cardiac arrests had an arrest on a unit other than the cardiac units (one in the Emergency Department and one on a Medical/Surgical unit), which brought the total cardiac arrests on the cardiac units to 57 events for the project year.

Healthcare providers. Participation in the post-arrest debriefing intervention was open to all frontline providers on the cardiac units regardless of their role or participation in a recent IHCA. Cardiac Units A, B, and C all had cardiac arrests during the project surveillance period and staff from those units attended a post-arrest debriefing.

Measures

The AHA GWTG-R registry requires all data abstractors to receive training and pass certification testing to gain access to the website for data entry. To access and utilize the GWTG-R database, the project leader underwent training through the AHA to become a certified data abstractor for the project hospital. GWTG-R uses standard definitions to facilitate reliable data comparisons across multiple facilities (Bradley et al., 2012). Refer to Figure B1 for information abstracted from patient charts. The GWTG-R registry is operated by the Quintiles

Company (www.quintiles.com), which synthesizes data and creates reports on measures ("Get With The Guidelines – Resuscitation Patient Management Tool, 2014). The single certified data abstractor was used throughout the project to assure inter-rater reliability.

The survey used to evaluate the post-arrest debriefing intervention was created for this project and was not a tool used previously with any validity or reliability (Figure B2). Survey questions were reviewed by five doctoral nursing students familiar with post-arrest debriefings and given a content validity index score for an averaged reviewer rating of question relevance. The content validity index score was 0.92 averaged across the 10 questions with the five reviewers. A score greater than 0.80 is generally considered acceptable, or greater than 0.90 for stricter standards (Polit & Beck, 2006).

Procedures

Project implementation followed the quality improvement method of PDCA. (See Figures A3 and A4).

IHCA chart review.

Plan. To gather and analyze current cardiac arrest process and outcome measures at the medical facility. The project leader became a certified data abstractor for GWTG-R.

Do. IHCA chart data for the cardiac units were abstracted and inputted into the data registry of GWTG-R for all adult in-patients for the project year.

Check. Cardiac arrest data compiled in the GWTG-R registry was analyzed for trends to find opportunities for improvement to meet resuscitation guidelines. Measures selected for review were the GWTG-R "recognition measures" and data on frequency of cardiac arrest events by month, time of day, day of the week, survival of event, and survival to discharge. Data was

compared between the different cardiac units in this facility and also between similar hospital systems participating in the GWTG-R registry for select measures. Pertinent outcome measures were compared both annually and quarterly.

Act. The process and outcome findings from the analysis were summarized and disseminated to frontline cardiac floor staff at post-arrest debriefings by the project leader (refer to Figure A3). Leadership staff of Nursing Manager and/or Clinical Nurse Specialist were present at each of the debriefings and received the same information.

Post-arrest debriefing interventions.

Plan. Develop "cold" post-arrest debriefing interventions combining data from specific recent IHCAs, guideline recommendation reminders and recent AHA updates, and a summary of comparison data within the hospital system and against GWTG-R registry facilities and benchmarks.

Do. After a cardiac arrest event occurred on one of the selected cardiac units during the three month project surveillance period, attempts were made to schedule a post-arrest debriefing for that unit. Staff were notified of the debriefings by leadership staff on their unit. The debriefings were all integrated into unit meetings that were already scheduled, either for a general staff meeting or a shared governance meeting. Data collected at the debriefings included a sign-in sheet asking name, title, and email (see Figure B3), and also a post intervention survey (see Figure B2). Demographic data was collected in the survey and are discussed with the survey results.

The debriefings were delivered in a PowerPoint presentation format with the PowerPoint presented on a screen or printed out for staff to view. The PowerPoint presentation included

information on the most recent cardiac arrest, charts and information from the GWTG-R database, and highlighted data pertinent to the unit that covered areas of excellence or opportunities for improvement. Staff were also given handouts that they were allowed to keep that covered an excerpt of information from the AHA guideline updates, but this information was not verbalized with much detail at the debriefings (refer to Figure B4). Open discussion was permitted and encouraged after the PowerPoint presentation. The three debriefings that occurred were scheduled, on average, over a month after the cardiac arrest event had happened. The post-arrest debriefings lasted approximately ten to fifteen minutes with additional time for the open discussion.

Check. After implementation of the post-arrest debriefings, front line staff were encouraged to fill out a paper survey to assess and evaluate acceptance and helpfulness of the post-arrest debriefing intervention. The created survey covered questions related to the staff member's role, recent basic life support or advanced cardiovascular support training, and opinions of benefit, acceptability, and future recommendations for the post-arrest debriefing recommendation (see Figure B2). Data from the surveys were analyzed for common themes and trends in data. Due to the late timing of the debriefing intervention, no pre- post- evaluation of GWTG-R data was evaluated.

Act. Information obtained from the survey and continued monitoring of GWTG-R data can be used to guide modification of the post-arrest debriefings and/or additional interventions to address quality improvement of cardiac arrest outcomes at this medical center (refer to Figure A4).

Data Analysis

Data obtained from GWTG-R and the quantifiable post-arrest debriefing survey data were analyzed. Descriptive statistics to compare means, percentages, and ranges were computed in either Microsoft Excel or within GWTG-R using the Quintiles software. Comparisons between units and between hospitals in the GWTG-R database were displayed by Excel graphs and/or charts created in the GWTG-R registry. The two open ended questions collected from the survey were searched for central repeating themes and were summarized. Demographic data from the survey were analyzed for frequency of percentages of staff responses. Completion rate of the survey was also calculated.

Protection of Human Subjects

This quality improvement project was submitted to the facility Institutional Review Board (IRB) for approval prior to implementation. The IRB determined the project to be an improvement project that did not meet the criteria of research with human subjects, so IRB review was not required (see Figure E5). Data entered into the GWTG-R registry did not include HIPAA identifiers, and only individuals who pass the AHA GWTG-R certification testing may access the registry data. Patient information was not stored or saved for this project anywhere other than the GWTG-R registry website.

Approval was obtained from the leadership staff of all participating units (see Appendix E). Participation in the debriefing was voluntary, and the multidisciplinary staff was invited to the debriefing by their leadership team on their unit. Participation in the survey to evaluate the post-arrest debriefing intervention was also voluntary. The front page of the survey had a

disclosure for informed consent of intent to analyze and report findings with anonymity of an individual's responses.

Results

Cardiac Arrest Data

Characteristics of sample. During the three month project period, the cardiac arrest events by units were as follows: Cardiac Unit A had two events during the project and three total cardiac arrest events for the year, Cardiac Unit B had one cardiac arrest event during the project and six total events for the year, Cardiac Unit C had two events during the project and 22 annual cardiac arrests in total, Cardiac Unit D was the unit that chose not to participate in the project and had 25 events for the year, Cardiac Unit E had one event for the entire year which was not during the project period.

Data findings. The data abstracted from the patient medical records and entered into the GWTG-R registry was reviewed across all of the cardiac units: as an annual whole and quarterly against selected GWTG-R measures, other hospitals participating in GWTG-R, and between the different cardiac units. Other data reviewed were frequency of events for day of the week, month, time of day, unit, survival of event, and survival-to-discharge. For each post-arrest debriefing, the most recent cardiac arrest records were also reviewed on an individual patient level for discussion with staff.

The four main GWTG-R measures reviewed were the "recognition measures" which determine eligibility for an award from AHA GWTG if an 85% benchmark is met for all four measures either annually or quarterly. The four recognition measures were percent of pulseless cardiac arrests monitored or witnessed, time to first chest compressions less than or equal to 1

minute, device confirmation of correct endotracheal (ET) tube placement, and time to first defibrillation less than or equal to 2 minutes from recognition of ventricular fibrillation/pulseless ventricular tachycardia. Collectively, the cardiac units together did not meet all four measures either annually, or in three of the quarters for the project year. However, these percentages are similar when compared to other hospitals in GWTG-R.

Annual guideline findings. Although the medical center did not meet all four benchmark measures, the annual results did meet the benchmarks in three of the four categories. The medical center met percent of pulseless cardiac arrests monitored or witnessed (98.2%), time to first chest compression (96.2%), and device confirmation for correct endotracheal tube (ETT) placement (87.5%). Time to first defibrillation of less than or equal to 2 minutes for ventricular fibrillation/pulseless ventricular tachycardia did not meet the benchmark. The overall percentage for that measure was 83.3%, and although this missed the benchmark, the other comparison hospitals struggled to meet this measure as well (see Table C1).

Quarterly guideline findings. The data results broken down by quarters were comparable to the overall year's data both in meeting benchmarks and in comparison to the other hospitals in the GWTG-R registry. Time to defibrillation in both Quarter 2 (75%) and Quarter 4 (66.7%) were below 85%, but the benchmark was rarely met across the comparison data as well (Figure C1). In addition, device confirmation for correct ETT missed the benchmark in Quarter 3 (60%) (Figure C2). The other two measures met the benchmarks for each of the quarters.

Unit-specific guideline findings. These GWTG-R recognition measures were compared between the units to bring unit-specific data during the post-arrest debriefings. Cardiac Unit A met all measures at 100% except for time to defibrillation, where one out of two patients did not

receive defibrillation in the allotted time, resulting in 50% of measure met. Cardiac Unit B also missed the defibrillation measure, with zero out of one patients meeting the measure. Cardiac Unit C achieved 84.6% for the time to first chest compression measure. Cardiac Unit C also had one out of two misses for the ET confirmation measure, for a 50% met measure. Cardiac Unit C met the other two recognition measures at 100%.

Frequency of events findings. The frequency of events, broken down by month, day of the week, and time of day, were determined for all the cardiac units as a whole, and also reviewed for trends on a unit-level. The month with the highest amount of cardiac arrests was May with 11 and the lowest was August with one arrest (see Figure C3). By day of the week, Thursday had the highest amount at 14, and Friday the lowest with four, however the trend line across all of the days of the week was a straight line, without any uptrend or downtrend (see Figure C4). Separation of time-of-day, in 4 hour blocks, did show an uptrend throughout the day, with the highest incidence of cardiac arrests occurring between 8pm and midnight (Figure C5).

On a unit-by-unit level, Cardiac Units A, B, and E had very few cardiac arrests to trend, but Cardiac Units C and D had more events to review. Cardiac Unit A had no specific trends with only three cardiac arrests for the year. Cardiac Unit B had half of their events on Saturdays, and four out of six events occurred between 4pm and 8pm. Cardiac Unit C had their highest amount of cardiac arrests occurring from 8pm to midnight, which caused an uptrend in their incidence time, and accounted for 71% of the total cardiac arrests in that time period for the year (see Figure C6). Unit C also had an uptrend in incidence during the days of the weeks, with the higher incidences occurring near the weekend (Figure C7). Unit D, the other ICU and the unit

with the highest incidence of cardiac arrests, showed opposite trends, with trends showing a decreased incidence throughout the day and days of the week (see Figures C8 and C9).

Cardiac arrest survival. Other major measures collected, analyzed, and reported in the debriefings were survival of cardiac arrest and survival-to-discharge. Survival of cardiac arrest was 50% or greater for all of the units, and the majority of the units had greater than 90% survival of the cardiac arrest event (see Figure C10). Survival of cardiac arrest was also reviewed within the measure of time to defibrillation, and the analysis showed 100% survival for the patients that met the defibrillation guideline and 50% survival for the patients that did not. Survival- to-discharge was the final major measure evaluated after the data abstraction, with 31.8% of the cardiac unit patients surviving to discharge. Units A, B, and E were combined for a 25% survival to discharge rate, Unit C was 52.9%, and Unit D had 14.3% survival to discharge.

Post-Arrest Debriefing Data

Characteristics of sample. Three post-arrest debriefings occurred; one each on Cardiac Unit A, B, and C. A total of 44 staff members signed in on the attendance roster from the three debriefings. Of those 44 staff members, 28 completed and returned the post-arrest debriefing survey, for an approximate 65% survey return rate. The 65% response rate on the survey yielded the following data, including responses from nurse managers, clinical nurse specialists, staff nurses, and patient care technicians. Survey data was included in analysis as long as at least one question was answered.

The demographic data collected was quite homogenous. The majority of survey responders identified as being a staff nurse (78%), White (89%), age 21-29 (44%), and female (85%). Please refer to Table D1 for the full demographic results. Staff participation in recent

educational classes and cardiac arrests were also asked for a different category of background information on the participating staff and results are displayed in Figure D1.

Data Findings. The main survey questions following the post-arrest debriefing included questions on how beneficial the staff felt the debriefing was, how likely they would recommend a post-arrest debriefing, what they learned, how the debriefing could be improved, and perceived barriers to attendance. Two of the questions were open answers and were fully answered by only 10 staff members, but the main questions were answered by all 28 staff members. Please refer to Figure B2 for the full survey.

Debriefing benefit. The first survey question asked, in multiple separate questions, how beneficial was the post-arrest debriefing. Ninety percent of staff members found the post-arrest debriefing to be at least moderately beneficial for the review of recent cardiac arrests, and, of that 90%, 47% felt it was very or extremely beneficial. This was followed by the question that received the lowest ratings; staff chose the review of CPR guidelines to "not" be beneficial in 15% of surveys, however, 60% still found it to be moderately or very beneficial. In terms of learning about the medical center's comparison data, staff selected that the post-arrest debriefing was at least moderately beneficial in 86% of surveys, and 61% of those responses chose very or extremely beneficial as their response. Eighty-three percent of staff responded that the post-arrest debriefing was at least moderately beneficial to influence team behaviors at future cardiac arrests, and that response went to 86% when asked about the influence on their personal behavior in future cardiac arrests. The last question regarding the benefit of the post-arrest debriefing asked about learning something new, and staff responded that the debriefing was at least moderately beneficial in 82% of surveys. Sixty-three percent of the 82% felt it was very or

extremely beneficial to learn something new. The percentages for each question can be viewed in Figure D2.

Debriefing recommendations. The next set of questions asked the staff member to answer two questions with a short answer and then rank how likely they would recommend the debriefing on a scale of 0-10. The average rating for how likely the staff member would recommend the post-arrest debriefing to a friend or colleague was 7.14, with a range in scores from 2 to 10, and the most frequent response was a rating of 10, accounting for 25% of respondents. Sixty-eight percent of respondents rated this question a 7 or higher. A breakdown of ratings from a low (0-3), moderate (4-6), and high (7-10) rating is represented in Figure D3.

The short answer questions asked the most important point that the staff member learned at the debriefing and what could be done to improve future post-arrest debriefings. Twenty-one staff members listed the important point that they learned, and the general themes in the responses were importance of charting data/times, identification of cardiac arrest benchmarks, and endpoints for staff to improve upon/focus on. Eight staff members gave responses on how to make future post-arrest debriefings better. Three of the eight responses suggested immediate debriefings directly after a cardiac arrest. The rest of the answers suggested that improved staff documentation would improve debriefings, stated continued want for specific trending cardiac arrest data over time, and a wish for national guidelines to be changed to reflect specific cardiac surgery needs. The eight staff members that chose to give suggestions for future debriefings had an average recommendation score of 7.75. The two staff members who gave the lowest recommendation scores (a 2 and a 3) did not give offer input to make future debriefings better.

Debriefing barriers. The last major question on the survey asked staff to address perceived barriers to attending post-arrest debriefings. The question allowed for multiple choices and an "other" for staff to write in additional thoughts. A total of 61 responses were recorded. The most frequent choice for a barrier was staff being "busy at work" (n=23). This was followed by "not willing to come in on a day off" (n=18), "time/location of debriefing not convenient" (n=14), "lack of interest" (n=4), and the "other" category (n=2) including difficulty with parking and commute time.

Responses by unit and role. The survey questions were also separated by unit and role to look for different trends in responses for benefit of the post-arrest debriefing and ratings for recommendation. Overall, the trends in responses were similar between the three units (see Table D2). The registered nurse responses were not separated out from the full data due to Registered Nurses making up the vast majority of the total sample. Patient care technicians and the leadership staff members (Nurse Mangers and Clinical Nurse Specialists) were reviewed individually even with their low numbers (three in each category). There were no specific trends across all questions identified, although the patient care technicians did respond higher than the majority for the benefit of the debriefing teaching them something new. The overall leadership answer percentages were not far from the average percentages, but one of the three leadership nurses did respond as "not beneficial" or "slightly beneficial" for all questions. The recommendation rating averages in the subsets were comparable to the overall average (7.14): Cardiac Unit A (7.09), Cardiac Unit B (7.78), Cardiac Unit C (6.5), PCT (7.0), and Leadership (7.33). Comparisons between units and roles were not tested for significance.

Discussion

Targeting improvement in cardiac arrest outcomes requires a multifaceted approach when outcomes are impacted by the series of events before a cardiac arrest, during an arrest, and with post-resuscitative care. The AHA and IOM both endorse utilizing continuous quality improvement measures to fully operationalize the necessary components together that will increase the likelihood of success. Essential quality improvement components that must be considered are collecting process and outcome data, comparing the data measures against benchmarks, providing feedback to staff, and incorporating strategies to improve upon the measures (Institute of Medicine, 2015). This project implemented a cardiac arrest quality improvement project utilizing a registry database and post-arrest debriefings at an academic medical center.

Using a cold debriefing method, cardiac arrest data was shared with staff. According to the literature, cold debriefings show greater improvement of patient outcomes than with hot debriefings. There was no standard in the literature for how best to implement a cold post-arrest debriefing, therefore individual unit preferences were integrated.

Although the sample of staff members from this project were very homogenous, which is similar with most of the studies in the literature review, this sample included mostly bedside nurses in contrast to samples almost solely comprised of physicians. Focusing education efforts on the staff that are at the patient bedside and first responding to deteriorating patient condition will likely provide greater benefit than a focus on physicians or leadership staff that spend the majority of time outside of the patient room.

In alignment with Zebuhr et al.'s 2012 study, the staff at this academic medical center provided positive feedback on the post-arrest debriefing surveys. Overall, the staff responded that post-arrest debriefings are beneficial and could impact changes. Although most research on cold debriefings include supplemental defibrillator data on CPR measures, such as compression depth and rate, the staff at this medical center were responsive to the supplemental GWTG-R data. Lack of defibrillator data makes it more difficult to collect and evaluate specific CPR process measures, but many of the measures in GWTG-R can help bring objective focus to resuscitation guidelines, such as time to defibrillation, epinephrine administration, and ET tube device confirmation. Implementing immediate "hot" debriefings after cardiac arrests at this facility could be a successful additional intervention to collect and address those CPR process measures without having to spend large amounts of money on new defibrillators.

The utilization of the Get With The Guidelines – Resuscitation registry also proved useful in obtaining baseline data at the academic medical center and comparing the results to guidelines and other facilities. The data abstraction of cardiac arrest data from patient medical records resulted in a plethora of information to review in GWTG-R. The data showed this academic medical center to be very close to meeting all of the four recognition measures in GWTG-R. Had the medical center had one additional on-target time to defibrillation measurement, or additional nursing units' data added to the database to increase the denominator, this benchmark would have likely been met for the year. This is important for multiple reasons. First, the data showed that patients who did not meet the defibrillation guideline at this hospital were less likely to survive, so improving this measure could positively impact mortality rates. Second, meeting the recognition measures makes the hospital eligible for

recognition awards from AHA GWTG-R, which are national recognitions that can help show the hospital's dedication to improving cardiac arrest outcomes. The four recognition guidelines are also likely to be measures chosen to be reported if cardiac arrest outcomes become nationally mandated. With further monitoring of these measures with GWTG-R, and focus on improving them, this academic medical center shows a high likelihood to meet the benchmarks in coming years.

The academic medical center also displayed comparable outcomes to other hospitals in the GWTG-R registry. Although one of the limitations of the registry data is that it is not generalizable outside of the registry because the hospitals that choose to participate are inherently different than those that do not (Goldberger & Nichol, 2013), seeing that the medical center had comparable outcomes to other registry participants, shows this medical center is on par with other facilities and also that the hospitals in the registry have similar opportunities for improvement.

In addition to comparing medical center outcomes against the guidelines, GWTG-R registry was also useful for reviewing and analyzing for potential trends in IHCA data, both on a hospital level and unit level. Unit B, a non-ICU unit, had six of the 57 cardiac arrests, when the other non-ICU units had far fewer events. The incidence of IHCA on Unit C showed increased trends near the weekend and between 8pm and midnight, which appears to follow with the surgical schedule, and shows a potential target to focus future improvement initiatives. The above examples and the data reported in the results section demonstrate the high yield of data obtained from the GWTG-R registry data abstraction and the potential utility of the information to create performance improvement projects and monitor their successes.

The hospital trends and unit-specific results were discussed during the post-arrest debriefings and after the general presentation of data, the facilitator encouraged discussion about the specific unit's areas for improvement and thoughts on how outcomes could be improved on their unit. Cardiac Unit A felt that their unit was very effective and efficient during cardiac arrests, and talked about improving documentation and the difficulties in completing proper documentation. Cardiac Unit B talked about the trend of their cardiac arrests occurring between 4pm and 8pm. The team discussed the fast tempo of flow that usually occurs during that time and the potential for alternate staffing patterns. Cardiac Unit C did not provide input on their increased cardiac arrest frequency at the end of the week or the end of the day, but instead spent most of the discussion on how cardiac surgery patient treatment differs from the guidelines supported by the AHA. Cardiac Unit C expressed hope that the AHA soon supports cardiac surgery advanced life support (CALS) guidelines, and they felt that their achievement of benchmarks will be improved if this occurs. The takeaway from the discussions was that the separate units recognized some of the areas for improvement and deliberated on ideas to address them.

Strengths and Weaknesses

Due to the nature of the project design, there are both strengths and weaknesses of this project. A strength of the design is the structured data collection from using a standardized registry that is valuable not only for the baseline assessment, but also the comparison for any post-intervention outcomes in the future. There was only one data abstractor during the course of the project and that removed inter-rater reliability concerns with the data abstracting. Clinical relevance is an additional strength of this project, as both the initiation of GWTG-R and

implementation of post-arrest debriefing fit easily into a PDCA quality improvement methodology, and follow recommendations by the IOM and AHA. The intervention was also well regarded by most staff that participated, with a high recommendation score, which helps to show acceptability and feasibility of continuing these quality improvement measures. Even though this was quality improvement and not research, other hospital systems could benefit from the information obtained from this project. The GWTG-R registry and post-arrest debriefing at this academic medical center could also easily stimulate further research surrounding these interventions.

The inherent weakness of this quality improvement project is that the results of this project are not generalizable to other facilities. The GWTG-R data collected was very specific to the patients treated at this facility and nursing units and only included data from select cardiac units. The interventions were also very individualized to this facility, and causal inferences will not be able to be made with this project. Using a non-validated tool for the survey questions was also a weakness for interpreting the results from those questions, even with assessing face validity by undergoing content validation. Survey non-response rate is also a potential risk of bias in the results based on who did and did not complete the survey. The survey results are also limiting because there was dearth of interprofessional diversity in the sample. It is unknown how physicians or respiratory therapists at this facility would evaluate a debriefing, and they are key team members in a cardiac arrest.

The data collection methods in this project also have limitations. All attempts were made to capture all adult IHCA events on the cardiac units, however, there is a risk that loss of data capture occurred. Because charting cardiac arrests in the EMR was new to the academic

medical center in the beginning of the project year, it is possible that staff may have written the event documentation on paper and not transferred it to the EMR. It is also possible that they did not chart an event in the designated location, which would not trigger an occurrence on the code report for the data abstractor. The time commitment of the data abstractor is another limitation for a quality improvement project designed this way. This person or persons would need to be paid for their time and they would have other responsibilities to balance with data abstraction. Finding the necessary funds to train and support data abstractors may be difficult.

This project had a short three month surveillance period at the end of the project year, which did not enable the ability to show if any changes in cardiac arrest processes or outcomes occurred after the intervention. Because cardiac arrests are relatively infrequent events, the project monitoring would need to extend multiple years to collect quantifiable data necessary to show steady changes. Some facilities might have difficulty utilizing quality improvement methods like this if immediate gains in outcome improvements are not easily identified to reinforce the efforts.

Nursing Practice Implications

This quality improvement project to describe and evaluate the implementation of a continuous quality improvement project to improve cardiac arrest outcomes has the potential to lead the way for improved cardiac arrest care and outcomes at this facility. The PDCA methodology influenced by the Donabedian conceptual model assists to demonstrate the cyclic effect small change can have on process and outcomes. The results of this project can help guide other healthcare facilities through the process of continuous quality improvement and encourage the utilization of standardized reporting, through measures such as GWTG-R, to contribute to

national data on cardiac arrest processes and outcomes. The positive staff response to the debriefing coupled with objective data from GWTG-R shows an acceptability of using this combination and makes this objective data a feasible alternative when advanced defibrillator data is not available.

Lessons learned from this project can help to influence the future implementation at this facility, at other facilities implementing quality improvement of cardiac arrests, and research of interventions to improve cardiac arrest outcomes. One of the main difficulties in the implementation of this project was effective communication with unit leadership to schedule post-arrest debriefings. Had the debriefing facilitator been an employee at the academic medical center, this may have been easier. If each unit had its own data abstractor/debriefing facilitator as a "unit champion" for cardiac arrests, this could greatly help to establish this quality improvement method. The unit champion would have a relationship with the staff on the unit to better know the specific needs of that unit, when a cardiac arrest occurs, and be more capable of scheduling debriefings at the most convenient times to improve turnout and encourage interprofessional attendance. A data abstractor on each unit would also help to spread out the time commitment of inputting the cardiac arrest information, making it less of a financial burden. A committed cardiac arrest unit champion could also help offset difficulties with leadership buy-in, which this project did observe in survey results on Cardiac Unit C.

Due to the system nature of this large quality improvement project, a facilitator for the unit champions, such as a nurse with a Doctor of Nursing Practice degree, would be justified. It is important to organize, analyze, and trend system-wide cardiac arrest data with a broad outlook instead of only a unit-specific focus, and a facilitator separate from the individual units could

provide that. The project facilitator could also provide oversight to data abstraction certification and help monitor correct and complete data abstraction.

The survey results from the post-arrest debriefing included comments supporting the use of immediate, "hot" post-arrest debriefings. Cardiac Unit C already regularly utilizes immediate debriefings after cardiac arrests and other major events on their unit. Coupling hot and cold debriefings would be an ideal scenario to receive the benefits associated with the two different types and better address any staff emotional concerns. This form of debriefing would be less suited to a cardiac arrest champion, however, because a single staff member could not be present at each event. Because of that, this form of debriefing may need support from physicians and/or leadership to be fully implemented. Of interest, Cardiac Unit C was the unit with a leadership member that gave poor benefit and recommendation scores for this post-arrest debriefing, yet this was also the unit that currently utilizes hot debriefing for events. This could suggest that leadership support is less necessary than anticipated or that the leadership on that unit has a preference for hot debriefing methods.

The results from this project can be used to support the continued use of post-arrest debriefing and stimulate further research to collect and publish patient cardiac arrest outcome data. A research study that reviewed the effect of the GWTG-R registry and post-arrest debriefing together, as with this project, would contribute new knowledge to this field. The research has shown that these measures separately have an impact on outcomes, so it is not unwarranted to hypothesize that they would extend that effect together.

Products of the Project

This project can serve as a pilot for cardiac arrest quality improvement interventions at this academic medical center. The debriefing intervention received positive feedback, and would likely be well accepted as a continued quality improvement method on the nursing units. If the intervention stayed successful on the cardiac units, the methods could be implanted throughout the hospital, which would collect even larger amounts of data and be more likely to improve cardiac arrest outcomes. If the post-arrest debriefings were not continued, further participation in GWTG-R could still help show areas for improvement for other cardiac arrest interventions and contribute to the national data on cardiac arrests.

This project was also the focus of a Doctor of Nursing Practice scholarly capstone project to fulfill requirements for graduation in a written report. A journal article manuscript was written for this project for potential submission to the *Journal of Nursing Care Quality* (see Appendix F). This project will also be submitted for a poster presentation at a Doctor of Nursing Practice conference.

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Appendix A

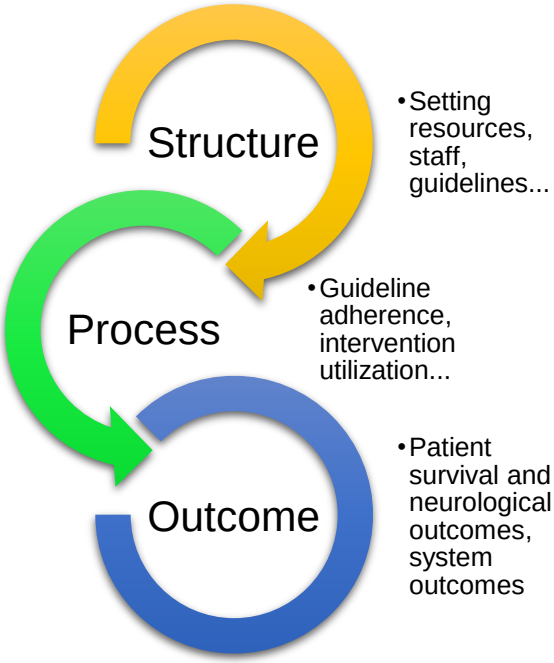


Figure 1. Donabedian conceptual framework with cardiac arrest focus.
Adapted from: Donabedian, A. (1992). The role of outcomes in quality assessment and assurance. *Quality Review Bulletin, 18*(11), 356-360.

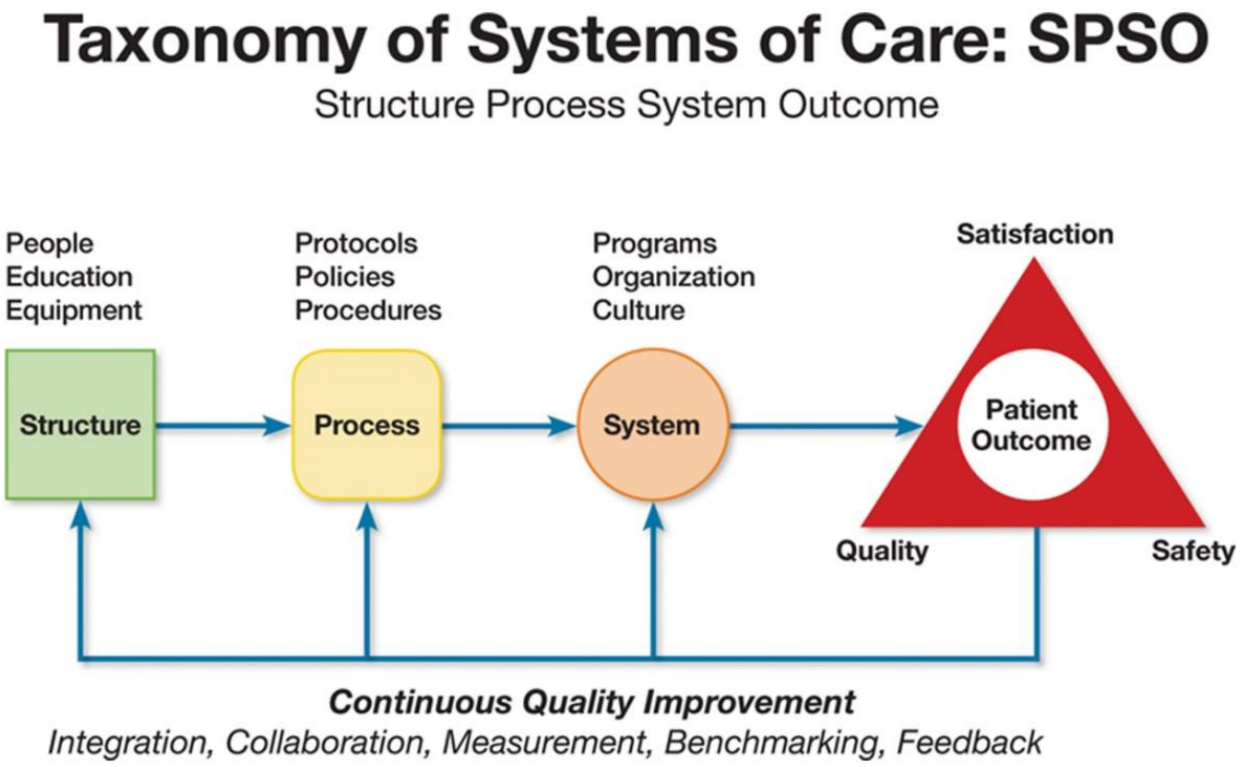


Figure 2: "Figure 1. Taxonomy of systems of care." Retrieved from Kronick, S. L., Kurz, M. C., Lin, S., Edelson, D. P., Berg, R. A., Billi, J. E., . . . Welsford, M. (2015). Part 4: Systems of care and continuous quality improvement: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation, 132(18 suppl 2), S397-S413. doi:10.1161/CIR.0000000000000258 Permissible reprinting for education purposes.

Figure 3. Plan-Do-Check-Act of registry implementation.
Adapted from: Plan-Do-Check-Act (PDCA) Cycle. (n.d.). Retrieved from http://asq.org/learn-about-quality/project-planning-tools/overview/pdca-cycle.html

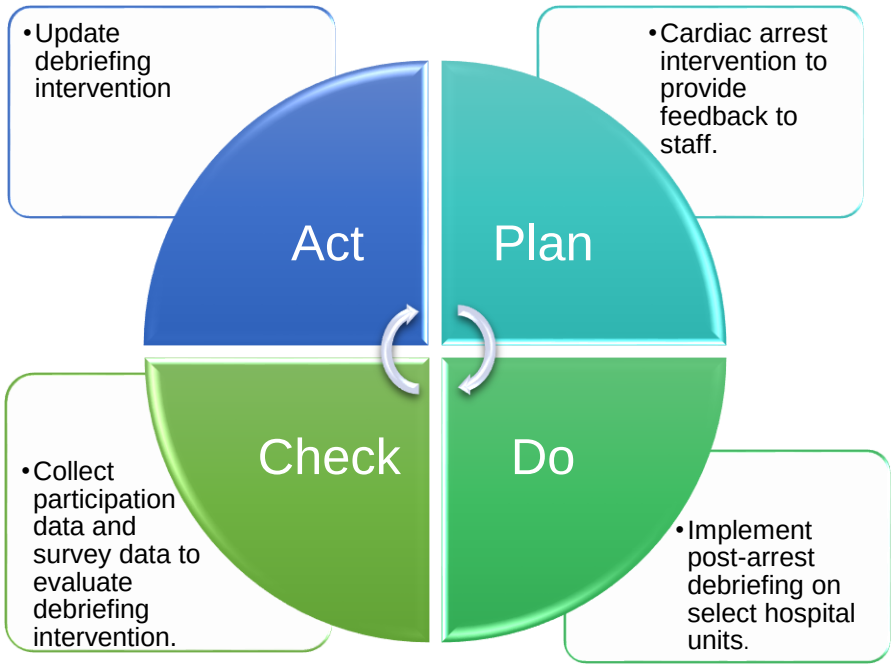


Figure 4. Plan-Do-Check-Act of post-arrest debriefing.
Adapted from: Plan-Do-Check-Act (PDCA) Cycle. (n.d.). Retrieved from http://asq.org/learn about-quality/project-planning-tools/overview/pdca-cycle.html

Appendix B

Admission and discharge data	System entry date/time; date/time of birth; gender; race; Hispanic ethnicity; cerebral performance category/scale; induced hypothermia; discharge status; discharge disposition; discharge date/time, DNAR?; If DNAR, when declared?; life support and organ donation; discharge cerebral performance category/scale; hospital unit.
Pre-event data	Recent discharge from ICU, ED, or PACU in past 24 hours; sedation in past 24 hours; vital signs prior to event; out-of-hospital arrest prior; pre-existing conditions at time of event.
Event data	Date/time of birth; age; patient/subject type; illness category; event location; event witnessed; resuscitation response activated; event trigger; chest compressions; date/time of compression initiation; rhythm present; AED use; date/time of AED use; VF or VT presence and date/time; defibrillation use and date/time; ventilation/airways used; date/time of ET tube placement; methods of ET tube placement verification; epinephrine given and date/time; vasopressin given and date/time; other drugs given or continued during event; non-drug interventions during event; event outcome and date/time; post-arrest temperature.

Figure 1. Data collected for Get With The Guidelines – Resuscitation registry.
Adapted from “Resuscitation Patient Management Tool: Admission & Discharge”. (2015). Retrieved from http://www.heart.org/idc/groups/heart-public/@private/@wcm/@hcm/@gwtg/documents/downloadable/ucm_457480.pdf; “Resuscitation Patient Management Tool: CPA Event”. (2015). Retrieved from http://www.heart.org/idc/groups/heart-public/@private/@wcm/@hcm/@gwtg/documents/downloadable/ucm_457481.pdf

WELCOME AND DISCLOSURE

Thank you for participating in this survey. Your feedback is important.

This survey is part of a capstone project for a Doctor of Nursing Practice student at the University of Virginia.

Data from this survey will be analyzed for project outcomes to evaluate the intervention of post-arrest debriefing and help make improvements.

All responses are anonymous, and no questions are meant to personally identify you.
Answering or not answering questions will in no way impact your job or result in negative consequences.

If you would like more information on post-arrest debriefings or want direct feedback, please email rlc2bc@virginia.edu

By completing this survey, you are acknowledging understanding of the above and are consenting to participation.

POST ARREST DEBRIEFING EVALUATION

1. How beneficial was the post-arrest debriefing:

	Not beneficial	Slightly beneficial	Moderately beneficial	Very beneficial	Extremely beneficial
For review of recent cardiac arrests?	○	○	○	○	○
For review of CPR guidelines?	○	○	○	○	○
To learn about UVA cardiac arrest comparison data?	○	○	○	○	○
To influence team behaviors at future cardiac arrests?	○	○	○	○	○
To influence my personal behavior at future cardiac arrests?	○	○	○	○	○
To teach me something new?	○	○	○	○	○

2. What was the most important point that you learned/took away from the debriefing?

3. What could we do to make future post-arrest debriefings better?

4. How likely is it that you would recommend the post-arrest debriefing to a friend or colleague?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10

POST-ARREST DEBRIEFING ATTENDANCE

5. For this and future debriefings, what do you see as a barrier to staff attendance? (select all that apply)

- [ ] Lack of interest
- [ ] Time/location of debriefing not convenient
- [ ] Busy at work
- [ ] Not willing to come in on a day off
- [ ] Other (please specify)

BASIC QUESTIONS

6. When did you last:

	Never	Less than 3 months ago	Between 3-6 months ago	Between 6 months-1 year ago	1-2 years ago	Greater than 2 years ago
Complete ACLS class?	○	○	○	○	○	○
Complete BLS class?	○	○	○	○	○	○
Participate in a mock code?	○	○	○	○	○	○
Participate in an actual cardiac arrest?	○	○	○	○	○	○
Go to "The first 5 minutes" class?	○	○	○	○	○	○

7. Which of the following best describes your current occupation?

- ○ Registered Nurse- staff nurse
- ○ Patient Care Tech
- ○ Respiratory Therapy
- ○ Physician
- ○ Medical Student
- ○ Nursing Student
- ○ Clinical Nurse Specialist
- ○ Nurse Practitioner
- ○ Nurse Manager

Other (please specify)

8. What is your gender?

- Female
- Male
- Prefer not to answer

9. What is your age?

- 20 or younger
- 21-29
- 30-39
- 40-49
- 50-59
- 60 or older

10. Please describe your race/ethnicity.

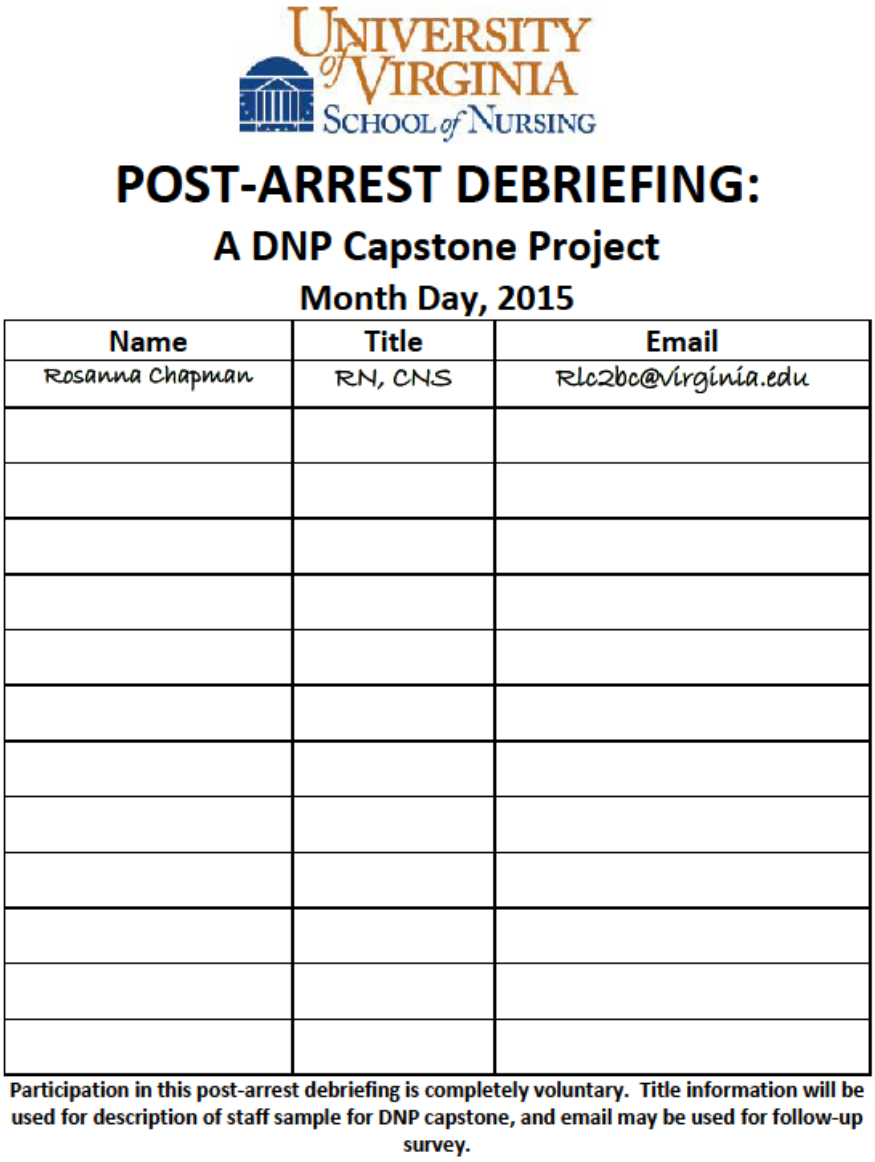
- White
- Black or African-American
- American Indian or Alaskan Native
- Asian
- Native Hawaiian or other Pacific Islander
- From multiple races

Some other race (please specify)

THANK YOU

Thank you for completing this survey. Your responses will help to improve this project.

Figure 2. Post-arrest debriefing survey



UNIVERSITY of VIRGINIA
SCHOOL of NURSING

POST-ARREST DEBRIEFING:

A DNP Capstone Project

Month Day, 2015

Name	Title	Email
Rosanna Chapman	RN, CNS	Rlc2bc@virginia.edu

Participation in this post-arrest debriefing is completely voluntary. Title information will be used for description of staff sample for DNP capstone, and email may be used for follow-up survey.

Figure 3. Post-arrest debriefing sign-in form.

Cardiac Unit

Post-Arrest Debriefing

Date

Rosanna Chapman, MSN, RN, ACCNS-AG, CEN

DNP Student

This handout you may keep.

Objectives

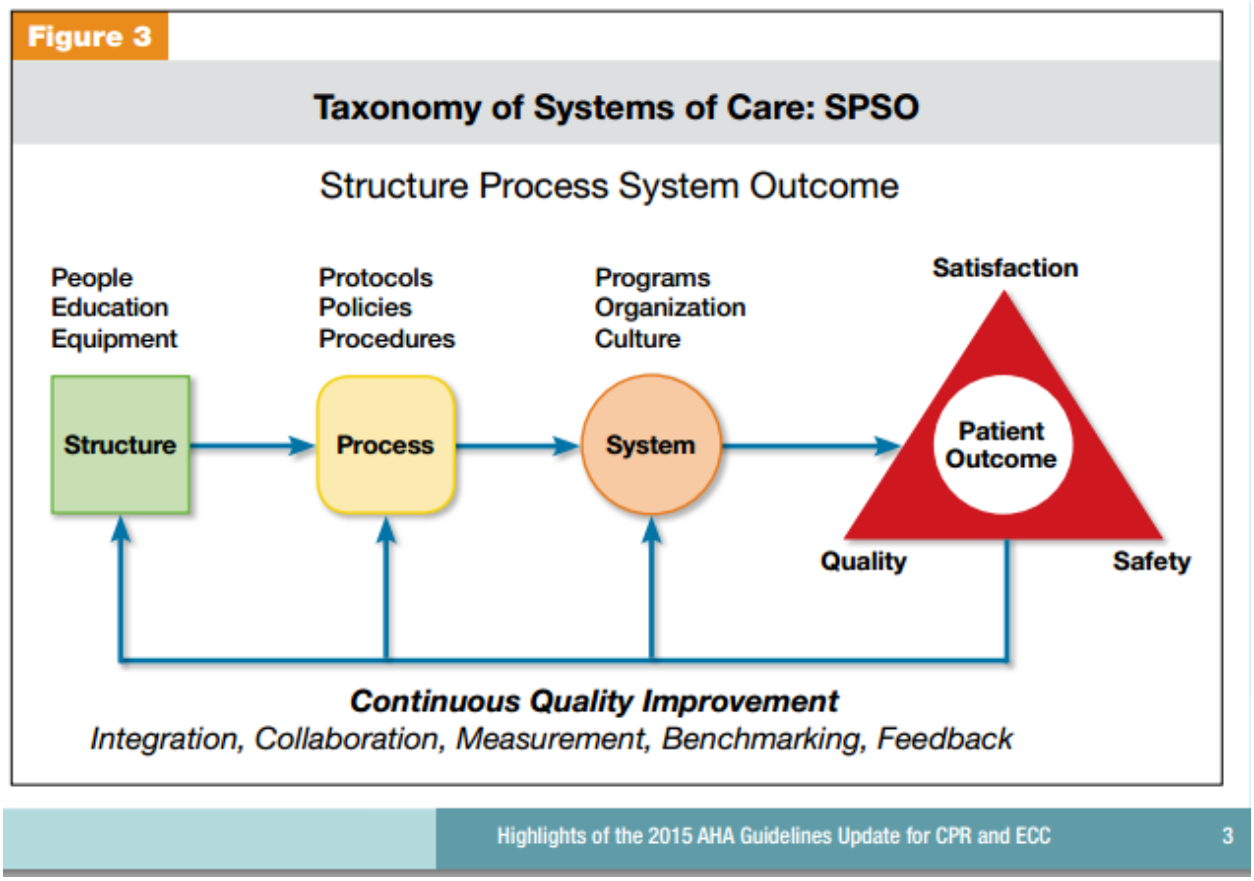
- Describe AHA Get With The Guidelines-Resuscitation as continuous quality improvement
- Review information obtained in data abstraction at the medical center
- Review the recent cardiac arrests
- Discuss any thoughts to improve the system and outcomes for cardiac arrests at UVA
- Complete a survey for DNP capstone project to assess acceptability and improve post-arrest debriefing process

Background and Problem

- Survival from cardiac arrest is directly impacted by the quality of CPR delivered
- Poor adherence to guidelines worsens outcomes in the return of spontaneous circulation, survival to discharge, and good neurological outcomes

- Cardiac arrest mortality rates vary by hospital, time of day, and day of the week

American Heart Association
life is why™
GUIDELINES 2015 CPR & ECC



All figures, excepts, and tables retrieved from https://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf

Adult Basic Life Support and CPR Quality: HCP BLS

Summary of Key Issues and Major Changes

- Compression **rate** is modified to a range of 100 to 120/min.
- Compression **depth** for adults is modified to at least 2 inches (5 cm) but should not exceed 2.4 inches (6 cm).
- To allow full chest wall **recoil** after each compression, rescuers must avoid leaning on the chest between compressions.
- Criteria for **minimizing interruptions** is clarified with a goal of chest compression fraction as high as possible, with a target of at least 60%.

Table 1 BLS Dos and Don'ts of Adult High-Quality CPR

Rescuers Should	Rescuers Should *Not*
Perform chest compressions at a rate of 100-120/min	Compress at a rate slower than 100/min or faster than 120/min
Compress to a depth of at least 2 inches (5 cm)	Compress to a depth of less than 2 inches (5 cm) or greater than 2.4 inches (6 cm)
Allow full recoil after each compression	Lean on the chest between compressions
Minimize pauses in compressions	Interrupt compressions for greater than 10 seconds
Ventilate adequately (2 breaths after 30 compressions, each breath delivered over 1 second, each causing chest rise)	Provide excessive ventilation (ie, too many breaths or breaths with excessive force)

All figures, excepts, and tables retrieved from https://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf

Table 2 **Summary of High-Quality CPR Components for BLS Providers**

Component	Adults and Adolescents	Children (Age 1 Year to Puberty)	Infants (Age Less Than 1 Year, Excluding Newborns)
Scene safety	Make sure the environment is safe for rescuers and victim		
Recognition of cardiac arrest	Check for responsiveness No breathing or only gasping (ie, no normal breathing) No definite pulse felt within 10 seconds (Breathing and pulse check can be performed simultaneously in less than 10 seconds)		
Activation of emergency response system	If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available	***Witnessed collapse*** Follow steps for adults and adolescents on the left ***Unwitnessed collapse*** Give 2 minutes of CPR Leave the victim to activate the emergency response system and get the AED Return to the child or infant and resume CPR; use the AED as soon as it is available	
Compression-ventilation ratio *without advanced airway*	***1 or 2 rescuers*** 30:2	***1 rescuer*** 30:2 ***2 or more rescuers*** 15:2	
Compression-ventilation ratio *with advanced airway*	Continuous compressions at a rate of 100-120/min Give 1 breath every 6 seconds (10 breaths/min)		
Compression rate	100-120/min		
Compression depth	At least 2 inches (5 cm)*	At least one third AP diameter of chest About 2 inches (5 cm)	At least one third AP diameter of chest About 1½ inches (4 cm)
Hand placement	2 hands on the lower half of the breastbone (sternum)	2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum)	***1 rescuer*** 2 fingers in the center of the chest, just below the nipple line ***2 or more rescuers*** 2 thumb–encircling hands in the center of the chest, just below the nipple line
Chest recoil	Allow full recoil of chest after each compression; do not lean on the chest after each compression		
Minimizing interruptions	Limit interruptions in chest compressions to less than 10 seconds		

*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.

All figures, excepts, and tables retrieved from https://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf

Adult Advanced Cardiovascular Life Support

Summary of Key Issues and Major Changes

Key issues and major changes in the 2015 Guidelines Update recommendations for advanced cardiac life support include the following:

- The combined use of vasopressin and epinephrine offers no advantage to using standard-dose epinephrine in cardiac arrest. Also, vasopressin does not offer an advantage over the use of epinephrine alone. Therefore, to simplify the algorithm, vasopressin has been removed from the Adult Cardiac Arrest Algorithm–2015 Update.
- In cardiac arrest patients with nonshockable rhythm and who are otherwise receiving epinephrine, the early provision of epinephrine is suggested.
- Studies about the use of lidocaine after ROSC are conflicting, and routine lidocaine use is not recommended. However, the initiation or continuation of lidocaine may be considered immediately after ROSC from VF/pulseless ventricular tachycardia (pVT) cardiac arrest.
- One observational study suggests that β-blocker use after cardiac arrest may be associated with better outcomes than when β-blockers are not used. Although this observational study is not strong-enough evidence to recommend routine use, the initiation or continuation of an oral or intravenous (IV) β-blocker may be considered early after hospitalization from cardiac arrest due to VF/pVT.

Post–Cardiac Arrest Care

Summary of Key Issues and Major Changes

Key issues and major changes in the 2015 Guidelines Update recommendations for post–cardiac arrest care include the following:

- Emergency coronary angiography is recommended for all patients with ST elevation and for hemodynamically or electrically unstable patients without ST elevation for whom a cardiovascular lesion is suspected.
- TTM recommendations have been updated with new evidence suggesting that a range of temperatures may be acceptable to target in the post–cardiac arrest period.
- After TTM is complete, fever may develop. While there are conflicting observational data about the harm of fever after TTM, the prevention of fever is considered benign and therefore is reasonable to pursue.
- Identification and correction of hypotension is recommended in the immediate post–cardiac arrest period.
- Prognostication is now recommended no sooner than 72 hours after the completion of TTM; for those who do not have TTM, prognostication is not recommended any sooner than 72 hours after ROSC.
- All patients who progress to brain death or circulatory death after initial cardiac arrest should be considered potential organ donors.

All AHA excerpts from Hazinski, M., Shuster, M., Donnino, M., Travers, A., Samson, R., Schexnayder, S., …AHA Guidelines Highlights Project Team (2015). Highlights of the 2015 American Heart Association guidelines update for CPR and ECC. Retrieved from http://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-English.pdf

Figure 4. Sample staff handout at post-arrest debriefing.

Appendix C

Table 1. *Annual Recognition Measure Results from GWTG-R*

Recognition Measure	**Hospital System Achievement Percentage**			
	Project Hospital	***All Hospitals***	***VA Hospitals***	***Hospitals with >500 beds***
Pulseless cardiac events monitored or witnessed	98.2%	96.3%	96.6%	96.7%
Time to first chest compressions <= 1 min	96.2%	96.8%	97.8%	97.6%
Device confirmation of ET tube placement	87.5%	92.1%	94.6%	93.7%
Time to Defibrillation <=2 min for VF/pulseless VT as first documented rhythm	83.3%	74.2%	78.9%	78.5%

Note. Benchmark goal is 85% or greater. GWTG-R = Get With The Guidelines – Resuscitation; VA = Virginia; <= stands for less than or equal to; > stands for greater than.

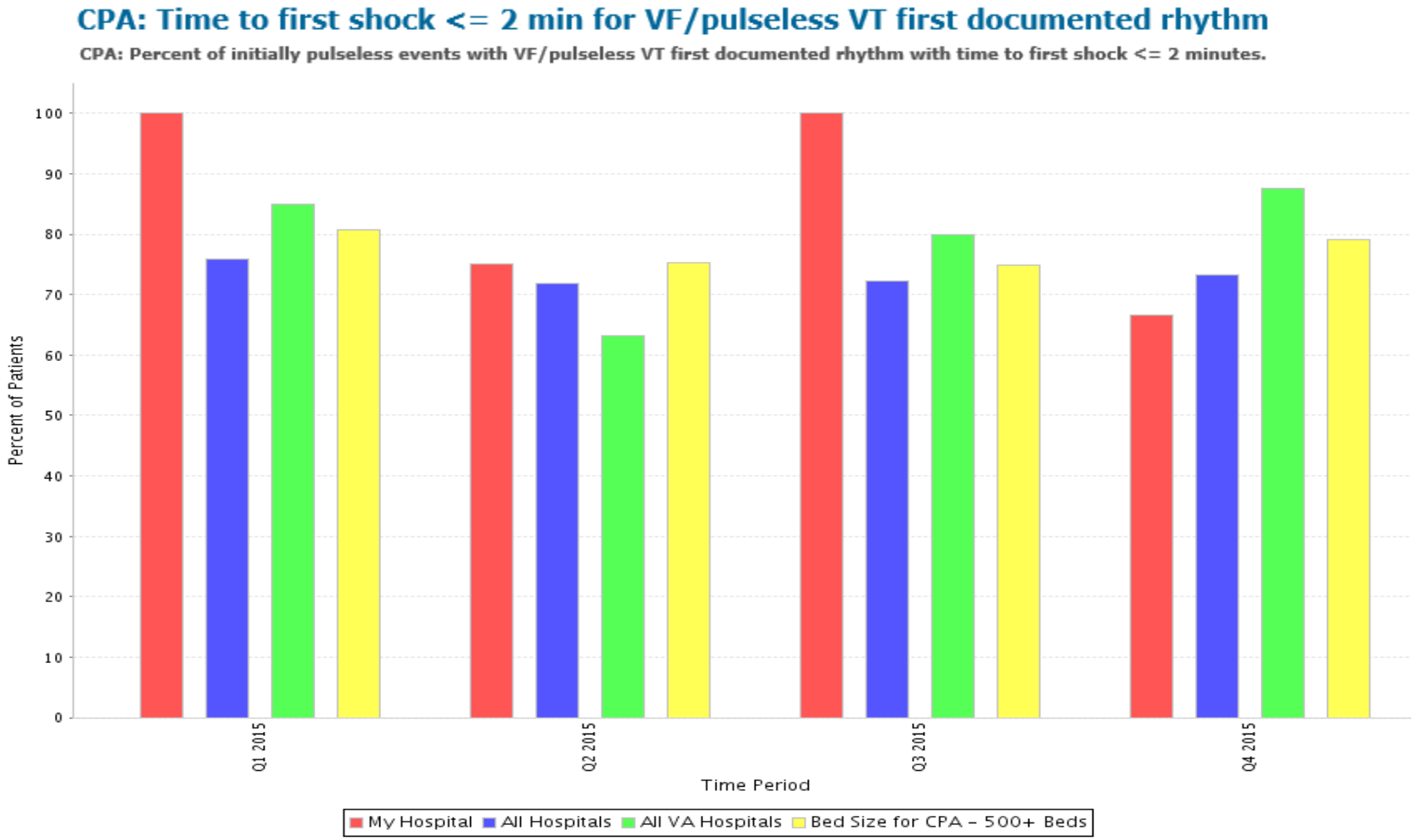


Figure 1. GWTG-R recognition measure for achievement of time to first defibrillation for VF/pulseless VT. GWTG-R = Get With The Guidelines – Resuscitation; VF = ventricular fibrillation; VT = ventricular tachycardia. Figure created in the GWTG-R registry using Quintiles software at http://qi.outcome.com

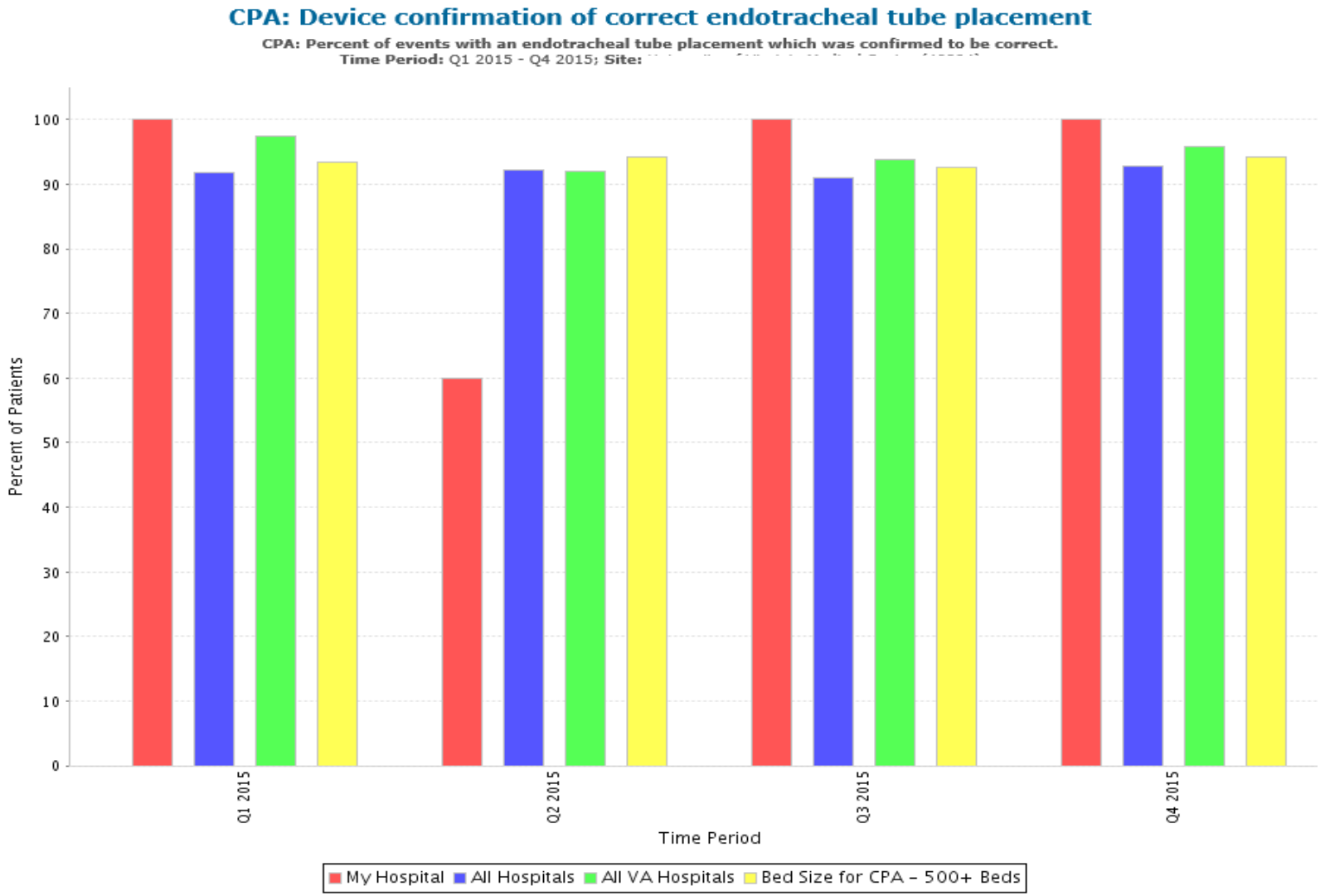


Figure 2. GWTG-R recognition measure for achievement of device confirmation of correct ETT placement. GWTG-R = Get With The Guidelines – Resuscitation; ETT = endotracheal tube. Figure created in the GWTG-R registry using Quintiles software at http://qi.outcome.com

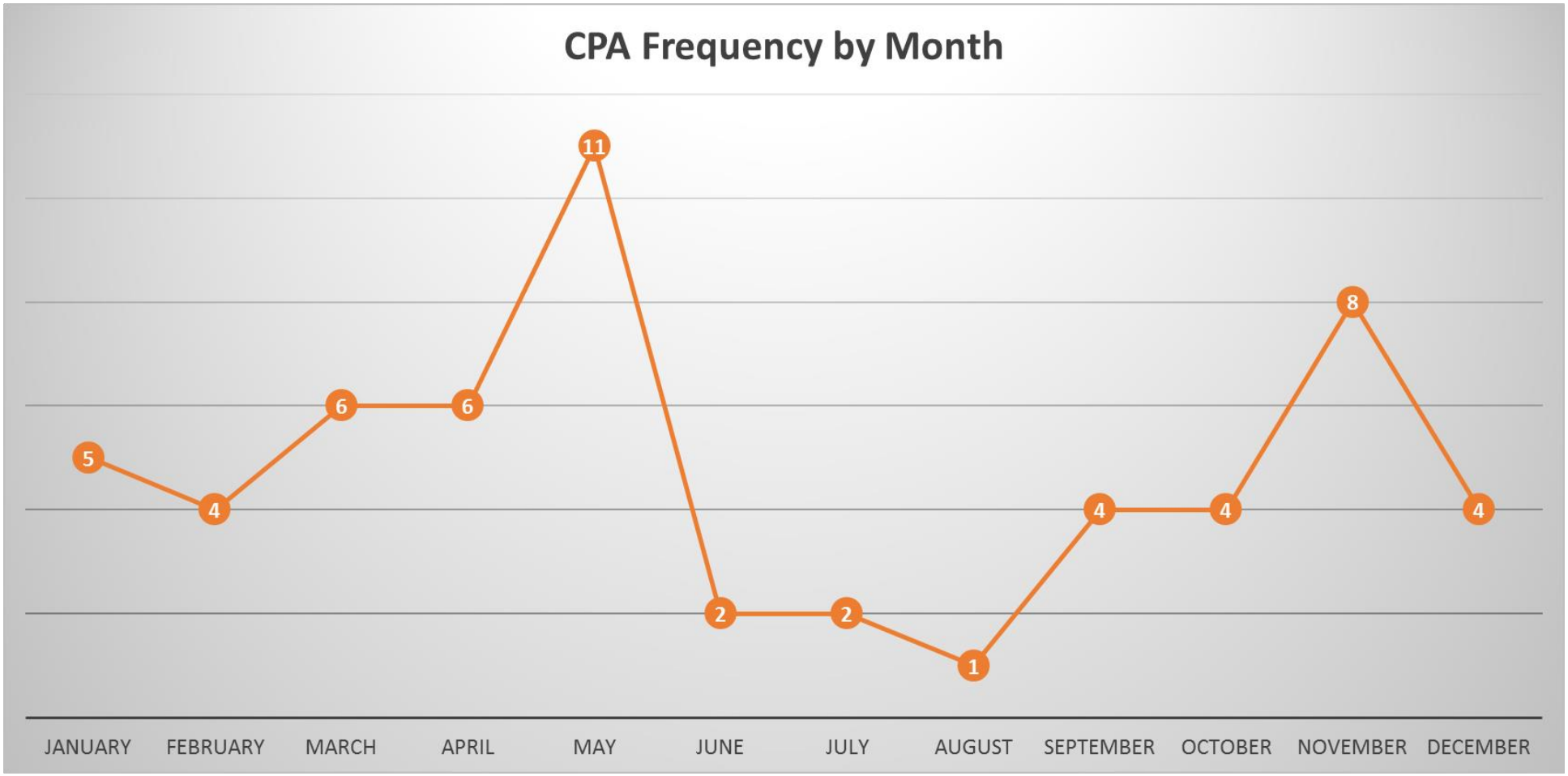


Figure 3. Cardiac units' collective annual frequency of cardiac arrests by month.

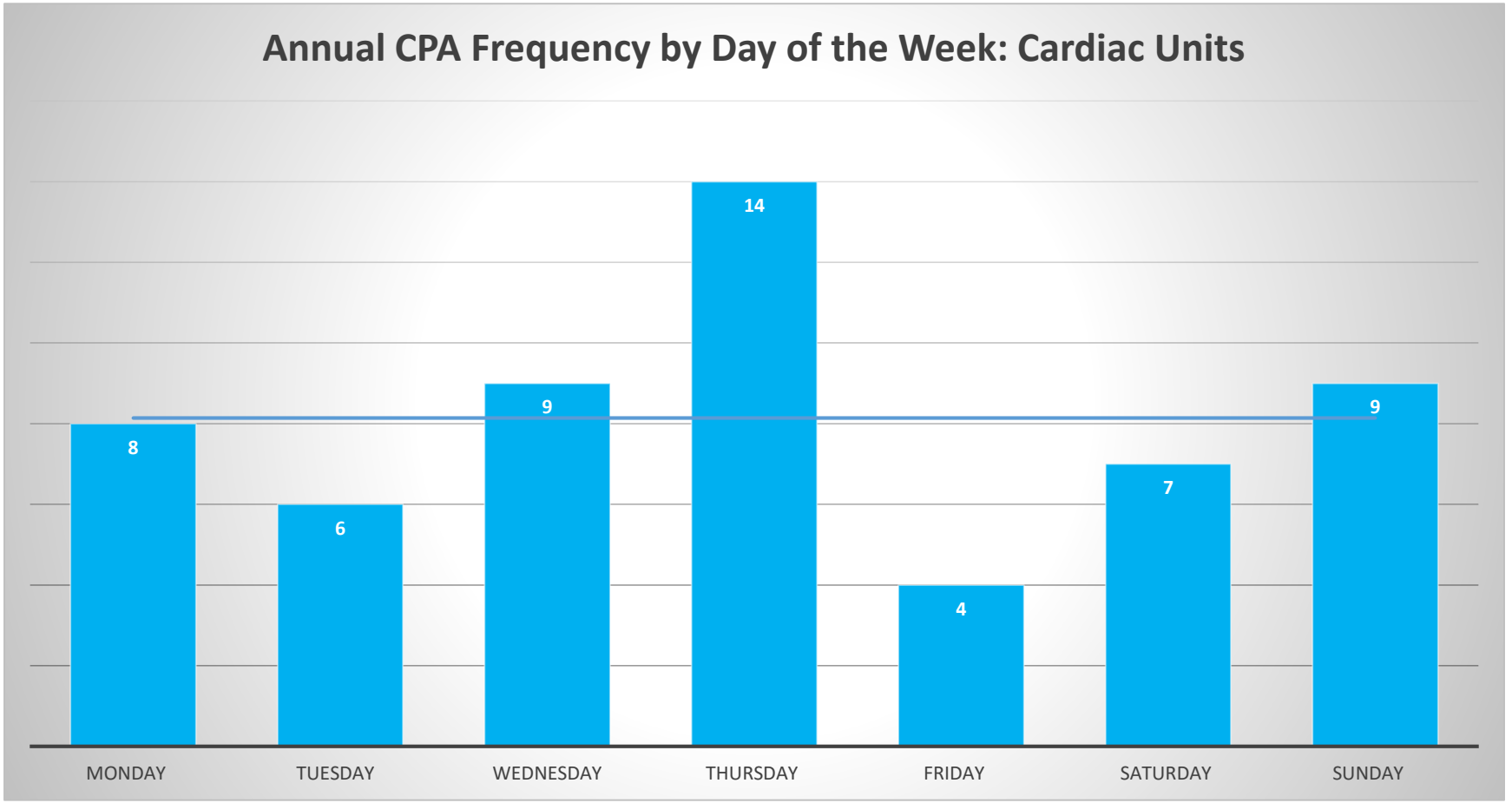


Figure 4. Cardiac units' collective annual frequency of cardiac arrests by day of the week with trend line. CPA = cardiopulmonary arrest.

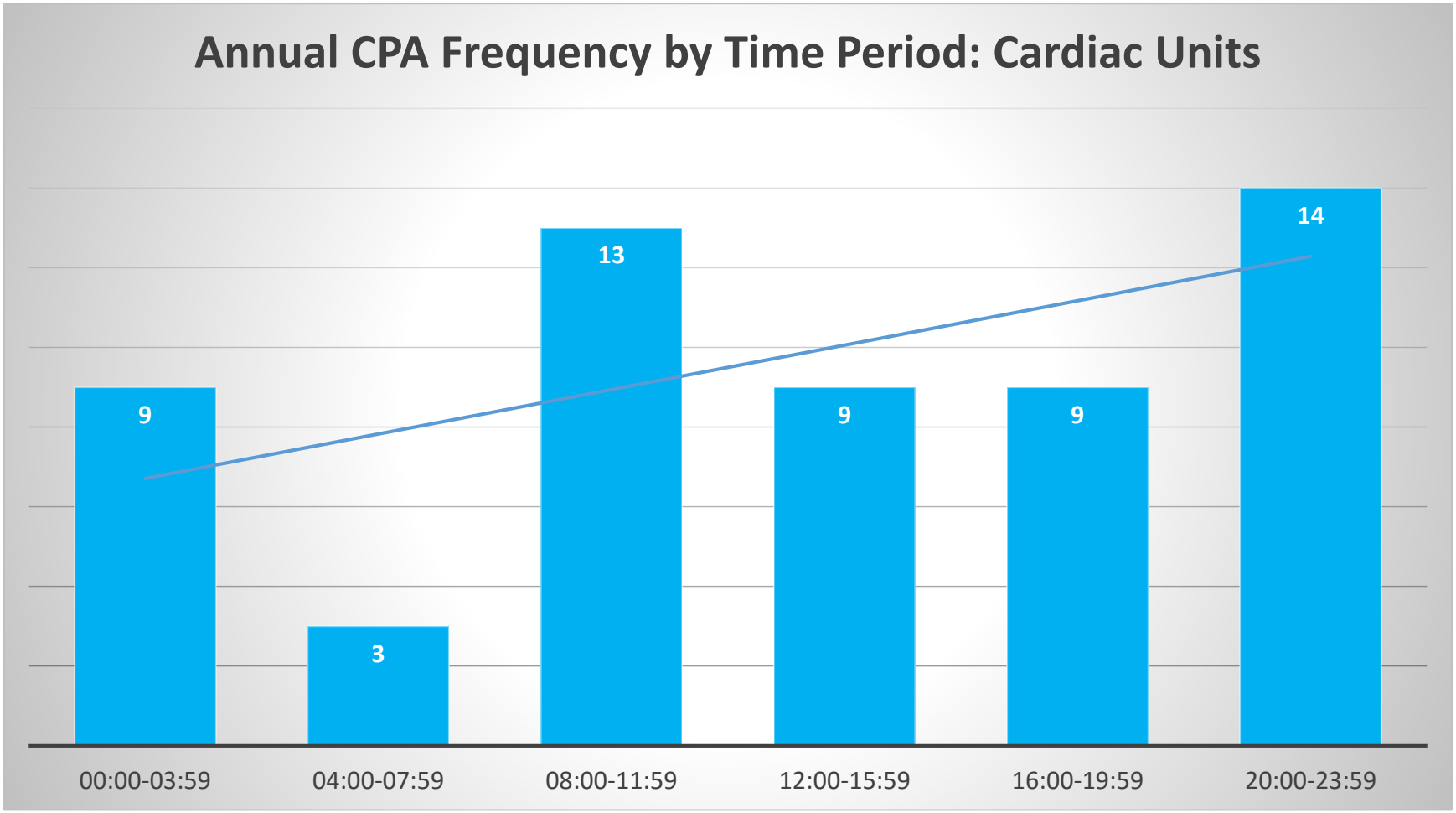


Figure 5. Cardiac units' collective annual frequency of cardiac arrests by time of day with trend line. CPA = cardiopulmonary arrest

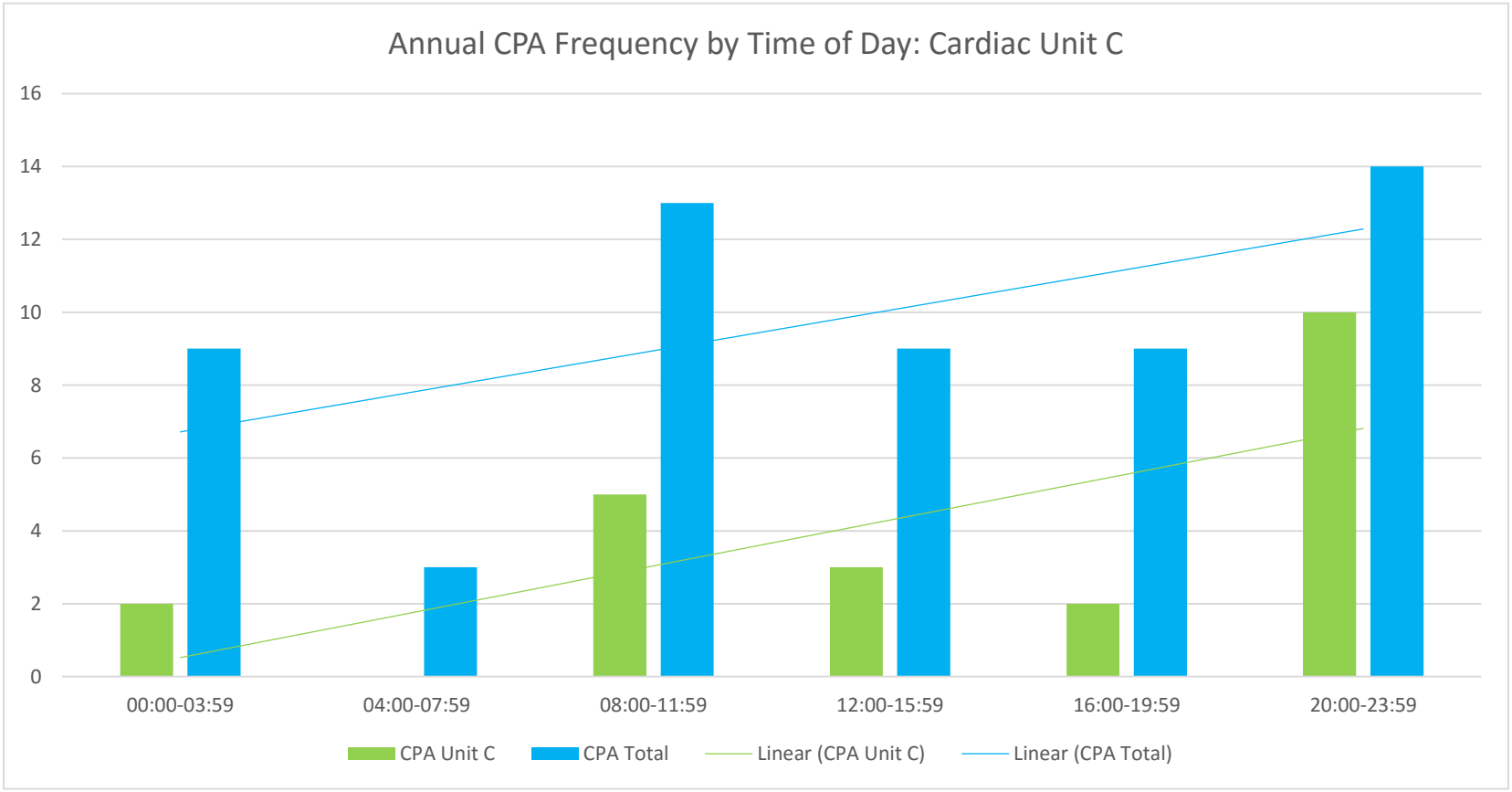


Figure 6. Cardiac Unit C frequency of cardiac arrest by time of day compared to all cardiac unit arrests with trend lines. CPA = cardiopulmonary arrest. CPA Total = cardiac arrests for all of the cardiac units combined.

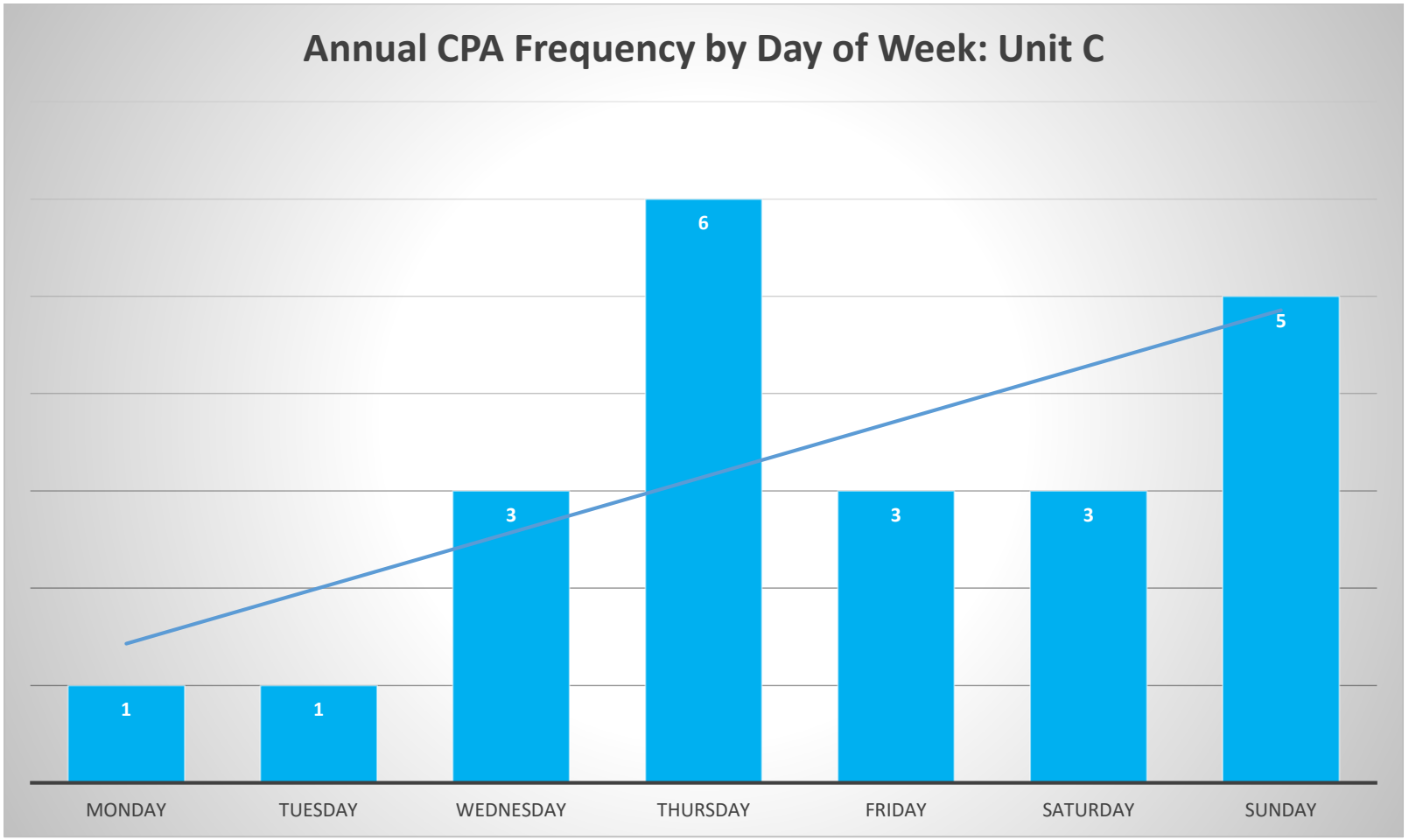


Figure 7. Cardiac Unit C frequency of cardiac arrest by day of the week with trend line. CPA = cardiopulmonary arrest.

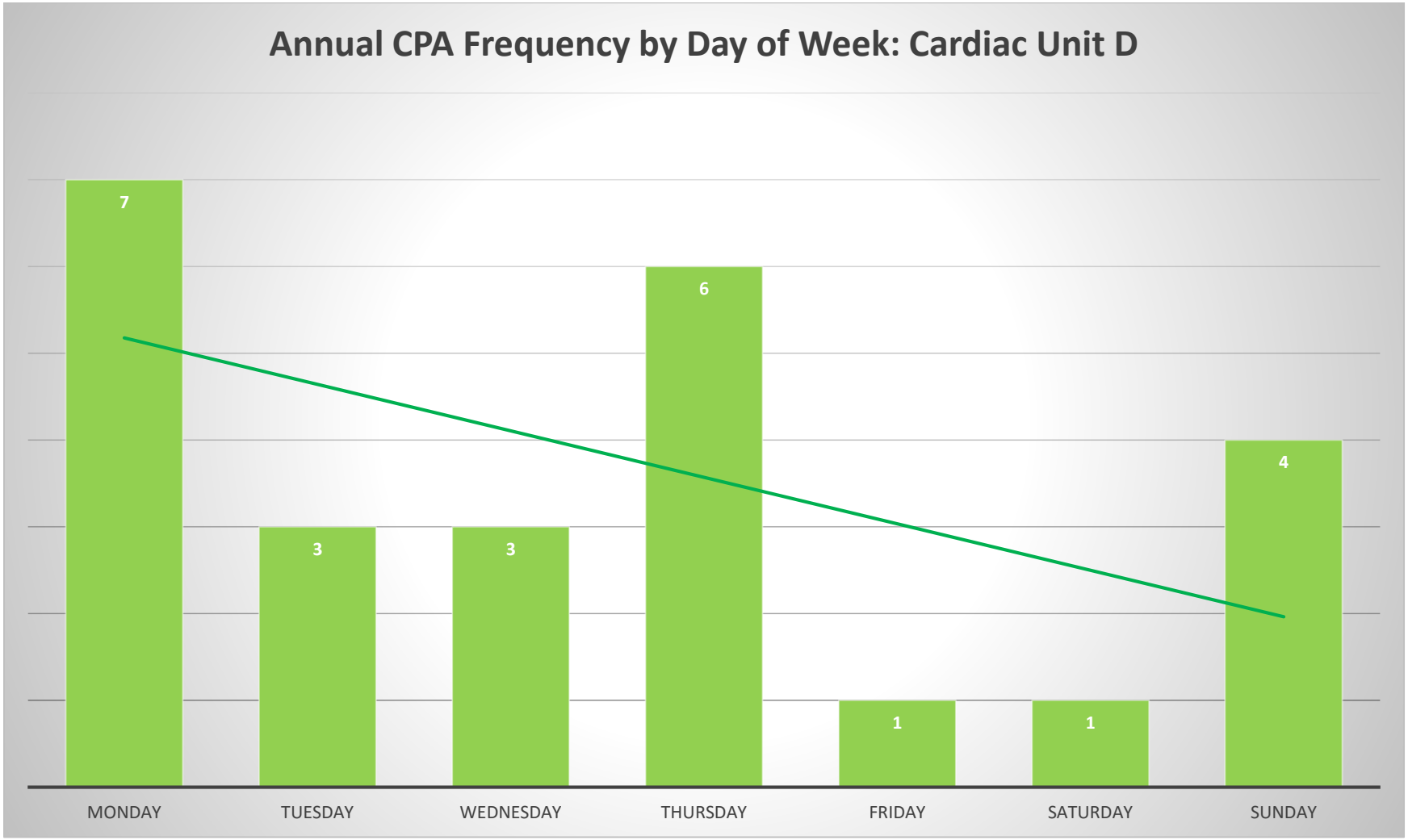


Figure 8. Cardiac Unit D frequency of cardiac arrest by day of the week with trend line. CPA = cardiopulmonary arrest.

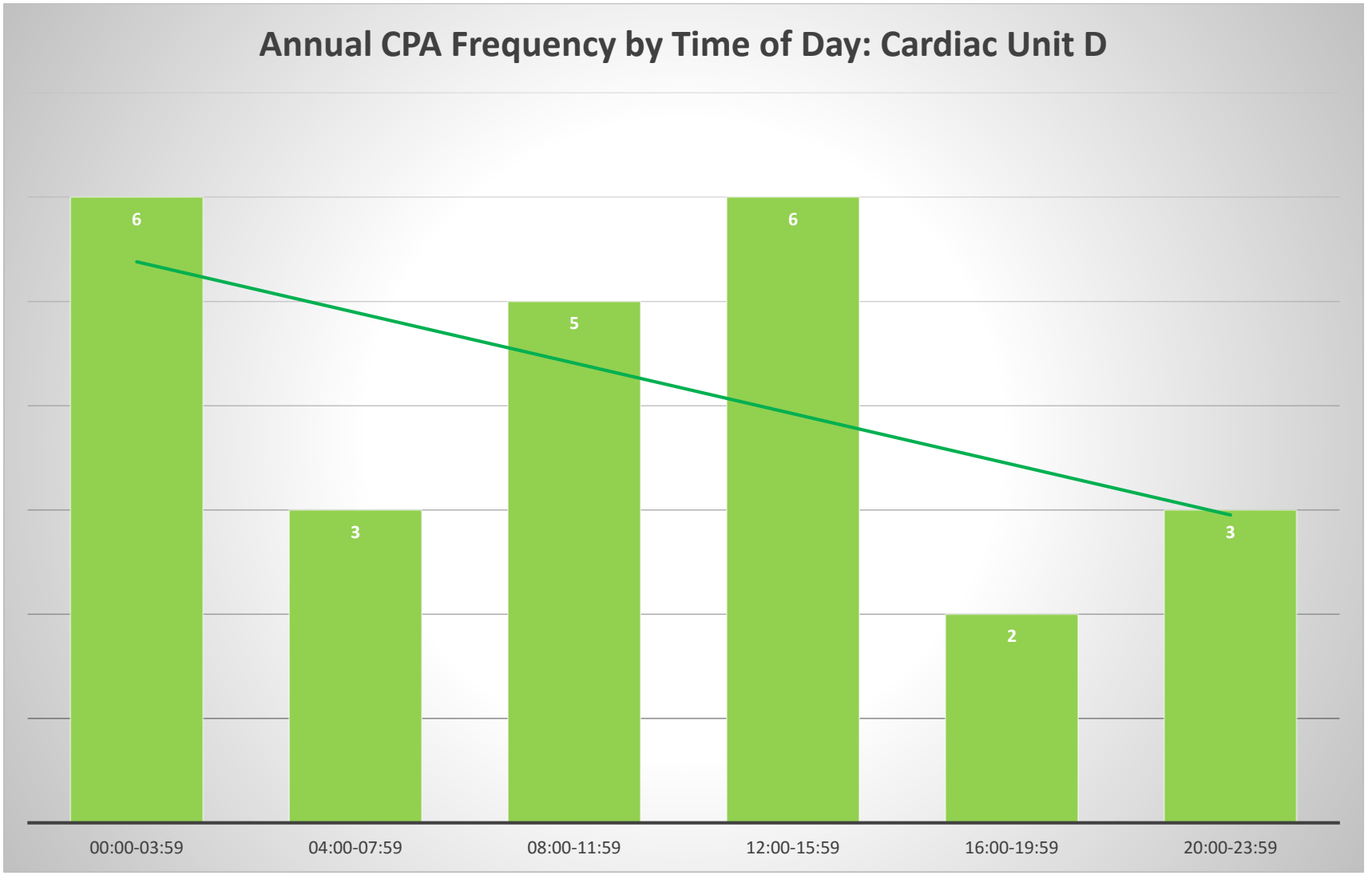
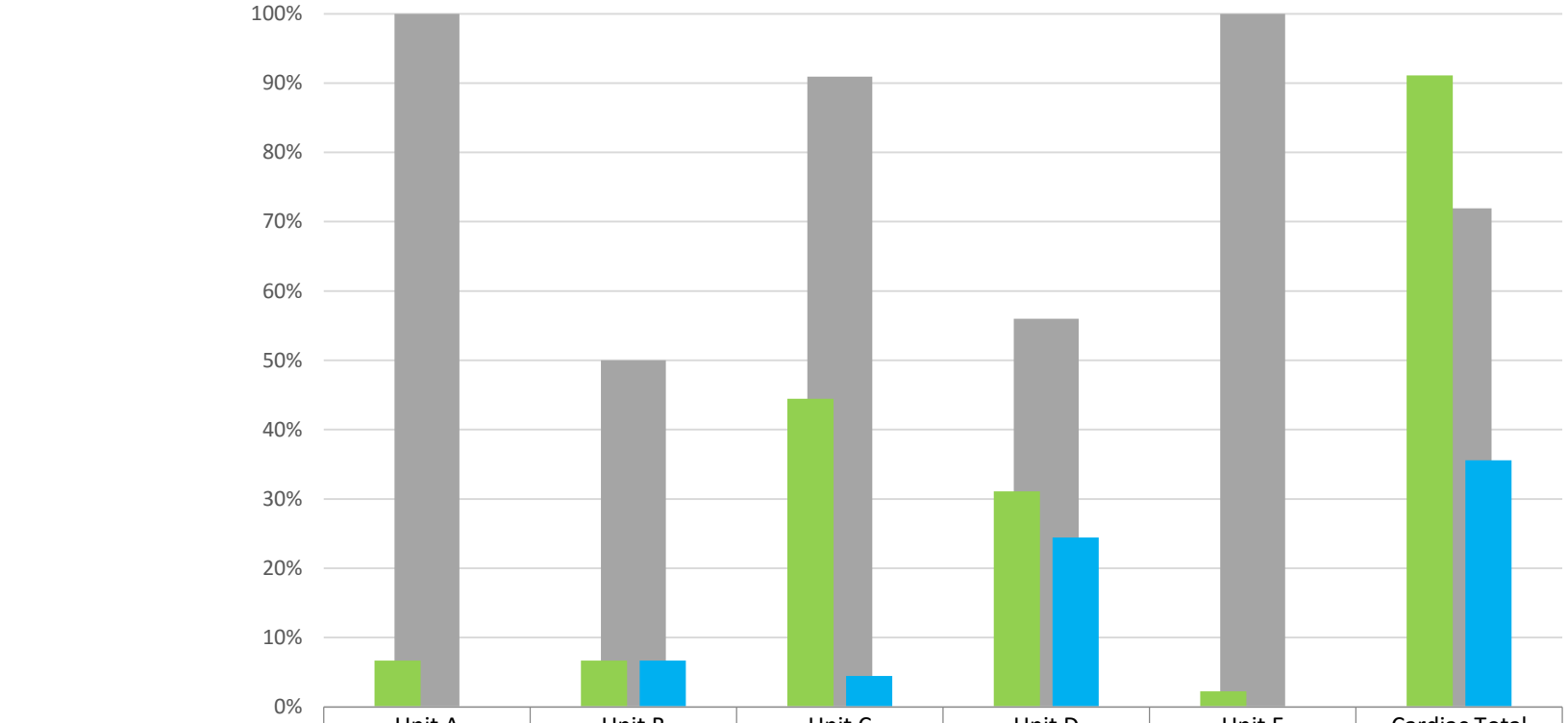


Figure 9. Cardiac Unit D frequency of cardiac arrest by time of day with trend line. CPA = cardiopulmonary arrest.



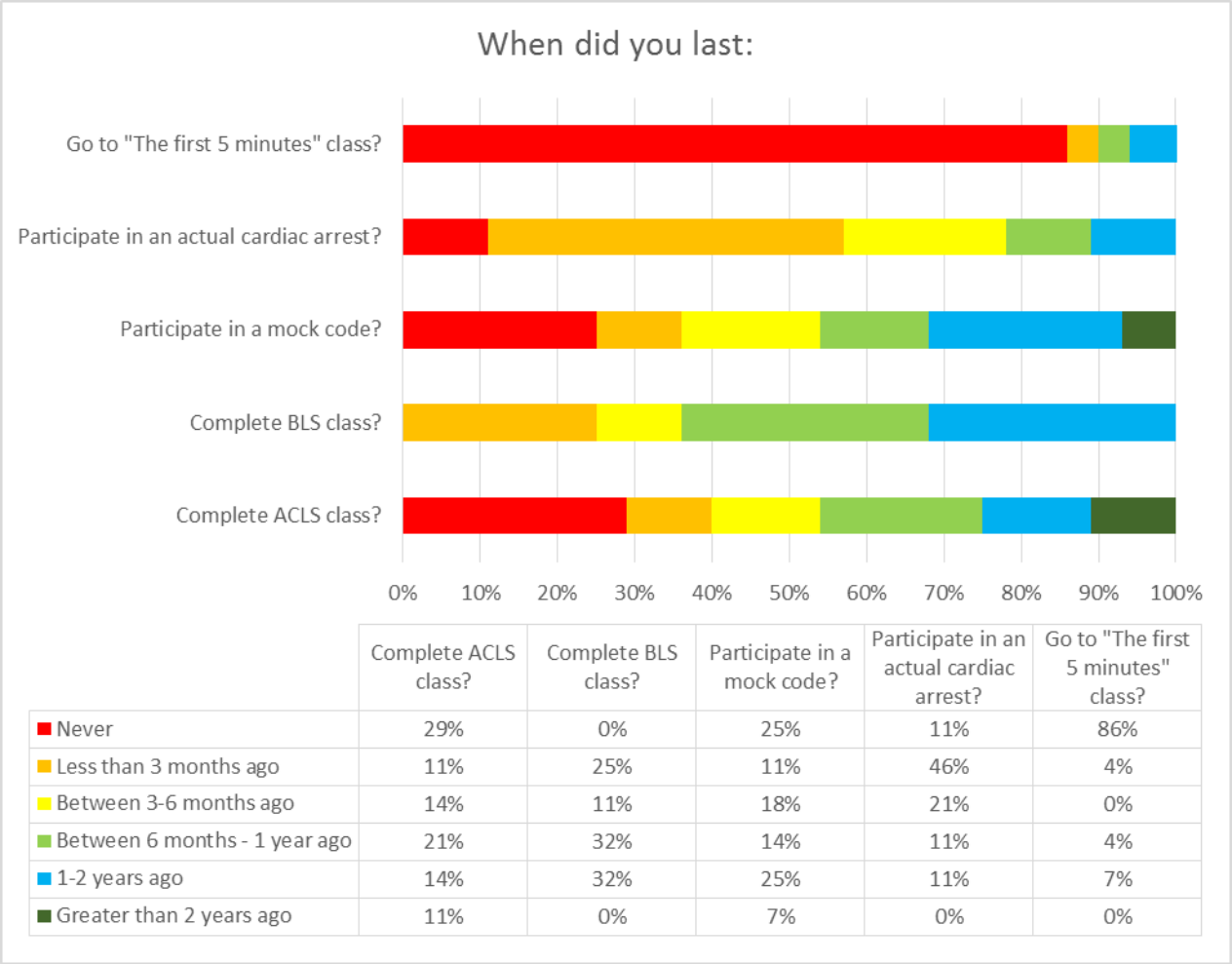
	Unit A	Unit B	Unit C	Unit D	Unit E	Cardiac Total
CPA Event Survival % ROSC	100%	50%	91%	56%	100%	72%
CPA Event Survival Yes	3	3	20	14	1	41
CPA Event Survival No	0	3	2	11	0	16

Figure 10. CPA event survival by unit and comprehensive total with percentage of ROSC. CPA = cardiopulmonary arrest; ROSC = return of spontaneous circulation.

Appendix D

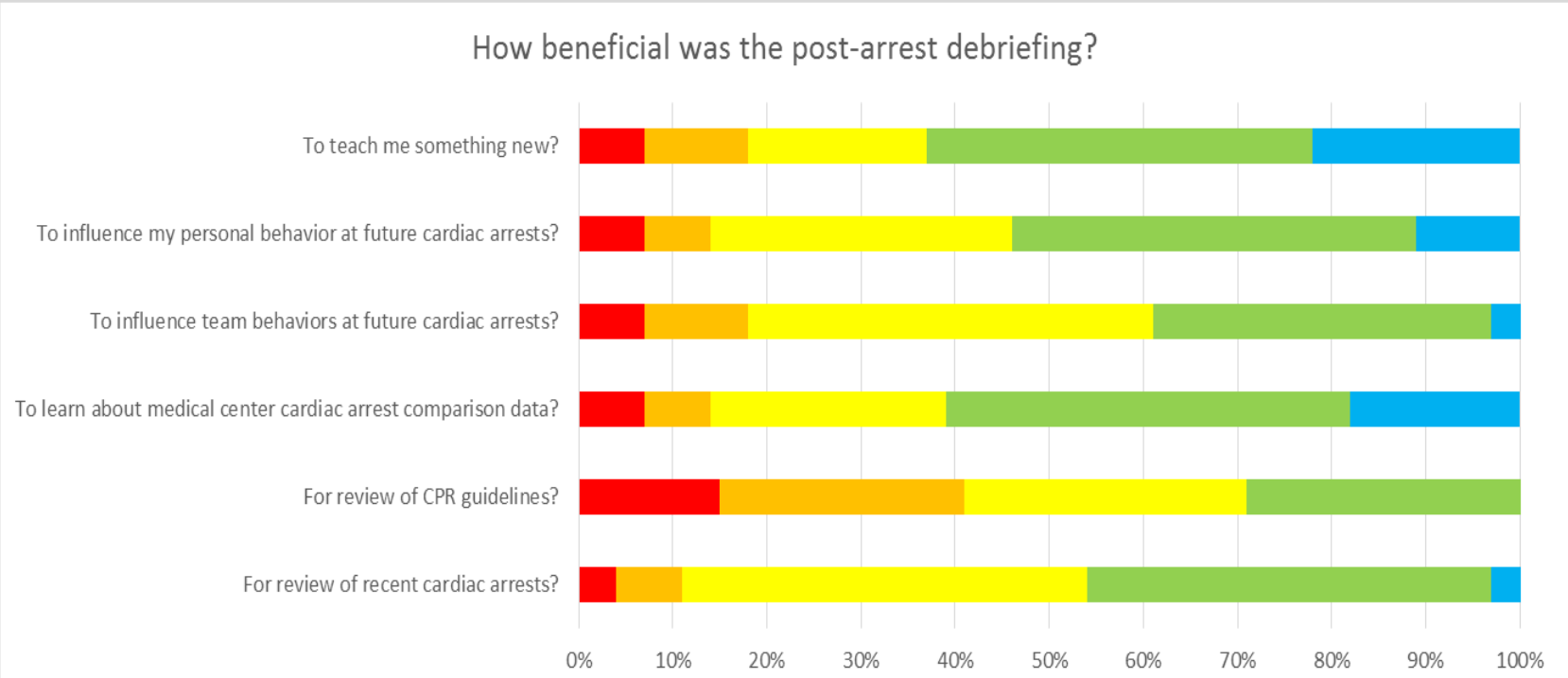
Table 1. *Characteristics of Staff Sample for Post-Arrest Debriefing Survey*

Characteristics (total responding)		**n**	**%**
Gender (n = 27)			
	Male	4	15
	Female	23	85
Age (n = 27)			
	20 or younger	-	-
	21-29	12	44
	30-39	4	15
	40-49	4	15
	50-59	5	19
	60 or older	2	7
Race/ethnicity (n = 27)			
	White	24	89
	Black or African American	1	4
	American Indian	-	-
	Asian	-	-
	Hispanic/Latino	1	4
	Multiple races	1	4
Current occupation (n = 27)			
	Registered Nurse – staff nurse	21	78
	Patient care tech	3	11
	Respiratory therapy	-	-
	Physician	-	-
	Medical student	-	-
	Nursing student	-	-
	Clinical Nurse Specialist	1	4
	Nurse Practitioner	-	-
	Nurse Manager	2	7



	Complete ACLS class?	Complete BLS class?	Participate in a mock code?	Participate in an actual cardiac arrest?	Go to "The first 5 minutes" class?
Never	29%	0%	25%	11%	86%
Less than 3 months ago	11%	25%	11%	46%	4%
Between 3-6 months ago	14%	11%	18%	21%	0%
Between 6 months - 1 year ago	21%	32%	14%	11%	4%
1-2 years ago	14%	32%	25%	11%	7%
Greater than 2 years ago	11%	0%	7%	0%	0%

Figure 1. Post-arrest debriefing survey: Assessment of recent staff education and participation in cardiac arrests. ACLS = advanced cardiovascular life support; BLS = basic life support.



	For review of recent cardiac arrests?	For review of CPR guidelines?	To learn about medical center cardiac arrest comparison data?	To influence team behaviors at future cardiac arrests?	To influence my personal behavior at future cardiac arrests?	To teach me something new?
Not beneficial	4%	15%	7%	7%	7%	7%
Slightly beneficial	7%	26%	7%	11%	7%	11%
Moderately beneficial	43%	30%	25%	43%	32%	19%
Very beneficial	43%	30%	43%	36%	43%	41%
Extremeley beneficial	4%	0%	18%	4%	11%	22%

Figure 2. Post-arrest debriefing survey: Assessment of staff perceived benefit of post-arrest debriefing. CPR = cardiopulmonary resuscitation.

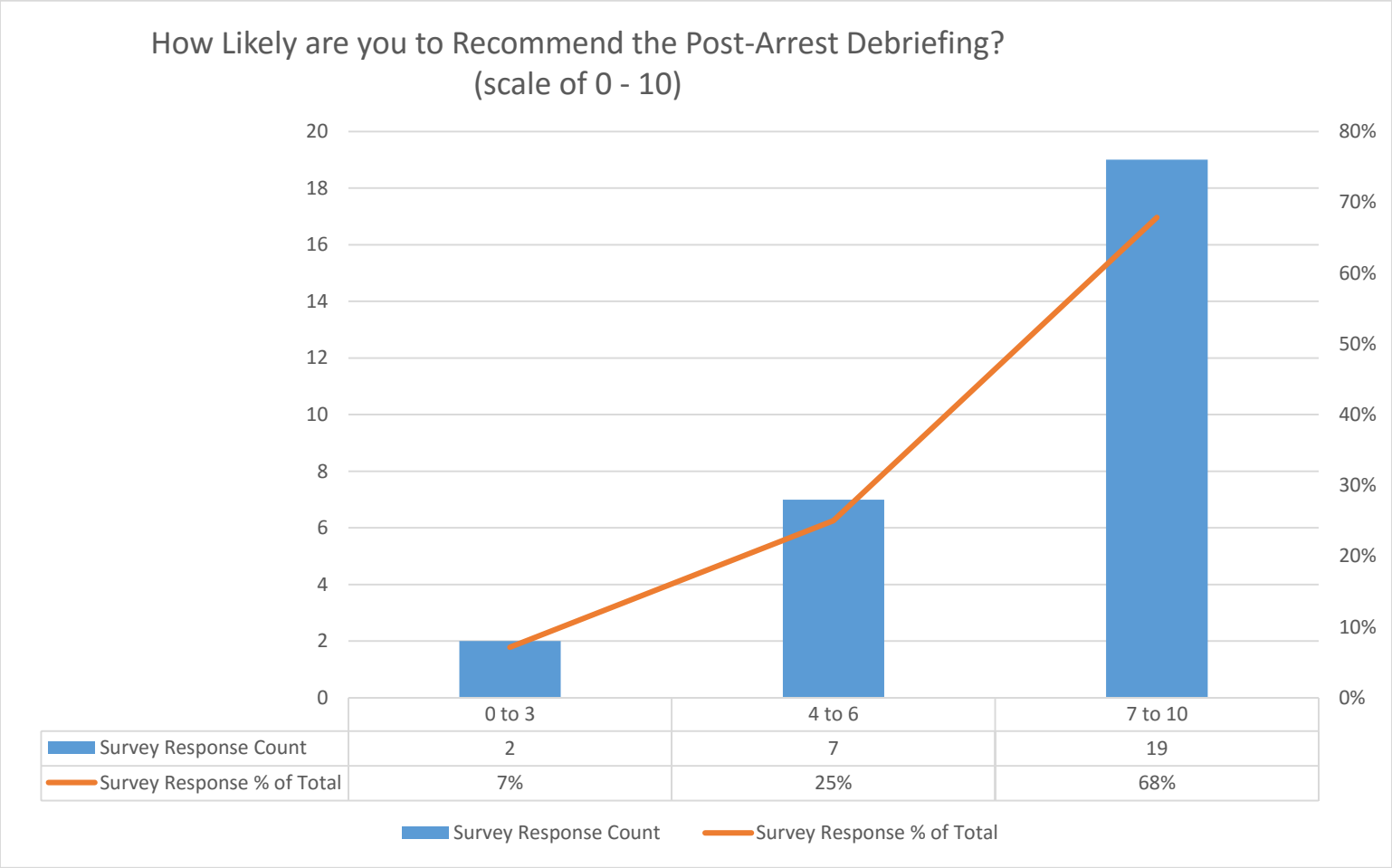


Figure 3. Post-arrest debriefing survey: Recommendation scores.

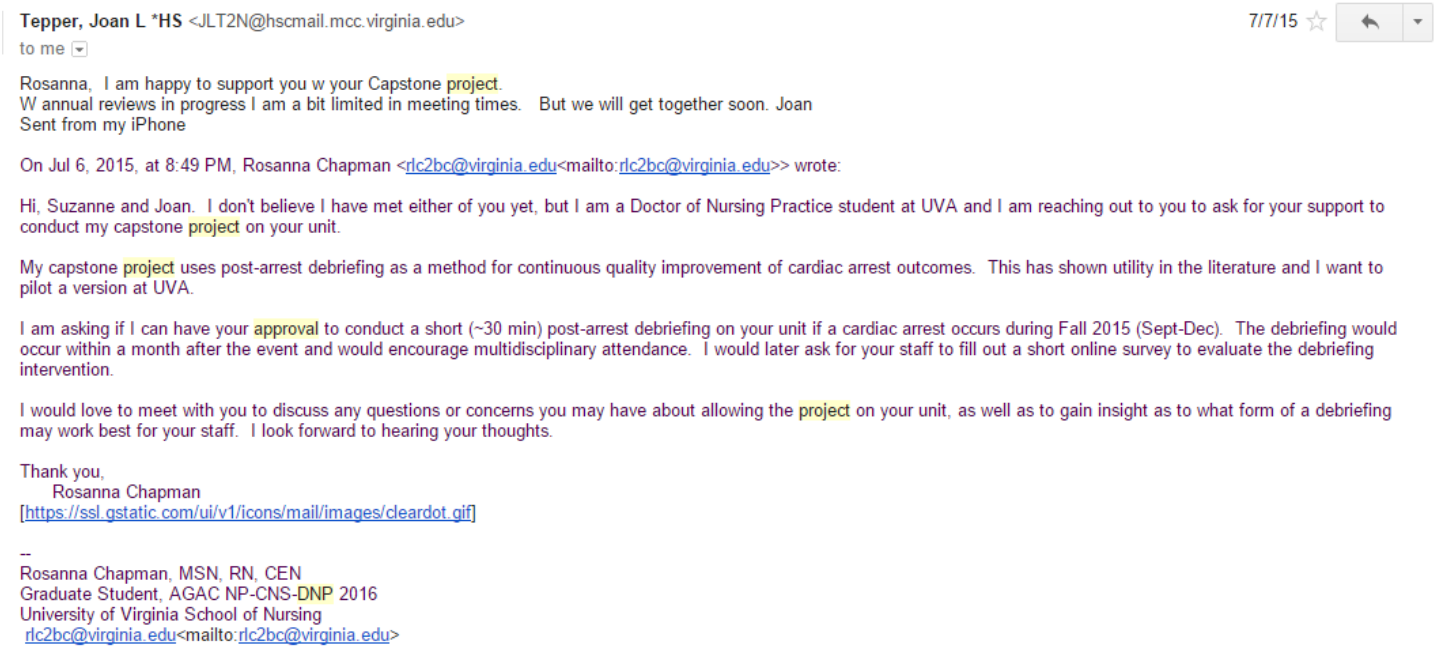
Table 2. *Comparison of Staff Perceived Benefit of the Post-Arrest Debriefing by Unit and Role*.

How beneficial was the post-arrest debriefing:						
		Not beneficial	**Slightly beneficial**	**Moderately beneficial**	**Very beneficial**	**Extremely beneficial**
	Sample	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
For review of recent cardiac arrests?	Total sample	1 (4%)	2 (7%)	12 (43%)	12 (43%)	1 (4%)
	Unit A	-	1 (9%)	7 (64%)	3 (27%)	-
	Unit B	1 (11%)	-	-	7 (78%)	1 (11%)
	Unit C	-	1 (13%)	5 (63%)	2 (25%)	-
	PCT	-	-	-	2 (67%)	1 (33%)
	Leadership	-	1 (33%)	-	2 (67%)	-
For review of CPR guidelines?	Total sample	4 (15%)	7 (26%)	8 (30%)	8 (30%)	-
	Unit A	1 (9%)	3 (27%)	4 (36%)	3 (27%)	-
	Unit B	2 (22%)*	1 (11%)*	1 (11%)*	4 (44%)*	-
	Unit C	1 (13%)	3 (38%)	3 (38%)	1 (13%)	-
	PCT	-	1 (33%)	1 (33%)	1 (33%)	-
	Leadership	-	1 (33%)*	1 (33%) *	-	-
To learn about medical center cardiac arrest comparison data?	Total sample	2 (7%)	2 (7%)	7 (25%)	12 (43%)	5 (18%)
	Unit A	1 (9%)	2 (18%)	2 (18%)	4 (36%)	2 (18%)
	Unit B	-	-	1 (11%)	6 (67%)	2 (22%)
	Unit C	1 (13%)	-	4 (50%)	2 (25%)	1 (13%)
	PCT	-	-	1 (33%)	2 (67%)	-
	Leadership	1 (33%)	-	-	2 (67%)	-
To influence team behaviors at future cardiac arrests?	Total sample	2 (7%)	3 (11%)	12 (43%)	10 (36%)	1 (4%)
	Unit A	1 (9%)	1 (9%)	5 (45%)	4 (36%)	-
	Unit B	-	2 (22%)	3 (33%)	4 (44%)	-

	Unit C	1 (13%)	-	4 (50%)	2 (25%)	1 (13%)
	PCT	-	1 (33%)	1 (33%)	1 (33%)	-
	Leadership	1 (33%)	-	-	2 (67%)	-
To influence my personal behavior at future cardiac arrests?	Total sample	2 (7%)	2 (7%)	9 (32%)	12 (43%)	3 (11%)
	Unit A	1 (9%)	2 (18%)	3 (27%)	5 (45%)	-
	Unit B	-	-	2 (22%)	6 (67%)	1 (11%)
	Unit C	1 (13%)	-	4 (50%)	1 (13%)	2 (25%)
	PCT	-	-	1 (33%)	1 (33%)	1 (33%)
	Leadership	1 (33%)	-	1 (33%)	1 (33%)	-
To teach me something new?	Total sample	2 (7%)	3 (11%)	5 (19%)	11 (41%)	6 (22%)
	Unit A	1 (9%)	3 (27%)	2 (18%)	3 (27%)	2 (18%)
	Unit B	-	-	1 (11%)*	4 (44%)*	3 (33%)*
	Unit C	1 (13%)	-	2 (25%)	4 (50%)	1 (13%)
	PCT	-	-	-	1 (33%)	2 (67%)
	Leadership	1 (33%)	-	1 (33%)	1 (33%)	-

Notes: *= a question left blank by staff member, but % determined by total amount of nine instead of eight.

Appendix E



Tepper, Joan L *HS <JLT2N@hscmail.mcc.virginia.edu> 7/7/15

to me

Rosanna, I am happy to support you w your Capstone project.
W annual reviews in progress I am a bit limited in meeting times. But we will get together soon. Joan
Sent from my iPhone

On Jul 6, 2015, at 8:49 PM, Rosanna Chapman <rlc2bc@virginia.edu<mailto:rlc2bc@virginia.edu>> wrote:

Hi, Suzanne and Joan. I don't believe I have met either of you yet, but I am a Doctor of Nursing Practice student at UVA and I am reaching out to you to ask for your support to conduct my capstone project on your unit.

My capstone project uses post-arrest debriefing as a method for continuous quality improvement of cardiac arrest outcomes. This has shown utility in the literature and I want to pilot a version at UVA.

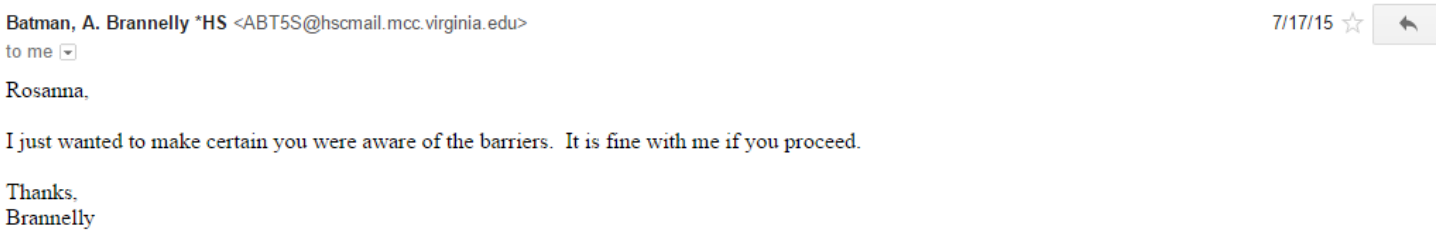
I am asking if I can have your approval to conduct a short (~30 min) post-arrest debriefing on your unit if a cardiac arrest occurs during Fall 2015 (Sept-Dec). The debriefing would occur within a month after the event and would encourage multidisciplinary attendance. I would later ask for your staff to fill out a short online survey to evaluate the debriefing intervention.

I would love to meet with you to discuss any questions or concerns you may have about allowing the project on your unit, as well as to gain insight as to what form of a debriefing may work best for your staff. I look forward to hearing your thoughts.

Thank you,
Rosanna Chapman
[https://ssl.gstatic.com/ui/v1/icons/mail/images/cleardot.gif]

--
Rosanna Chapman, MSN, RN, CEN
Graduate Student, AGAC NP-CNS-DNP 2016
University of Virginia School of Nursing
rlc2bc@virginia.edu<mailto:rlc2bc@virginia.edu>

Figure 1. Unit A manager approval for project.



Batman, A. Brannelly *HS <ABT5S@hscmail.mcc.virginia.edu> 7/17/15

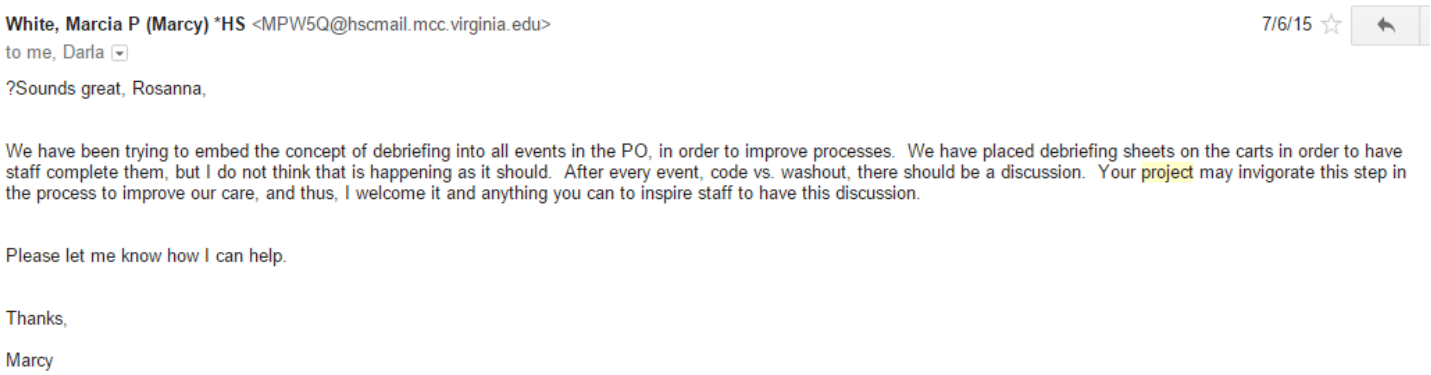
to me

Rosanna,

I just wanted to make certain you were aware of the barriers. It is fine with me if you proceed.

Thanks,
Brannelly

Figure 2. Unit B manager approval for project.



White, Marcia P (Marcy) *HS <MPW5Q@hscmail.mcc.virginia.edu> 7/6/15

to me, Darla

?Sounds great, Rosanna,

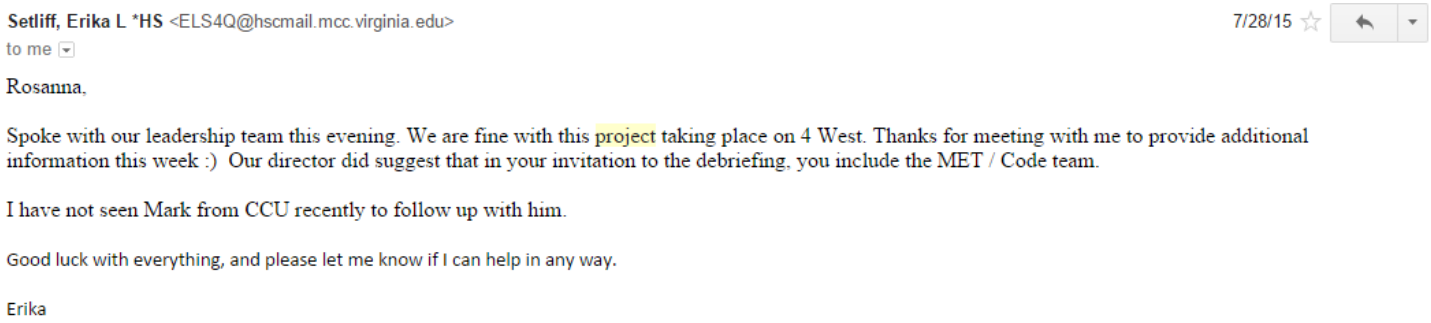
We have been trying to embed the concept of debriefing into all events in the PO, in order to improve processes. We have placed debriefing sheets on the carts in order to have staff complete them, but I do not think that is happening as it should. After every event, code vs. washout, there should be a discussion. Your project may invigorate this step in the process to improve our care, and thus, I welcome it and anything you can to inspire staff to have this discussion.

Please let me know how I can help.

Thanks,

Marcy

Figure 3. Unit C manager approval for project.



Setliff, Erika L *HS <ELS4Q@hscmail.mcc.virginia.edu> 7/28/15

to me

Rosanna,

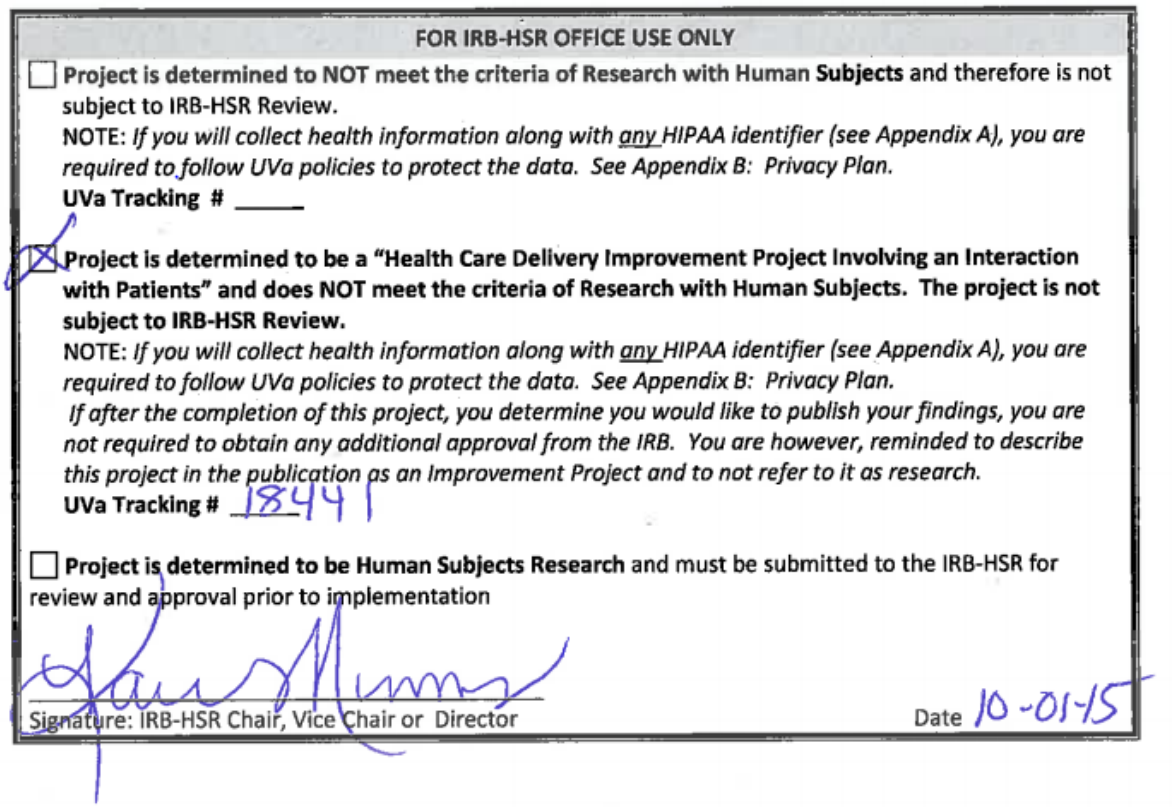
Spoke with our leadership team this evening. We are fine with this project taking place on 4 West. Thanks for meeting with me to provide additional information this week :) Our director did suggest that in your invitation to the debriefing, you include the MET / Code team.

I have not seen Mark from CCU recently to follow up with him.

Good luck with everything, and please let me know if I can help in any way.

Erika

Figure 4. Cardiac Unit E approval for project.



FOR IRB-HSR OFFICE USE ONLY

☐ **Project is determined to NOT meet the criteria of Research with Human Subjects** and therefore is not subject to IRB-HSR Review.
NOTE: *If you will collect health information along with any HIPAA identifier (see Appendix A), you are required to follow UVa policies to protect the data. See Appendix B: Privacy Plan.*
UVa Tracking # _____

☒ **Project is determined to be a "Health Care Delivery Improvement Project Involving an Interaction with Patients" and does NOT meet the criteria of Research with Human Subjects. The project is not subject to IRB-HSR Review.**
NOTE: *If you will collect health information along with any HIPAA identifier (see Appendix A), you are required to follow UVa policies to protect the data. See Appendix B: Privacy Plan.*
If after the completion of this project, you determine you would like to publish your findings, you are not required to obtain any additional approval from the IRB. You are however, reminded to describe this project in the publication as an Improvement Project and to not refer to it as research.
UVa Tracking # 1844

☐ **Project is determined to be Human Subjects Research** and must be submitted to the IRB-HSR for review and approval prior to implementation

Signature: IRB-HSR Chair, Vice Chair or Director

Date 10-01-15

Figure 5. Determination of improvement project by Institutional Review Board.

Appendix F

Journal of Nursing Care Quality Online Submission and Review System

Editorial Purpose

The primary objective of the *Journal of Nursing Care Quality (JNCQ)* is to provide practicing nurses and nurses in leadership roles with useful information about patient safety, quality care, and the application of quality principles in the clinical setting. Articles in the *JNCQ* address patient safety, innovative and effective approaches to improving quality and safety in healthcare, research on quality care, and evidence-based practice in nursing. The *JNCQ* provides a forum for the discussion of patient safety issues and "real world" implementation of quality-related activities.

Manuscript Review

The *JNCQ* is a peer-reviewed journal. Published manuscripts have been reviewed, selected, and developed with the guidance of the editorial board. Manuscript content is assessed for relevance, accuracy, and usefulness to practicing nurses, nurses in leadership roles, and other healthcare providers involved in evaluating and improving safety and quality of care. Manuscripts are reviewed with the understanding that neither the manuscript nor its essential content has been published or is under consideration by others.

Authorship Responsibility

All persons designated as authors should qualify for authorship. Each author should have contributed significantly to the conception and design of the work and writing the manuscript to take public responsibility for it. The editor may request justification of assignment of authorship. Names of those who contributed general support or technical help may be listed in an acknowledgment placed after the narrative and before the references.

Query Letters

Although not necessary, query letters allow the editor to indicate interest in, and developmental advice on, manuscript topics.

Manuscript Preparation

Prepare manuscripts according to the *American Medical Association (AMA) Manual of Style (10th ed)*. The maximum manuscript length is approximately 16 pages including references. As a general rule, a 16-page paper should have no more than 3 figures or tables.

For manuscripts describing quality improvement studies, follow the Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines at http://www.squire-statement.org/guidelines. (see also Oermann MH. SQUIRE guidelines for reporting improvement

studies in healthcare: Implications for nursing publications. *J Nurs Care Qual*.2009; 24(2):91-95 For some manuscripts, it may not be appropriate to include every guideline item, but authors should consider each item in preparing their papers for submission. The "Discussion" section should include nursing implications.

Format

Double space the manuscript using a 12-point type size, any font style.
Left justify all text, including headings.
Divide the text into main sections by inserting subheadings.
All headings are flush left, in bold, and distinguished by level as follows:

FIRST-LEVEL HEADING (CAPITALIZED ON SEPARATE LINE)
Second-level heading (Regular on separate line)
Third-level heading (Italic on separate line)

Do not use running headers or footers.

Title/Author Biography Page

Information for the title/author biography page is placed in a 1-page Word file. This information should not be placed in any other file. This title page Word file should contain only the:

Title of the manuscript;

1. Author(s) names and credentials (highest earned credential only, followed by RN, and certifications);
2. Author(s) affiliation(s): job title, department, institution, city, state, country;
3. Corresponding author: For publication, it is preferable to use a work address. You must include an e-mail address at the end of your mailing address; and
4. Funding information and other disclaimer or disclosure information. Include disclosure of funding received for this work from any of the following organizations: National Institutes of Health (NIH); Welcome Trust; Howard Hughes Medical Institute (HHMI); and other(s).

Abstract

Include an abstract of 50 to 75 words that stimulates readers' interest in the topic and states what they will learn from reading the article.

Tables and Figures

Tables and figures, if any, should be saved as individual files. All tables must be numbered consecutively with Arabic numbers and have a title. All figures must be numbered consecutively with Arabic numbers and have a title. Tables and figures must be cited in numerical order in the text. All figures and other artwork should be submitted in black and white.

A) Creating Digital Artwork

1. Learn about the publication requirements for Digital Artwork: http://links.lww.com/ES/A42
2. Create, Scan and Save your artwork and compare your final figure to the Digital Artwork Guideline Checklist (below).
3. Upload each figure to Editorial Manager in conjunction with your manuscript text and tables.

B) Digital Artwork Guideline Checklist

Here are the basics to have in place before submitting your digital artwork:

- Artwork should be saved as TIFF, EPS, or MS Office (DOC, PPT, XLS) files. High resolution PDF files are also acceptable.
- Crop out any white or black space surrounding the image.
- Diagrams, drawings, graphs, and other line art must be vector or saved at a resolution of at least 1200 dpi. If created in an MS Office program, send the native (DOC, PPT, XLS) file.
- Photographs, radiographs and other halftone images must be saved at a resolution of at least 300 dpi.
- Photographs and radiographs with text must be saved as postscript or at a resolution of at least 600 dpi.
- Each figure must be saved and submitted as a separate file. Figures should not be embedded in the manuscript text file.

Remember:

- Cite figures consecutively in your manuscript.
- Number figures in the figure legend in the order in which they are discussed.
- Upload figures consecutively to the Editorial Manager web site and enter figure numbers consecutively in the Description field when uploading the files.

References

Prepare references according to the style used in the *AMA Manual of Style* (10th ed.). References should be typed double-spaced and placed at the end of the manuscript. They should be numbered consecutively in the order in which they are cited in the text. Whenever a reference is repeated in the text, it uses the same reference number each time. Journal titles should be abbreviated according to the listing in the PubMed Journals database. If not listed there, journal titles should be spelled out.

Examples:
Journal article with 1 author:
Clancy CM. The promise and future of comparative effectiveness research. *J Nurs Care Qual*. 2010;25(1):1-4.

Journal article with multiple authors:
Levin RF, Keefer JM, Marren J, Vetter MJ, Lauder B, Sobolewski S. Evidence-based practice improvement: merging 2 paradigms. *J Nurs Care Qual*.2010;25(2):117-126.

Book:
Oermann MH, Hays JC. *Writing for Publication in Nursing*. 3rd ed. New York: Springer;2016.

Web site:
2010 National Patient Safety Goals (NPSGs). The Joint Commission Web site. http://www.jointcommission.org/patientsafety/nationalpatientsafetygoals/. Published June 2006. Accessed May 1, 2010.

For other electronic references, follow guidelines in the *AMA Manual of Style* p. 63.

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Compliance with NIH and Other Research Funding Agency Accessibility Requirements

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Authors must state all possible conflicts of interest in the manuscript, including financial, consultant, institutional and other relationships that might lead to bias or a conflict of interest. If there is no conflict of interest, this should also be explicitly stated as none declared. All sources of funding should be acknowledged in the manuscript. All relevant conflicts of interest and sources of funding should be included on the title page of the manuscript with the heading "Conflicts of Interest and Source of Funding:". For example:

Conflicts of Interest and Source of Funding: A has received honoraria from Company Z. B is currently receiving a grant (#12345) from Organization Y, and is on the speaker's bureau for Organization X – the CME organizers for Company A. For the remaining authors none were declared.

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On submission, all authors will be emailed a hyperlink to verify their co-authorship and complete the LWW Copyright Transfer and Disclosure Form within Editorial Manager. Co-authors do not have to register in Editorial Manager.

Online Manuscript Submission

All manuscripts must be submitted online through our Web-based Editorial Manager system at http://jncq.edmgr.com. Submit your manuscript according to the author instructions. You will be able to track the progress of your manuscript through the system.

First-time users: Click the Register button from the menu (on the upper banner) and enter the requested information. On successful registration, you will be sent an e-mail indicating your user name and password. Save a copy of this information for future reference.

Return users*:* If you have received an e-mail from us with an assigned user ID and a password, or if you are a repeat user, do not register again. Just log in. Once you have an assigned ID and a password, you do not have to re-register even if your status changes (ie, author or reviewer).

After registering as an author, log on to http://jncq.edmgr.com and select "Submit a New Manuscript." You will then:

1. Select an "article type" from the drop down menu
2. Enter the title of your manuscript
3. Add information about the author(s) of the paper
4. Enter abstract of your manuscript
5. Enter a few key words that describe your manuscript's content
6. Enter your comments to the editor in a dialogue box, mentioning any prior query you may have had with the editor
7. Attach your various individual files containing elements of your entire manuscript. No file should contain information found in any other file:
   Title/author biography page
   Abstract
   Manuscript text, ending with the references
   As many individual files as necessary, each containing 1 table or figure.

When all files are attached, the system will prompt you to complete a process that will submit your manuscript to the editorial office. You will receive an e-mail to let you know that the journal office

received your manuscript. After the review process, you will receive an e-mail letting you know the final disposition of the manuscript. You may check the status of your manuscript at any time by logging in to http://jncq.edmgr.com. Select "Submissions Being Processed."

Revised Submission

If your manuscript is accepted for publication, the revision is submitted online at http://jncq.edmgr.com. **Do NOT submit your revision as a "New Submission" under the heading "New Submissions."** Log in using the same user name and password. On the Author Main Menu, under the heading **"Revisions,"** select the "Submissions Needing Revision" link, which will be the only active link.

Help

If at any time during this process you have questions, please e-mail moermann@msn.com or marilyn.oermann@duke.edu, phone 248-568-1848. The Editorial Office mailing address is *Journal of Nursing Care Quality*, Marilyn H. Oermann (Editor), 148 Saxapahaw Run, Chapel Hill, North Carolina 27516, USA.

Figure 1. Journal of Nursing Care Quality author guidelines. Retrieved from http://edmgr.ovid.com/jncq/accounts/ifauth.htm

Draft Manuscript

A Cardiac Arrest Quality Improvement Initiative Utilizing Get With The Guidelines – Resuscitation Registry and Post-Arrest Debriefing

Rosanna Chapman, DNP, RN, ACCNS-AG, CEN
Doctoral Student
University of Virginia, School of Nursing, Charlottesville, VA

Beth Quatrara, DNP, RN, CMSRN, ACNS-BC
Clinical Assistant Professor
University of Virginia, School of Nursing, Charlottesville, VA

Author Correspondence: Contact Rosanna Chapman
RLC2BC@VIRGINIA.EDU

No disclaimers or disclosures

ABSTRACT

Recommended methods to improve cardiac arrest outcomes center on continuous quality improvement initiatives. To collect and compare baseline cardiac arrest data at an academic medical center and disseminate the findings to staff, a quality improvement project utilizing the AHA Get With The Guidelines – Resuscitation registry and post-arrest debriefing was implemented. Cardiac arrest data showed opportunities for improvement and targets for further interventions. Post-arrest debriefing received positive feedback from staff.

PROBLEM AND BACKGROUND

Improving quality of care is becoming an increasingly important focus in the United States and improving cardiopulmonary resuscitation outcomes are not an exception.[1] Despite decades of utilization and multiple technological advances, outcomes from cardiopulmonary resuscitation (CPR) remain poor, with only approximately 20% of adults surviving to discharge after an in-patient cardiac arrest. [1,2,3,4] Survival from cardiac arrest is directly impacted by the quality of CPR delivered.[1,4,5,6,7,8,9,10] Poor adherence to guidelines worsens outcomes for the return of spontaneous circulation (ROSC), survival to discharge, and neurological outcomes.[11] Current guideline care for adults include a focus on compression depth between 5-6 cm, a compression rate between 100-120 per minute, time away from compressions less than 10 seconds, no over-ventilation, and full chest recoil in-between compressions.[4,8,12] Although many hospitals require staff resuscitation training through the AHA, research shows that guidelines are not always followed, there is a lack of uniform reporting of outcomes, and utilization of interventions vary greatly between hospitals.[1,4,5,7,8,11,13]

Cardiac arrest mortality rates fluctuate by hospital, time of day, and day of the week, and these findings point to differing levels of quality care and opportunities for improvement in process and system interventions. [1,4,8,13,14] With greater than 200,000 adults experiencing an in-hospital cardiac arrest (IHCA) in the United States each year, this results in a large number of opportunities for improved care and outcomes.[2,4,5,6] To improve cardiac arrest processes, the AHA and the Institute of Medicine (IOM) recommend continuous quality improvement (CQI) initiatives that collect and measure the cardiac arrest processes and outcomes, compare data to check for opportunities, provide feedback on performance, and develop strategies and interventions to improve those processes and outcomes.[14,15]

Continuous quality improvement initiatives with the above components help determine and maintain benchmarking goals for cardiac arrests. Although the Joint Commission currently only requires that cardiac arrest data be collected and reviewed "periodically", it is likely that cardiac arrest data will soon follow the way of stroke and other conditions, which necessitate hospital systems to benchmark their performance.[15] Frequent review of cardiac arrest data has also shown to be significantly associated with increased survival-to-discharge from cardiac arrests.[16]

LITERATURE REVIEW

Get With The Guidelines- Resuscitation Registry

Get With The Guidelines – Resuscitation (GWTG-R), formerly known as National Registry of Cardiopulmonary Resuscitation, is a registry developed by the AHA that can be used as a quality improvement measure for hospitals to monitor and review their cardiac arrests by

abstracting the data from documentation records.[2] Data registries are one measure to collect and review data to improve processes and outcomes.[2]

Research on the GWTG-R data registry demonstrates improved cardiac arrest outcomes with use. Duration of participation was associated with improved event survival (odds ratio 1.02, $p = 0.046$), but not survival to discharge (odds ratio 1.02, $p = 0.18$).[2] An additional study showed increased survival to discharge and decreased neurological disability with registry participation.[17] That study's data showed an 8.6% absolute improvement in risk-adjusted survival from 2000 to 2009, which accounted for an estimated 17,200 additional patients surviving.[17] Utilizing the GWTG-R registry for quality improvement of cardiac arrest outcomes shows a potential for addressing standardized definitions of events, national reporting of events and outcomes, evaluation of intervention effectiveness, and improving cardiac arrest outcomes.

Post-Arrest Debriefing

A cardiac arrest quality improvement intervention used to provide feedback on performance and develop strategies and interventions to improve processes and outcomes is post-arrest debriefing. During World War II, debriefing post-event was first used by the military after battle as a method to gather information and strategize, and has since found its way into healthcare in both simulation training and post-arrest to discuss events and improve quality outcomes.[1,7,9,18,19,20] Debriefing facilitates discussion amongst the healthcare team to address both optimal and suboptimal performances to improve behaviors and outcomes.[17] The use of debriefings post-arrest is endorsed by the AHA and by the IOM.[14,15]

A way to separate debriefing interventions mentioned in the literature is by timing of the intervention: either immediately after the event, or a delayed debriefing later in time. A "hot

debriefing" is a debriefing (usually interprofessional) that occurs either immediately or shortly after the event when the event is still readily in the resuscitation teams' mind.[20] These hot debriefings generally only include the staff that participated in the cardiac arrest efforts, and cover their subjective experience and thoughts for improvement – often addressing both skills and emotions.[6,14,20]

The research on hot debriefings points to the usefulness for performance improvement feedback and addressing process errors and outcomes.[6,20] There is also some evidence citing significant improvements in chest compression depth ($p=<0.001$), percent of compression depth within guidelines ($p=0.001$), and mean chest compression release velocity ($p=0.001$).[6] There is not evidence to support improved rates of ROSC or survival-to-discharge.[6]

"Cold debriefings" are debriefings that are conducted after some time has passed since the resuscitation effort. Cold debriefing involves reviewing objective data, such as the patient record and/or quantitative defibrillator data from the cardiac arrest as available.[19,20] Cold debriefing is usually an interprofessional event that is not limited only to staff present at the resuscitation, which gives cold debriefing the potential to educate and affect more staff.[14,20]

Research reporting on cold debriefings shows a positive impact on patient outcomes in cardiac arrest. Studies researching cold debriefing highlight significant increased ROSC ($p=0.03$),[9,10] improvement in chest compression flow fraction ($p=0.007$),[20] chest compression rate ($p=0.002$),[10] chest compression depth ($p=0.05$),[10] decreased time delay before defibrillation ($p=0.006$),[20] improved adherence to guidelines ($p<0.02$),[19] and improved neurologic outcomes post-arrest with implementation ($p=0.036$).[19] As with hot debriefing research, cold debriefings do not demonstrate significant improvement in survival-to-discharge for cardiac arrest patients.

Although a literature yields only a few studies on post-arrest debriefing and a lack of results showing a significant improvement in patient survival-to-discharge with the intervention, the review does point to a reasonable clinical benefit from post-arrest debriefings. When a fairly simple intervention such as post-arrest debriefing has even a slight potential to improve CPR processes and patient outcomes, it is a sensible option for hospitals to consider. Post-arrest debriefings also readily coincide fit with quality improvement initiatives as a way to provide feedback to staff on benchmark data and strategies to improve outcomes, and has the benefit of high staff acceptance and support.[15,19] A review of the literature supports the use of cold debriefing for targeting team performance in in-hospital cardiac arrest and a more probable improvement in outcomes measures than hot debriefing. Cold debriefings can include more quantitative feedback data, information on pre-arrest patient status, and post-resuscitative outcomes to help educate and affect staff.[20]

PROJECT PURPOSE

The purpose of this project was to implement a continuous quality improvement project targeting the improvement of cardiac arrest outcomes to address the recommendations of the AHA and IOM and improve the gaps found in a system assessment.

The project objectives included: (a) a comparison of current year hospital process and outcomes data to national guidelines using AHA Get With The Guidelines – Resuscitation registry, (b) the implementation of a post-arrest debriefing intervention based upon GWTG-R data to both review recent cardiac arrests and educate staff, (c) an evaluation of a post-arrest debriefing intervention.

METHODS

Project Design

This project implemented a cardiac arrest quality improvement project using the quality improvement method of Plan-Do-Check-Act (PDCA) to describe and evaluate the impact of post-arrest debriefing.

Setting

The project hospital was an academic medical center with approximately 600 inpatient beds located in the southeastern United States. The project was conducted in the inpatient cardiac area, which included both cardiac medicine and cardiac surgery patients in telemetry medical/surgical units, progressive care units, and intensive care units. The cardiac conditions serviced at this medical center include a range of clinical situations, such as myocardial infarctions, heart failure, new transplants, and patients using left ventricular assist devices.

Sample

Patient medical records

Cardiac arrest data for the entire project year was abstracted from patient electronic medical records of all adult IHCA on the cardiac specific units during a three month project surveillance period. Forty-seven patient medical records required data abstraction into the GWTG-R registry for cardiac arrests, which included 59 cardiac arrests. Fifty-seven of those cardiac arrests occurred in one of the cardiac units.

Healthcare providers

Participation in the post-arrest debriefing intervention was open to all frontline providers on the cardiac units regardless of their role or participation in a recent IHCA.

Measures

The AHA GWTG-R registry is an established database operated by the Quintiles Company that requires all data abstractors to receive training and pass certification testing to gain access to the website for data entry.

The survey used to evaluate the post-arrest debriefing intervention was created specifically for the project and did not have an established validity or reliability. Survey questions were reviewed by five doctoral nursing students familiar with post-arrest debriefings and given a content validity index score for an averaged reviewer rating of question relevance. The content validity index score was 0.92 averaged across the 10 questions with the five reviewers. A score greater than 0.80 is generally considered acceptable, or greater than 0.90 for stricter standards.[21]

Procedures

Project implementation followed the quality improvement method of PDCA.

IHCA chart review

Before starting data abstraction, the project leader underwent training and testing to become a certified data abstracter in the GWTG-R registry. The cardiac arrests were data abstracted into the registry and analyzed for trends to find opportunities for improvement to meet resuscitation guidelines. Measures selected for review were the GWTG-R "recognition measures" and data on frequency of cardiac arrest events by month, time of day, day of the week, survival of event, and survival to discharge. Data was compared between the different cardiac units in this facility and also between similar hospital systems participating in the GWTG-R registry for select measures. Pertinent outcome measures were compared both annually and

quarterly. This information was then disseminated to frontline cardiac floor staff at post-arrest debriefings.

Post-arrest debriefing interventions

The information in the post-arrest debriefings combined data from specific recent IHCAs, guideline recommendation reminders and recent AHA updates, and a summary of comparison data on the cardiac floor units and hospital system identified in the GWTG-R registry. Three of the participating cardiac nursing units had a cardiac arrest during the project 3 month surveillance period and had post-arrest debriefings integrated into scheduled meetings. The debriefings were delivered in a PowerPoint presentation format with the PowerPoint presented on a screen or printed out for staff to view with the aforementioned content. The three debriefings were scheduled, on average, over a month after the cardiac arrest event had happened. The post-arrest debriefings lasted approximately ten to fifteen minutes with additional time for the open discussion. After implementation of the post-arrest debriefings, front line staff were encouraged to fill out a paper survey to assess and evaluate acceptance and helpfulness of the post-arrest debriefing intervention.

Data Analysis

Data obtained from GWTG-R and the quantifiable post-arrest debriefing survey data were analyzed. Descriptive statistics to compare means, percentages, and ranges were computed in either Microsoft Excel or within GWTG-R using the Quintiles software. Comparisons between units and between hospitals in the GWTG-R database were displayed by Excel graphs and/or charts created in the GWTG-R registry. The two open ended questions collected from the survey were searched for central repeating themes and were summarized. Demographic data

from the survey were analyzed for frequency of percentages of staff responses. Completion rate of the survey was also calculated.

Protection of Human Subjects

This quality improvement project was submitted to the facility Institutional Review Board (IRB) for approval prior to implementation and was determined to be an improvement project that did not require IRB review. Approval was obtained from the leadership staff of all participating units, and participation in the debriefing and completing the post-arrest debriefing survey was voluntary. Participants were provided a disclosure of informed consent if they chose to participate in the survey.

RESULTS

Get With The Guidelines – Resuscitation Data

Using the GWTG-R registry it was possible to organize and evaluate individual cardiac arrest items, such as percent of ROSC, "recognition measures", such as the percent of pulseless cardiac arrest monitored or witnessed, and trends in cardiac arrest incidence, such as an increase in cardiac arrests by a day of the week. The registry also allowed analysis of data with all available data, unit specific data, by individual patient, or in comparison to other facilities that participate in GWTG-R.

Analysis showed several missed opportunities to receive GWTG-R "recognition measures" for achieving guideline benchmarks during the project year. The analysis also revealed trends in the incidence of cardiac arrest at specific time periods that could potentially become the target of future interventions to target key outcomes like ROSC and survival to

discharge. Figure 1 shows the ROSC for the 5 cardiac nursing units separate and together during the project year.

Post-Arrest Debriefing Data

A total of 44 staff members attended the debriefings. Of those 44 staff members, 28 completed and returned the post-arrest debriefing survey, for an approximate 65% survey return rate. The demographic data collected was quite homogenous, with the majority of survey responders identified as being a staff nurse (78%), White (89%), age 21-29 (44%), and female (85%). Please refer to Table 1 for the full demographic results.

The main survey questions following the post-arrest debriefing included questions on how beneficial the staff felt the debriefing was, how likely they would recommend a post-arrest debriefing, what they learned, how the debriefing could be improved, and perceived barriers to attendance. There was almost no difference in trends of responses between the three units or the three different nursing roles responding (leadership, staff nurse, patient care technician).

The first survey question asked, in multiple separate questions, how beneficial the post-arrest debriefing was on a scale from "not beneficial" to "very beneficial". The staff provided primarily supportive responses and the breakdown of percentages can be viewed in Figure 2. The average rating for how likely the staff member would recommend the post-arrest debriefing to a friend or colleague was also supportive, with an average rating of 7.14, and a range in scores from 2 to 10. The most frequent response was a rating of 10, accounting for 25% of respondents. Sixty-eight percent of respondents rated this question a 7 or higher.

The last major question on the survey asked staff to address perceived barriers to attending post-arrest debriefings. The question allowed for multiple choices and an "other" for

staff to write in additional thoughts. A total of 61 responses were recorded. The most frequent choice for a barrier was staff being "busy at work" (n=23). This was followed by "not willing to come in on a day off" (n=18), "time/location of debriefing not convenient" (n=14), "lack of interest" (n=4), and the "other" category (n=2) including difficulty with parking and commute time.

DISCUSSION

Summary and Interpretation

Targeting improvement in cardiac arrest outcomes requires a multifaceted approach when outcomes are impacted by the series of events before a cardiac arrest, during an arrest, and with post-resuscitative care. Essential quality improvement components that must be considered are collecting process and outcome data, comparing the data measures against benchmarks, providing feedback to staff, and incorporating strategies to improve upon the measures.[11] This project implemented a cardiac arrest quality improvement project utilizing a registry database and post-arrest debriefings at an academic medical center.

The utilization of the Get With The Guidelines – Resuscitation registry proved useful in obtaining baseline data at the academic medical center and comparing the results to guidelines and other facilities. With further monitoring of these measures with GWTG-R, and focus on improving them, this academic medical center shows a high likelihood to meet the benchmarks in coming years. In addition to comparing medical center outcomes against the guidelines, GWTG-R registry was also useful for reviewing and analyzing for potential trends in cardiac arrest data, both on a hospital level and unit level, which could help focus future interventions.

The potential utility of the GWTG-R information to create performance improvement projects and monitor their successes is high.

The benchmarking capabilities of GWTG-R registry is not only useful at an individual hospital level to monitor and improve patient outcomes, but also to meet national benchmarking criteria, and to organize the information to review cardiac arrest data and disseminate it to staff. A recent study showed increased survival-to-discharge after cardiac arrests at facilities that perform at least monthly or quarterly review of data,[16] and GWTG-R could be utilized to facilitate the data reviews, as with this project.

This CQI project incorporated a cold debriefing method to share cardiac arrest data with staff. According to the literature, cold debriefings show greater improvement of patient outcomes than with hot debriefings. There was no standard in the literature for how best to implement a cold post-arrest debriefing, therefore individual unit preferences were integrated. Focusing education efforts on the staff that are at the patient bedside and first responding to deteriorating patient condition will likely provide greater benefit than a focus on physicians or leadership staff that spend the majority of time outside of the patient room.

The staff at this academic medical center provided positive feedback on the post-arrest debriefing surveys. Overall, the staff responded that post-arrest debriefings are beneficial and could impact changes. Although most research on cold debriefings include supplemental defibrillator data on CPR measures, such as compression depth and rate, the staff at this medical center were responsive to the supplemental GWTG-R data. Lack of defibrillator data makes it more difficult to collect and evaluate specific CPR process measures, but many of the measures

in GWTG-R can help bring objective focus to resuscitation guidelines, such as time to defibrillation, epinephrine administration, and ET tube device confirmation.

Strengths and Weaknesses

Strengths of this project include a standardized data registry and a single certified data abstractor, clinical relevance, and high acceptability of the interventions per staff survey. The implementation of GWTG-R to benchmark data and outcomes shows high future utility both at a hospital level and nationally. Other hospital systems could benefit from the information obtained from this project, and this academic medical center could easily stimulate further research surrounding these interventions.

The weakness of this project include lack of generalizability due to the nature of an individualized quality improvement project, the use of a non-validated survey, potential response bias, and lack of interprofessional diversity. The time commitment of the data abstractor is another limitation for a quality improvement project designed this way because this person or persons would need to be paid for their time and they would have other responsibilities to balance with data abstraction.

Nursing Practice Implications

This project describes the process of incorporating GWTG-R and debriefing into a cardiac arrest quality improvement initiative. This system-wide initiative is well suited to be implemented by a nurse trained in evidence-based practice and systems-wide focus, such as with a Doctor of Nursing Practice (DNP) prepared nurse. The DNP could help facilitate implementation of the quality improvement interventions with unit-focused nurse “champions” that are invested and motivated to improve outcomes on their unit. Continued utilization of

continuous quality improvement initiatives can help to monitor and improve cardiac arrest outcomes at facilities across the nation. Investing in strategies to drive needed practice changes before mandates are enforced by regulatory agencies paves the way to true quality care.

DISCLOSURES AND CONFLICTS OF INTEREST

The authors have no disclosures or conflicts of interest to report.

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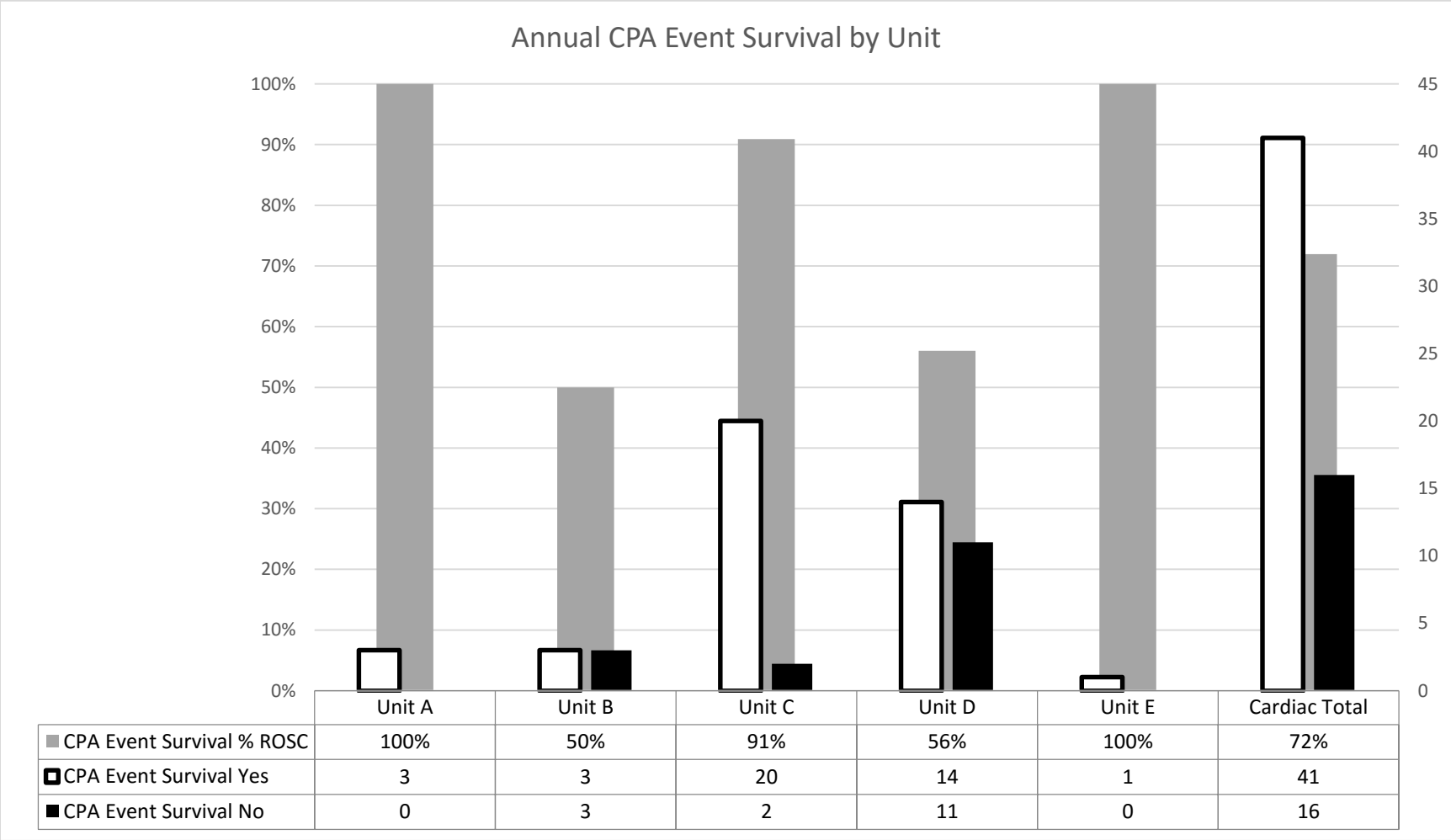
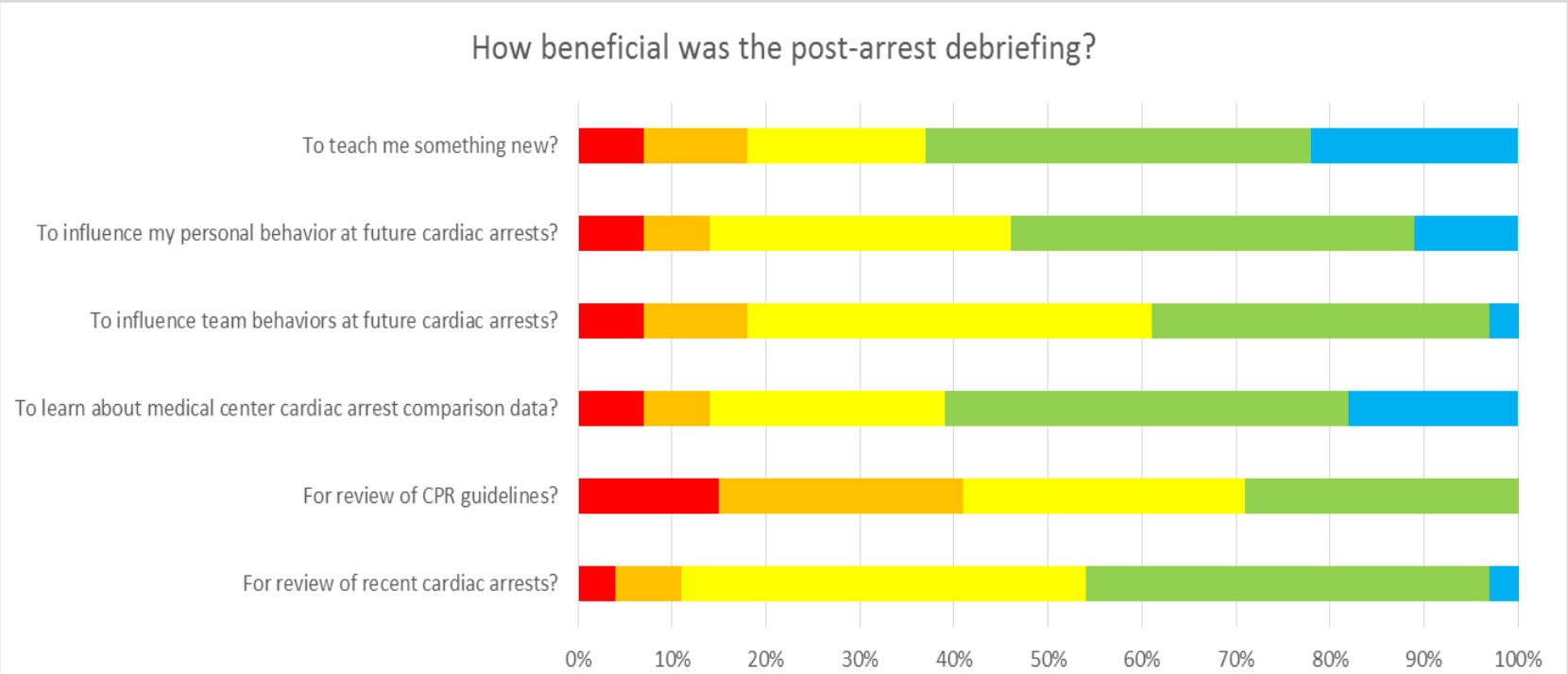
Table 1. *Characteristics of Staff Sample for Post-Arrest Debriefing Survey*

Characteristics (total responding)		**n**	**%**
Gender (n = 27)			
	Male	4	15
	Female	23	85
Age (n = 27)			
	20 or younger	-	-
	21-29	12	44
	30-39	4	15
	40-49	4	15
	50-59	5	19
	60 or older	2	7
Race/ethnicity (n = 27)			
	White	24	89
	Black or African American	1	4
	American Indian	-	-
	Asian	-	-
	Hispanic/Latino	1	4
	Multiple races	1	4
Current occupation (n = 27)			
	Registered Nurse – staff nurse	21	78
	Patient care tech	3	11
	Respiratory therapy	-	-
	Physician	-	-
	Medical student	-	-
	Nursing student	-	-
	Clinical Nurse Specialist	1	4
	Nurse Practitioner	-	-
	Nurse Manager	2	7



	Unit A	Unit B	Unit C	Unit D	Unit E	Cardiac Total
CPA Event Survival % ROSC	100%	50%	91%	56%	100%	72%
CPA Event Survival Yes	3	3	20	14	1	41
CPA Event Survival No	0	3	2	11	0	16

Figure 1. CPA event survival by unit and comprehensive total with percentage of ROSC. CPA = cardiopulmonary arrest; ROSC = return of spontaneous circulation.



	For review of recent cardiac arrests?	For review of CPR guidelines?	To learn about medical center cardiac arrest comparison data?	To influence team behaviors at future cardiac arrests?	To influence my personal behavior at future cardiac arrests?	To teach me something new?
Not beneficial	4%	15%	7%	7%	7%	7%
Slightly beneficial	7%	26%	7%	11%	7%	11%
Moderately beneficial	43%	30%	25%	43%	32%	19%
Very beneficial	43%	30%	43%	36%	43%	41%
Extremeley beneficial	4%	0%	18%	4%	11%	22%

Figure 2. Post-arrest debriefing survey: Assessment of staff perceived benefit of post-arrest debriefing. CPR = cardiopulmonary