Improving outcomes in out-of-hospital cardiac arrest in the Emergency Department

by

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Abstract page

Challenges exist among hospital staff in performing high quality cardio pulmonary resuscitation (CPR) according to the 2010 international guidelines. Effective and uninterrupted chest compressions have demonstrated improved patient outcomes. The literature recommends that education and training specific to teamwork and leadership be provided to healthcare providers caring for patients requiring resuscitation. The overall aim of this study was to evaluate patient survival and neurologic outcomes using a nurse team leader approach that was initiated in June 2012 for the management of out of hospital cardiac arrest in the emergency department. A retrospective data analysis design was used in this study. Data was collected from the medical records of patients admitted to the Emergency department during a six month period pre and post practice change. The results demonstrated no significant differences (χ^2, p =.058) in patients achieving ROSC in the pre group (7/20) compared to the post group (2/20). Nine patients survived to admission in the pre group with significance (χ^2, p =.038) compared to three in the post group. There were no significant differences in survival to discharge with two in the pre-group and none in the post group. Neurologic outcome was not analyzed due to the lack of survival in the post group. The results suggest that future research should include a large group of subjects to fully evaluate the effect through patient outcome analysis. The implementation of an evidence based nurse led resuscitation team training program in the emergency department can promote teamwork and empowerment among staff. Training specific to leadership skills to empower nurse timing of events, introduce team skills such as pre-brief and de-brief and cross monitoring team adherence to resuscitation treatment guidelines

Key words: Nurse leadership; Teamwork; Cardiac arrest; Cardiopulmonary resuscitation

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Chapter One

Introduction

Cardiac arrest is an unpredictable event that can occur anytime, anywhere across the US. Each year, approximately 350,000 cardiac arrest occur with 50% occurring out-of the hospital and 50% occurring in-the-hospital with an overall survival rate of <10% (Travers et al, 2010). Several studies conducted in the pre-hospital and hospital setting show variations still exist among healthcare providers response that can contribute to poor patient outcomes (Abella, et al., 2005, Carr et al., 2009, Liu et al.,2008 & Wik et al., 2005). Studies show that sub-optimal standards still exist among hospital staff in performing cardio pulmonary resuscitation (CPR) (Abella et al., 2005). A recent study of 1029 patients found sub-optimal compression depth in almost all of the patients according to the 2010 international guidelines for cardiopulmonary resuscitation (Stiell et al., 2012). There is evidence that shows a relationship in the patient's chance of survival with having return of spontaneous circulation to the rate of chest compressions (Field et al., 2010).

Nichol and colleagues in their prospective observational study out of hospital cardiac arrest (OHCA) demonstrated a large variation in survival rates across ten sites in North America from 7.7% to 39.9% with a median of 22% (Nichol et al., 2008). Research is needed to understand why the variances occur however their study noted that survival rates could be improved (Nichol et al., 2008). With the variances in survival rates, cardiac arrest can be viewed as a treatable cause with an estimated 15,000 premature deaths prevented in out of hospital cardiac arrest (OHCA) (Nichol et al., 2008). Sanders and Kern (2008) commented that the wide variation in survival rates from Nichol et al. study demonstrates a need for increased community awareness to assess their role within the chain of survival and how to improve survival rates.

In a prospective study evaluating the 2005 American Heart Association guidelines new emphasis on circulation during CPR revealed improvements in patient's survival to discharge and neurological outcome (Aufderheide et al., 2010). The study showed patients presenting with an initial rhythm of ventricular fibrillation or ventricular tachycardia had a survival to discharge of 20% in the control group versus 32.3% in the intervention group ($p < .001$) (Aufderheide et al., 2010).

Significance of the Problem

Patients are transported to emergency departments for advanced life saving measures therefore, nurses working in the emergency department need to be knowledgeable and skilled in resuscitation management and practice within the latest evidenced-based guidelines to increase patient survival. "Outcome after cardiac arrest and cardiopulmonary resuscitation is dependent on critical interventions, particularly early defibrillation, effective chest compressions, and advanced life support" (Jacobs et al., 2004, p.3385). Emergency departments are perceived as fast paced environments often chaotic in nature. There can be limited notification and little to no time to prepare in advance for high acuity patients. Resuscitation efforts are not left to one individual but rather to a team approach. Several leadership challenges exist among personnel working in Emergency medicine due to the environment and ad hoc nature of the teams (Fernandez et al., 2008). All health care team members must be prepared for the unexpected, and function as a cohesive team. To achieve this, nurses must be knowledgeable and trained to be highly skilled practitioners; moreover, nurses must be excellent communicators to facilitate the team approach to coordinate the highest quality of care. Through this coordination of care and nurse leadership approach, a patient's chance of survival may be improved. The 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Science recommend leadership and teamwork training is included in advanced life support courses (Soar et al., 2010). They also recommended frequent training and evaluation of skill performance than what is currently offered in ACLS programs (Soar et al., 2010).

Not all nurses are familiar with the new 2010 AHA guidelines, therefore care in resuscitation may vary among team members. Emergency departments are challenged with ensuring that healthcare providers not only acquire and maintain the needed knowledge, skills and team attitude to maximize outcomes in resuscitation but also to evaluate that practice is evidence based. Poor clinical outcomes in the medical setting have been attributed to poor teamwork and lack of leadership (Edelson et al., 2008, Hunziker et al., 2009 & Schenarts & Cohen, 2010).

Nurses in the emergency department are stretched in caring for a diverse patient population with various medical complaints. In resuscitation efforts, knowledge of treatment management is vital and timing is critical. Nurses must remain current in their knowledge base and practice skill set specific to advance resuscitative efforts. Communication failure among team members has been attributed to preventable medical errors (Bergs et al., 2005, Dunn et al., 2007 & Risser et al., 1999). A lack of clear roles and responsibilities can result in delays in care, create chaotic environments and overall impact the quality of care provided to the patient. Training to improve patient safety is recommended by the Institute of Medicine (IOM) to include simulated team training (Wehbe-Janek, et al., 2012).

Problem Statement

Research shows that effective and uninterrupted chest compressions have demonstrated improved patient outcomes. Teamwork and leadership approach is recommended by the 2010

AHA clinical practice resuscitation guidelines. Not all nurses may practice within the current evidence or work cohesively in a team environment. Nurses may lack the knowledge, skills and attitude to function as leaders in the code room or in the coordination of a complex team. The lack of standardization among team members can lead to tasks not being performed in a timely manner, role confusion, chaos, lack of responsibility and overall noncompliance in resuscitation treatment guidelines. A cohesive team working effectively and efficiently with clear communication to minimize the interruption in chest compressions can improve a patient's chance of survival. All team members need to know specifically what their role will be when they are a member of a code team and a clear understanding of what is expected from them. Education and training specific to team roles and responsibilities is needed along with specific nurse leadership training. Empowering a nurse leadership approach to resuscitation to ensure the implementation of evidence based practice guidelines can help save more lives.

Purpose Statement

The overall aim of this study was to evaluate patient outcomes using a nurse team leader approach that was initiated in June 2012 for the management of out of hospital cardiac arrest in the emergency department as compared to previous clinical practice prior to June 2012. The patient outcomes of interest in this study are survival and neurologic outcomes in patients. Specific outcomes include: (a) return of spontaneous circulation (ROSC) in the emergency department, (b) survival to admission, (c) survival to discharge and (d) neurological outcome.

Chapter Two

Literature Review

Review of studies published from July 1st, 2001, through February 24, 2013 using PubMed, CINAHL, Medline, and all Evidenced-Based Medicine Reviews. The following keywords were used: code blue, out of hospital cardiac arrest, resuscitation, cardiopulmonary resuscitation, nurse led codes, teamwork and nurse leadership. A review of literature demonstrated the following headings; definitions of terms within resuscitation, clinical practice guidelines, teamwork and leadership training, nurse leadership and improving resuscitation skills.

Definition of terms within resuscitation

In 1997, Cummins et al. standardized the reporting of cardiac arrest data with the development of guidelines according to the Utstein style for resuscitation within the hospital (Leong & Chua, 2011). The Utstein style represents a guideline for consistency in reporting of cardiac arrest. The name was derived from the Utstein Abbey where the proposal was first presented at the conference of European Society of Cardiology, the European Academy of Anesthesiology, and the European Society for Intensive Care Medicine in 1990 for standardization (Cummins et al., 1991). The definitions of the twenty nine core data elements were later revised in 2004 (Jacobs et al., 2004). For the purpose of this study, the following data elements will be used and described below; cardiac arrest, witnessed arrest, cardiopulmonary resuscitation (CPR), return of spontaneous circulation (ROSC), first monitored rhythm, bystander CPR end of event, survival to hospital admission, survival to hospital discharge, neurological outcome and the Glasgow coma scale.

Cardiac arrest is "the cessation of cardiac mechanical activity as confirmed by the absence of signs of circulation" (Jacobs et al., 2004 p.3387). Arrest, witnessed is "a witnessed cardiac arrest is one that is seen or heard by another person or an arrest that is monitored" (Jacobs et al., 2004 p.3387). Cardiopulmonary resuscitation (CPR) is "an attempt to restore spontaneous circulation by performing chest compressions with or without ventilations" (Jacobs et al., 2004 p.3387). Return of Spontaneous Circulation (ROSC) is defined as a palpable pulse or a measurable blood pressure of at least 30 seconds which is evidence of restoration of spontaneous circulation (Jacobs et al., 2004). When a patient is in cardiac arrest and a monitor or defibrillator is applied, the first cardiac rhythm that is present will be known as the first monitored rhythm (Jacobs et al., 2004). CPR that is performed on a patient in cardiac arrest by a person who is not part of the emergency response system will be known as bystander CPR (Jacobs et al, 2004). End of event is "a resuscitation event is deemed to have ended when death is declared or spontaneous circulation is restored and sustained for twenty minutes or longer. If extracorporeal life support is being provided, then the end of event is twenty minutes after extracorporeal circulation has been established" (Jacobs et al., 2004 p.3387). Survival to hospital admission is the point in which the patient leaves the emergency department to the inpatient unit. Survival to hospital discharge is "the point at which the patient is discharge from the hospital's acute care unit regardless of neurological status, outcome or destination" (Jacobs et al., 2004 p.3388). Neurological outcome at discharge from the hospital will be defined using the Glasgow Coma Scale (GCS). Several tools exist to evaluate a patient's neurological and overall functional status including the Glasgow Coma Scale, Glasgow Outcome Scale, Glasgow Outcome Scale- Extended, Cerebral Performance Category (CPC), and modified Rankin Scale

(Becker el al., 2011). According to Becker et al., the Glasgow coma scale is a valid and reliable tool used to evaluate eye opening, motor responses and verbal responses (2011).

Clinical Practice Guidelines

Background

In 1966, the American Heart Association developed the first guidelines for treatment of patients in cardiac arrest using the research conducted by PJ Safar, WB Kouwenhoven and colleagues (Gaieski et al, 2012). Safar (1964) identified and published three phases within emergent resuscitation which included 1) first aid treatment along with assessing airway, breathing and circulation, 2) begin chest compressions along with drug delivery, defibrillation and fluids and 3) recover the patient, look at causes for arrest and provide intensive care (Safar, 1964). In 1992, the International Liaison Committee on Resuscitation (ILCOR) was formed consisting of physicians, and nurses from the world's resuscitation councils including members from the American Heart Association (AHA), the European Resuscitation Council, the Australian and New Zealand Committee in Resuscitation, Resuscitation Council of Southern Africa, the Heart and Stroke Foundation of Canada, the Inter-American Heart Foundation, and the Resuscitation Council of Asia with the goal to develop treatment recommendation based off of their review of the knowledge and scientific evidence of cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC) (Mancini, 2011).

American Heart Association 2010 Guidelines

Based on the International Liaison Committee on Resuscitation (ILCOR) review of scientific evidence and published 2010 international consensus statement, the American Heart

Association (AHA) developed new clinical practice guidelines in 2010. The executive summary highlights of the 2010 AHA Guidelines for CPR and Emergency Cardiovascular Care (ECC) recommend high-quality CPR as the cornerstone to improving patient outcomes beyond return of spontaneous circulation (ROSC) (Field et al., 2010). Based on the evidence, recommendations for high- quality CPR include providing adequate rate and depth with compressions, minimizing interruptions in compressions, allowing complete chest recoil and avoiding excessive ventilation (Field et al., 2010). There are now five links in the chain of survival bridging basic life support (BLS) with advanced cardiac life support (ACLS) and care post arrest (Berg et al., 2010). The chain of survival starts with BLS as the foundation with immediate recognition of cardiac arrest and the emergency response system activation. The second link begins with initiating early high quality CPR with focus on chest compression, rapid defibrillation, advance life support and the addition of the new fifth link of comprehensive integrated post-cardiac arrest care (Field et al., 2010). The 2010 guidelines now emphasize performing compressions first and have changed the steps of CPR from ABC (airway, breathing, circulation) to CAB (compression, airway and breathing) to prevent delays in beginning chest compressions (Field et al., 2010). A 30:2 compression to ventilation ratio is recommended with chest compressions performed at a rate of 100 a minute at a depth of 2 inches (Field et al., 2010). The focus with the new researched based guidelines is to teach healthcare providers to perform quality chest compressions by minimizing interruptions until ROSC or termination of efforts and to take no more than ten seconds to check for presence of a pulse before beginning compressions (Field et al., 2010).

Adherence to Clinical practice guidelines and impact on patient outcome

Chan and colleagues studied the relationship of in-hospital cardiac arrest delays in defibrillation and the impact on patient survival. The National Registry of Cardiopulmonary resuscitation (NRCPR) was used to gather data from January 1, 2000 to July 31, 2005 and reviewed the events that had pulseless ventricular tachycardia or ventricular fibrillation identified as the initial rhythm. From this time period, 14,190 cases were identified. Outcomes included; survival to hospital discharge, return of spontaneous circulation for twenty minutes, survival in 24 hours, and neurologic outcome at discharge. A significant relationship was seen in delayed defibrillation and decrease chance of survival to hospital discharge (adjusted odd ratio, 0.48; 95% CI, 0.42 to 0.54; p <0.001), lower likelihood of return of spontaneous circulation (adjusted odds ratio, 0.55; 95% CI, 0.49 to 0.62; p<0.001) and survival at 24 hours (adjusted odds ratio, 0.52; 95% CI, 0.46 to 0.58; p<0.001) (Chan et al., 2008). Strengths of this study included the large sample size and use of the Utstein uniform reporting guidelines.

Team work and Leadership training

The 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science recommended leadership and teamwork training to be included in advanced life support courses (Soar et al., 2010). They also recommended more frequent training and evaluation of skill performance than what was currently offered in ACLS programs (Soar et al., 2010). Several studies have demonstrated resuscitation team performance improvements when leadership and/or team training was provided to healthcare providers (Cooper & Wakelam, 1999, Edelson et al., 2008, Hunziker et al., 2009, Makinen et al., 2007, Marsch et al., 2004, & Morey et al., 2002).

Hunziker and colleagues conducted a prospective randomized study at the University of Basel in Switzerland to explore if the process of team building among physicians who function as first responders had an impact on adherence to the algorithms of CPR. The study was conducted during two separate simulation workshops using the same cardiac arrest scenario. They compared the performance of pre-formed teams versus those that formed ad hoc during a simulated witnessed cardiac arrest. One hundred and fifty general practitioners and 150 hospital physicians were allocated to 100 teams. All participated once. The findings revealed in the initial three minutes of cardiac arrest, the ad-hoc forming teams provided 30 second less hands-on time and 40 second delay in the first defibrillation compared to the teams that formed prior to the arrest (Hunziker et al., 2009).

Teamwork training is limited in the healthcare professions initial curriculum, therefore there is a need for health care organizations to offer and require staff to attend formal teamwork training programs to bridge the knowledge gap that exist (Salas et al., 2009). The literature points to improved clinical outcomes and better adherence to clinical guidelines when teamwork is in place.

Nurse leadership

A prospective study conducted in the United Kingdom of emergency nurses trained in advanced cardiac life support (ACLS) revealed that they performed as well in the team leader role as the senior house officers in a simulated cardiac arrest case (Gilligan et al, 2005). A total of 57 participated in the study with three groups; 20 being advanced life support (ALS) trained nurses, 19 were ALS trained accident and emergency (A&E) senior house officers, and 18 A&E senior house officers without formal ALS training. Participation was voluntary. Outcome

variables measured included subjective stress, time taken to defibrillate and knowledge of reversible causes of cardiac arrest. At the completion of the scenario, participants scored their level of stress on a scale of 1-10 along with having their pulse rate and blood pressure measured before and after the scenario to assess physiological stress. An analysis of the data showed no significant differences of the stress level among the three groups. Participants were asked to list possible reversible causes and half of the nurses knew compared to only a quarter of the house officers without ALS training. Time to defibrillation was noted with no statistically significant difference between the groups. Strengths of this study included empowering ALS trained nurse to assume leadership roles in ALS resuscitation if a senior house officer was not available. Limitations of the study included; a small sample size along with the nursing group in the study had significantly more experience compared to the two physician groups. This experience level variation may have contributed to an unequal comparison (Gilligan, 2005).

Yeung and colleagues studied the relationship between team leadership skills and the quality of cardiopulmonary resuscitation in adult simulated cardiac arrest (2012). Participants consisted of 40 ALS providers who served as a team leader of a simulated standardized resuscitation with three ALS providers as members of their team. Outcome variables consisted of simple technical skills and complex skills. Chest compression rate, compression depth and ventilation rate comprised the simple technical skills measured (Yeung et al, 2012). The Cardiac Arrest Simulation Test (CASTest) was the instrument used to measure complex technical skill performance along with preshock pause, hands off ratio, and time to first shock. The CASTest consist of 25 test domains that are scored from one to four with the higher score representing higher performance in that area (Yeung et al., 2012). The Leadership Behavior Description Questionnaire (LBDQ) was used to rate the participants ability to lead and initiate *team structure*

using numeric scoring of zero to four with four representing always to a zero representing never. Interrater reliability was high result. An analysis of the data revealed that the overall quality of CPR was good. Using univariate linear regression, the effect of leadership skills on the quality of CPR with statistical significance in the following areas; complex skills of cardiac arrest scenario performance (p <.001), preshock pause as measured in seconds (p <.001), and hand-off ratio (p .01) thus confirming the relationship of strong leadership skills and the quality of cardiopulmonary resuscitation (Yeung et al., 2012). Strengths of the study included the demonstration of teams led by highly skilled leaders displayed a higher quality of resuscitation. This study further supports the success of team-leadership training skills and how it impacts overall team performance. Leadership skills can be taught. Limitations of the study included the sample size was small and the setting was simulated versus an actual clinical environment which can account for a safer environment (Yeung et al., 2012).

A nurse leadership approach works in collaboration with the physician to maintain awareness of all team members. Emergency department physicians may become task focused on invasive procedures such as airway management or arterial line placement. There is an increase risk of losing situation awareness with regard to the timing of code events. A nurse code leader can monitor the entire team to ensure effectiveness of high quality chest compression and timeliness of resuscitative interventions. Research was lacking in the realm of a nurse leadership approach to resuscitation in the Emergency department.

Improving resuscitation

Bobrow and colleagues conducted a prospective study to evaluate a minimally interrupted cardiac resuscitation (MICR) approach by emergency medical services to improve

patient's survival in out of hospital cardiac arrest. This approach introduced methods to minimize chest compression interruptions and to allow for maximization of myocardial and cerebral perfusion. Training of the pre-hospital providers included the assignment of clear roles and tasks to be carried out. The study was conducted between January 1, 2005 to November 22, 2007 and found that survival to hospital discharged increased from 1.8% before training to 5.4% after training with a odds ratio 3.0; 95% confidence interval 1.1-8.9 (Bobrow et al., 2008).

Edelson and colleague's prospective study explored the use of audiovisual feedback and debriefing from in-hospital cardiac arrest as a potential educational intervention to improve quality of CPR and initial patient survival. The education intervention was known as RAPID defined as resuscitation with actual performance integrated debriefing. The study commenced in March 2006 through February 2007 enrolling 127 patients during the intervention (RAPID) period. Weekly debrief sessions were held lasting approximately 45 minutes consisting of case reviews highlighting CPR quality deficiencies, general discussion along with brief didactic instructions. Sample size of the study consisted of 123 patients in the intervention period with 112 trainees who attempted resuscitation compared to the control group of 101 patients with 143 trainees (Edelson et al., 2008). Study results revealed an improvement in quality associated with CPR in the RAPID cohort. Statistically significant outcomes included using mean (SD); compression depth increased from 50 vs. 44 ($p<.001$), ventilation rate decreased 13 vs. 18 ($p<.001$), preshock and postshock pause times significantly decreased ($p<.001$). The rate of ROSC (return of spontaneous circulation) improved from 45% to 59% ($p = .03$). (Edelson et al., 2008). Strengths of the study included the participant's value of the debriefing sessions in improving comfort level, promoting leadership skills and improving knowledge of the guidelines (Edelson et al, 2008).

AHA 2010 guidelines recommended several strategies for improving resuscitation skills which include the implementation of checklist and cognitive aids along with debriefing after cardiac arrest events as a means to improve performance (Bhanji et al, 2010). The guidelines point out that there were limited studies that had evaluated patient outcomes in resuscitation using checklist or cognitive aids revealing a need for research to determine how to best implement debriefing. Fernandez and colleagues agreed in their review of team training literature, that research was needed to identify *best practices* for team debriefing (2008). The process of debriefing allows for reflection of the team performance and identification of what went well and what did not in efforts to improve (Fernandez et al., 2008).

Conceptual framework

The Iowa Model developed at the University of Iowa Hospitals and Clinics, will serve as a framework to improve patient outcomes and enhance nursing practice. The foundation of the Iowa Model of evidence-based practice utilizes a problem solving method in the scientific process to guide the health care team in the implementation of code nurse leader training in the Emergency department (Melynyk & Fineout-Overholt, 2011). The model begins with the identification of an initial clinical problem or practice question in the form of triggers that are either knowledge -focused or problem–focused (Melynyk & Fineout-Overholt, 2011). For purposes of this educational program, a knowledge- focused trigger was selected for emergency nurses knowledge of resuscitation management, leadership, team roles and communication styles. The model then requires a decision to occur to determine if it meets a priority for an organization to form a team that will led the practice change. If so, then a pilot is done first to select achievable outcomes, collect baseline data, implement the Nurse led Code team, evaluate process and outcomes and modify guideline or protocol if needed. In the model, upon evaluation

of the pilot a decision will be made to institute the change in practice (Melynyk & Fineout-Overholt, 2011). Once implemented, an ongoing process will occur to monitor and evaluate the structure, process and outcome indicators. The Iowa model incorporates feedback loops and analysis of the data as a method to disseminate results and allow the clinicians to make modifications reflective of the data (Melynyk & Fineout-Overholt, 2011)

Kanter's structural theory of organizational empowerment was used as it relates to the nurse leadership approach to resuscitation in the emergency department. Kanter's theory has two main components; opportunity and structure of power. The first component is opportunity which represents growth, mobility and increase in one's knowledge and skills (Kanter, 1977). All emergency department staff received an opportunity to grow and develop in their knowledge of the resuscitation clinical practice guidelines through specialized training in team codes as part of their annual competency evaluation program in the spring of 2012. The resuscitation team model had a focus on nurse led timing of events in collaboration with the physician coordinating the care. An open invitation was provided for nurses who were interested in developing leadership skills in the department to participate in additional leadership training in the summer of 2012. The cost of paying nurses for an additional four hours of training was supported by the emergency department leadership team. Applying Kanter's theory of empowerment, anyone who expressed an interested in their own growth as a leader was given the educational opportunity and further supported through mentorship by the advanced clinician team.

The second component of Kanter's theory is structure of power and the ability to access and mobilize needed resources (Kanter, 1977). Prior to implementing the practice change, a resuscitation taskforce was formed and led by frontline staff. The resuscitation taskforce defined the code team roles and responsibilities, created the education materials for staff, developed a

resuscitation cart in addition to the standard code cart so team members would have access to specific resources and supplies and developed the process for forming the code team for out of hospital arrest. A code team assignment tool was created. The process that was created for forming the team allowed the charge nurse flexibility to pull appropriate team members in an ad hoc nature. The resuscitation taskforce served as a forum for staff to bring feedback to during the implementation phase. The resuscitation taskforce provided the structure to apply components of Kanter's theory of empowerment to the emergency department staff.

TeamSTEPPS standing for Team Strategies and Tools to Enhance Performance and Patient Safety is a model used to incorporate components of teamwork and communication to improve patient safety in the healthcare setting (http://teamstepps.ahrq.gov). In 2005, TeamSTEPPS was developed as a team training program based on team training theory and research by the United States Department of Defense in partnership with the Agency for Healthcare Research and Quality (Turner, 2012). The model incorporates teaching of team skills, knowledge and attitudes utilizing strategies to improve communication, situation monitoring and mutual support. Communication and team tools such as closed loop communication, call outs, pre-briefing, huddles, de-briefing were taught in the resuscitation training. Components of the model were introduced in a simulated *perfect code* video and the nurse leadership training for the resuscitation education program.

The goal of the Emergency department resuscitation team training was to drive compliance with the 2010 AHA guidelines and to improve patient's neurologic outcome and survival to discharge. Education will focus on; resuscitation management and treatment using the AHA 2010 guidelines, standardization of team roles and responsibilities using TeamSTEPPS model as

a framework and empowerment of nurse led resuscitation through nurse leadership training and weekly mock codes

Chapter Three

Methods

Nurses need training in leadership and education in the new clinical practice guidelines in order to effectively lead a code team. They need to practice resuscitation skills such as defibrillation, medication administration along with code team roles prior to being assigned to the code room. All team members need to know specifically what their role will be when they are a member of a code team and a clear understanding of what is expected from them.

The purpose of this study was to evaluate patient outcomes using a nurse team leader approach that was initiated in June 2012 for the management of out of hospital cardiac arrest in the Emergency Department as compared to previous clinical practice prior to June 2012. The patient outcomes of interest in this study were survival and neurologic outcomes in patients. Specific outcomes included: (a) return of spontaneous circulation (ROSC) in the Emergency Department, (b) survival to admission, (c) survival to discharge and (d) neurological outcome.

Design of study

The setting for this evidence based practice project took place at an urban southern California emergency department. A retrospective data analysis study design was used to evaluate a pre June 2012 standard practice as compared to post standard practice of a nurse leader approach using patient outcome analysis with a retrospective chart review. Data collection was performed during a six month period pre and post practice change to evaluate if the following occurred in patients who met out-of-hospital cardiac arrest criteria using related ICD-9-CM-Codes : (a) ROSC in the ED, (b) survival to admission, (c) survival to discharge and (d) neurologic outcome.

Setting and Sample

The setting for this study took place in an urban Emergency department in Southern California. A convenience sampling method was used for the retrospective analysis. Medical records of patients admitted to the Emergency department from October, 2011 to March 2012 and October, 2012 to March 2013 were selected for this study. The inclusion criteria included patients: (a) adults over 18 years of age, (b) witnessed out of hospital cardiac arrest presenting to the Emergency department requiring full cardiopulmonary resuscitation. The exclusion criteria for the chart review included patients with a: (a) unknown patient downtime without a pulse or prolonged downtime without a pulse, (b) pre-existing do not resuscitate (DNR) status, (c) terminal illness, or (d) traumatic arrest. The estimated sample size was projected to be approximately one hundred patients.

Instruments

The data collection tool used the variables and definitions of the Utstein template for reporting data of in hospital and out of hospital cardiac arrest. Inconsistencies in terminology existed between the out of hospital and in hospital Utstein definitions and reporting templates leading to inadequate comparison of research studies (Jacob et al., 2004). A task force of the International Liaison Committee on Resuscitation (ILCOR) met in 2002 to revise the in hospital and out of hospital Utstein definitions and reporting template to develop one template for uniform collection and reporting of data on cardiac arrest within hospitals, emergency medical services (EMS) systems, and communities(Jacobs et al, 2004). The data collection tool used in this study incorporated the Utstein definitions of; gender, age, witnessed arrest, bystander CPR,

first monitored rhythm, ROSC, survived event and survival to hospital discharge. For purpose of this study, survived event was documented as survival to hospital

Study Procedure

The evidenced based practice change occurred in five phases beginning in February 2012 through June 2012. This study was reviewed and approved by the Institutional Review Board (IRB) at Point Loma Nazarene University (see Appendix A) and by the Institutional Review Board (IRB) for Sharp Memorial Hospital (see Appendix B)

Phase 1: Forming of ED Resuscitation Taskforce

In February, 2012 an emergency department resuscitation taskforce formed consisting of front line staff and members of the leadership team to evaluate the current state of the department's response to out- of- hospital cardiac arrests presenting to the emergency department. The taskforce members included the Emergency Services Director, Emergency Department Nurse Educator, Emergency Department physician and frontline staff.

Phase 2: Identify Current Practice Gaps

A needs assessment was performed through observation and staff feedback during the months of February and March, 2012. Observations revealed a lack of standardization existed among team member roles and assigned responsibilities. Inconsistencies observed by staff in performing uninterrupted chest compressions. The experience level of nurses assigned to a code leader role varied from novice to expert. The use of and knowledge of resuscitation equipment and supplies varied among staff along with room set-up.

Phase 3: Practice Change Proposal

Phase three occurred in March 2012 when the resuscitation taskforce and emergency department physician champion presented to the emergency department nurse leadership and advanced clinician team members a plan to improve teamwork and nursing leadership consistent with the AHA 2010 clinical practice guidelines.

Phase 4: Resuscitation Team and Leadership Training

Resuscitation education and training of all staff working in the emergency department including physicians, nurses and health care partners was conducted in May and June of 2012. A total of 127 registered nurses, 46 health care partners and 26 emergency room physicians participated in the training. The education consisted of an emergency department resuscitation team study guide (see Appendix C), emergency standing orders (ESO) study guide and a video of a *perfect code* or simulated cardiac arrest in the emergency department (Robinson & Austin, 2012). The code team resuscitation study guide highlighted the key evidence based AHA 2010 resuscitation guideline recommendations. The study guide served as method to educate on the standardization of the team roles and responsibilities along with room set-up. The roles and responsibilities of the individual code team members were described along with the standardization of room set-up of equipment and supplies for an anticipated arrival of an out of hospital arrest. The components of a pre-brief and de-brief checklist were created in a Code Team assignment form (see Appendix D) to be initiated by the code team leader for each out of hospital arrest was introduced in the training. A 15 minute video was created to illustrate a *perfect code* and incorporated room set-up of equipment and supplies along with the application of the team roles in a simulated cardiac arrest. The video highlighted components using the TeamSTEPPs model during a simulated cardiac arrest.

During the annual competency evaluation program held in May, 2012, all registered nurses in the emergency department were required to review the code team resuscitation self learning module, watch the *perfect code* video, and attend a mock code (simulated cardiac arrest event) skill station to perform a return demonstration of the three code team roles using a competency validation method of evaluation. All emergency department registered nurses were required to be competency trained on emergency standing orders as part of their employment. Health care partners were trained in June, 2012. Healthcare partners were required to review the code team resuscitation self learning module and attended a one hour mandatory training on room set-up, supplies and discussion of their role in performing effective and uninterrupted chest compression.

Weekly mock code sessions were conducted in the emergency department in the months of July and August, 2012 for all emergency department staff including emergency department physicians. Simulated or mock code events serve as a method for staff to practice the various team roles and receive feedback in the form of team debrief. Mock code sessions are now conducted twice a month in the department led by the emergency department advanced clinician team. Leadership training was offered for all emergency department nurses who were interested in being assigned the code nurse team leader role. Initial classes were held in June, July and August, 2012 focusing on leadership skills, knowledge and attitude using the Team STEPPS model in lecture, and role playing through simulated scenarios. A total of 67 nurses attended the four hour training. All of the emergency department clinical leads and advanced clinicians attended the leadership training in June and now serve as mentors for staff in the department.

Phase 5: Integration to Orientation and Ongoing Education

Code nurse team leader classes are now offered throughout the year for emergency department RN's. The code team resuscitation self learning module was included in our emergency department orientation program and emergency standing order (ESO) study guide. Additionally, it was located on the department website as a reference. All new hire registered nurses were required to complete the competency team training prior to being assigned to the code team. Monthly mock codes are conducted by the advanced clinician team.

Data analysis

The Emergency department educator completed chart audits during a six month period pre and post practice change utilizing a resuscitation data collection tool (see Appendix E)

Analytic strategies

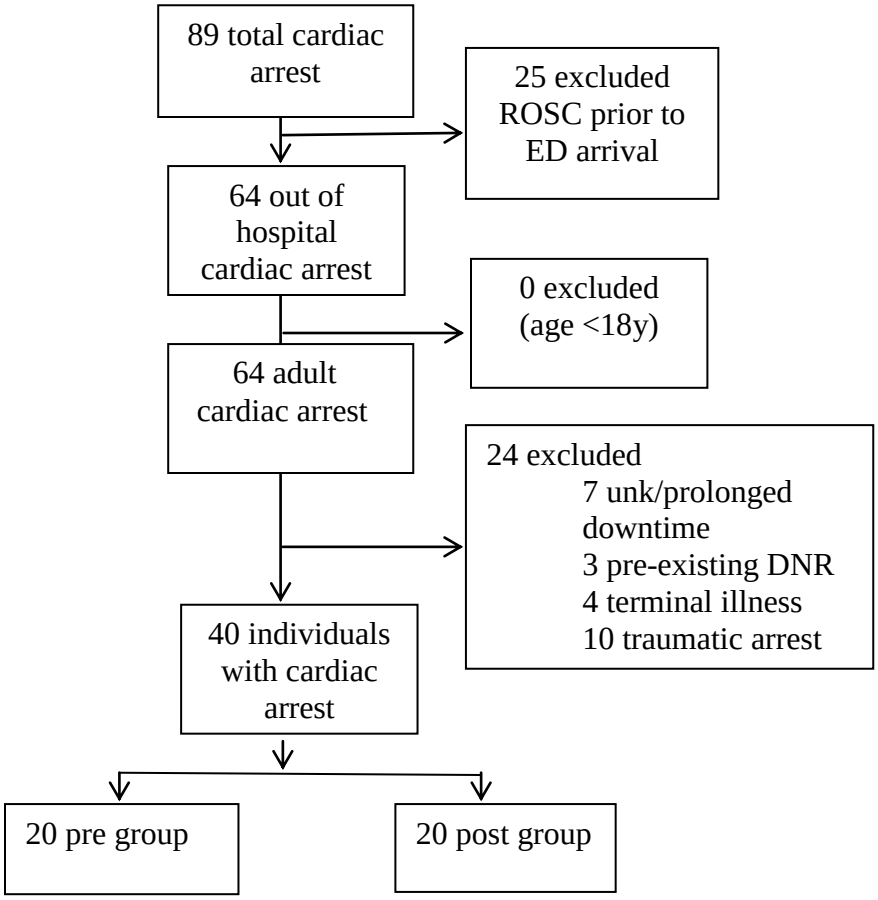
Descriptive statistics were utilized to calculate the percentage, means, medians and standard deviations. The Pearson Chi-square test and t-test were used to analyze the results. The Pearson Chi-square test was used to compare the groups in the pre and post group. The t-test was used to analyze the difference between two means. Continuous variables were presented as a mean (SD) and analyzed by using the t-test. Correlations were performed among the outcome variables using Kendall's tau_b and Spearman's rho test. A statistician was consulted to calculate the results. Data analysis was performed using the SPSS version 18.0. For the purpose of this study significance level was set at 0.05.

Chapter Four

Results

The overall aim of this study was to evaluate patient outcomes using a nurse team leader approach that was initiated in June 2012 for the management of out of hospital cardiac arrest in the emergency department as compared to previous clinical practice prior to June 2012. The project was evaluated using patient outcome analysis with a retrospective chart review. A total of 89 charts were coded as out of hospital cardiac arrest during the data collection period. Sixty four met the inclusion criteria of age >18 years of age and requiring full cardiopulmonary resuscitation (CPR). Twenty five patients obtained return of spontaneous circulation during emergency medical system (EMS) transport to the emergency department and therefore did not meet the inclusion criteria. Of the 64 patients, 24 were further excluded based on the predetermined criteria. Patients excluded included seven patients with unknown or prolong downtime, three with pre-existing DNR status, four with a terminal illness and ten with traumatic arrest (Figure 1). The remaining 40 patients met inclusion criteria with 20 in the pre group and 20 in the post group therefore underwent further evaluation in this analysis. The significance reported in the results should be interpreted with caution due to the small sample size.

Figure 1. Flow Diagram of patient enrollment in the pre and post group analysis



Demographics

A total of forty patients were studied. A Pearson Chi-square t-test was used to examine differences between the two groups. Significance should be interrupted with caution due to the small sample size. There were no differences in age or gender between the two groups. The pre group had a mean patient age of 68.85 years (SD ± 12.9; range, 40 -88 years). The post group had a mean patient age of 69.50 years (SD ± 12.8; range, 41-90 years). In the pre group, 14 (70%) were male and 6 (30%) were female. In the post group, 13 (65%) were male and 7 (35%) were female. The event characteristics analyzed included; cardiac arrest witnessed or un-witnessed, bystander CPR performed, and initial cardiac rhythm. In comparing the two groups

there were no significant differences noted among witnessed arrest (χ^2, p =.028) with 12 in the pre group compared to 18 in the post group. There were no significant differences between the two groups in having bystander CPR performed with 13 of the 20 patients receiving bystander CPR in the pre group compared to 14 of the 20 patients in the post group. There were no significant differences between the pre and post group (χ^2, p =.183) with initial presenting cardiac rhythm of asystole, pulseless electrical activity (PEA), or ventricular fibrillation (VFIB) (Table 1).

TABLE 1

Event characteristics in the pre and post group analysis[a]

Event Characteristics	Pre group (n=20)	Post group (n=20)	χ^2, p value
Bystander CPR performed	13 (48.1)	14 (51.9)	.736
Witnessed arrest	12 (40)	18 (60)	.028
Initial rhythm Asystole PEA Vfib	 11 (64.7) 4 (30.8) 5 (50)	 6 (35.3) 9 (69.2) 5 (50)	.183

[a] Data are presented as No. (%) unless otherwise specified

Findings

The patient outcomes of interest in this study were survival and neurologic outcomes. Specific outcomes included: (a) return of spontaneous circulation (ROSC) in the emergency department, (b) survival to admission, (c) survival to discharge and (d) neurological outcome. There were no significant differences (χ^2, p =.058) in patients achieving ROSC in the pre group (7/20) compared to the post group (2/20). Patients who did not achieve ROSC but had an intervention of cardiopulmonary support in the emergency department showed no significance.

There were no significant differences between the two groups in the patients who had achieved ROSC and placed on therapeutic hypothermia treatment with six placed on therapy in the pre group compared to one in the post group (χ^2, p=.037). Nine patients survived to admission in the pre group with significance of (χ^2, p =.038) compared to three in the post group. There were no significant differences in survival to discharge with two in the pre-group and none in the post group. Neurologic outcome was not analyzed due to the lack of survival in the post group.

TABLE 2

Comparison of outcomes in the pre and post group analysis [a]

Outcomes	Pre group (n=20)	Post group (n=20)	χ^2, p value
ROSC in ED	7 (77.8)	2 (22.2)	.058
No ROSC- CPS	2 (40)	3 (60)	.633
Hypothermia Tx in ED	6 (85.7)	1 (14.3)	.037
Survival to admission	9 (75)	3 (25)	.038
Survival to discharge	2 (100)	0	.147

[a] Data are presented as No. (%) unless otherwise specified

Correlations

Correlations were conducted using Kendall's tau_b and Spearman's rho in the pre and post group. In the pre group, a statistically significant positive correlation was found between those that had ROSC in the ED to survival to admit, and therapeutic hypothermia treatment. A similar correlation was found between those who received therapeutic hypothermia treatment in the ED and survival to admit (Table 3). In the post group, there was a statistically significant positive correlation relationship found between those that had ROSC in the ED to survival to

admit, and therapeutic and hypothermia treatment in the ED. Caution should be used in the interpretation due to small sample size (Table 4).

TABLE 3
Correlations from pre group

Pre Group Sig. (2 tailed)	ROSC in ED	Hypothermia Tx in ED	Survival to admit
ROSC in ED Kendall's tau_b Spearman's rho		.004 .001	.000 .000
Hypothermia Tx in ED Kendall's tau_b Spearman's rho	.004 .001		.002 .000
Survival to admit Kendall's tau_b Spearman's rho	.000 .000	.002 .000	

TABLE 4
Correlations of post group

Post Group Sig. (2 tailed)	ROSC in ED	Hypothermia Tx in ED	Survival to admit
ROSC in ED Kendall's tau_b Spearman's rho		.003 .001	.001 .000
Hypothermia Tx in ED Kendall's tau_b Spearman's rho	.003 .001		
Survival to admit Kendall's tau_b Spearman's rho	.001 .000		

Chapter Five

The purpose of this project was to evaluate patient outcomes using a nurse team leader approach that was initiated in June 2012 in the management of out of hospital cardiac arrest in the emergency department. The patient outcomes of interest were survival and neurologic outcomes in patients. Specific outcomes included: (a) return of spontaneous circulation (ROSC) in the emergency department, (b) survival to admission, (c) survival to discharge and (d) neurological outcome. The literature showed a need to improve communication among team members to prevent medical errors (Bergs et al., 2005, Dunn et al., 2007 & Risser et al., 1999). The evidence recommends healthcare providers perform high quality CPR and minimize interruptions (Field et al., 2010). The literature also revealed resuscitation team performance improvements when leadership and/or team training was provided to healthcare providers (Cooper & Wakelam, 1999, Edelson et al., 2008, Hunziker et al., 2009, Makinen et al., 2007, Marsch et al., 2004, & Morey et al., 2002).

This project implemented education and training as recommended through the evidence to improve teamwork and nurse leadership using TeamSTEPPS as a model. It provided healthcare providers in the emergency department an opportunity to practice team roles and communication techniques within a mock event. Additional training was offered to nurses specific to leadership skills to empower nurse timing of events, introduce team skills such as pre-brief and de-brief and cross monitoring team adherence to resuscitation treatment guidelines. Through collaboration with emergency department leaders and front line staff, the resuscitation nurse led team model was successfully developed and implemented in the emergency department. This program has provided front line staff with structure and standardization among team roles to promote a less chaotic environment and the opportunity to practice skills not

frequently used in an ongoing basis among team members. This program allowed for nurses who were interested in developing leadership skills an opportunity for additional training and mentorship. The resuscitation taskforce initially met monthly to implement the practice change and now meets on an ad hoc basis.

The patient outcome results of this project should be considered within the context of the study design. The small number of subjects led to the inability to fully evaluate the impact of the evidence based practice change through analysis of patient outcomes of survival and neurologic function. There was not enough power to draw significance or relationship. The sample design considered seasonal variances by including similar months in both pre and post group from October through March.

Nine patients survived to admission in the pre group with significance of (χ_2, p =.038) compared to three in the post group. Two patients survived to hospital discharge in the pre group compared to none in the post group. Patients studied had an initial presenting rhythm on scene of asystole or PEA which accounted for 15 of the 20 cases in both the pre and post group. Therefore 75% of the patients in out of hospital cardiac arrest had a predictor of poor survival due to their initial cardiac rhythm (Sasson et al., 2010). The predicators of survival used by the pre-hospital setting for out of hospital cardiac arrest include the following five clinical findings of bystander witnessed arrest, EMS witnessed arrest, bystander CPR, a shockable cardiac rhythm defined as ventricular fibrillation or pulseless ventricular tachycardia, and ROSC in the field (Sasson et al., 2010). Sasson et al's meta-analysis of over 142,000 patients of out-of-hospital cardiac arrest reported an aggregate survival rate between 6.7 to 8.4% (Sasson et al., 2010).

Implications to Nursing

Since the implementation of the practice change, there has been significance in the clinical area in the nurse's empowerment and ownership of the entire code event. The code team now has a defined nurse leader using a structured team approach. Nurses are educated, mentored and supported to professionally grow and develop in the ability to lead a team. They continue to participate in monthly mock code events on the unit. Through the standardization of roles, team members are displaying more confidence and awareness of what is expected of them in the resuscitation of the patient. Observations reveal that communication is geared towards patient care in a more direct manner and orders are implemented in a more timely fashion. Information is shared openly in the debrief process and team members participate for learning and areas of improvement.

The emergency department team members are better prepared to allow family presence in a code now that roles have been defined. The ability to perform in front of a family member may be less stressful for staff now that there is a clear leader of the code and specific roles that they have been trained to and feel comfortable doing in a mock simulated experience. A family facilitator role is now being developed with plans to implement. A culture shift has occurred in the department in who can perform CPR. Only trained personnel are assigned to the compressor role and learning opportunities to practice for students are now offered in mock events.

The emergency department provides specialty training programs to onboard nurse residents and new to level of care nurses. Since 2012, the department has trained 27 nurses to the specialty of emergency nursing. Many nurses come with little to no experience of being in a code. Through the orientation process and ongoing mock code events, nurses can participate and practice the various team roles. Experienced clinicians mentor novice nurses to the resuscitation

code team process. Through the implementation of the debrief process, the team shares what went well and areas for improvement. Lessons learned are shared openly in various forums such as the change of shift report or monthly staff meeting.

Nurses are taking an active role in assessing and re-assessing the need for supplies and equipment to assist the team in the resuscitation room. The resuscitation taskforce is currently leading a department trial to evaluate the newest technology of a device that performs automatic chest compressions.

Study Limitations

This study was conducted in a southern California emergency department and findings may be limited to this population area compared to other emergency department populations. The study was retrospective in design and only evaluated patients in full cardiopulmonary arrest presenting to the emergency department. Patients who achieved ROSC in the pre-hospital setting prior to arrival were excluded. This represented a small limitation in the study design to further evaluate if the team and leadership training impacted neurologic outcome within this specific group of patients. The group of patients that achieved ROSC prior to arrival may not have had a return in neurologic function and still require post resuscitative measures as it relates to survival or neurologic outcomes. Another limitation was differences between the two groups that may have existed and not captured in the data analysis, such as severity of illness or co-morbidities.

Future Research

The literature shows that communication failure among team members has been attributed to preventable medical errors (Bergs et al., 2005, Dunn et al., 2007 & Risser et al., 1999). Through the standardization of team roles and responsibilities during a code along with

tools to enhance communication, healthcare providers can start to minimize potential future errors and delay in care.

The design of the study did not allow for evaluation of the perceptions from emergency department staff about the perceived advantages and disadvantages of initiating a nurse leadership and teamwork training program. It may be of value to explore the relationship of human behaviors such as motivation and attitude that may influence team performance and leadership thereby enhancing patient outcomes. Additional research is needed in this area to further evaluate the impact of a nurse leadership approach in resuscitation.

Through nurse leadership, emergency departments can develop a systematic quality review process using the Utstein method for collecting data of out of hospital cardiac arrest. The development of a peer review process to review cases for areas of improvement and learning in post arrest care. A process to monitor team compliance to the clinical practice guidelines through adherence of timing of events with CPR duration, medication administration, and the utilization of team tools such as pre-brief, de-brief and observations of team communication use of call outs and closed loop communication.

Conclusion

In the last decade, studies have shown that outcomes vary among the EMS and hospital organizations leading to improvement efforts through strengthening the chain of survival (Gaieski et al., 2012). Observational studies reveal practice varies with implementation of resuscitative guidelines (Abella et al., 2005 & Wik et al., 2005). The 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science recommend leadership and teamwork training to be included in advanced life support courses (Soar et al., 2010). The implementation of an evidence based nurse led resuscitation team

training program in the emergency department can promote teamwork and empowerment among staff. The positive responses from the emergency department staff has led to a plan to continue the resuscitation team model and nurse led timing of events as the standard for the unit.

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Appendix A

PLNU IRB
Expedited Review
1241

DATE: June 14, 2013
PI: Wyma, Heather
Additional Investigators: Chris Walker, Annette Austin
Faculty Advisor: Jeanne Maiden, PhD
Title: Improving outcomes in out-of-hospital cardiac arrest

The research proposal was reviewed and verified as an expedited review under category 7 and has been approved in accordance with PLNU's IRB and federal requirements pertaining to human subjects protections within the **Federal Law 45 CFR 46. 110**. Your project will be subject to approval for one year from the date of approval.

If your project is being conducted in an educational setting, please note that you must also comply with the Family Educational Rights and Privacy Act regulations 20 U.S.C. 1232g(b)(1)(F) of the setting. Please consult the host school for FERPA or other internal policies that may apply to your project.

After completion of your study or no later than the same month and day in 2014, you must submit a summary of your project or a request for continuation to the IRB. If any changes to your study are planned or you require additional time to complete your project, please notify the IRB chair.

For questions related to this correspondence, please contact the IRB Chair, Patricia Leslie, at the contact information below. To access the IRB to request a review for a modification or renewal of your protocol, or to access relevant policies and guidelines related to the involvement of human subjects in research, please visit the PLNU IRB web site.

Best wishes on your study,

Patricia Leslie, Ph.D., M.A. – S.S.A.
Department of Sociology and Social Work
Director, Social Work Program
IRB Chair

Point Loma Nazarene University
3900 Lomaland Dr.
San Diego, CA 92106
619.849.2676
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Appendix B

Sharp IRB approval

SHARP
Institutional Review Board
8695 Spectrum Center Blvd
San Diego, CA 92123
P (858) 499-4836 / F (858) 499-3105
http://sharpnet/irb/ www.sharp.com/research
E-mail: research@sharp.com

130584
Wyma
05/15/2013
8-4

May 23, 2013

Heather Wyma, BSN
Sharp HealthCare
Sharp Memorial Hospital
7901 Frost St.
San Diego, CA 92123

RE: IRB #130584
Improving outcomes in out-of-hospital cardiac arrest in the Emergency Department

Dear Ms. Wyma:

The Sharp HealthCare Institutional Review Board (IRB00000920; FWA00000084) has reviewed and approved your application for the above-referenced research activity in accordance with 45 CFR 46.110(b)(1), Category 5. This approval includes:

- Waiver of authorization per 45 CFR 164.512(I)(2)
- Waiver of informed consent allowed per 45 CFR 46.116(d)(1-4)
- ED Resuscitation Team Training Study Guide (Info only; Apr2012)
- SMH Critical Care Emergency Standing Orders (ESO) Standardized Procedure and Code Blue Study Guide (Info only; Apr2012)
- Code Team Assignments (Info only; no version date)
- Resuscitation Data Collection Key (20May2013)
- Resuscitation Data Collection Tool (Rev20May2013)
- Resuscitation Database (20May2013)

This action will be reported to all committee members at the May 15, 2013 meeting.

The following site(s) and site personnel are approved:

Site: Memorial

Principal Investigator: Heather Wyma, BSN

Study Coordinator: None

Sub-investigators and Other Site Personnel:
Walker, Christopher T. MS, RN Austin, Annette BSN Ozeki, Katharine BS

The IRB reference number is 130584. Please include this reference number in all future correspondence relative to this research activity.

As a reminder, it is the responsibility of the Principal Investigator to submit periodic status reports to the IRB. Periodic review of this research activity may be conducted via an expedited process and is scheduled for inclusion on the April 16, 2014 IRB meeting agenda. Approval for this research activity will expire if periodic review is not conducted on or before May 8, 2014. Please provide a completed Continuation Request with required supporting documentation to research@sharp.com no later than April 1, 2014 to assure timely review and continuation of this research activity.

Changes or amendments to the research activity protocol, informed consent documents, and to other research activity-related documents, as well as new documents, tools or advertisements to be utilized as part of this research activity, must be reviewed and approved by the IRB before changes are implemented.

It is the policy of Sharp HealthCare IRB that the investigator(s) submit a copy of any abstracts, papers, manuscripts, posters, presentations, articles, etc. to the IRB prior to publication or dissemination. Sharp HealthCare would expect that if the results of the research project came to publication, their role would be properly recognized in the research or have the opportunity to have the organization's name withheld. This also gives the organization the opportunity to prevent disclosure of data or information that is beyond the scope of the research agreement.

Thank you and please feel free to contact me at (858) 499-4836, if you have any questions.

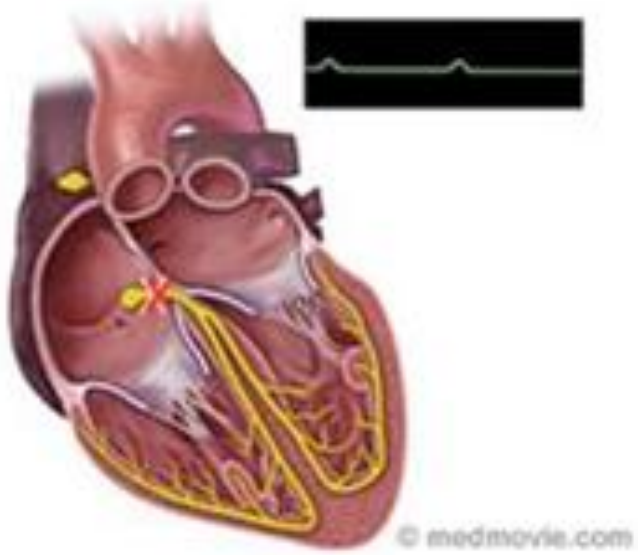
Sincerely,

Caryn L. Burgess, CIP
IRB Specialist

Enc.

Appendix C

ED Resuscitation Team Training Study Guide



Created by SMH ED Resuscitation Task Force
April 2012

Why the change?

The best outcome for a coding patient to achieve return of spontaneous circulation (ROSC) is a cohesive, well trained team of medical personnel

- Standardizing the process of how a code runs in our ED is, really, what is best for the patient
- This change in our culture is about our patients and achieving the best outcomes for them
- According to the 2010 American Heart Association guidelines, "Resuscitation skills are often performed simultaneously and healthcare providers must be able to work collaboratively to minimize interruptions…"
- In addition……

Does this look familiar?

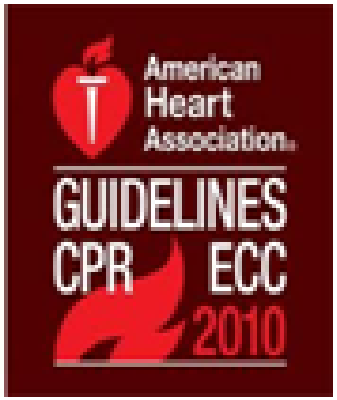
Less chaos + Less clutter + set team members = better patient care & outcomes.

(this picture is not from our ED)

Evidence Based Practice

- Clinical Best Practice

- 2010 AHA guideline's for CPR and Emergency Cardiovascular Care focused on resuscitation science and guidelines that are most important
(AHA guidelines CPR ECC 2010)
- The guidelines are based on an international evidence evaluation process that involved hundreds of resuscitation scientists and experts
(AHA guidelines CPR ECC 2010)
- Our ED Resuscitation team at Sharp Memorial will be prepared to assure that these guidelines are upheld to the highest standards



Evidence Based Practice

- Clinical Best Practice

Highlights of the 2010 AHA guidelines

- Change in CPR sequence from A-B-C to C-A-B
- Continued emphasis on high quality, chest compressions by minimizing interruptions, compressing at a rate of 100/minute and a depth of 2 inches to assure full recoil of the chest and to avoid excessive ventilation.
- 1 shock for VF and pulse less V-Tach vs. 3 stacked shocks.
- Atropine is no longer used for PEA/Asystole.

Evidence Based Practice

- Clinical Best Practice

- Cardiopulmonary arrest data is benchmarked against the "Gold Standards" of the National Registry of Cardio-Pulmonary Resuscitation (NRCPR):
  - Time event recognized to first chest compression ≤ 1 minute
  - Time event recognized to first defibrillation ≤ 3 minutes (initial rhythm is VF or pulseless VT)
  - Biphasic defibrillation shock provided at ≥ 120 joules (greater than 12 years old and/or 50kg)
  - Subsequent shock delivered ≥ 2 minutes from previous shock (allow **full 2 minutes** of chest compressions).
  - Time pulselessness recognized to first IV/IO Epinephrine ≤ 5 minutes
  - Time event recognized to first assisted ventilation ≤ 1 minute

Evidence Based Practice

- An Effective Team

- The team approach to a resuscitation is emphasized in many research realms
- AHA 2010 guidelines states "There is an increased focus on providing CPR as a team"
- The systematic approach to a critically ill patient by a team competent group…preserves a teams focus and prevents errors.[1] (Xiao, Y. 1998)
- Patient safety can be improved by specific organizational steps [2](Wellick and Adam, 2008)

How we are going to do this….

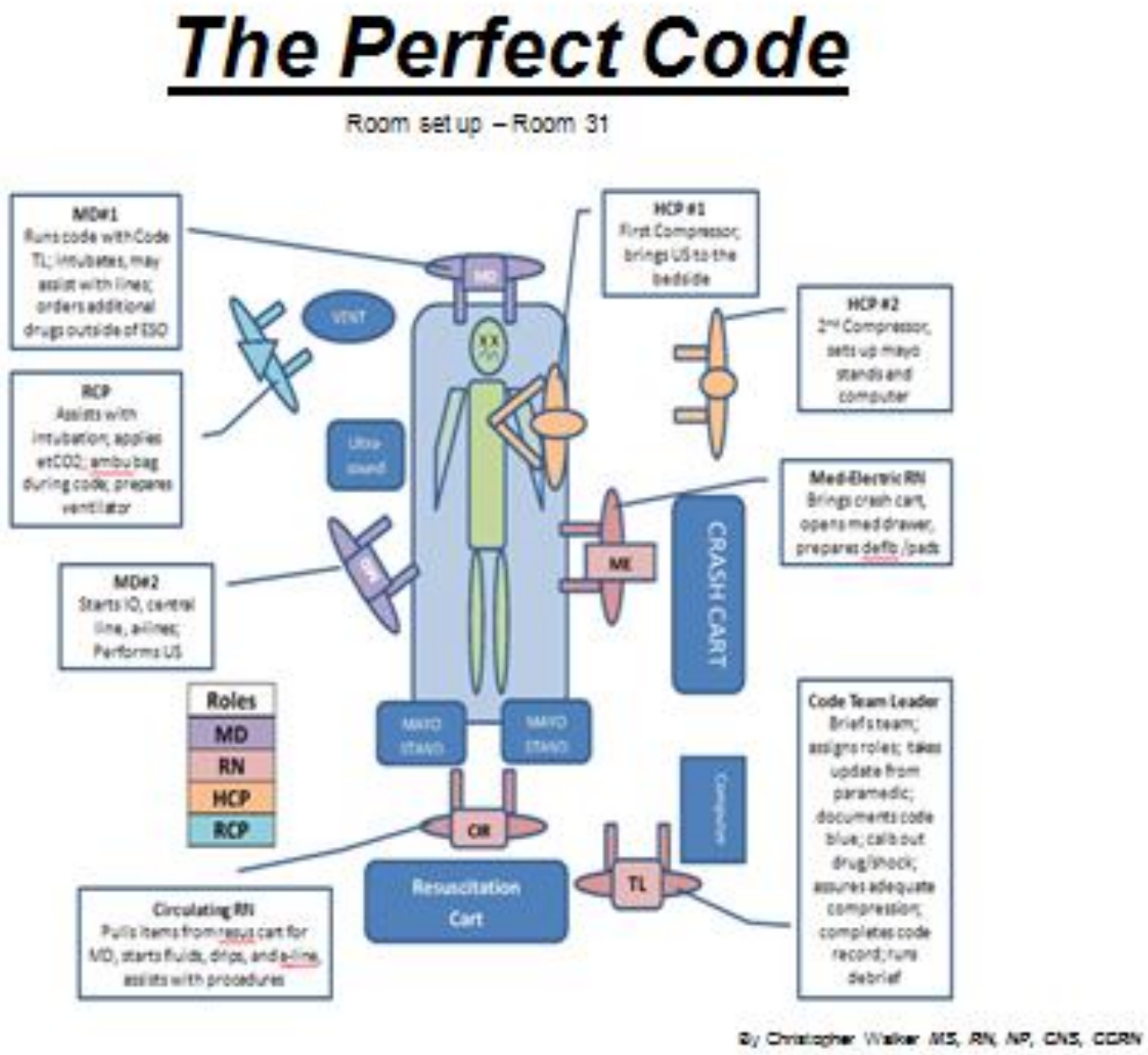
- This study guide and attached information will provide a study pathway for ED RN's/HCP's to learn about "The Perfect Code" and be prepared for CEP (Competency Evaluation Program) also known as Skills Day
- The ED RN will be responsible for coming to all CEP skills stations prepared and ready for testing on competency requirements
- All RN's will be required to take their annual ESO exam at CEP
- At the Mega Code station, the ED RN will be evaluated to assess competency, ability to perform as a code team member and potentially as a code **team leader**
- All HCP's will be trained

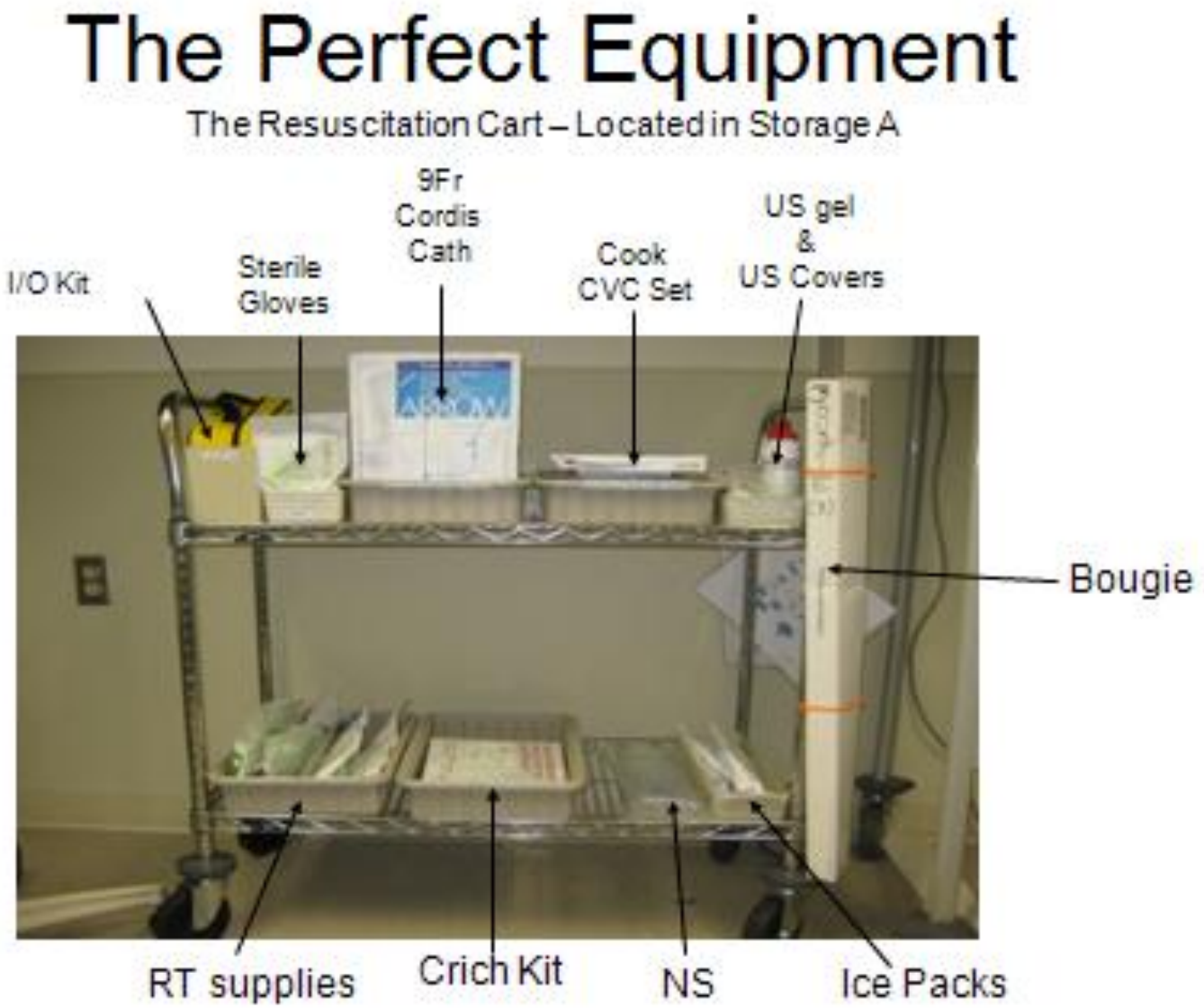
The beginning of our team…..

- The *code team* consists of…..
  - 2 MD's (ER A and another available ERMD)
  - 3 RN's (code team leader, MERN (medication/electric RN), and Circulating RN)
  - 3 HCP's (2 chest compressors, 1 circulator if needed)
- *The code room*; Bed 32 in the trauma room (may change due to trauma room availability)
- The code team will congregate for *inbound ambulance patients only*
- The code team will be identified at safety briefing daily
- Team Leaders, Trauma Float, TNTL, Charge Assist, and HCP's are the most likely candidates for these roles
- The code team members will be notified by the charge RN of inbound code and the code room location

Pre-brief Tool

- MICN report of patient
- Identify team member roles and assure understanding of responsibilities
- Assure environment is set up with equipment and only required staff
- Remind team members to call out therapies and medications
- Assure high quality, uninterrupted chest compressions


The Perfect Code
Room set up – Room 31
MD#1
Runs code with Code TL; intubates, may assist with lines; orders additional drugs outside of ESO
RCP
Assists with intubation; applies etCO2; ambu bag during code; prepares ventilator
MD#2
Starts IO, central line, a-lines; Performs US
Roles
MD
RN
HCP
RCP
Circulating RN
Pulls items from resus cart for MD; starts fluids, drips, and a-line; assists with procedures
HCP #1
First Compressor; brings US to the bedside
HCP #2
2nd Compressor; sets up mayo stands and computer
MedElectric RN
Brings crash cart; opens med drawer; prepares defib /pads
Code Team Leader
Briefs team; assigns roles; takes update from paramedic; documents code blue; calls out drug/shock; assures adequate compression; completes code record; runs debrief
MD
VENT
Ultra-sound
RN
ME
CRASH CART
MAYO STAND
MAYO STAND
OR
TL
Computer
Resuscitation Cart
By Christopher Walker MS, RN, NP, CNS, CCRN


The Perfect Equipment
The Resuscitation Cart – Located in Storage A
I/O Kit
Sterile Gloves
9Fr Cordis Cath
Cook CVC Set
US gel & US Covers
Bougie
RT supplies
Crich Kit
NS
Ice Packs

Roles and Responsibilities

All code team members will be assigned a role by the Code Leader

- Each role will have designated tasks that each team member will be responsible for completing.
- The following slides delineates responsibilities of each code team role.

The Perfect Role & Responsibilities

The "Code Leader"

- Pre-brief / De-brief
- Assure Resuscitation and Crash cart is at bedside.
- Delegation of RN/HCP role assignments in code room.
- Documentation of the code
- Pulse / Rhythm checks every 2 minutes *ONLY*.
- Ensure that drugs are given at appropriate timed intervals.
- Assure high quality, non-interrupted chest compressions by HCP.
- Encourage call out and check backs.
- Ensure the code room is a calm and quiet environment. Only code team members should be present.
- Confirm that the Resuscitation and Crash carts are restocked after use.

The Perfect Role and Responsibilities

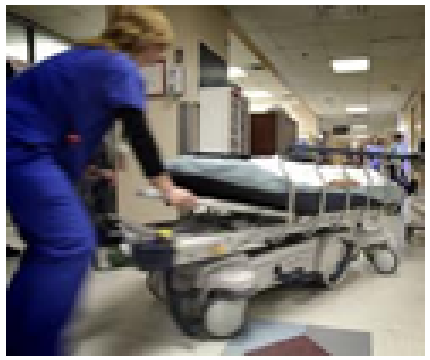
The ME-RN – Med/Electric therapy RN

- Bring crash cart into code room
- Place patient on crash cart monitor and defibrillation pads
- Assure patency of all IV / IO lines
- Administer drugs / fluids via IV/IO
- Administer defibrillation, cardio-version and pacing as required
- Call out of drugs administered
- Call out of electric therapy provided including the energy and reason
- Assure that there are no pauses for pulse / rhythm checks after defibrillation. Hands should be back on chest immediately after shock for compressions
- Assure quality, non-interrupted chest compressions by the HCP's

The Perfect Role and Responsibilities

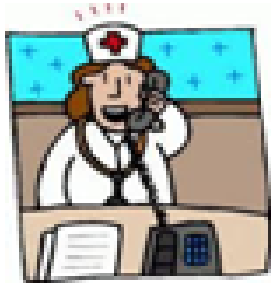
The Circulating RN

- Circulate throughout the code room for any tasks that need attention
- Assure monitor, BP and O2 saturation probe is applied to the patient
- Assure patient privacy with use of the curtains
- Apply ice packs to the axilla
- Perform I-Stat and obtain patient temperature
- Set up and assist with art lines, central lines, preparation of IVF/gtt's and IV medications
- Peripheral IV insertion
- Assist with IO insertion
- Assure quality, non-interrupted chest compressions by the HCP's



The Perfect Role & Responsibilities

The Charge RN



- Pre-assign code team members at daily safety briefings and adjust as needed
- Assign room for the inbound code
- Page social worker and chaplain for family support and contact
- Facilitate communication between family and code team
- Determine appropriateness of family presence during resuscitation and ensure a staff member is with family
- Provide additional resources as needed

The Perfect Role and Responsibilities

The HCP's

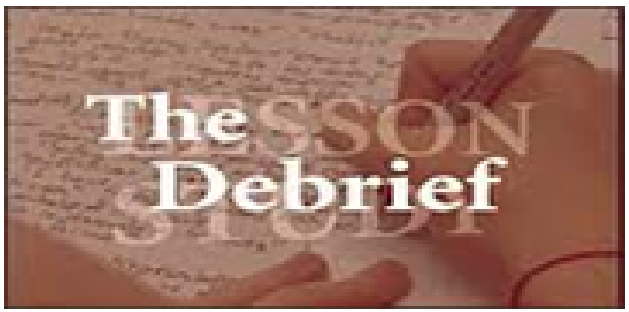
- Bring Ultrasound machine & Resuscitation cart to bedside
- Perform high quality, **uninterrupted** chest compressions
- Monitor co-HCP for high quality, uninterrupted chest compressions
- Switch with co-HCP every 2 minutes for chest compressions
- Place patient on the monitor/ BP cuff/o2 sensor
- Remove patient clothing
- Document and secure patient valuables
- Stay in the room at all times during the code
- A third HCP may be staged outside the code room as a runner or to replace a fatigued HCP

Debrief Checklist:

"Debriefing is a learner-focused, nonthreatening technique to help individual rescuers and teams reflect on and improve performance"

(AHA guidelines CPR ECC 2010)

- Was our communication clear?
- Were roles / responsibilities understood and practiced?
- Was Situation Awareness maintained?
- Workload distribution balanced?
- Did we ask for or offer assistance?
- Were errors made or avoided?
- Were runners utilized and for what purpose?
- ***What went well?***
- ***What should change?***
- ***What can we improve?***



What's the next step?

- Read the updated 2012 ESO and Mock Code Blue Study guide
- Watch "The Perfect Code" demonstration video on ED CEP website
- Study for the ESO test & return demonstration of the code team roles

Please come to CEP prepared! We will see you there

**All Images from goggle Images

Appendix D Date: _____

Code Team Assignments

(For inbound CODES/CPR - Charge RN pulls form & assigns Code Leader)

Code Leader : _____

MERN : _____

Circulator : _____

HCP 's : _____ / _____

MD: _____ / _____

PREBRIEF CHECKLIST:

- ☐ MICN report of patient
- ☐ Assigns team member their role & validates understanding of responsibilities
- ☐ Confirm environment/room is set up & appropriate required staff present
- ☐ Remind team members to call out therapies and medications.
  **TEAM LEADER calls out timing of Medication & Defib (confirm w/MD).
  **CIRCULATOR calls out Temp & Glucose.
- ☐ Assure high quality, uninterrupted chest compressions.

DEBRIEF CHECKLIST:

- ☐ Clear communication.
- ☐ Roles / responsibilities were understood.
- ☐ Adequate resources.
- ☐ Situational awareness maintained.
- ☐ Comments/Suggestions:

NOT PART OF MEDICAL RECORD
Return to SMH ED educator's box

Patient Label

Appendix E

Resuscitation Data Collection Tool

1. Patient Code#_____
2. Date of ED admission _____
3. Gender: Male (0)_____ Female(1)_____
4. Age_____ (enter ">89" for subjects age 90 and above)
5. Age <18: No (0)_____
   Yes (1)_____ STOP
6. Pre-existing DNR
   No (0)_____
   Yes (1)_____ STOP
7. Known terminal illness
   No (0)_____
   Yes (1)_____ STOP
8. Traumatic arrest
   No (0)_____
   Yes (1)_____ STOP
9. Unknown downtime or prolong field downtime
   No (0)_____
   Yes (1)_____ STOP
10. Was the Arrest:
    Witnessed (0)_____ Unwitnessed (1)_____
11. Bystander CPR performed
    No (0) _____
    Yes (1) _____
12. Initial Cardiac rhythm on scene:
    Asystole (0)_____
    PEA (1)_____
    Vfib (2) _____
    Pulseless VT (3)____
13. ROSC in the ED
    No (0) _____
    Yes (1) _____
14. No ROSC – CPS/ECMO
    No (0) _____
    Yes (1) _____
15. Therapeutic hypothermia initiated in the ED
    No (0) _____
    Yes (1) _____
16. Survival to hospital admission
    No (0) _____
    Yes (1) _____
17. Survival to hospital discharge
    No (0) _____
    Yes (1) _____
18. GCS score on discharge_____