IMPROVING NURSES CPR SKILLS, KNOWLEDGE, AND CONFIDENCE USING A RESUSCITATION QUALITY IMPROVEMENT PROGRAM

by

Reginaldo Horwitz

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__________________________________________
Signature Faculty Reader

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Signature Program Director
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Dedication

I dedicate this evidence-based practice project to my late father Raymundo Horwitz who instilled in me early in life the value of education and whose untimely demise from status asthmaticus spawned my interest in the healthcare field. I wish to dedicate this project to my late grandparents who inspired me to pursue my dreams and supported me wholeheartedly when I started my nursing journey more than a quarter of a century ago.

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Abstract

Large variations in survival rates for in-hospital cardiac arrests (IHCAs) remain despite substantial scientific advances in cardiac arrest care. Several studies have demonstrated that the quality of CPR is directly related to survival outcomes. The challenge is that CPR skills decay occurs rapidly after initial training and that there is a clear need to have more frequent assessment of resuscitation skills. The purpose of this evidence-based practice project was to improve CPR skills retention, knowledge, and confidence in local Veterans Affairs (VA) acute care nurses by utilizing American Heart Association’s (AHA) Resuscitation Quality Improvement (RQI) program. Nurses were surveyed after each brief RQI training intervention in weeks one and two as well as in weeks six and seven regarding their CPR skills, knowledge, and confidence. Data were collected from 101 nurses. The total group mean scores from the follow-up RQI CPR skills session showed improvement. The group composite passing scores of at least 90% showed a 12.68% increase in staff nurses achieving the higher mark at the repeated RQI CPR skills session. The CPR knowledge showed a 1.61% percentage increase in the overall mean percentage score of the first survey from 85.74% to 87.12%. Lastly, the CPR confidence level showed that the group mean percentage of staff reporting at least a confident level were maintained at 100% with at least 89% (n=90) of participants maintaining very confident to extremely confident levels. RQI, as a leadership-supported innovation for maintaining CPR competency improved skills retention, knowledge, and confidence.

Key words: Cardiopulmonary resuscitation; Poor CPR skills retention; CPR skills decay; Resuscitation quality improvement; RQI program
# Table of Contents

Acknowledgments .................................................................................................................. 2  
Dedication ............................................................................................................................... 3  
Abstract ................................................................................................................................ 4  
Chapter One: Overview of the Problem of Interest ................................................................. 9  
  Background Information ....................................................................................................... 9  
  Significance of the Problem ................................................................................................. 11  
  Question Guiding Inquiry (PICO) ....................................................................................... 13  
    Population ........................................................................................................................ 14  
    Intervention ..................................................................................................................... 15  
    Comparison ..................................................................................................................... 15  
    Outcomes ....................................................................................................................... 16  
  Summary ............................................................................................................................ 16  
Chapter Two: Review of the Literature .................................................................................. 17  
  Methodology ...................................................................................................................... 18  
    Sampling strategies ........................................................................................................ 18  
    Inclusion/exclusion criteria ............................................................................................ 19  
  Literature Review Findings ............................................................................................... 20  
  Discussion .......................................................................................................................... 25  
    Limitation of literature review ....................................................................................... 25  
    Conclusions of findings ................................................................................................. 26  
    Potential practice change ............................................................................................. 27  
  Summary ............................................................................................................................ 28
Chapter Three: Theory and Model for Evidence-based Practice

Theory

Application to practice change

Model for Evidence-based Practice

Application to practice change

Summary

Chapter Four: Pre-implementation Plan

Project Purpose

Project Management

Organizational readiness for change

Inter-professional collaboration

Risk management assessment

Organizational approval process

Use of information technology

Materials Needed for Project

Institutional Review Board Approval

Plan for Project Evaluation

Plan for demographic data collection

Plan for outcome data collection and measurement

Plan for evaluation tool

Plan for data analysis

Plan for data management

Summary
Chapter Five: Implementation Process ................................................................. 49
  Setting ............................................................................................................... 49
  Participants ..................................................................................................... 50
  Recruitment ..................................................................................................... 50
  Implementation Process .................................................................................. 51
  Plan Variation .................................................................................................. 52
  Summary .......................................................................................................... 53

Chapter Six: Evaluation and Outcomes of the Practice Change ....................... 55
  Participant Demographics ............................................................................. 55
    Table 1 ........................................................................................................... 57
    Figure 1 ........................................................................................................ 58
  Outcome Findings ........................................................................................... 58
    Improved CPR psychomotor skills ............................................................... 58
    Improved knowledge on high quality CPR ................................................... 59
    Table 2 ........................................................................................................... 60
    Improved CPR confidence ........................................................................... 60
    Figure 2 ........................................................................................................ 61
  Summary .......................................................................................................... 61

Chapter Seven: Discussion ................................................................................. 63
  Site Recommendations .................................................................................... 63
    Plans to sustain site change ......................................................................... 64
  Implications for Policy ..................................................................................... 65
  Links to Health Promotion ............................................................................. 67
Chapter One: Overview of the Problem of Interest

Worldwide, the incidence of out-of-hospital cardiac arrest (OHCA) ranges from 20 to 140 per 100,000 people (Berdowski, Berg, Tijssen, & Koster, 2010). In the United States, cardiac arrest is a major public health problem claiming more than 500,000 lives per year among children and adults. According to Meaney et al. (2013), cardiac arrest survival rates range from 3% to 16% for OHCA and from 33% to 49% for pediatric in-hospital cardiac arrest (IHCA). Large variations in survival rates for both out-of-hospital and in-hospital cardiac arrest remain despite substantial scientific advances and innovations in cardiac arrest care and resuscitation performance of healthcare professionals play a role in this wide discrepancy (Girotra et al., 2014; Perkins & Cooke, 2012). High quality cardiopulmonary (CPR) is the primary component influencing survival to discharge from cardiac arrest (Meaney et al., 2013). The purpose of this paper is to introduce an evidence-based practice (EBP) change project that focuses on the implementation of a Resuscitation Quality Improvement Program in the critical care setting.

Background Information

Major variability in survival outcomes have been found for cardiac arrest victims in the hospital setting, particularly when the location of the cardiac arrest or the time of day is considered (Peberdy et al., 2008). Although survival rates are greater than 20% within a hospital setting between the hours of 7 AM and 11 PM, this rate drops to 15% for the remaining hours of the day (Meaney et al., 2013). Inconsistencies in performance of both healthcare professionals and the systems in which they work likely contribute to these differences in outcome (Idris et al., 2015). According to Bhanji, Donoghue et al. (2015), defining the optimal means of delivering resuscitation education to address the critical determinants of survival may help to improve outcomes from cardiac arrest.
Several studies have demonstrated that the quality of CPR is directly related to survival outcomes hence poor-quality CPR should be considered a preventable harm. (Meaney et al., 2013; Morrison et al., 2013). In a large study by Stiell et al. (2012), when rescuers compress at a depth of <38 mm, survival to discharge rates after out-of-hospital arrest are reduced by 30%. Similarly, when rescuers compress too slowly, return of spontaneous circulation (ROSC) after in-hospital cardiac arrest falls from 72% to 42%.

According to Bhanji et al. (2010), the challenge is that CPR skills decay occurs rapidly after initial training and that there is a clear need to have more frequent assessment and reinforcement of skills. This reflects the emerging trend of continuous maintenance of competence and calls for a competency-based approach to resuscitation education rather than a time-based certification standard. In a study by Hernández-Padilla, Suthers, Granero-Molina, and Fernández-Sola (2015), the use of a student-directed strategy to retrain basic life support (BLS) and automated external defibrillator (AED) skills has resulted in a higher proportion of nursing students achieving and retaining competency in BLS/AED at three months when compared to an instructor-directed strategy.

At this North Carolina Veterans Health Administration (VHA) medical center, the IHCA survival-to-discharge rates in the last three fiscal years (FY) were 20% for FY2013, 40% for FY2014 and 25% for FY2015 (A. Mathis, personal communication, September 23, 2016). When benchmarked against survival outcomes from hospitals in the United States participating in the American Heart Association (AHA) Get With The Guidelines-Resuscitation (GWTG-R) program, there were opportunities for improvement at this federal facility given the national risk-adjusted rate of survival to discharge increased from 13.7% in 2000 to 22.3% in 2009 (Girotra et al., 2014). In 2010, the AHA Emergency Cardiovascular Care Committee (ECCC) set a 10-year...
goal of doubling IHCA survival rates from 19% to 38% by 2020 (Neumar, Eigel et al., 2015). The VA medical center has been utilizing the AHA traditional 2-year renewal cycles for BLS and advanced cardiac life support (ACLS) with concern about CPR skills competence if no program to prevent skills deterioration is instituted (M. Summey, personal communication, September 23, 2016).

**Significance of Clinical Problem**

Sudden cardiac arrest remains a leading cause of death in the United States. Outcome of IHCA is still poor with survival to discharge rates from 22.3% to 25.5% (Kleinman et al., 2015; Mozaffarian et al., 2015). For IHCA, two significant provider-dependent determinants of survival are early defibrillation for shockable rhythms and high quality CPR (Bhanji, Donoghue et al., 2015). High quality CPR should be established as the foundation on which all other resuscitative efforts are built (Bhanji, Finn et al., 2015; Kleinman et al., 2015; Meaney et al., 2013). However, there is significant variation in monitoring, implementation and quality improvement making high quality CPR both a challenge and an opportunity for organizations as they assess their resuscitation programs. Given that poor CPR quality is a preventable harm addressing CPR performance with quality improvement processes is vital in minimizing its occurrence and in impacting survival to discharge outcomes (Bhanji, Finn et al., 2015).

Elements of high quality CPR that showed improved survival from cardiac arrest include ensuring chest compressions of adequate rate and depth, allowing full chest recoil between compressions, minimizing interruptions in chest compressions and avoiding excessive ventilation (Kleinman et al., 2015). Furthermore, excellent outcomes can occur after well-choreographed, high quality CPR with effective chest compressions, ventilation and early defibrillation (Kronick et al., 2015). It is the quality of CPR performed that is crucial, because poor compliance with
recommended guidelines has been associated with lower survival (Abella et al., 2007; Stiell et al., 2012).

CPR training helps people learn and apply the cognitive, behavioral and psychomotor skills then develop the self-efficacy to provide CPR when necessary (Bhanji, Finn et al., 2015; Neumar, Shuster et al., 2015). Soreide et al. (2013) discussed extensively a formula of cardiac arrest survival that consists of high quality resuscitation science, effective education and training of lay providers and healthcare professionals and a well-functioning chain of survival. Integrating these three factors is critical to building and maintaining a strong and quality resuscitation program.

Healthcare providers do not retain CPR skills for long without refresher and practice sessions with universally poor skill performance documented in as little as three months after CPR training has been established (Berden et al., 1993; Meaney et al., 2012; Montgomery, Kardong-Edgren, Oermann, & Odom-Maryon, 2012; Sutton et al., 2011). Based on these several studies about CPR skills decay and suboptimal CPR performance, the AHA recognized that there must be a change in the frequency of resuscitation training since the quality of CPR is directly related to survival outcomes (Meaney et al., 2013).

Two-year retraining cycles are not optimal. More frequent training in BLS as well as retraining in advanced cardiac life support (ACLS) may be helpful for providers who are likely to encounter cardiac arrest in their work settings (Bhanji, Finn et al., 2015). The AHA’s Resuscitation Quality Improvement (RQI) program as an innovative approach to maintaining CPR competence is a timely response to the urgent Institute of Medicine (IOM) report on Strategies to Improve Cardiac Arrest Survival: A Time to Act. IOM’s fifth recommendation called for adoption of continuous quality improvements (Neumar, Eigel et al., 2015).
At the targeted VHA Care System, the hospital-wide Critical Care Committee and its Resuscitation subcommittee recognized the medical center’s in-hospital survival to discharge rates to be inconsistent, lower than the national benchmark average range on some years and slightly higher on other years. Survival rates at the VA medical center were as follows: FY2010 (22%), FY2011 (32%), FY2012 (18%), FY2013 (20%), FY2014 (40%) and FY2015 (25%). Given the role of high quality CPR in improving survival to discharge rates the chair of the Critical Care Committee has expressed great interest in improving the organization’s survival outcome by participating in AHA’s GWTG-R. The GWTG-R program would allow not just benchmarking with like facilities participating in the national CPR registry but also supporting strong adherence with evidence-based resuscitation guidelines. The VA medical center participated briefly in 2012 using grant funding for subscription and data gathering but could not sustain it after grant funds ceased in 2013 (A. Barbeito, personal communication, September 9, 2016).

RQI can provide a potential solution to this VA facility’s low survival to discharge rate and the reality of CPR skills decay with its traditional 2-year cycles of AHA retraining and renewal courses. According to Neumar, Eigel et al. (2015), RQI can possibly save participating hospitals scarce clinician time and dollars through brief quarterly training while maintaining staff’s CPR skills performance at a high level. The clinical problem guiding this EBP change project was the deterioration of CPR skills among BLS and ACLS providers who were currently in two-year retraining or renewal cycles and who respond to code blue activations within the medical center to provide basic and advanced cardiac life support services.

**Question Guiding Inquiry (PICO)**
EBP focuses on the need of integrating quality research into practice decisions to provide high-level and safe nursing care and promote optimal healthcare outcomes (Chinn & Kramer, 2015; Chism, 2016). EBP also decreases geographic variation in care and reduces costs (Melnyk, Gallagher-Ford, & Fineout-Overholt, 2017). According to Melnyk and Fineout-Overholt (2015), EBP also integrates the best evidence from high-quality studies with a clinician’s expertise and patient’s values and preferences. The formulation of a clinical question is usually the first step in the EBP process and the use of the PICO (population, intervention, comparison, & outcome) format to construct the clinical question jumpstarts the development of a search strategy that is effective in getting the best evidence in an efficient manner (Hall & Roussel, 2017; Melnyk et al., 2017). The PICO question that guided this EBP change project asked, “In acute care nurses (P), will AHA’s Resuscitation Quality Improvement (RQI) program (I) for BLS and ACLS training improve CPR skills performance or retention (O1), CPR knowledge (O2), and CPR confidence (O3)?”

Population. The population of interest needs to be explicitly described to focus the search and help retrieve the most relevant evidence (Melnyk & Fineout-Overholt, 2015). For this EBP change project, the acute care nurses in various units of the medical center, namely the emergency department (ED), surgical intensive care unit (SICU), the medical intensive care unit (MICU), the cardiac intensive care unit (CICU), the cardiac catheterization laboratory (CCL), the post-anesthesia recovery unit (PACU), vascular interventional radiology and recovery unit (VIRRU), the gastrointestinal clinic (GIC), the clinical education and simulation department (CESD) and the medical-surgical units (MSU) is the population of interest. This is a very diverse group of over 100 registered nurses (RNs) and licensed practical nurses (LPNs) from different
races and ethnic backgrounds. Staff nurses’ levels of education range from diploma-prepared to doctoral prepared nurses.

Acute care nurses generally work either day or night shifts ranging from 8 to 12 hours.

**Intervention.** The intervention may include but is not limited to any exposure or treatment being considered for the population of interest (Melnyk & Fineout-Overholt, 2015). For this EBP change project, AHA’s RQI, a high frequency, low dose training strategy for BLS and ACLS renewal to enhance CPR skills competence and confidence was utilized. Only those with current AHA BLS and ACLS completion cards were enrolled into RQI. RQI has scheduled quarterly psychomotor skills training consisting of adult or infant compressions and ventilations conducted at strategically located unit-based mobile skills and simulation stations (Edmonson, Klacman, & Tippy, 2016; Laerdal Medical, 2018). As part of the RQI curriculum, updated AHA online cognitive content divided into smaller sections was also assigned during RQI enrollment to boost BLS and CPR knowledge. Acute care nurses were surveyed after the RQI training manikin activity regarding their CPR performance, knowledge and confidence (Hernández-Padilla et al., 2015; Montgomery et al., 2012). The initial post-training RQI 10-item survey was conducted in weeks one and two while the second post-training RQI 10-item survey was completed two weeks later. At the time of RQI psychomotor skills assessment, actual CPR skills performance scores on compression and ventilation quality generated by the RQI computer program were collected and captured when nurse took the survey.

**Comparison.** The comparison requires special consideration as it may be appropriate for a given intervention. Such comparison can be a true control or it may not be appropriate or relevant (Melnyk & Fineout-Overholt, 2015). For this EBP change project, there was no comparison group as this project was developed for quality improvement and the population of
concern are all the same. The participant group was evaluated after each defined RQI intervention two weeks apart for improvement or retention of CPR knowledge, skills and confidence.

**Outcomes.** The outcomes identified in the clinical question enable the project manager to find evidence that explored the same outcome variable even though measurement of the variable may be done differently (Melnyk & Fineout-Overholt, 2015). For this EBP change project, the desired outcomes of the practice change were: 1) Improved CPR skills performance or retention; 2) Increased CPR knowledge; and 3) Increased CPR confidence. It is the goal of the RQI program that improving these outcomes can eventually contribute to higher IHCA survival rates.

**Summary**

Various studies in resuscitation education continue to demonstrate improved learning from “frequent, low-dose” versus “comprehensive, all-at-once” instruction (Bhanji, Donoghue et al., 2015; Mancini et al., 2010). Like the adage that practice makes perfect, there is substantial evidence to suggest that mastery learning is key to skills maintenance and retention and prevention of rapid decay in skills and knowledge after simulation-based learning. This will empower learners to achieve the highest standards for educational outcomes and abandon the goal of simply meeting the minimum standard (Bhanji, Donoghue et al., 2015). By doing so, performance and delivery of high quality CPR by competent clinicians can ultimately impact survival outcomes.
Chapter Two: Review of the Literature

For more than four decades, the American Heart Association (AHA) has published guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC) including early activation of emergency medical services (EMS) and early CPR (Neumar, Shuster et al., 2015). Over the past 35 years, numerous studies have demonstrated that healthcare professionals’ CPR skills are quickly lost (Broomfield, 1996; Fnesen & Stotts, 1984; Meaney et al., 2013; Moser & Coleman, 1992; Sullivan, 2015). Healthcare providers are often expected to provide high quality CPR when the clinical situation calls for it. However, clinical staff find themselves providing suboptimal CPR due to poor CPR skills retention (Fossel, Kiskaddon, & Stembach, 1983; Montgomery, Kardong-Edgren, Oermann, & Odom-Maryon, 2012; Sutton et al., 2011). Greig, Elliott, Parboteeah, and Wilks (1996) defined CPR skills retention as retaining the capacity to perform CPR effectively at a certain point in time after CPR training.

There are an estimated 209,000 in-hospital cardiac arrests (IHCAs) annually in the United States with low survival to discharge rates ranging from 22.3% to 25.5% (Mozaffarian et al., 2015). Numerous studies have demonstrated that the CPR quality is directly related to survival outcomes hence poor-quality CPR should be considered a preventable harm (Meaney et al., 2013; Morrison et al., 2013). The AHA recognized that there must be a change in the frequency of resuscitation training as two-year retraining cycles are not effective (Bhanji, Donoghue et al., 2015; Bhanji, Finn et al., 2015). The purpose of this integrative review of the literature was to discuss the relevant evidence for the implementation of AHA’s Resuscitation Quality Improvement (RQI), a low dose, high frequency simulated training approach with a robust feedback mechanism to maintain competence in CPR and improve CPR skills, knowledge and confidence levels.
Methodology

**Sampling strategies.** A comprehensive literature search was performed using the following electronic databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL) with Full Text, Cochrane, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cochrane Methodology Register, PubMed and Clinical Key (which includes MEDLINE and clinical guidelines). Keywords used in the Boolean or phrase search were: cardiopulmonary resuscitation skills, CPR skills retention, CPR skills decay, CPR skills deterioration, CPR skills loss, CPR competence, CPR competency, basic life support (BLS), CPR, BLS skills, BLS skills retention, BLS retention, AHA resuscitation, AHA CPR, and AHA CPR skills. Initially, the search was performed with no limiters to see how much evidence exists in the literature but with results in the thousands the advanced search easily allowed limits to be set as needed. The following limiters were used: English only, full text, academic journals, clinical trial and year ranges from 10 to 40 years.

The seven-level Rating System for the Hierarchy of Evidence was used to rate the literature chosen for inclusion as evidence. Melnyk, Gallagher-Ford, and Fineout-Overholt (2017) described the evidence levels as follows: Level 1 – a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs); clinical guidelines based on systematic reviews or meta-analyses; Level II - One or more RCTs; Level III - Controlled trials without randomization (quasi-experimental); Level IV - Case-control or cohort studies (studies of prognosis); Level V - Systematic review of descriptive and qualitative studies; Level VI - Single descriptive or qualitative study; Level VII - Expert opinion. The higher a methodology ranks in the hierarchy, the more likely the results accurately represent the actual situation and the more
confidence clinicians can have that the intervention will produce the same clinical outcomes (Melnyk & Fineout-Overholt, 2015).

**Inclusion/exclusion criteria.** When evaluating and deciding to include evidence for the evidence-based practice (EBP) change project, its relevance to the population (P), intervention (I), comparison (C) and outcome (O) question especially the planned intervention, was established. According to Melnyk and Fineout-Overholt (2015), it is important to conduct a rapid critical appraisal (RCA). Hence, for each selected study, the following overarching questions were asked:

1. Are the study results valid? (validity)
2. What are the results? (reliability)
3. Will the results help in implementing an EBP change project? (applicability)

The 2015 AHA Guidelines Update for CPR and ECC was reviewed by examining the evidence evaluation process utilized by the International Liaison Committee on Resuscitation (ILCOR) and AHA. The ILCOR has a very rigid critical appraisal that includes determining the level (quality) of evidence and establishing the class (strength of recommendations) using the grading of recommendation, assessment, development and evaluation (GRADE) Development Tool. GRADE reviews evidence to determine the confidence in the estimate of effect. A public comment period is also part of the evidence evaluation process (Morley et al., 2015). AHA guidelines related to the clinical question, the EBP change project and its related intervention were kept. The validity, reliability and applicability of the studies evaluated and included in the new AHA guidelines update boosted confidence in the EBP change project and the elements identified in the clinical question. All evidence levels were considered for the review. However, only levels I, II, and III emerged from the selected literature. Majority of the studies were level
II, which all indicated CPR skills decay and recommendations for increased frequency of psychomotor skills practice or training using various instructional methods to improve CPR quality and eventually increase survival outcomes.

**Literature Review Findings**

CPR skill retention is affected by the methods of instruction used to deliver resuscitation education. In a systematic review by Mäkinen, Niemi-Murola, Mäkelä, and Castren (2007) of various methods of assessing CPR skills, studies were considered relevant if they included an educational intervention, a study population of adult life support providers randomized and divided into groups and an evaluation or assessment of the performance. Twenty-five RCTs fulfilled these inclusion criteria. In 17 studies, the participants were English-speaking laymen. Twelve studies were published by groups working in the United Kingdom, five from the United States, three from Norway, two from Netherlands and one each from Finland, Canada and Australia. Findings indicated a wide variation of checklists, of which the most commonly used were the Cardiff assessment of response to a cardiac arrest scenario and the CPR performance evaluation using the Resusci Anne printout. Studies on new teaching technologies aimed at reducing reliance on instructors indicated better skills acquisition and retention. Video self-instruction studies demonstrated superior results to traditional teaching. An audible feedback system helped trainees to achieve correct ventilation and compression technique. An automated voice advisory manikin (VAM) system improved long-term retention of practical skills better than overtraining (Mäkinen et al., 2007).

Sullivan (2015) conducted an integrative review on instructional strategies to improve nurses’ retention of CPR priorities. Within that review, there were six Level I studies which were RCTs, two quasi-experimental Level II studies, and five Level III observational studies. In
general, this review included high level, good quality studies with good designs and adequate sample size. Some of the study samples consisted of 60–70 participants while others had about 600 volunteers. The evidence revealed several common themes as instructional strategies including simulation and mock codes, video training, and e-learning. The use of deliberate practice or frequent structured practice sessions improving skills retention was reported in numerous studies (Sullivan, 2015).

In Madden’s (2006) quasi-experimental time-series design study, a pre-test, CPR training, post-test, and re-test were conducted. CPR knowledge was assessed by a multiple-choice assessment and psychomotor skills were assessed by observing CPR performance on a Resusci-Anne skill-meter manikin. The results demonstrated an improved performance immediately post-training in both skills/priorities ($p < 0.000$) and knowledge ($p < 0.000$). The 10-week retest revealed a deterioration in performance in both skills/priorities ($p < 0.000$) and knowledge ($p = 0.004$) from the immediate post-test indicating the skill deterioration that is noted in the literature but those scores were an improvement over the initial pretest (Madden, 2006).

Hamilton (2005) conducted an integrative review of the literature on nurses’ knowledge and skill retention following cardiopulmonary resuscitation training. Of 105 primary and 157 secondary references, 24 met the criteria and were included in the final literature sample. Four studies were found pertaining to cardiac arrest simulation, three to peer tuition (instruction), four to video self-instruction, three to the use of different resuscitation guidelines, three to computer-based learning programs, two to VAMs, two to automated external defibrillators, and one to self-instruction. Due to these numerous findings from the integrative review by Hamilton that indicated improved CPR skills performance and retention using different instructional strategies,
recommendations were developed. Resuscitation training should be based on in-hospital scenarios and current evidence-based guidelines and should be taught using simulations. Staff should be assessed using a manikin with feedback mechanism or an experienced instructor to ensure that CPR skills are adequate. Remedial training must be provided at least every 3–6 months to prevent deterioration of the skills and knowledge. CPR equipment should be made available at ward/unit level to allow self-study and practice to prevent deterioration between updates. Video self-instruction has been shown to improve competence in resuscitation (Hamilton, 2005).

In the Hernández-Padilla, Suthers, Granero-Molina, and Fernández-Sola (2015) randomized controlled study, 177 European nursing students were randomly assigned to either an instructor-directed or a student-directed four-hour retraining session on BLS and automated external defibrillator (AED) and assessed at pre-test, post-test and three-month retention test. Hernández-Padilla et al. measured three outcomes: a multiple-choice questionnaire (cognitive knowledge), the Cardiff Test and the Laerdal SkillReporter software (psychomotor), and Basic Resuscitation Skills Self-Efficacy Scale (BRS-SES). Study findings demonstrated that using a student-directed (SD) strategy to retrain BLS/AED skills resulted in a higher proportion of nursing students achieving and retaining competency at three months when compared to an instructor-directed (ID) strategy. The difference in proportions of students who achieved a high level of self-efficacy at post-test and at three-month follow up was significantly higher in the SD group when compared to the ID group.

A RCT by Oermann, Kardong-Edgren, and Odom-Maryon (2011) examined the effects of monthly practice on nursing students’ CPR psychomotor skill performance. Six hundred four nursing students were randomly assigned to a six-minute monthly practice group or a control
group with no practice option. Oermann et al. examined the effects of short monthly skills practice on nursing students’ CPR psychomotor skills performance at 3, 6, 9, and 12 months compared to a control group without skills practice, and of repeating the initial BLS course at 12 months. Oermann et al. found that skills performance and retention were improved over baseline with brief monthly practice sessions. At three or six months, the practice or experimental group had significantly better scores as compared to the control group in compressions with adequate depth ($p = 0.005$) and adequate ventilations ($p = 0.004$).

In the Kardong-Edgren, Oermann, Odom-Maryon, and Ha (2010) RCT, two instructional modalities for nursing student CPR skill acquisition were compared. Six hundred and six nursing students from 10 schools of nursing throughout the United States were randomized by school to course type. After successful course completion, students performed three minutes each of compressions; ventilations with bag-valve masks (BVM); and single rescuer CPR on a Laerdal Resusci Anne SkillReporter manikin. There were no differences in compression rates between the two courses. However, students with HeartCode BLS with VAM training performed more compressions with adequate depth and correct hand placement and had more ventilations with adequate volume than students who had instructor-led (IL) courses particularly when learning on hard molded manikins. During single rescuer CPR, students who had HeartCode BLS with VAM training had more compressions with adequate depth and ventilations with adequate volume than students with IL training. Results of this study provide evidence to support the use of HeartCode BLS with VAM for training nursing students in CPR (Kardong-Edgren et al., 2010).

Montgomery et al. (2012) conducted a RCT that evaluated the effects of brief monthly refresher training on CPR skill retention, confidence, and satisfaction with CPR skill level of 606 nursing students from ten different US schools. Students were randomized to course type,
HeartCode BLS or an IL course, and then randomized to a practice group, six minutes of
monthly practice or no further practice. End-of-study survey results were compiled and reported
as percentages. Short answer data were grouped by category for reporting. Fewer HeartCode
BLS students were satisfied with their CPR training compared to the IL students. Students who
practiced CPR monthly were more confident than students who did not practice. Monthly
practice improved CPR confidence, but initial course type did not. Students were most satisfied
when they participated in the IL courses and frequent practice of CPR skills.

Broomfield (1996) conducted a quasi-experimental research study to investigate the
retention of basic CPR skills and knowledge by qualified nurses following a course in
professional development. The 19 nurses participating in the research were qualified staff
undertaking a professional development course, which included a refresher on basic CPR skills
and included some discussion regarding advanced techniques. The 1993 guidelines issued by the
Resuscitation Council were used, which also aided in the design and use of the two research
tools, namely an eight-point skills-testing observation tool and a 26-point knowledge-testing
questionnaire. While a three-hour update in CPR skills revealed an initial improvement, the
decrease in retention of skills 10 weeks later was significant ($p = 0.0000$). The update in CPR
knowledge also revealed an initial improvement but the decrease in knowledge retention 10
weeks later was significant ($p = 0.0000$). The results indicated that the retention of CPR skills
and knowledge quickly deteriorate if not used or updated regularly. Therefore, this research
supports the importance of CPR refresher courses on a regular basis (Broomfield, 1996).

Sutton et al. (2011) investigated the effectiveness of brief bedside CPR training to
improve the skill retention of hospital-based pediatric providers using a prospective, randomized
interventional trial design. To evaluate CPR quality, CPR recording/feedback defibrillators were
used. Eighty-nine basic life support-certified, hospital-based providers were randomly assigned to 1 of 4 study arms: (1) instructor-only training; (2) automated defibrillator feedback only; (3) instructor training combined with automated feedback; and (4) control (no structured training). Each session (time: 0, 1, 3, and 6 months after training) consisted of a pre-training evaluation (60 seconds), booster training (120 seconds), and a post-training evaluation (60 seconds). Seventy-four (83%) participants completed all brief (two minutes) and frequent CPR practice sessions within a six-month period. Retention of CPR skills was 2.3 times (95% confidence interval [CI]: 1.1–4.5; \( p = 0.02 \)) more likely after two trainings and 2.9 times (95% CI: 1.4–6.2; \( p = 0.005 \)) more likely after three trainings. The findings demonstrate that brief bedside booster CPR training improves CPR skill retention (Sutton et al., 2011).

**Discussion**

*Limitations of literature review.* Literature related to rapid CPR skill decay and the need for repetitive or more frequent skills practice prior to the biennial renewal cycle was abundant. Psychomotor skills deterioration by one year or less after initial training was well established yet there is no guidance as to the exact dosing and frequency of skills training. In all the nursing studies or where nurses and nursing students were participants in a combined study of healthcare providers’ CPR skill retention, most of the nursing study participants were female, it may be difficult to generalize such findings more broadly to other healthcare providers. Some of these studies also have a small population and sample size so generalizability is limited while in other studies the authors acknowledged the potential of selection bias given that CPR training participants were typically interested or enthusiastic volunteers and not participants randomly selected from the general healthcare provider population. Even in studies with good research
designs, many variables outside of the control of the researchers could be introduced between testing and retesting that would impact the outcome measures.

While improvements in CPR quality metrics were demonstrated with brief but more frequent skills practice during simulation using a manikin, there is no assurance of how well this would translate to improved CPR performance during actual resuscitation events. Another limitation identified was the variation in the instruments or tools used to measure CPR skills. While many of the studies reviewed utilized objective measurement tools such as improved versions of the Resusci Anne SkillReporter as technology improved over the years, other validated tools or scales to measure CPR performance were utilized in some of the studies that required raters with different levels of CPR expertise to make judgments on performance. Guidelines incorporated in such tools were standardized only to a country or continent. There is great potential for improvement in the use of standardized measurement tools with the release of ILCOR’s International Consensus on CPR and ECC Science with Treatment Recommendations in 2005.

**Conclusion of findings.** Rapid CPR skills decay is inevitable unless brief skills retraining, refresher or practice occurs more frequently. As early as two weeks from initial CPR training, psychomotor skills deteriorate (Fnesen & Stotts, 1984; Fossel et al., 1983). The most common recommendations from the studies included increasing the frequency of skills training while making the skills refresher sessions brief to reduce the burden on staffing and disruption on patient care (Bhanji, Donoghue et al., 2015). However, there was no set frequency and duration of CPR retraining recommended from the findings that are ideal for healthcare leaders, managers and educators to use as a guide for implementation. The AHA’s RQI program’s aim to maintain CPR competence is a timely response to the urgent Institute of Medicine (IOM) report
on Strategies to Improve Cardiac Arrest Survival: A Time to Act. IOM’s fifth recommendation called for the adoption of continuous quality improvements (Neumar, Eigel et al., 2015). This high-frequency, low dose approach appears counterintuitive and disruptive when compared to the traditional two-year renewal cycle of retraining and renewal that healthcare providers are used to. However, the ability to make the practice sessions available to staff members in their units provide the flexibility that adult learners seek and reduce the time staff are away from their units and patients. The intervention of implementing AHA’s RQI is well supported by literature evidence.

**Potential practice change.** Implementation of AHA’s RQI is an evidence-based approach that can improve CPR skills retention and reduce skills deterioration to ensure high quality CPR is provided during IHCA and resuscitation attempts. Utilization of the findings in practice signals alignment with the emerging trend of continuous maintenance of competence and calls for a competency-based approach to resuscitation education rather than a time-based certification standard that healthcare professionals have embraced as tradition for many decades. Furthermore, the implementation of RQI can impact patient outcomes by improving CPR quality, its main focus.

Procedures, protocols and policies can be developed or revised to reflect evidence-based guidelines on resuscitation education to support this innovative instructional strategy and ensure its compliance. Lastly, the evidence strongly suggested that utilizing an educational intervention that upholds adult education principles and allows for readily accessible, short deliberate CPR skills practice sessions and testing more frequently using low-fidelity simulation while incorporating audiovisual performance feedback and debriefing at the time of the CPR skills training can improve CPR skills retention and CPR quality.
Summary

CPR skills retention is not a new phenomenon. The lack of CPR skills retention or the rapid skills deterioration in healthcare providers has been explored and researched for more than 30 years and recommendations for reducing CPR skills decay have been advanced and articulated. However, there remains a wide variation in instructional strategies and educational approaches employed to reduce CPR skills decay. There is also a tendency to use educational strategies long held as the traditional way to maintain CPR competency. An EBP change project was developed to address the clinical problem of CPR skills decay with the implementation of RQI, a continuous quality improvement strategy identified by both the IOM and AHA recently. An integrative review of the literature revealed that CPR skills retention and poor quality CPR remain a major challenge in the clinical setting. The findings have consistently demonstrated that the quality of CPR is directly related to survival outcomes and that implementing a unit-based, self-directed, high frequency, low dose CPR training intervention that incorporates advances in computer technology including simultaneous audiovisual performance feedback and immediate debriefing after training. Therefore, it was imperative that the clinical problem was addressed urgently and decisively using all the best evidence that currently exists.
Chapter Three: Theory and Model for Evidence-based Practice

According to Fawcett and DeSanto-Madeya (2013), the structure of nursing knowledge is described as the structural holarchy of nursing knowledge that differentiates five components of nursing knowledge according to their level of abstraction. This holarchy of nursing (systems where the whole is governed by its parts) ranges from the most abstract to the least abstract or most concrete namely metaparadigm, philosophy, conceptual model, theory and empirical indicator (Cody, 2013; McEwen & Wills, 2014). The purpose of this chapter is to identify and describe both the theoretical structure and evidence-based practice (EBP) model for the change project. The conceptual and theoretical frameworks originated from the behavioral and cognitive theories of deliberate practice and self-efficacy, while the model for EBP suited for implementation is the Iowa Model of EBP to Promote Quality Care.

Theory

According to Melnyk and Fineout-Overholt (2015), identifying a theory is an important step in designing a clinical study to provide a framework. Nursing theory refers specifically to a distinct and well-articulated system of concepts and propositions rooted explicitly in a philosophy of nursing and intended solely to drive theory-guided, evidence-based nursing practice and research (Cody, 2013). Deliberate practice is defined as a structured and reflective activity, which is designed to develop a critical aspect of performance. Deliberate practice provides an opportunity for error detection and correction, repetition, feedback access and requires utmost effort, undivided concentration and full attention (Causer, Barach, & Williams, 2014). The theory of deliberate practice posits that development of expertise requires incorporating a self-reflective feedback loop into the skill delivery or development (i.e., practice)
process negotiating motivational and external constraints, rather than simply performing a task repetitively until mastered (Ericsson, Krampe, & Tesch-Romer, 1993; Oermann et al., 2010).

**Application to practice change.** Deliberate practice has already been used in medicine and nursing to teach and train their students or professionals (Clapper & Kardong-Edgren, 2012; Ericsson, 2004; Oermann, Molloy, & Vaughn, 2015; Wang & Zorek, 2016). To achieve maximal efficiency, time for self-reflection and instantaneous feedback are vital for allowing the learner to self-adjust and make improvements before engaging in the next task. Mastery is thus achieved through repeated cycles of focused practice and self-editing, with each cycle emphasizing one or more aspects of a desired skill (Ericsson, 2008; Wang & Zorek, 2016). Therefore, Ericsson’s Deliberate Practice Theory lends strong support to the concept of cardiopulmonary resuscitation (CPR) skills retention and numerous studies including those by Oermann et al. (2010) and Sutton et al. (2011) demonstrate use of this theory.

What complements the theory of deliberate practice is Bandura’s social cognitive theory. Bandura’s theory is based on the concept of reciprocal determinism and concerned with social influences that affect learning (McEwen & Wills, 2014). According to Bandura, competent functioning requires both skill and self-efficacy to use them in an effective manner (as cited in Montgomery, Kardong-Edgren, Oermann, & Odom-Maryon, 2012). Quarterly practice with extrinsic feedback provided by voice advisory manikins presents an active learning experience that enhances skills mastery and self-perceptions as objective verbal feedback motivates students to monitor their actions and to return for their quarterly practice. As CPR skills improve, the voice-advisory and debriefing feedback from the voice-advisory manikin (VAM) communicates when skills are performed better making deliberate practice a self-reinforcing mechanism. This increased awareness of good CPR skills increases a person’s self-efficacy that the skills mastery
will result in better performance during subsequent practice and in actual resuscitation events (Montgomery et al., 2012). Therefore, Bandura’s Social Cognitive Theory provides an excellent framework to the concept of CPR skills retention and recent studies (Hernández-Padilla, Suthers, Granero-Molina, & Fernández-Sola, 2015; Roh & Issenberg, 2014) demonstrate effective use of this theory. In conclusion, both Ericsson’s Deliberate Practice Theory and Bandura’s Social Cognitive Theory are theoretical frameworks that can strongly support and complement the EBP change project.

**Model for Evidence-based Practice**

It is important to choose the appropriate EBP model to guide the change project because the model can provide a blueprint for the design and implementation of evidence-based approaches to guide decision making and facilitate changes in practice (Melnyk & Fineout-Overholt, 2015). The various EBP models are similar in that they have been developed to facilitate the integration of best practices for changes in care and maximizing positive patient outcomes in the most efficient manner. According to Melnyk and Fineout-Overholt (2015), EBP models guide the design and implementation of methods intended to bolster evidence-based decision making and assist clinicians implement practice change. Many existing EBP models provide a template in the organization of EBP, maximize time and resources, and aid in the implementation of the project. They are process-oriented and therefore, they outline sequential steps needed for implementing EBP in organizations (Melnyk, Gallagher-Ford, & Fineout-Overholt, 2017).

**Application to practice change.** The Iowa Model of EBP to Promote Quality Care focuses on organizational processes and inter-professional collaboration incorporating conduct and use of research, along with other types of evidence (Melnyk et al., 2017; Polit & Beck, 2003;
Titler et al., 2001). The Iowa Model takes an interdisciplinary approach and uses feedback loops to guide change process, so the lack of evidence leads to conducting research while adequate evidence promotes EBP adoption. The Iowa Model includes a pilot or trial of the practice change before implementation occurs across the system (Brown, 2014; Doody & Doody, 2011). This model allows healthcare providers to focus on knowledge and problem-focused triggers or impetus, leading staff to question current nursing practices and whether care can be improved using current evidence (Melnyk & Fineout-Overholt, 2015; Polit & Beck, 2003).

Problem-focused triggers are those problems that derive from risk management data, financial data, or the identification of a clinical problem (Gawlinski & Rutledge, 2008; Titler et al., 2001). Knowledge-focused triggers are those that come forward when new research findings are presented or when new practice guidelines are warranted (Brown, 2014; Rempher, 2006; Schaffer, Sandau, & Diedrick, 2013). The steps of the Iowa Model were followed to implement the EBP change project. The clinical topic of rapid skills decay was selected for its importance and priority for the organization then the clinical question was formulated. A team of key stakeholders from various disciplines was formed. Evidence retrieval was conducted and yielded numerous supportive studies. With sufficient evidence in the literature, an EBP standard was developed in collaboration with inter-professional team members. The EBP change project was implemented once all necessary approvals were obtained to pilot Resuscitation Quality Improvement (RQI) in acute care units in the medical center. The project was evaluated frequently and after a quarter of CPR skills performance data. Outcomes from the pilot guided hospital-wide implementation and led to dissemination of findings.
Summary

Fawcett’s Conceptual-Theoretical-Empirical Systems support the development of nursing knowledge. For this EBP project, the concept of CPR skills retention and the combined cognitive theories of deliberate practice and self-efficacy provided the theoretical framework to support this EBP change. Deliberate practice plays a major role in the improvement and mastery of CPR skills that lead to maintenance of competency and self-reinforcing confidence in providing high quality CPR. Guided by the Iowa Model of EBP to Promote Quality Care the intended outcomes of improved CPR skills, knowledge, and confidence were the focus of a project implementation.
Chapter Four: Pre-implementation Plan

Cardiopulmonary resuscitation (CPR) skills decay is a reality among healthcare providers particularly in acute care nursing staff who participate in CPR training every two years. This is a cause of concern in the provision of life-saving high quality CPR to in-hospital cardiac arrest (IHCA) patients. Strategies to combat CPR skills decay have been documented in the literature and focus on increasing the frequency of CPR retraining and refreshers that are short, meaningful and targeted (Kardong-Edgren, Oermann, Odom-Maryon, & Ha, 2010; Sutton et al., 2011). The purpose of this chapter is to review the pre-implementation planning of an innovative evidence-based practice (EBP) change project aimed at improving CPR skills retention, performance, knowledge, and confidence levels.

Project Purpose

The purpose of this EBP change project was to improve CPR skills retention, knowledge and confidence among acute care nurses by utilizing the American Heart Association (AHA)’s Resuscitation Quality Improvement (RQI) program. RQI is a high frequency, low dose training strategy for AHA basic life support (BLS) and advanced cardiac life support (ACLS) renewal. RQI has scheduled quarterly psychomotor skills training consisting of adult or infant compressions and ventilations conducted at strategically located unit-based mobile skills and simulation stations. These stations were equipped with adult and infant manikins and a tablet computer that connected the student to the training material. Cognitive online content was assigned during RQI enrollment to be reviewed in small doses for the duration of the RQI curriculum. Each completion of the quarterly skills training or advances the expiration date a quarter further each time; thereby, creating a perpetual electronic completion card (Edmonson, Klacman, & Tippy, 2016; Laerdal Medical, 2018; Neumar, Eigel et al., 2015).
As part of the EBP change project, implementation of RQI based on the 2015 AHA Guidelines Update for CPR and Emergency Cardiovascular Care was offered to acute care nurses in the organization. The desired outcomes of the practice change were: 1) Increased CPR skills knowledge; 2) Increased CPR skills confidence; and 3) Improved CPR skills quality. It is the goal of the RQI program that improving these outcomes would eventually contribute to higher IHCA survival rates.

**Project Management**

Project management is the “application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (Program Management Institute, 2017, para. 5). It begins long before project implementation, specifically with the planning and designing of the project (Harris, Roussel, Dearman, & Thomas, 2016). Project management is important because the activities and processes to be accomplished need to be carefully organized, coordinated and carried out in order to achieve the project goal.

**Organizational readiness for change.** According to Melnyk and Fineout-Overholt (2015), assessing organization readiness for EBP implementation is a vital step and must include all levels of administrative leadership and clinical staff. Organizational assessment tools such as an organization change readiness survey or formal and informal discussions with leaders and stakeholders affected by the change and their feedback or input would be helpful in ascertaining the organization’s readiness for change and how much it values the change project (Moran, Burson, & Dianne, 2017; Ogrinc et al., 2012). The Critical Care Committee (CCC) through its resuscitation subcommittee oversees the resuscitation program of the targeted organization including monthly monitoring of IHCA survival outcomes and promoting quality improvements in resuscitation education to improve outcomes. The organization’s Nursing Education
Department (NED) implements AHA’s resuscitation education courses such as BLS and ACLS. Both the CCC and NED were approached about initiating RQI due to their roles in resuscitation.

As approving bodies, they expressed their support of the EBP change project. Initial discussions with acute care nurses on RQI generally revealed their interest and openness to changing from the traditional two-year renewal cycle to brief quarterly psychomotor skills sessions while others wanted to know more about the change. Successful project management involves balancing competing priorities related to team needs, stakeholder needs and organizational needs (Harris et al., 2016; Moran et al., 2017).

**Inter-professional collaboration.** According to Hall and Roussel (2017), inter-professional team development is a major component of strategic project planning along with risk assessment and cost-benefit analysis. The inter-professional team at the organization involved in implementing the EBP project was comprised of individuals from diverse backgrounds. According to Zaggagnini and White (2014), inter-professional signals the inclusion of individual professionals from a particular discipline or knowledge branch who bring their differing experiences, education, values, roles, identities and expectations to the process. Given that this EBP change project was a technology-driven resuscitation quality improvement program, the inter-professional team being formed included leaders and staff members from the Office of Information Technology (OIT) and Information Security Office (ISO). Other members were from CCC, NED, simulation, nursing labor union, quality management (QM), Process Improvement Committee (PIC), Clinical Professional Practice Committee (CPPC), EBP Committee (EBPC), and Nurse Executive Coordinating Council (NECC). The clinical nurse managers and staff super-users were also important additions to the team.
The nursing education and simulation partners incorporated RQI into the curriculum as this not only supports credentialing of BLS and ACLS healthcare providers but also impacts resuscitation education instructor or facilitator resources. The CCC oversees the resuscitation program of the organization including approval of services and therapies offered and related policies. The committee also directs the education or training programs that support credentialing and maintenance of competency for critical care/emergency care interventions. QM provides regulatory oversight, quality improvement and patient outcome monitoring of the resuscitation program and its associated initiatives. The nursing labor union advocates for the front-line nurses and bargains or recommends solutions acceptable to both nursing staff and nursing management. All shared governance councils lend their support or recommendations to make the resuscitation program successful and sustainable in both the practice and quality improvement arena. The scope of this project was broad given that the goal of a successful RQI program is eventually tied to excellent CPR skills retention and performance to improve clinical outcomes hence the name RQI; thus, not purely an educational initiative.

**Risk management assessment.** This EBP change project involved introducing a low-dose, high frequency CPR skills training to clinical nursing staff. This initiative required a thorough clinical needs assessment where quantitative and qualitative data are obtained through a gap assessment and strengths, weaknesses, opportunities, threats (SWOT) analysis of the environment (Harris et al., 2016). The strengths and opportunities are positive forces that can be exploited to effect change while weaknesses and threats are potential barriers that must be addressed to minimize its impact on the project. The findings of the clinical needs assessment and SWOT analysis provide context or inform the developing, planning and implementing phases of a project (Harris et al., 2016).
The strengths of the organization included its strong EBP culture and the expression of support for RQI by senior leadership, CCC and other significant stakeholders and partners. Opportunities identified include innovative EBP change being encouraged by the Veterans Health Administration (VHA) simulation community and specialty organizations such as the AHA. Federal or congressional budget constraints impacting resources for the project were considered threats while potential staff resistance to change was an identified weakness.

According to Harris et al. (2016), leadership, values, culture, infrastructure and a new mindset are vital factors for achieving change as change is constant, not necessarily a linear process and may appear at any time during the organizational assessment. Therefore, vigilance is required in monitoring the SWOT elements especially as weaknesses and threats can become barriers to implementation. Lastly, as the risk assessment was completed, a work plan that included defining goals, objectives and strategies, creating a timeline and developing project milestones, communicating updates and aligning project tasks with available resources were executed (Harris et al., 2016). Transparent planning and continued engagement with the interprofessional team minimized the implementation barriers, recognized resource limitations, and reduced staff resistance identified with the RQI change project.

**Organizational approval process.** According to Melnyk and Fineout-Overholt (2015), organizational culture and change leadership are foundational to implementation of EBP projects and quality improvement. The organization embraces EBP and welcomes practice change that is aligned with its mission to provide high quality patient care. The organization’s IHCA survival to discharge rates were lower or equal to national rates reported by the AHA. Furthermore, the organization, being an approved AHA training site, used AHA’s traditional two-year renewal cycle in offering AHA BLS and ACLS certification courses.
The RQI program was presented to the hospital’s CCC and NED in September 2016. Both entities provided approval and support to implement the EBP change project and had active membership within the inter-professional team assembled for the project. The support of local leadership stemmed from the signing of an official Memorandum of Understanding between the local Veterans Administration (VA) facility and VHA as required by VHA’s Simulation Learning, Education and Research Network (SimLEARN) for all VA medical centers implementing RQI (see Appendix A). VA facilities have until 2018 to rollout RQI with a goal of 100% implementation system-wide by early 2019. SimLEARN is the VHA’s program for simulation in health care training. Since RQI implementation was targeted for the acute care units, leadership support from the acute care nurse managers as well as the Chief Nurse Executive was requested, and approval was given to offer RQI to staff nurses through the NECC. The medical center’s OIT also provided approval. OIT’s role is discussed as a separate section below.

**Use of information technology.** According to Harris et al. (2016), a well-orchestrated and engaged project team may require the inclusion of professionals from technology, health policy management, and library science. The use of technology can directly contribute to the preparation, success and excellence of its users including the project manager, team members and staff learners (Moran et al., 2017). The electronic library resources including numerous databases were instrumental in formulating and refining the clinical question and in conducting the literature review for evidence to support interventions for the change project. Computer software programs and applications have significant impact in project planning and management. Microsoft Word is a helpful program in summarizing the literature review and in creating numerous project tools and forms needed, while Microsoft Excel is instrumental in data
collection, analysis and presentation. Microsoft PowerPoint is convenient for creating promotional handouts and project presentations, while email facilitates effective and timely communication among project team members.

Since the unit-based RQI program runs on a web-based platform, the internet connectivity needed to be both wired and wireless to reduce disconnections or interruptions given the VHA network is already running hundreds of programs to support clinical and administrative operations of the organization. The competing bandwidth operating within the highly secure VHA network can impact the speed of the programs running concurrently. Hence, the OIT specialists and information security officer (ISO) approved and continuously support the project as technology-driven programs always require ongoing support in order to succeed.

Depending on size and complexity of a health care facility, investing in information technology or electronic health record (EHR) can be costly and is a capital investment for many hospital systems (Nelson & Staggers, 2017). At the targeted organization, the nursing education department regularly assesses the needs for resuscitation training supplies and equipment including CPR mobile simulation stations with laptops and makes an official request to the VHA’s AHA Training Center every six months or as the need arises. Lastly, strong support from the board of directors, physician champion, nurse administrator and nurse educator among others can help overcome information technology barriers (Nelson & Staggers, 2017).

Materials Needed for Project

Project materials included the CPR Skills Performance, Knowledge and Confidence Survey instrument (see Appendix B), the Participant Cover Letter (see Appendix C), consent form (see Appendix D), pencils, and locked box to keep completed survey forms and a paper bin for the survey forms and the cover letters. For each participating acute care unit, a mobile
simulation station was equipped with a set of one adult and one infant manikin. One set of appropriately sized pocket mask and bag valve mask was also provided for each adult and infant manikin. A laptop computer, tablet and a projector HDTV were utilized to present the RQI program.

One hundred copies of a two-page packet each consisting of the survey and the cover letter, were needed as the survey was repeated once and another 25 copies of the consent form, for a total of 125 copies. SurveyMonkey was also utilized to allow online access to the survey. Twenty-five hard copy RQI PowerPoint handouts were distributed to participants who were able to attend. The RQI PowerPoint as an electronic version was also available upon request.

The organization provided the printer copier and paper utilized to photocopy cover letters, consents, and handouts of the PowerPoint program. Paper products were printed on 8 ½” by 11” paper. All participant documents utilized approximately six sheets of paper. Therefore, 150 sheets of paper were needed for the 25 participants enrolled in the project. Hard copy data were stored in a locked file cabinet in the facility’s education department. Data collection and analysis were done utilizing Microsoft Excel on a laptop computer. The presentation was created using Microsoft PowerPoint while other pertinent documents used Microsoft Word. For the initial presentation of the RQI project plan, the education conference room with seating capacity of up to 12 participants was reserved. A mobile simulation station with both adult and infant manikins equipped with appropriately sized pocket mask and bag valve mask was set up.

**Institutional Review Board Approval**

The Institutional Review Board (IRB) approval for this EBP change project was sought directly through the organization where RQI was being implemented. Learning about the IRB process during the project development stage is crucial. According to Colt and Mulnard (2006, p.
1607), the IRB does not exist to block research or QI but to assist researchers or project managers by assessing for risks that may have been overlooked or underemphasized by the investigator; thereby, protecting not only the investigator but the organization and all potential human subjects (as cited in Moran et al., 2017).

The project was submitted as an Expedited proposal to the project site’s IRB on July 12, 2017. QI projects pose nothing more than minimal risks to the participant. With minimal risk, a participant can expect no more harm or discomfort to come to them than could be expected in daily life. They are often reviewed by either the IRB chairperson or an IRB member designated by the IRB chairperson (Hall & Roussel, 2017). On July 17, 2017, the project sites IRB determined that this EBP change project was not considered human subjects research and, therefore, not subject to IRB review and approval (see Appendix E). Specifically, the IRB determined that this project was a non-research VHA operations activity being conducted as part of a degree program requirement and results of the project were intended to be used internally for VA. Furthermore, if the results of this project are presented or published they cannot be presented as research, nor does it have research approval. Lastly, the Human Research Protection Program Coordinator advised the project manager (PM) that the project could proceed without further IRB evaluation with instructions to consult with nursing leadership prior to implementation (H. White, personal communication, July 17, 2017).

**Plan for Project Evaluation**

The PM should be cognizant that the project life cycle phases of initiation, planning and execution will not be complete without evaluation as each phase is crucial to the success of the change project. Evaluation includes reviewing overall processes and outcomes of the EBP project (Harris et al., 2016). The evaluation plan determined the criteria that was used to evaluate
what worked and served as a mechanism to assist the PM to identify the needed next steps after project completion (Moran et al., 2017). In this section, the outcome measures as well as the processes for data analysis and management are discussed.

**Plan for demographic data collection.** Basic demographic data collected on each participant were age, gender, race, height, weight, educational level, nurse type, years of nursing experience, work unit, time from last CPR training, and actual use of CPR in clinical setting since last training, and prior use of computer technology for resuscitation education. The demographic data was stored in a separate Microsoft Excel document utilizing the coding system (see Appendix F). The intent of this data collection was to be able to describe or make inferences about the participant group. A table was used to display the data set. A mean age range was calculated while gender, race, height, weight, educational level, nurse type, work unit, and actual use of CPR in clinical setting in the last 12 months were expressed as percentages. A pie chart was used to highlight the percentage breakdown of participant’s educational level.

**Plan for outcome data collection and measurement.** To assess the effectiveness of the project, outcomes need to be measured and analyzed. Selecting a benchmark in relation to evaluating and presenting project outcomes is an important aspect of quality improvement. In the early phases of the project life cycle (e.g., initiation, planning), gaps are identified during the clinical needs assessment by comparing benchmarks against actual metrics or outcome data points. Benchmarks are also part of quality data to be monitored throughout the project's life (Harris et al., 2016). That said, appropriately identified benchmarks are useful during the project’s life cycle and especially where it matters, benchmarks provide helpful information for the project manager in making changes to the project plan so that accountability, resources, quality and deliverables are addressed to align them to desired project outcomes. Appropriately
chosen benchmarks (e.g., process performance) are targets that complement the metrics used to evaluate project implementation outcomes (Harris et al., 2016). Since RQI is about improving CPR skills retention through a low-dose, high frequency deliberate practice and training strategy, project effectiveness should result in improvement or retention of CPR psychomotor skills, CPR knowledge and CPR confidence level (not skills decay) after each brief training session.

**Plan for evaluation tool.** The CPR Skills Performance, Knowledge and Confidence Survey tool consists of items on CPR psychomotor skills scores, CPR knowledge and CPR confidence level after each brief CPR training session. The initial week one and week two survey was completed online by each participant after either a self-guided or a facilitated 10-minute CPR skills session. Week six and week seven survey was administered online to each participant after either a self-guided or a facilitated 10-minute CPR skills session. The Laerdal computer program scores CPR skills performance but does not save the data for retrieval later hence the software-generated composite scores based on chest compression depth/rate, chest recoil, minimal interruption and ventilation rate/volume were self-reported by the participant after each skills session.

**Plan for data analysis.** A data analysis plan was created and was carried out to determine project effectiveness. To determine if the RQI project was effective at improving CPR skills retention or performance, CPR knowledge and CPR skills confidence, a comparative means analysis that used a percentage change was conducted on each item of the survey as an aggregate group. Data were aggregated for each survey item obtained after the week one and week two self-guided 10-minute CPR skills session as well as after the week six and week seven self-guided 10-minute CPR skills session. The week one and week two data were then compared to data obtained at week six and week seven to assess the level of CPR performance on the three
subscales (psychomotor skills, knowledge and confidence) and evaluate occurrence of CPR skills decay. The data from each outcome measure were numerically displayed in tables and demonstrated using bar graphs to assess project effectiveness.

CPR psychomotor skills performance. The first outcome to be measured was the CPR psychomotor skills, the operational definitions of which are based on the updated 2015 AHA guidelines for CPR. The new AHA CPR guidelines recommend compressing the chest on the lower half of the sternum at a rate of 100 to 120 compressions per minute with a compression depth of approximately 2 inches while avoiding excessive chest compression depths of greater than 2.4 inches in an average-sized adult. Leaning on the chest is to be avoided between compressions to allow full chest-wall recoil (Bhanji, Donoghue et al., 2015). These outcome measures are programmed into Laerdal’s RQI software program as the skills performance benchmarks with composite scores of at least 75% to be considered a passing score.

The RQI psychomotor skills training consists of adult or infant compressions and ventilations conducted at strategically located unit-based mobile skills and simulation stations using Quality CPR (QCPR) technology (Laerdal Medical, 2018). QCPR technology utilizes real-time CPR feedback technology through a voice-advisory manikin and has demonstrated during training or actual resuscitations that real-time objective audiovisual CPR feedback improves CPR skills retention and performance. QCPR saves lives (Abella et al., 2007; Bobrow et al., 2013; Kramer-Johansen et al., 2006; Yeung, Meeks, & Edelson, 2009). The Laerdal computer program scores CPR skills performance but does not save the data for retrieval later hence the software-generated composite scores based on compression depth, rate, hand position and ventilations rate/volume were self-reported by the participant after each skills session. The data collected were entered into an Excel Spreadsheet with its own column heading for each data
point and formulas to calculate means comparison for CPR psychomotor skills. Composite scores for the compression and ventilation items for the second survey showed improvement or maintenance of passing score from the first survey.

**CPR knowledge.** The second outcome to be measured was CPR knowledge that focused on the new 2015 AHA guidelines for CPR as benchmarks and consisted of multiple choice items. Elements of high quality CPR that show improved survival from cardiac arrest include ensuring chest compressions of adequate rate and depth, allowing full chest recoil between compressions, minimizing interruptions in chest compressions and avoiding excessive ventilation (Kleinman et al., 2015; Stiell et al., 2012). These five elements served as benchmarks and were specified in the 2015 AHA CPR guidelines as follows: compressing the chest on the lower half of the sternum at a rate of 100 to 120 compressions per minute with a compression depth of approximately 2 inches (5 centimeters [cm]) while avoiding excessive chest compression depths of greater than 2.4 inches (6 cm) in an average-sized adult. Ventilation rate for rescue breathing is 10 to 12 breaths per minute. Chest leaning is to be avoided between compressions to allow full chest-wall recoil (Bhanji, Donoghue et al., 2015). The data collected were entered into an Excel Spreadsheet with its own column heading for the five data points and formulas to calculate mean score comparison for CPR knowledge of the first and second surveys. This was illustrated also as a table that compared these data points. Total group mean or average score results on the five knowledge items for the first survey were calculated and compared to the second survey results.

**CPR confidence level.** The third outcome to be measured was the CPR confidence level that asked about how confident the learner was in applying his/her refreshed CPR skills to actual code blue event. Numerous studies on CPR skills self-efficacy demonstrated that learners’ self-confidence increase immediately after training. The first item on CPR confidence level was
based on studies that nursing students gain confidence in applying their CPR skills after skills practice and training (Hernández-Padilla, Suthers, Granero-Molina, & Fernández-Sola, 2015; Montgomery, Kardong-Edgren, Oermann, & Odom-Maryon, 2012; Roh & Issenberg, 2014). The difference in proportions of students who achieved a high level of self-efficacy at post-test and at 3-month follow up was significantly higher in the student-directed group when compared to the instructor-directed group (Hernandez-Padilla et al., 2015). The two other items on the confidence or self-efficacy level related to effective chest compressions and effective bag-mask valve ventilation from the Resuscitation Self-Efficacy Scale (RSES) for nurses was used as prior permission of the author, Sook Young Roh was obtained by the PM. The data collected was entered into an Excel Spreadsheet with its own column heading for the three data points and formulas to calculate means comparison for CPR confidence level of the first and second surveys. This was illustrated also as a column or bar graph that compared these data points. Total group mean or average score results on the three confidence level items for the first survey were calculated and compared to the second survey results.

**Plan for data management.** To maintain confidentiality, the PM developed a master list that contained the participant’s name and work unit matched to an assigned code. The assigned code was used in place of any identifying participant information on every document to keep track of each participant. The master list was stored in a Microsoft Excel document on a password-protected computer over a secure network only accessible by the PM.

Each participant completed two surveys: week one and two questionnaires (e.g. A-1), and week six and seven questionnaires (e.g. A-2). After the data was collected, the master list was permanently deleted from the computer by emptying the recycling bin after initial deletion.
Once deleted, there would be no identifying information linking the participant to the collected data.

All hard copy data was stored in a locked file cabinet in the office of the PM. The coding system allowed for data removal from participants who did not complete all project steps. After five years of data storage, paper documents containing project data will be shredded and recycled while records stored on a computer hard drive will be erased using a commercial software application designed to remove all data from the storage device.

Summary

Worldwide, cardiac arrest continues to be a major cause of death in the adult population. Numerous studies suggest that providing high quality CPR remains a serious challenge among healthcare providers. Current EBP guidelines for resuscitation offer great opportunities to reduce CPR skills degradation and enhance CPR quality. Implementing EBP change entails utilizing sound project planning strategies to ensure acceptance, success and sustainment. The purpose of this EBP change project was to improve CPR skills retention, knowledge and confidence using AHA’s RQI program. Improved IHCA survival rates from this project’s identified outcome measures indicative of high quality CPR can illustrate the value of the practice change as well as its sustainment and adoption throughout the local healthcare system.
Chapter Five: Implementation Process

The success of a project implementation is influenced by the project manager’s (PM) ability to coordinate the planned activities and reaching a balance of the competing needs of team members, stakeholders and the organization (Moran, Burson, & Dianne, 2017). The purpose of this carefully planned evidence-based practice (EBP) project was to effectively implement a low dose, high frequency cardiopulmonary resuscitation (CPR) training innovation that would improve CPR skills retention, knowledge, and confidence focused on the components of high quality CPR. Moreover, successful implementation is dependent on effective educational strategies to ensure that resuscitation providers have the necessary knowledge and skills in combination with the provision of necessary infrastructure and resources (Mancini et al., 2010). This chapter discusses the project’s setting, population, recruitment methods, and detailed implementation steps.

Setting

The targeted project setting was a 274-bed Veterans Affairs (VA) medical facility located in the southeastern United States. The current location is accredited by The Joint Commission (TJC) and has a Level 1a care complexity. A Level 1a VA facility provides the most complex care, while a Level 3 facility provides the least complex care in the VA system. The acute care units in the medical center were the specific locations for the project implementation which included the 8-bed Cardiac Intensive Care Unit (CICU), 11-bed Surgical Intensive Care Unit (SICU), and 8-bed Medical Intensive Care Unit (MICU), the recently expanded 20-bed Emergency Department (ED), the Clinical Simulation Education Department (CSED) supporting the medical center’s resuscitation program, the 60-bed Medical Surgical (MS) Floors providing acute medical and surgical postoperative care as well as telemetry and oncology services, the
Vascular Interventional Radiology and Recovery Unit (VIRRU), the Endoscopy Department providing gastrointestinal and bronchoscopic diagnostic services, the Cardiac Catheterization Laboratory (CCL) which includes Electrophysiology (EP) services, and the 10-bed Post-Anesthesia Care Unit (PACU).

**Participants**

The planned population were adults aged 18 years and older who were Registered Nurses (RNs) and Licensed Practical Nurses (LPNs) employed in the aforementioned acute care units required to have basic life support (BLS) and advanced cardiac life support (ACLS) as an expectation of their job. There were over approximately 200 nurses on staff with an estimated 20% needing to renew their BLS or ACLS certification each quarter. Only those with current BLS and ACLS cards and had at least six months left prior to card expiration qualified to participate in Resuscitation Quality Improvement (RQI). There were no restrictions on gender, race, educational level, and years of nursing experience or use or non-use of CPR so long as the American Heart Association (AHA) card was not expired.

**Recruitment**

On the first day of implementation, numerous posters were displayed on the nursing education office bulletin board and in acute care areas where mobile simulation skills stations were located to generate interest in the RQI project. The recruitment strategy started out with an email message sent by the facility BLS Program Director to the nurse managers and staff nurses of these identified units explaining to them that this was a voluntary, evidence-based option to renew BLS and ACLS. Participation was maximized by promoting RQI to the nurses via face-to-face presentations at regularly scheduled staff meetings, along with the distribution of posters (see Appendix H), flyers, brochures (see Appendix G), and informational email.
Implementation Process

The final preparation and pre-implementation meeting with all major stakeholders, sponsors, influential leaders, nurse managers and superusers occurred on January 2, 2018. Project implementation began on January 3, 2018 after ensuring that all crucial checks showed unit readiness related to laptop wireless or wired internet connectivity, adequate equipment, supplies and instruction sheets.

A carefully drafted email invitation with participation instructions was sent out by the BLS Program Director to acute care staff with current BLS and ACLS certification to begin recruitment. RQI flyers, brochures, handouts and posters were widely distributed while face-to-face presentations were offered at the outset and supplemented by informational emails. New BLS and ACLS staff compliance and delinquency reports of acute care staff nurses were thoroughly checked for potential/prospective RQI participants by the BLS Program Director and PM at the beginning of the project and on a weekly basis. Qualified acute care nurses were assigned RQI curriculum in the VA’s learning management system. The PM’s contact information was included in this critical email message for any questions potential participants may have. This allowed staff nurses to ask questions as part of the informed consent process. The PM rounded in acute care units with various media for introducing and presenting the EBP RQI program during project launch. The heightened awareness on RQI elicited further interest and inquiries. Rounding in the RQI clinical areas was continued on a daily basis through implementation.

Laminated RQI posters with instructions and contact information were posted conspicuously in identified simulation skills station space in each unit and other strategic locations. The PM provided simple and clear instructions on how to access and complete the RQI
assignments and post-training survey. The self-guided skills practice and the skills testing could be individually completed in six to ten minutes at the unit-based skills station any time of the day (24/7). Participants were given the option to complete the skills session using the instruction guide only or with PM facilitation and coaching during regular office hours (8:00 AM – 4:30 PM) and as needed during off tours and holidays as well. The primary option to complete the survey was via online and the web address was conspicuously posted, so it could be accessed any time. Paper survey forms were made available at the skills station, so they could be completed right after the skills session.

The PM was able to track the CPR RQI skills session completions, so email reminders were provided to participants listed on the RQI completion report to complete the survey and to return for a repeat CPR RQI skills session in two to four weeks. Data collection followed each individual 10-minute CPR training that occurred in Weeks 1-2 (January 2-12, 2018) and Weeks 6-7 (February 5-16, 2018) for the second 10-minute CPR training based on new 2015 AHA guidelines for CPR. Data collected were entered into a Microsoft Excel spreadsheet for analysis. Project updates and findings were shared with key stakeholders including leaders, superusers, and participating unit staff nurses.

**Plan Variation**

The unforeseen circumstances that proved challenging in the first five weeks of project implementation included: 1) the snow storms in the first and third weeks in January 2018; 2) the protracted influenza season; 3) information technology (IT) and connectivity challenges; and 4) two brief federal shutdowns. These challenges exacerbated the nurse staffing shortages that already existed in the acute care areas. The hospital was dealing with one of its highest ED visits and admissions in recent history due to a protracted influenza season. This literally set back the
timelines by a few weeks as recruitment stretched three weeks. Moreover, some staff members were not only ill and had to stay home, remaining staff nurses were spread thin. The PM had numerous polite requests from willing participants to come back in a week or two as either they were busy doing patient care and, in some cases, felt weak or unfit to perform CPR skills. This extended recruitment to accommodate staff nurses’ availability and ability to participate in CPR knowledge and psychomotor skills refresher training.

The PM had to compensate for these challenges by staying in the medical center longer in the hope of being able to catch more participants who would otherwise not try without assistance or encouragement. Although not completely surprising, the laptop internet connectivity and some down times with VA’s learning management system, called TMS (Talent Management System), where RQI program was accessed also caused serious delays or worse, cancelled RQI sessions as the promised 10-15 minutes away from patient care had become 45 minutes to 1 hour for some participants. The PM reached out to the Office of Information Technology (OIT) and had limited success with work or trouble tickets. OIT staff are always at risk to be furloughed during federal shutdowns and had staffing shortages in their department. The PM learned to troubleshoot several problems but there were other IT issues that were beyond the PM’s skills set and area of expertise.

**Summary**

CPR skills decay is not a new phenomenon and was observed in the early 1980s among medical students (Fossel, Kiskaddon, & Stembach, 1983). Poor CPR skills retention remains a challenge to healthcare providers needing to provide timely and effective resuscitation care. An extensive review of the literature revealed that two-year retraining cycles are not optimal. More frequent training in BLS as well as retraining in ACLS may be helpful for providers who are
likely to encounter cardiac arrest in their work settings (Bhanji, Finn et al., 2015). This chapter discussed the setting, participants, recruitment process, implementation process, and the plan variations to the RQI project.
Chapter Six: Evaluation and Outcomes of the Practice Change

According to Melnyk and Fineout-Overholt (2015), “the process of managing health outcomes is a natural fit for evidence-based practice (EBP), allowing for the decisions about clinical issues through outcomes measurement and the success (or not) of the implementation” (p. 226) of an EBP change project. After the American Heart Association’s (AHA) Resuscitation Quality Improvement (RQI) was implemented, it was critical that previously identified outcomes be evaluated. An evaluation of the outcomes of the practice change and the dissemination of the outcomes of the EBP change are crucial to share innovations and develop the scientific base of the nursing profession (Melnyk & Fineout-Overholt, 2015; Melnyk, Gallagher-Ford, & Fineout-Overholt, 2017; Oermann & Hays, 2016). This EBP change project was implemented to improve the cardiopulmonary resuscitation (CPR) skills performance, CPR knowledge on components of high quality CPR, and CPR confidence. The purpose of this chapter is to present an evaluation of the measured outcomes and the findings of the EBP change project.

Participant Demographics

There are over 200 acute care nurses working in the various clinical units implementing the RQI project including the three Critical Care Units namely Cardiac Intensive Care Unit (CICU), Surgical Intensive Care Unit (SICU), and Medical Intensive Care Unit (MICU), the Emergency Department (ED), the Clinical Simulation Education Department (CSED), the two Medical Surgical (MS) Floors, Vascular Interventional Radiology and Recovery Unit (VIRRU), the Endoscopy Department providing gastrointestinal and bronchoscopic diagnostic services, the Cardiac Catheterization Laboratory (CCL), and the Post-Anesthesia Care Unit (PACU). Of that number about one fifth renew their basic life support (BLS) and advanced cardiac life support
(ACLS) credential every quarter providing an opportunity for the RQI project to meet the need for maintenance of CPR competency.

In the first three weeks of the EBP implementation, 182 nurses had attended a combination of group and individualized education sessions in the simulation classroom, unit conference rooms, staff meetings and personalized education at the mobile skills station on the components of high-quality CPR and how RQI works to promote such high-quality CPR through its low dose, high frequency training facilitated and accessible at the unit level. Since the RQI project required two brief CPR sessions and a survey each time, only 101 acute care nurses were able to complete both CPR sessions and survey for the EBP change project (see Table 1).

Ninety-eight nurses (97%) held a Registered Nurse (RN) license, while three nurses (3%) held a Licensed Practical Nurse (LPN) license. Female nurses comprised 70% (n=71) of the sample, while 30% (n=30) were male. Participants’ ages ranged from 22 to 65 years with a median age range of 41-45 years. Among the nurse participants, 42.57% (n=43) of the nurses identified as being Caucasian, 18.81% (n=19) identified as being African American, 4.95% (n=5) identified as being Hispanic or Latino, and 33.66% (n=34) identified as being Asian/Pacific Islander. In regard to educational preparation, 69.3% (n=70) of the nurses had earned a Bachelor’s Degree in Nursing, 45.24% (n=38) earned an Associate Degree, 18.81% (n=19) had earned a Master’s Degree in Nursing and 1.98% (n=2) were prepared at the doctoral level (see Figure 1). In the participating acute care nurses, 39.6% (n=40) did not have an opportunity to perform CPR during an actual resuscitation attempt in the last 12 months, while 26.73% (n=27) performed CPR two to five times during the same period.
Table 1

*Survey Participant Demographic Profile*

<table>
<thead>
<tr>
<th>Demographic Item</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Female</td>
<td>71</td>
<td>70</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
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<tr>
<td>18 to 25 years</td>
<td>2</td>
<td>1.98</td>
</tr>
<tr>
<td>26 to 30 years</td>
<td>5</td>
<td>4.95</td>
</tr>
<tr>
<td>31 to 35 years</td>
<td>5</td>
<td>4.95</td>
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<tr>
<td>36 to 40 years</td>
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<td>15.84</td>
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<td>46 to 50 years</td>
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<td>51 to 55 years</td>
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<td><strong>Height</strong></td>
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<td>5' or below</td>
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<td>5'1&quot; - 5'3&quot;</td>
<td>25</td>
<td>24.75</td>
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<td>5'4&quot; - 5'6&quot;</td>
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<td>5'7&quot; - 5'9&quot;</td>
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<td>5'10&quot; - 6'</td>
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<td>8.91</td>
</tr>
<tr>
<td>greater than 6'</td>
<td>4</td>
<td>3.96</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
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<td></td>
</tr>
<tr>
<td>Caucasian</td>
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<td>42.57</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>5</td>
<td>4.95</td>
</tr>
<tr>
<td>Black or African American</td>
<td>19</td>
<td>18.81</td>
</tr>
<tr>
<td>Native American or American Indian</td>
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<td>0</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>34</td>
<td>33.66</td>
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<tr>
<td>Other</td>
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<td></td>
</tr>
<tr>
<td><strong>License Type</strong></td>
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</tr>
<tr>
<td>RN</td>
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<td>97</td>
</tr>
<tr>
<td>LPN</td>
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<td>2</td>
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<tr>
<td><strong>Education Level</strong></td>
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<tr>
<td>Associate Degree</td>
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<tr>
<td>Bachelor's Degree</td>
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<td>68.31</td>
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<tr>
<td>Master's Degree</td>
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<td>18.81</td>
</tr>
<tr>
<td>Doctorate Degree</td>
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<td>1.98</td>
</tr>
<tr>
<td><strong># of CPR done in last year</strong></td>
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<td></td>
</tr>
<tr>
<td>0</td>
<td>41</td>
<td>40.59</td>
</tr>
<tr>
<td>1 time</td>
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<td>27.72</td>
</tr>
<tr>
<td>2-5 times</td>
<td>27</td>
<td>26.73</td>
</tr>
<tr>
<td>6-12 times</td>
<td>4</td>
<td>3.96</td>
</tr>
<tr>
<td>more than 12 times</td>
<td>1</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*Note.* N=101. Percentage calculation based on 101 total participants. RN = Registered Nurse; LPN = Licensed Practical Nurse
Outcome Findings

As previously stated, the RQI project’s objective was to prevent CPR skills decay with three identified outcomes. Improvement of nurses’ CPR skills performance is a life-saving competency that is the centerpiece of RQI. Increased knowledge on high quality CPR guides excellent performance and boosts confidence too. CPR confidence from deliberate practice continuously enhances and complements competence in providing such high quality CPR during a simulated or actual resuscitation event.

Improved CPR psychomotor skills. The first defined outcome was to improve nurses’ CPR skills performance. All 101 acute care nurses attended two brief separate CPR retraining sessions at least two weeks apart consisting each of 60 adult chest compressions and 12 bag-valve mask ventilation after watching a standardized AHA educational video content on high quality CPR at the mobile skills station as part of the RQI curriculum and then completed an immediate post-training survey each time. The CPR psychomotor skills were measured in real-time using Laerdal Quality CPR (QCPR) software technology which scores by deducting for...
deviations from evidence-based guidelines on providing chest compressions of adequate rate and depth, allowing full chest recoil between compressions, minimizing interruptions in chest compressions and avoiding excessive ventilation (Cortegiani et al., 2017). All 101 nurses (100%) achieved computer-generated passing scores of 75% or higher for each of the compression and ventilation sections with at least 71% \( (n=72) \) of participants attaining scores higher than 90%.

On the repeated RQI CPR skills session four weeks later, 100% \( (n=101) \) of the nurses once again achieved the benchmark score of 75% or higher on the psychomotor CPR skills with at least 80% \( (n=81) \) of participants attaining scores higher than 90%. No percentage change calculation was performed on the overall psychomotor CPR skills scores as 100% \( (n=101) \) met benchmark or passing scores in both the initial and second RQI CPR hands-on sessions. However, a percentage change was calculated for participants who scored at least 90%. This showed a 12.68% increase in staff nurses achieving the higher mark at the repeated RQI CPR skills session.

**Improved knowledge on high quality CPR.** Avoiding CPR skills deterioration and knowledge decay related to CPR through RQI’s low dose, high frequency refresher training should result in knowledge retention or improvement. The benchmark was originally set at the 60% passing percentage score given two of the test questions were complex and relatively new concepts in the resuscitation guidelines. However, the overall group mean percentage score on both surveys conducted after each RQI skills session achieved the benchmark passing percentage score of 75%. On the first survey post-RQI skills session, the overall aggregated mean percentage score of the five high quality CPR knowledge questions based on the updated 2015 AHA guidelines was 85.74% and the overall aggregated mean percentage score of the second survey post-RQI skills session was 87.12%. This showed a 1.61% increase from the overall
aggregated mean percentage score of the first survey to the overall aggregated mean percentage score of the second survey.

Analysis of the individual questions revealed that only 67% (n=68) of respondents selected the correct response for question five on the minimum acceptable chest compression fraction (CCF) per the 2015 AHA guidelines. CCF remains to be a complex concept to nursing staff as it has not been as widely emphasized in resuscitation education until CPR coaching devices were made commercially available for resuscitation training. Table 2 highlights aggregated group responses to each survey question. Questions three through seven pertained to the knowledge component of the 10-item CPR Skills Performance, Knowledge and Confidence Survey tool.

Table 2

Correct Response Percent Change of High Quality CPR Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Post-RQI Session 1 Survey: Correct responses n (%)</th>
<th>Post-RQI Session 2 Survey: Correct responses n (%)</th>
<th>% change in participants' correct responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>87 (86.13%)</td>
<td>92 (91.09%)</td>
<td>5.74%</td>
</tr>
<tr>
<td>4</td>
<td>80 (79.21%)</td>
<td>86 (85.14%)</td>
<td>7.50%</td>
</tr>
<tr>
<td>5</td>
<td>68 (67.32%)</td>
<td>68 (67.32%)</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>98 (97.03%)</td>
<td>97 (95.05%)</td>
<td>-1.02%</td>
</tr>
<tr>
<td>7</td>
<td>100 (99.01%)</td>
<td>98 (97.03%)</td>
<td>-2.00%</td>
</tr>
<tr>
<td>Overall mean % scores</td>
<td>85.74%</td>
<td>87.12%</td>
<td>1.61%</td>
</tr>
</tbody>
</table>

Note. Calculation based on total participants (N=101). Questions 3, 4, 5 & 7 were on AHA’s recommended adult chest compression rate, depth, fraction, and recoil respectively. Question 6 was on AHA’s recommended ventilation rate.

**Improved CPR confidence.** The RQI change project also intended to increase resuscitation self-efficacy or confidence level in being able to deliver life-saving, high quality CPR in an actual CPR event (question 8) as well as confidence level in being able to demonstrate
effective chest compressions (question 9) and ventilations (question 10). For at least two of the three self-efficacy questions, all but one (99%) of the 101 nurses achieved confidence levels that range from being confident to being extremely confident with at least 90% (n=91) of participants attaining very confident to extremely confident levels. On the repeated RQI CPR skills session two weeks later, 99% (n=100) of the nurses achieved the benchmark level of confident or higher on the psychomotor CPR skills with at least 89% (n=90) of participants attaining very confident to extremely confident levels on at least two of the three self-efficacy questions.

![Comparison of CPR Confidence Levels (First and Second RQI Sessions)](image)

*Figure 2.* Nurses’ first (RQI.1) and second (RQI.2) sessions CPR confidence levels compared (N=101) on three items: high quality CPR during actual event (Q8), effective chest compressions (Q9), and effective bag-mask ventilations (Q10).

**Summary**

Analyzing collected data and evaluating identified outcomes of the EBP change project is critical. For the AHA’s RQI project, all of the objectives were met. This EBP project reproduced what was already shown repeatedly in the literature that more frequent skills
retraining, or refreshers can benefit those staff members who respond to cardiac arrest activations. This EBP change project demonstrated that the implementation of an innovative low dose, high frequency deliberate CPR training refreshers improved CPR skills retention, knowledge and confidence by meeting the established benchmarks. On the CPR skills performance, not only did 100% (N=101) pass the computer-scored psychomotor skills testing, a percentage change was calculated for participants who scored at least 90% on their overall CPR skills performance. This showed a 12.68% increase in staff nurses achieving the higher mark at the repeated RQI CPR skills session. The CPR knowledge improved with the group composite scores increased by 1.61% from 85.74% to 87.12%. Lastly, for both first and second RQI sessions, 100% (n=101) reported confidence levels that range from being confident to being extremely confident, while at least 89% (n=90) of participants maintained very confident to extremely confident levels in their ability to provide high quality CPR during an actual code blue event. RQI, as a leadership-supported innovation for maintaining CPR competency improved skills retention, knowledge and confidence.
Chapter Seven: Discussion

Cardiac arrest remains to be a major public health problem in the United States (U.S.). There are an estimated 209,000 in-hospital cardiac arrests (IHCAs) annually in the U.S. with low survival to discharge rates ranging from 22.3% to 25.5% (Kleinman et al., 2015; Mozaffarian et al., 2015). Inconsistencies in performance of both healthcare professionals including poor cardiopulmonary (CPR) skills retention and the systems in which they work likely contribute to these differences in outcomes (Idris et al., 2015). The implementation of the American Heart Association’s (AHA) Resuscitation Quality Improvement (RQI) as an evidence-based practice (EBP) change project not only increased the acute care nurses’ CPR skills performance, but also boosted their knowledge of high quality CPR and confidence in their ability to perform CPR.

The purpose of this chapter is to discuss recommendations for the practice site, implications for policy, links to health promotion and the critical role of the doctoral prepared nurse, the next steps and plans for dissemination of the EBP change project.

Site Recommendations

Supporting the EBP project involves strategically aligning the innovation with the organization’s mission and goals (Porter-O’Grady & Malloch, 2015). Therefore, the Project Manager’s (PM) primary recommendation is that the positive outcome findings from the RQI project implementation would need to be consistently aligned with the medical center’s overall mission. This critical recommendation paves the way for several other plans and recommendations discussed in the next section that could sustain practice change and meaningful impact at the system, staff and patient levels. The mission of the Veterans Affairs (VA) is to fulfill President Lincoln's promise to care for him who shall have borne the battle, and for his widow, and his orphan by serving and honoring the men and women who are America’s
Veterans (Department of Veterans Affairs [DVA], 2015). The local VA medical center elucidated this further with a mission statement derived from the above overall mission to honor America's veterans by providing exceptional health care that improves their health and well-being (DVA, 2016). Exceptional health care can be achieved by embracing the EBP change project that promotes high quality CPR.

**Plans to sustain site change.** Sustaining change at the practice site entails utilizing systems thinking and following an evidence-based implementation model. Such a model also supports and aligns with the steps of the evidence-based process especially the latter parts involved with translation to practice, implementation and sustaining the change (Gawlinski & Rutledge, 2008; Hamric, Hanson, Tracy, & O'Grady, 2014; Schaffer et al., 2013). In order to sustain the change at the local VA facility, it is important to share at least on a monthly basis with hospital, unit or departmental management and direct care providers the compliance reports of all clinical units already implementing RQI. Alongside these reports, there needs to be timely recognition of top performing RQI units and their champions to celebrate their achievement and diffuse the innovation. It is essential to continue promoting RQI to inter-professional leaders and staff members at formal and informal meetings or venues as the change project expands beyond pilot units and nurses. Sustaining change at the practice site should seriously consider hiring or detailing a full time or a part time RQI project manager for the maiden year of implementation given the extensive work that goes into getting two resuscitation program databases integrated and updated in addition to maintaining information technology uptime and equipment functioning during implementation. Furthermore, coaching and customer support for RQI first-time users may be necessary to facilitate CPR skills session especially when there are several healthcare providers with diverse learning needs competing to use the same mobile skills station.
This EBP change project, which required investment in technologically compatible equipment such as Laerdal’s QCPR manikins, mobile simulation carts and laptop computers, demonstrated not only better or increased CPR skills and knowledge retention which translated to increased self-confidence of nursing staff. Eventually that would translate to high quality CPR skills performance during actual code blue events and eventually overall survival rates from cardiac arrest. However, these complex factors can be assessed more systematically through a cost effectiveness analysis (CEA). Hence, another recommendation for the clinical site is a program CEA by year-end of rollout to demonstrate better outcomes for the costs incurred to implement RQI. CEA is helpful where major outcomes are either intangible or otherwise difficult to monetize (Celleni & Kee, 2010). During implementation, units with RQI champions or superusers served as great liaisons between the program manager and the implementing units. Therefore, another PM recommendation for the clinical site is to build the RQI superuser program and to firmly establish superusers at the unit level. The RQI superuser provides support and guidance to end users on the fundamental operations of the RQI system and report complex issues to the RQI program manager (DVA, 2018). Finally, the RQI program should be complemented by a robust simulation program that fosters not only the components of high quality CPR but also the critical concepts of leadership, communication and team work to effectively provide high quality CPR during high-stress, actual code blue events.

**Implications for Policy**

The PM presented RQI to various stakeholders at the local VA facility including the shared governance councils, the Clinical Simulation Education Department (CSED) and especially the Critical Care Committee (CCC) who has oversight of the facility’s resuscitation program. As a result, RQI was approved as one method to obtain or renew AHA credentials for
basic life support (BLS) or advanced cardiac life support (ACLS). The revised medical center CPR policy is awaiting final senior leadership approval and publication in spring 2018. Very few VA facilities and private hospitals in North Carolina and the southeastern region of the U.S. have started to implement RQI and are either considering requiring RQI per institutional or regional policy. The same approach is occurring across the VA system. The Veteran Health Administration (VHA) Simulation Learning Education and Research Network (SimLEARN) through its Resuscitation Education Initiative (REdI) is strongly promoting the adoption of RQI throughout VHA since 2016 but is facing challenges due to differences in implementation resources available at local VA facilities.

The PM sought advice and provided feedback to SimLEARN in summer 2017 on the need for a system-wide policy that addresses RQI implementation. In December 2017, a VA memorandum from SimLEARN laid out the minimum requirement for RQI implementation at VA facilities within two years. Currently, there are now over 50% of VA facilities at various stages of RQI implementation (M. Ferry, personal communication, February 13, 2018).

Based on several studies about CPR skills decay and suboptimal CPR performance, the American Heart Association recognized that there must be a change in the frequency of resuscitation training since the quality of CPR is directly related to survival outcomes (Meaney et al., 2013). Since RQI’s U.S. launch in 2014, the REdI Administration Manual (RAM) was revised twice with the last one published in January 2018 which included RQI program implementation. It is becoming apparent that RQI is groomed as the future of resuscitation education for healthcare providers and that AHA’s instructor-led and classroom course offerings are no longer favored as the primary methods of credentialing and maintaining BLS and ACLS competency. The AHA’s RQI program as an innovative approach to maintaining CPR
competence is a timely response to the urgent Institute of Medicine (IOM) report on Strategies to Improve Cardiac Arrest Survival: A Time to Act. IOM’s fifth recommendation called for the adoption of continuous quality improvements (Neumar, Eigel et al., 2015).

**Links to Health Promotion**

According to the World Health Organization (WHO; 2018), health promotion is the process of empowering individuals and communities in order to increase control over their health and its related causes through health literacy initiatives and multisector action to improve healthy behaviors. Cardiac arrest as a public health issue, for which RQI’s high quality CPR focus is crucial, can benefit from excellent health promotion. Disease prevention and health promotion share many goals, and have significant overlap between functions including communication, education, policy and environment (Centers for Disease Control and Prevention [CDC], 2017; Rural Health Information Hub, 2018; WHO, 2018). In both disease prevention and health promotion efforts, the DNP-prepared nurse is well-positioned to lead these processes especially as it applies to the full range of activities that prevent, reduce or manage cardiac arrest.

**Role of DNP-prepared nurse.** Doctor of Nursing Practice (DNP) programs are focused on systems leadership, quality improvement and safety, research synthesis, clinical prevention, evidence-based practice, information technology use, knowledge sharing, advocacy roles for patient-centered care and policy changes. These DNP essentials lend support to the DNP-prepared nurse in redesigning inefficiencies or gaps in the health care system (American Association of Colleges of Nursing [AACN], 2006). Therefore, the DNP graduate has the scientific foundations for clinical practice and allows the doctoral practitioner to collaborate effectively across disciplines and professions through clinical prevention, management and population health to improve practice and outcomes. This section discusses the role of the DNP-
prepared nurse in relation to the implementation of the EBP change project at the clinical practice site.

**Essential I. Scientific underpinnings for practice.** Integrating natural and social science knowledge as well as conceptual or theoretical foundations comprising nursing science provided enriched and diverse knowledge for the RQI PM to approach CPR skills decay innovatively and scientifically using AHA’s RQI program. According to Eldridge (2014), defining nursing science is challenging yet the DNP nurse’s appreciation of nursing science is made possible by recognizing the patterns of knowing and by analyzing the structure of nursing knowledge with its different levels of abstraction (as cited in Zaccagnini & White, 2014, p. 3-5). Several theories or conceptual frameworks that supported various aspects of the EBP project included Rogers’s theory of innovation diffusion, Knowles’ seminal adult learning theory, Kirkpatrick’s training evaluation model, Kolb’s experiential learning theory, Bandura’s social cognitive theory and Erickson’s deliberate practice theory. The last two theories provided program context and were especially evident during RQI implementation.

**Essential II. Organizational and systems leadership for quality improvement and systems thinking.** As a DNP-trained clinician implementing RQI this competency was invaluable. This essential equipped the PM in the role of systems leader with quality improvement strategies and in creating and sustaining changes at the organizational and policy level (Chism, 2016). Waxman (2013) maintains DNP leaders should have finance skills to monitor cost-effectiveness and economic viability of EBP programs in meeting healthcare needs. The PM was able to demonstrate the potential cost effectiveness and cost avoidance of the RQI project. Leading RQI implementation throughout the medical center advances nursing at the
systems or organizational level by improving staff and clinical outcomes while containing or managing program cost.

**Essential III. Clinical scholarship and analytical methods for evidence-based practice.**

According to the AACN (2006), “DNP graduates generate evidence through their practice to guide improvements in practice and outcomes of care” (p. 12). Translation of research into practice and the dissemination and integration of new knowledge as DNP-prepared RQI PM is just as important a competency as discovering new knowledge through original research.

The RQI pilot project showed positive results which were shared with both the VA RQI Manager and Laerdal VA RQI Project Implementation Coordinator. This has led to more VA facilities moving in the same direction. Implementing RQI advances nursing science as literature review supports evidence-based interventions proven to promote high quality CPR skills improve clinical practice including improved CPR skills retention and ultimately cardiac arrest survival rates which further enriches implementation science.

**Essential IV. Information systems/technology & patient care technology for improvement & transformation of health care.** According to Chism (2016), DNP graduates are information technology specialists who utilize nursing informatics to improve quality and health care outcomes as direct care providers and as system leaders. Being proficient in the use of information systems/technology resources to implement quality improvement initiatives such as AHA’s RQI and support clinical practice and administrative decision-making became increasingly invaluable to the PM with DNP competencies in implementing a RQI, a technology-driven project. The QCPR manikins used with RQI training digitally records and scores CPR performance using an algorithm that incorporates the components of high quality CPR. This innovative technology mirrors the CPR feedback device currently used by the organization.
during actual CPR events to measure and improve CPR quality. Effectively utilizing information systems/technology resources and skills to implement RQI advances nursing by leveraging technological and digital innovations to improve CPR skills performance and patient outcomes.

**Essential V. Health care policy for advocacy in health care.** DNP graduates possess the necessary tools such as practical experience, advanced education, EBP knowledge which make them powerful advocates for healthcare policies (Chism, 2016). Having the capacity to engage proactively in the development and implementation of health policy at all levels, including institutional, local, state, regional, federal, and international level is empowering to the PM for RQI in a complex and large federal facility. In translating evidence to practice by implementing RQI, nursing is advanced as the DNP nurse leader sees the benefits and breaks down barriers to challenges through EBP. This is related to the DNP leader’s ability to globally assess and navigate the organization and system through EBP, which puts the DNP graduate in a pivotal position to advocate for health care policy that benefits staff, patients, and organizations.

**Essential VI. Inter-professional collaboration for improving patient and population health outcomes.** The DNP graduate’s integrated role of fostering collaboration as a clinical leader creates the bridge between all members of the healthcare team (Chism, 2016). Facilitating collaborative team functioning or effective team leadership and overcome impediments to inter-professional practice is crucial to the RQI PM launching a new program that impacts various disciplines. Implementing RQI advances nursing as EBP project requires inter-professional engagement and collaboration to succeed.

**Essential VII. Clinical prevention and population health for improving the nation’s health.** According to AACN (2006), “DNP graduates analyze epidemiological, bio-statistical, occupational, and environmental data in the development, implementation, and evaluation of
clinical prevention and population health” (p. 15). Engaging in inter-professional collaborative leadership to integrate and institutionalize evidence-based clinical prevention and population health services for individuals, aggregates, and population is proving to be vital in implementing RQI as a PM. Implementation of RQI change project arose from public health concerns of low cardiac arrest survival rates and CPR skills degradation. Hence, nursing practice is advanced.

**Essential VIII. Advanced nursing practice.** Possessing foundational practice competencies that demonstrate refined assessment skills and base practice on the application of biophysical, psychosocial, behavioral, sociopolitical, cultural, economic, and nursing science as appropriate in one’s area of specialization is requisite for the DNP-prepared leader. In summary, DNP essentials such as strong organizational and systems leadership, inter-professional collaboration, information systems/technology, health care policy advocacy and clinical scholarship for EBP are valuable in transforming, redesigning and reforming health care to allow nurses to practice to the fullest extent of their education and training (AACN, 2006; Fairman, Rowe, Hassmiller, & Shalala, 2011).

**Next Steps for Evidence-based Practice**

The EBP RQI project’s three outcome measures to improve acute care nurses’ CPR skills retention and performance, CPR knowledge on components of high quality CPR, and CPR confidence. It is critical that the plans to sustain change discussed earlier are carried out using the Iowa Model of EBP to Promote Quality Care and consistently reassessed to evaluate continued effectiveness. Furthermore, the RQI inter-professional team, led by the PM, should frequently reflect on lessons learned to ensure RQI’s long-term success through monthly meetings with key stakeholders including additional RQI administrators, senior leadership and specialized staff from the Office of Information Technology (OIT). The unflinching support of these strategic
implementation partners is critical as RQI expansion is ongoing throughout 2018. This is of vital importance especially with the IT challenges such as slow computer, network or internet connectivity encountered during the initial rollout. The RQI project needs to be offered inter-professionally and beyond acute care nurses to include all healthcare providers required to have BLS or ACLS credentials.

Moreover, the RQI program should be expanded to the rest of the medical center including ambulatory care clinics, long-term care and specialty service settings, and eventually outside of the main campus and into the community-based outpatient clinics (CBOCs) starting in the second quarter of 2018. This would require the PM to once again assess readiness, conduct strengths, weaknesses, opportunities, threats (SWOT) analysis, survey, educate, collaborate and reach out to interdisciplinary leaders and staff members in the newly targeted units; while keeping in mind the recent lessons learned including strengthening of the remediation plan and waiver process for staff members unable to qualify or complete RQI hands-on CPR skills activity. Currently, the Social Work Service, five Medicine Service departments (Pharmacy, Respiratory Therapy, Hospitalist, Radiology), the Community Living Center Service (VA’s long-term care facility), the advanced practice providers including clinical nurse specialists, nurse practitioners, certified registered nurse anesthetists, physician assistants, and the nursing staff of the Psychiatric Acute Care and Ambulatory Care Service are targeted for RQI rollout in Spring and Summer 2018.

The PM also recommended to VHA national leadership about subscribing to the AHA’s “Get With the Guidelines- Resuscitation” and purchasing the RQI Analytics program from Laerdal to enhance the quality improvement and recognition activities of the EBP change project. A follow-up in summer 2018 should be made prior to the beginning of the new federal
fiscal year in October 2018. The PM should provide consolidated feedback to AHA’s RQI Program in fall 2018 on the most common implementation challenges or barriers that the medical center has faced.

**Plans for Dissemination**

Dissemination of the findings of the EBP change project is underway with internal stakeholders made aware through formal monthly meetings and scheduled live presentations augmented by PowerPoint and electronic presentations to senior leaders of the Nurse Executive Coordinating Council (NECC), the Critical Care Committee (CCC), and interested departments. The local VA facility RQI PM was invited by SimLEARN to present its RQI journey to VHA’s REdI Community of Practice in one of its 2018 monthly webinar meetings. This is an excellent opportunity to share best practices and lessons learned among implementing VA facilities. The PM was also invited to showcase RQI during one of the special festivities scheduled at the week-long Nurses Week celebration in May 2018. A similar event is targeted for June 2018 during CPR Week 2018 celebration at the medical center. The RQI demonstration exhibit will include CPR competition for the best composite performance scores on participants’ chest compressions and ventilations. The PM is also in close contact with the credentialing and education departments of Duke University Medical Center, the local VA hospitals academic affiliate, to update them regularly on the new official AHA BLS and ACLS cards generated by the RQI program. With implementation of the EBP change project, a query letter was submitted to the editor of a peer-reviewed journal and an initial response expressing interest in the clinical topic was received by the PM from the journal editor. Hence, a manuscript on the EBP project is scheduled for submission to the editorial board of MEDSURG Journal in summer 2018. Finally, the PM, as member of nursing professional specialty associations, plans to apply in spring 2018
for consideration or acceptance into the poster presentation category in both the 2019 National Doctors of Nursing Practice Conference in Washington DC and the 2019 National Association of Clinical Nurse Specialists (NACNS) Annual Conference in Orlando, FL.

**Summary**

Poor CPR skills retention or rapid skills decay among healthcare providers was identified as a clinical problem hampering delivery of high quality CPR to patients at a local VA medical center. A review of the literature revealed that low-dose, high frequency CPR skills mastery training improved CPR skills performance among healthcare staff. AHA’s RQI program, the EBP change project, was implemented to increase acute care nurses’ CPR skills retention and performance, CPR knowledge on components of high quality CPR, and CPR confidence. Data analysis of first and second RQI CPR skills session with post-training survey for each session demonstrated improved or maintenance of acute care nurses’ CPR skills retention and performance, CPR knowledge on components of high quality CPR, and CPR confidence. Project implementation findings were disseminated to key stakeholders, leaders and staff members at the project site and dissemination outside of the organization has been scheduled. Currently, the PM is closely collaborating with leadership in the local organization to sustain the initial RQI implementation success and expand the project to the rest of the medical center and associated CBOCs.
Chapter Eight: Final Conclusions

According to Hall and Roussel (2017), evidence-based practice (EBP), as a problem-solving approach, integrates research into practice, and affords clinicians the opportunity to identify problem questions and process improvement needs in clinical practice. The purpose of this EBP change project was to improve acute care nurses’ cardiopulmonary resuscitation (CPR) skills retention and performance, CPR knowledge on components of high quality CPR, and CPR confidence. This chapter outlines the final conclusions being discussed regarding this EBP change project.

Clinical Problem

Sudden cardiac arrest remains a leading cause of death in the United States and a public health issue with severe impact on human health. Outcomes of in-hospital cardiac arrest (IHCA) are still poor with survival to discharge rates from 22.3% to 25.5% (Kleinman et al., 2015; Mozaffarian et al., 2015). For IHCA, two significant provider-dependent determinants of survival are early defibrillation for shockable rhythms and high quality CPR (Bhanji, Donoghue et al., 2015). High quality CPR should be established as the foundation on which all other resuscitative efforts are built (Bhanji, Finn et al., 2015; Kleinman et al., 2015; Meaney et al., 2013). However, there is significant variation in monitoring, implementation and quality improvement making high quality CPR both a challenge and an opportunity for organizations as they assess their resuscitation programs. Given that poor CPR quality is a preventable harm addressing CPR performance with quality improvement processes is vital in minimizing its occurrence and in impacting survival to discharge outcomes (Bhanji, Finn et al., 2015). Inconsistencies in performance of both healthcare professionals including poor CPR skills retention and the systems in which they work likely contribute to these differences in outcomes.
The American Heart Association (AHA) recognized that there must be a change in the frequency of resuscitation training as two-year retraining cycles are not effective (Bhanji, Donoghue et al., 2015; Bhanji, Finn et al., 2015). The clinical problem guiding this EBP change project at the local Veterans Affairs (VA) facility was the deterioration of CPR skills among basic life support (BLS) and advanced cardiac life support (ACLS) providers who were currently in two-year retraining or renewal cycles and who respond to code blue activations within the medical center to provide basic and ACLS services.

**Evidence Base**

The integrative review of the literature sought to find relevant and supportive evidence for the implementation of AHA’s Resuscitation Quality Improvement (RQI), a low dose, high frequency refresher CPR training approach with a robust feedback mechanism to maintain competence in CPR and improve CPR skills, knowledge, and confidence levels. Sutton et al. (2011) investigated the effectiveness of brief bedside CPR training to improve the skill retention of hospital-based pediatric providers using a prospective, randomized interventional trial design. To evaluate CPR quality, CPR recording/feedback defibrillators were used. Eighty-nine BLS-certified, hospital-based providers were randomly assigned to 1 of 4 study arms: (1) instructor-only training; (2) automated defibrillator feedback only; (3) instructor training combined with automated feedback; and (4) control (no structured training). Each session (time: 0, 1, 3, and 6 months after training) consisted of a pre-training evaluation (60 seconds), booster training (120 seconds), and a post-training evaluation (60 seconds). Seventy-four (83%) participants completed all brief (two minutes) and frequent CPR practice sessions within a six-month period. Retention of CPR skills was 2.3 times (95% confidence interval [CI]: 1.1–4.5; \( p = 0.02 \)) more likely after two trainings and 2.9 times (95% CI: 1.4–6.2; \( p = 0.005 \)) more likely after three
trainings. The findings demonstrate that brief bedside booster CPR training improves CPR skill retention (Sutton et al., 2011).

A randomized control trial (RCT) by Oermann, Kardong-Edgren, and Odom-Maryon (2011) examined the effects of monthly practice on nursing students’ CPR psychomotor skill performance. Six hundred four nursing students were randomly assigned to a six-minute monthly practice group or a control group with no practice option. Oermann et al. examined the effects of short monthly skills practice on nursing students’ CPR psychomotor skills performance at 3, 6, 9, and 12 months compared to a control group without skills practice, and of repeating the initial BLS course at 12 months. Oermann et al. found that skills performance and retention were improved over baseline with brief monthly practice sessions. At three or six months, the practice or experimental group had significantly better scores as compared to the control group in compressions with adequate depth \((p = 0.005)\) and adequate ventilations \((p = 0.004)\).

Sullivan (2015) conducted an integrative review on instructional strategies to improve nurses’ retention of CPR priorities. Within that review, there were six Level I studies which were RCTs, two quasi-experimental Level II studies, and five Level III observational studies. In general, this review included high level, good quality studies with good designs and adequate sample size. Some of the study samples consisted of 60–70 participants while others had about 600 volunteers. The evidence revealed several common themes as instructional strategies including simulation and mock codes, video training, and e-learning. The use of deliberate practice or frequent structured practice sessions improving skills retention was reported in numerous studies (Sullivan, 2015).

The research findings have consistently demonstrated that implementing a unit-based, self-directed, high frequency, low dose deliberate CPR practice and refresher training
intervention that incorporates advances in computer technology including simultaneous audiovisual performance feedback and immediate debriefing after training improves CPR skills performance and retention.

**Theory and Model for Evidence-based Practice**

The Iowa Model of EBP to Promote Quality Care focuses on organizational processes and inter-professional collaboration incorporating conduct and use of research, along with other types of evidence and a pilot of the practice change before wide scale implementation (Melnyk, Gallagher-Ford, & Fineout-Overholt, 2017; Polit & Beck, 2003; Titler et al., 2001). The steps of the Iowa Model were followed to implement the EBP change project. The clinical topic of rapid skills decay was selected for its importance and priority for the organization then the clinical question was formulated. A team of key stakeholders from various disciplines was formed. Evidence retrieval was conducted and yielded numerous supportive studies. With sufficient evidence in the literature, an EBP standard was developed in collaboration with inter-professional team members. The EBP change project was implemented once all necessary approvals were obtained to pilot RQI in acute care units within the medical center. The project was evaluated frequently and after a quarter of CPR skills performance data. Outcomes from the pilot guided hospital-wide implementation and led to dissemination of findings.

**Project Management**

Project management begins long before project implementation, specifically with the planning and designing of the project (Harris, Roussel, Dearman, & Thomas, 2016). Project management is important because the activities and processes to be accomplished need to be carefully organized, coordinated and carried out in order to achieve the project goal. For the RQI change project, the following planning and preparatory processes included an organizational
readiness for change, effective inter-professional collaboration of all stakeholders, risk
management assessment, organizational approval process including the medical center
institutional review board’s (IRB) approval prior to RQI rollout, project material management
and planning for project implementation, data analysis and evaluation.

Project Implementation

There were over 200 acute care nurses working in 13 clinical units across the medical
center that implemented the RQI project. During the EBP implementation, 182 nurses had
attended a combination of group and individualized education sessions in the simulation
classroom, unit conference rooms, staff meetings and personalized education at the mobile skills
station on the components of high-quality CPR and how RQI works to promote such high-quality
CPR through its low dose, high frequency training facilitated and accessible at the unit level.
Since the RQI project required two brief CPR skills assessment sessions and a survey each time,
only 101 acute care nurses were able to complete both CPR sessions and survey for the EBP
change project.

A CPR RQI hands-on assessment consisted of 60 adult chest compressions and 12 bag-
valve mask ventilations after watching a standardized two-minute AHA educational video
demonstration on high quality CPR. Real time audiovisual performance feedback using Laerdal
Quality CPR (QCPR) technology, voice advisory manikin (VAM), and a skills performance
dashboard as well as an immediate summative debrief of things done well and areas needing
improvement readily facilitated staff’s self-correction and reinforced skills retention. The CPR
psychomotor skills were electronically measured in real-time and scored by deducting for
deviations from evidence-based guidelines on providing chest compressions of adequate rate and
depth, allowing full chest recoil between compressions, minimizing interruptions in chest compressions and avoiding excessive ventilation.

**Outcome Findings**

The three identified outcomes of the AHA RQI project implementation namely increased CPR skills performance, CPR knowledge on high quality CPR, and self confidence in performing quality CPR were met. This EBP project reproduced what was already shown repeatedly in the literature that more frequent skills retraining, or refreshers can benefit those staff members who respond to cardiac arrest activations. This EBP change project demonstrated that the implementation of an innovative low dose, high frequency deliberate CPR training refreshers improved CPR skills retention, knowledge and confidence by meeting the established benchmarks. On the CPR skills performance, not only did 100% (N=101) pass the computer-scored psychomotor skills testing, a percentage change was calculated for participants who scored at least 90% on their overall CPR skills performance. This showed a 12.68% increase in staff nurses achieving the higher mark at the repeated RQI CPR skills session. The CPR knowledge improved with the group composite scores increased by 1.61% from 85.74% to 87.12%. Lastly, 98% (n=99) reported confidence levels that range from being confident to being extremely confident, while at least 88% (n=89) of participants maintained very confident to extremely confident levels in their ability to provide high quality CPR.

**Discussion Summary**

A DNP-prepared nurse leader is equipped with the required competencies to implement evidence-based interventions that can improve program, process, and patient outcomes. AHA’s RQI program, the EBP change project was implemented to increase acute care nurses’ CPR skills retention and performance, CPR knowledge on components of high quality CPR, and CPR
confidence. Data analysis of first and second RQI CPR skills session with post-training survey for each session demonstrated improved or maintenance of acute care nurses’ CPR skills retention and performance, CPR knowledge on components of high quality CPR, and confidence in being able to perform effective CPR. Project implementation findings were disseminated to key stakeholders, leaders and staff members at the medical center and dissemination outside of the organization has been scheduled. Currently, the PM is closely collaborating with leadership in the local organization to sustain the initial RQI implementation success and expand the RQI project to the rest of the medical center and affiliated community-based outpatient clinics (CBOCs).

**Final Conclusions**

Poor CPR skills retention or rapid skills decay among healthcare providers was identified as a clinical problem hampering delivery of high quality CPR to patients at a local VA medical center. A review of the literature revealed that low-dose, high frequency CPR skills mastery training improved CPR skills performance among healthcare staff. The RQI implementation replicated the findings that supported the EBP change. The doctoral prepared nurse’s specialized training and foundations in systems leadership, quality improvement and safety, research synthesis, clinical prevention, evidence-based practice, information technology use, knowledge sharing, advocacy roles for patient-centered care and policy changes lend support to the doctoral prepared practitioner’s ability to collaborate effectively across disciplines and professions through EBP project implementation to improve practice and outcomes.
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Appendix A

Organization Approval Letter

Memorandum of Understanding
Between VHA Employee Education System (EES/SimLEARN) And Durham VAMC/HCS
For the Resuscitation Quality Improvement (RQI) Training Program

Introduction

This Memorandum of Understanding is executed between Durham VAMC/HCS and EES/SimLEARN/REdI to provide details for the distribution and delivery of supplemental simulation-based training items including but not limited to equipment and warranties, curriculum, and training materials to facilitate the VA Medical Centers (VAMCs) in the instruction of national curriculum objectives associated with the Resuscitation Quality Improvement (RQI) program.

The Resuscitation Education Initiative (REdI) is a national program to standardize, document, track and monitor the provision of Advanced Cardiac Life Support (ACLS), Basic Life Support (BLS) training throughout VHA. REdI is a business unit within the EES Simulation Learning Education and Research Network (SimLEARN). It will provide critical train-the-trainer clinical training support to the field's efforts to provide training to large numbers of medical center clinical and non-clinical employees. The goals of the REdI Program are to expand the number of employees certified in ACLS/BLS/ to advance the quality of patient care, and to improve the documentation for resuscitation training.

Purpose

This MOU pertains to RQI program curriculum implementation and is executed between VHA EES/SimLEARN and the facility.

The American Heart Association’s Resuscitation Quality Improvement (RQI) program is a groundbreaking new approach to maintaining Cardiopulmonary Resuscitation (CPR) competence and a solution to address the problem of rapid skills degradation after initial training.

The RQI program uses realistic eSimulation patient cases and a mobile CPR Testing Station, for quarterly psychomotor skills activities, to help healthcare providers retain life-saving CPR skills. Additionally, the program will reduce the amount of time clinicians are away from clinical care for classroom training.

The program is a cloud-based, turnkey learning and training service available through the VA Talent Management System (TMS) from the AHA, with learning technology from Laerdal. It will use Elearning content with hands on skills conducted on facilities Voice Assisted Manikins (VAMs).

The program includes cognitive components that are delivered online and psychomotor skills assessments that can be performed at mobile VAM CPR Testing Stations. The mobile VAM CPR Testing Stations are equipped with adult and infant manikins and a tablet computer that connects the student to the training material.

Commitment

Commitment to change the culture of CPR is a pledge to save veteran lives. RQI program is a direct reflection of the “Blueprint for Excellence” to evolve health services towards delivering high quality modernized Veteran-centric care while fostering an environment of continuous learning to improve organizational effectiveness.
Memorandum of Understanding
Between VHA Employee Education System (EES/SimLEARN) and Durham VAMC/HCS
For the Resuscitation Quality Improvement (RQI) Training Program

The REDi RQI program strategy is a national simulation-based training effort focused on improving clinical providers’ skills in CPR with the ultimate goal of improving Veteran patient care. One goal unique to CPR is the reversal of clinical death, an outcome achieved in resuscitative efforts.

Facility leadership shall embrace and support this innovative revolutionary change of culture to ensure the highest quality Veteran Patient Care services are provided. By ensuring RQI Program adoption by learners, and facilitating communications with educators and other internal stakeholders, you will be a key participant in delivering a new generation of learning and assessment that is designed to build high-quality CPR skills for better patient outcomes.

RQI site Champions will be the program experts within your institution. Through the creation of Super Users – excellent learners who can mentor other learners – Champions will effectively project influence throughout the organization to achieve and maintain CPR competency.

Program success is a shared responsibility between REDi and the facility. Facility resource practitioners are encouraged to strongly participate with REDi in the formulation of strategies within their organizations. Importantly, together we must ensure clinicians are educated both about the risks they face and the actions they can take to reduce their risks. Because of this arrangement of responsibilities, only a life cycle, comprehensive and collaborative systems approach will enable facilities to sustain an effective reduction of risks.

Recommendation is for all appropriate staff to attend and successfully complete all requirements of this training program at the medical centers.

As part of this initiative, each participating medical facility is receiving simulation-based training equipment and provided train-the-trainer instruction delivered by the AHA vendor partner at each facility.

Executed on this 9th day of June, 2016

Between

Designated Learning Officer
Durham VAMC/HCS
Date

Chief Nurse, Nursing Edu/Medicine
Durham VAMC/HCS
Date

SimLEARN/REDi
VISN RQI MOU
Page 2 of 3
Memorandum of Understanding
Between VHA Employee Education System (EES/SimLEARN) 
And Durham VAMC/HCS
For the Resuscitation Quality Improvement (RQI) Training Program

Durham VAMC Facility CIO  Date
OI&T

Designated Learning Officer  Date
Veterans Health Administration

SimLEARN National Program Manager  Date
Employee Education System
Veterans Health Administration

Enclosure:
1. ROI Overview.
2. RQI Frequently Asked Questions.
3. RQI PowerPoint Presentation.
Appendix B

CPR Skills Performance, Knowledge and Confidence Survey

Demographic Data Sheet
Assigned Code: _______________

1. Gender
   a. Female
   b. Male

2. Age
   a. 18-25 years old
   b. 26-30 years old
   c. 31-35 years old
   d. 36-40 years old
   e. 46-50 years old
   f. 51-55 years old
   g. 56-60 years old
   h. 61-65 years old
   i. 66-70 years old

3. Height
   a. 5' or below
   b. 5'1" - 5'3"
   c. 5'4" - 5'6"
   d. 5'7" - 5'9"
   e. 5'10" - 6'
   f. greater than 6'

4. Weight
   a. 81-90 lb
   b. 91-100 lb
   c. 101-110 lb
   d. 111-120 lb
   e. 121-130 lb
   f. 131-140 lb
   g. 141-150 lb
h. 151-160 lb
i. 161-170 lb
j. 171-180 lb
k. 181-190 lb
l. 191-200 lb
m. greater than 200 lb

5. Race
   a. White
   b. Hispanic or Latino
   c. Black or African American
   d. Native American or American Indian
   e. Asian/Pacific Islander
      Other: __________________

6. Work Unit
   a. 6A
   b. 6B
   c. 7A
   d. 7B
   e. ED
   f. GI Clinic
   g. IRU/VIR
   h. Cath Lab/EP
   i. CICU
   j. SICU
   k. MICU
   l. PACU
      Other: __________________

7. License/Registration Type
   a. RN
   b. LPN
   c. CNA/NA/Tech

8. Educational Level
   a. High School
b. College
c. Bachelors
d. Masters
e. Doctorate

9. If you have performed CPR during an actual resuscitation attempt, how many times did you approximately perform CPR in the last 12 months? (If you did not, simply choose “0”)

a. 0
b. 1 time
c. 2-5 times
d. 6-12 times
e. more than 12 times
CPR Skills Performance, Knowledge and Confidence Survey

Assigned Code: __________
Week 1-2 Post RQI Training Survey______ Week 6-7 Post RQI Training Survey______

CPR Skills Performance, Knowledge and Confidence

The questions below ask you about your recently completed brief RQI CPR skills training including your CPR skills performance score, your CPR knowledge, and your CPR self-efficacy/confidence level.

CPR Skills Performance Composite Score

1. What is the final overall score on your adult compression performance that was shown on the computer screen’s upper left section after you completed chest compressions?

   f. less than 75%
   g. 75-80%
   h. 81-85%
   i. 86-90%
   j. 91-95%
   k. 96-100%

2. What is the final overall score on your bag-valve mask ventilation performance that was shown on the computer screen’s upper left section after you completed the ventilation assessment?

   a. less than 75%
   b. 75-80%
   c. 81-85%
   d. 86-90%
   e. 91-95%
   f. 96-100%

CPR Knowledge Based on 2015 AHA/ECC Guideline Update

3. What is the recommended 2015 American Heart Association (AHA) adult chest compression rate?

   a. 80-100 compressions/min
   b. at least 100 compressions/min
   c. 100-120 compressions/min
   d. 80-120 compressions/min
4. What is the recommended 2015 American Heart Association (AHA) adult chest compression depth?
   
   a. at least 38 mm (1.5 inches)
   b. 50 mm (2.0 inches)
   c. 50-60 mm (2.0-2.4 inches)
   d. up to 64 mm (2.5 inches)

5. What is the recommended 2015 American Heart Association (AHA) minimum acceptable chest compression fraction (or the percentage of time in which compressions are done by rescuers during a cardiac arrest attempt)?
   
   a. at least 60%
   b. at least 75%
   c. at least 90%
   d. 100%

6. What is the recommended 2015 American Heart Association (AHA) adult ventilation rate for rescue breathing?
   
   a. 10-12 breaths per minute
   b. 12-16 breaths per minute
   c. at least 16 breaths per minute
   d. 20 breaths per minute

7. What best describes the concepts of chest recoil (re-expansion) and chest leaning that provide high quality CPR based on the 2015 AHA/ECC guideline update for CPR?
   
   a. Full chest recoil: no residual leaning is recommended
   b. Full chest recoil: minimal residual leaning is recommended
   c. Full chest recoil: moderate residual leaning is recommended
   d. Full chest recoil: some residual leaning is recommended

**Resuscitation Self-Efficacy or Confidence Level**

8. How confident are you that you will be able to apply your newly refreshed CPR skills in an emergency situation on a real code blue patient?
   
   a. extremely confident
   b. very confident
   c. confident
   d. somewhat confident
   e. not confident
9. How confident are you that you will be able to demonstrate effective chest compressions (depth, rate, no leaning)?
   a. extremely confident
   b. very confident
   c. confident
   d. somewhat confident
   e. not confident

10. How confident are you that you will be able to demonstrate effective bag valve mask ventilations (volume, minute volume, pressure)?
    a. extremely confident
    b. very confident
    c. confident
    d. somewhat confident
    e. not confident

11. Please share any comment, feedback, opinion, suggestions or recommendations regarding your RQI experience or resuscitation education at DVAHCS in general (optional). Thank you!
    __________________________________________________________
    __________________________________________________________________________
    __________________________________________________________
Appendix C

Participant Cover Letter

Dear Participant,

My name is Reggie Horwitz and I am a Critical Care Nurse Educator currently seeking my doctoral degree at Chatham University in Pittsburg, Pennsylvania. My doctoral project involves improving the CPR skills retention or performance, CPR knowledge, and CPR confidence of acute care nurses through the American Heart Association’s Resuscitation Quality Improvement (RQI) program, a low-dose, high frequency CPR skills training as a means to complete BLS and ACLS renewal. This project consists of an initial brief presentation of the RQI program with instructions on how to access and complete the computer-based self-guided hands-on CPR skills training and post-session online survey followed by another brief CPR skills session and post-session online survey four weeks following the first one. The hands-on CPR skills training will take approximately 10 minutes while the post-training online survey will take approximately 5 minutes to complete. The brief CPR skills session and online survey will be unit-based and available in the acute care areas 24 hours a day and 7 days a week for two weeks (weeks one and two) to accommodate your busy schedule and a repeated skills session and online survey in four weeks (weeks six and seven) during a time of our choosing that is convenient for you.

The program is at no cost to you and poses no risk greater than what you are currently exposed to with traditional AHA courses available at this institution. After the 10-minute skills session, each participant will complete a brief online survey on his/her CPR skills performance, CPR knowledge, and CPR confidence. The same short skills session and online survey will be completed six weeks later. The online survey was created to maintain security and anonymity.
and is password-protected to protect privacy and confidentiality. There is no penalty for participating and you can withdraw at any time.

This is an opportunity to learn about an evidence-based innovation aimed towards improving CPR skills retention and performance, CPR knowledge and CPR confidence. With your participation in this project, my goal is to enhance CPR skills retention and performance, CPR knowledge and CPR confidence while providing facilitation and coaching. I am asking you to consider participating in this project. If you have any questions, please feel free to contact me at (919) 454-1258. Thank you for your time and consideration.

__________________________________________  ______________________________
Student                                     Faculty Advisor

Project Manager
Appendix D

Participant Consent Form

INVESTIGATOR(S) NAME: Reginaldo Horwitz

EVIDENCE BASED PRACTICE PROJECT TITLE: Improving CPR Skills Retention and Performance, CPR Knowledge and CPR Confidence Using AHA’s Resuscitation Quality Improvement (RQI) Program with Facilitation

PURPOSE OF THE EVIDENCE BASED PRACTICE PROJECT:
The purpose of this evidence-based practice project is to improve CPR skills retention and performance, CPR knowledge and CPR confidence while providing facilitation and coaching which will ultimately improve in-hospital cardiac arrest survival outcomes.

DESCRIPTION OF THE EVIDENCE BASED PRACTICE PROJECT:
The EBP project is implementation of American Heart Association’s Resuscitation Quality Improvement (RQI) program, a low-dose, high frequency CPR skills training as a means for staff member to complete BLS and/or ACLS renewal. This project consists of an initial brief presentation of the RQI program with instructions for the participant on how to access and complete the computer-based self-guided hands-on CPR skills training and post-session online survey followed by another brief CPR skills session and post-session online survey six weeks following the first one. The hands-on CPR skills training will take approximately 10 minutes while the post-training online survey will take approximately 5 minutes to complete. The brief CPR skills session and online survey will be unit-based and available in the acute care areas 24 hours a day and 7 days a week for two weeks (weeks one and two) to accommodate your busy schedule and a repeated skills session and online survey in four weeks (weeks six and seven) during a time of our choosing that is convenient for you.

RISKS AND DISCOMFORTS:
There is no part of the RQI skills session or online survey that will cause discomfort or will pose any risk greater than what you are currently exposed to with traditional AHA courses available at this institution. There are no identifiable risks involved in participation.
**BENEFITS:**
Participation will enhance CPR skills retention and performance, CPR knowledge and CPR confidence while facilitation and coaching are provided.

**ALTERNATIVE PROCEDURES:**
Individuals who choose not to participate will continue to have access to the traditional AHA courses available at the institution.

**CONFIDENTIALITY:**
All questionnaires will be coded to maintain confidentiality. All questionnaires will be destroyed after data collection.

**TERMINATION OF PARTICIPATION:**
Participation is voluntary. Individuals can withdraw at any time and there is no penalty for not participating in the program.

**COMPENSATION:**
Participants will not incur any cost for their participation and no compensation will be given.

**INJURY COMPENSATION**
Neither Chatham University nor any government or other agency funding this evidence-based practice project will provide special services, free care, or compensation for any injuries resulting from this project. I understand that treatment for such injuries will be at my expense and/or paid through my medical plan.

**QUESTIONS**
All of my questions have been answered to my satisfaction and if I have further questions about this project, I may contact Reggie Horwitz (the primary investigator, with email address). If I have any questions about the rights of evidence-based practice participation, I may call the Chairperson of the Durham VAHCS Institutional Review Board at (919) 286-6926.
VOLUNTARY PARTICIPATION

I understand that my participation in this evidence-based practice project is entirely voluntary, and that refusal to participate will involve no penalty or loss of benefits to me. I’m free to withdraw or refuse consent, or to discontinue my participation at any time without penalty or consequence.

I voluntarily give my consent to participate in this evidence-based practice project. I understand that I will be given a copy of this consent form.

Signatures:

________________________
Participant ’s Name (Print)

________________________
Participant ’s Signature ____________ Date

I, the undersigned, certify that to the best of my knowledge, the subject signing this consent form has had the study fully and carefully explained by me and have been given an opportunity to ask any questions regarding the nature, risks, and benefits of participation in this evidence-based practice project.

_____________________
Investigator’s Name (Print)

________________________
Investigator’s Signature ____________ Date

_____________________
Faculty Advisor Name (Print)

________________________
Faculty Advisor Signature ____________ Date

The Durham VAMC IRB has _______ the solicitation of participants for this study until (one year from approval date)
Appendix E
IRB Approval Letter

Durham VAMC Institutional Review Board (IRB)
CHECKLIST: QUALITY ASSURANCE OR IMPROVEMENT (OPERATIONS ACTIVITY) OR RESEARCH

In accordance with VHA Handbook 1058.05, "VHA Operations Activities That May Constitute Research", Durham VAMC employees may conduct certain operations activities which may or may not constitute research. Whenever the research versus non-research status of an operations activity may be in question, a determination of the status must be made.

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Improving CPR Skills Retention, CPR Knowledge and CPR Confidence Level Using Resuscitation Quality Improvement (RQI) Training Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Lead</td>
<td>Reginaldo Horwitz</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:Reginaldo.Horwitz@va.gov">Reginaldo.Horwitz@va.gov</a></td>
</tr>
<tr>
<td>Reason for Project</td>
<td>□ Locally initiated  □ Mandated by (name Program Office):  □ Degree Program Requirement</td>
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</tbody>
</table>

Research: A systematic investigation (including research development, testing and evaluation) designed to develop or contribute to generalizable knowledge. NOTE: Research typically involves the testing of concepts by the scientific method of formulating a hypothesis or research question, systematically collecting and recording relevant data, and interpreting the results in terms of the hypothesis or question to expand the knowledge base of a field of study (VHA Handbook 1058.05, VHA Handbook 1200.05, 45 CFR 46.102(d) and 45 CFR 164.50).

Generalizable Knowledge: Information that expands the knowledge base of a scientific discipline or scholarly field of study. Systematic investigations designed to develop or contribute to a generalizable knowledge constitute research. Systematic investigations designed to produce information to expand the knowledge based of a scientific discipline or other scholarly field of study constitute research (VHA Handbook 1058.05).

Operations Activities: Operations activities are certain administrative, financial, legal, quality assurance, quality improvement, and public health endeavors that are necessary to support VHA’s missions of delivering health care to the Nation’s Veterans, conducting research and development, performing medical education, and contributing to national emergency response. Operations activities may or may not constitute research (VHA Handbook 1058.05).  

CONDITIONS TO BE CONSIDERED FOR DETERMINATION OF RESEARCH VS. NON-RESEARCH OPERATIONS

<table>
<thead>
<tr>
<th>NOTE: If answers to questions 1 through 9 are marked “TRUE” the project is more likely not research.</th>
<th>TRUE</th>
<th>FALSE</th>
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<tbody>
<tr>
<td>1) The project is designed and/or implemented for internal VA purposes in support of the VA mission(s).</td>
<td>✓</td>
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<tr>
<td>2) The findings are designed to be used by and within VA (or by entities responsible for overseeing VA).</td>
<td>✓</td>
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<tr>
<td>3) The project is not designed for the purpose of contributing to generalizable knowledge.</td>
<td>✓</td>
<td></td>
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<tr>
<td>4) The project is not designed to produce information that expands the knowledge base of a scientific discipline (or other scholarly field).</td>
<td>✓</td>
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<td>5) The project is not funded or otherwise supported as research by the Office of Research and Development (ORD) or any other entity.</td>
<td>✓</td>
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<td>6) The project does not involve administration, dispensing and/or use of any drugs, devices and/or biologics.</td>
<td>✓</td>
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<tr>
<td>7) The project does not involve design characteristics typically reflective of research, e.g.:</td>
<td>✓</td>
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<tr>
<td>• Double-blind interventions</td>
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<tr>
<td>• Use of placebo controls</td>
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<td>• Prospective patient-level randomization to clinical interventions not tailored to individual benefit</td>
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Version Date 4/15/16
Durham VAMC Institutional Review Board (IRB)
CHECKLIST: QUALITY ASSURANCE OR IMPROVEMENT (OPERATIONS ACTIVITY) OR RESEARCH

8) The proposal includes provisions to ensure that the safety, rights, and welfare of patients and staff are appropriately protected as applicable. 

☐ ☐

9) As the project currently reads, the activity will not be supplemented or modified before, during, or after implementation in order to produce information to expand the knowledge base of a scientific discipline or scholarly field of study or otherwise contribute to generalizable knowledge.

☐ ☐

Multisite Projects or QA/QI Projects Mandated, Funded or Supported by a VA Program Office:

☐ This project includes obtaining data or participation from VA sites other than those covered by the DVAMC. Approval from the other facilities must be made prior to initiating the project at those facilities.

☐ This project includes quality improvement/assurance activities that are mandated by, funded by, or otherwise supported by a VA Program Office. The Program Office is responsible for documentation regarding the determination of status as non-research.

Durham VAMC IRB Determination:

☐ Not Research. The IRB has determined that based on the responses above and the proposed project description, approval by an IRB or other review committee is not needed. The project is considered to be non-research VHA operations activity. If the results of this project are presented or published they cannot be presented as research, nor does it have research approval. Any changes or modifications to this project will require re-review.

☐ Research Project. As designed this project requires review by an IRB or other appropriate review committee prior to initiation.

☐ Additional information is needed to make a determination. See comments below.

IRB Comments:
Note that the submission was to request exempt research status; this is not research, and so the exemption is denied but the project may proceed without further IRB evaluation.

IRB Chair or Co-Chair Signature: ___________________________ Date: 7/17/17

Reference:
VHA Handbook 1058.05 VHA Operations Activities That May Constitute Research

1Examples of operations activities include activities designed for internal VA purposes, including routine data collection and analysis for operational monitoring, evaluation and program improvement purposes, VHA system redesign activities, patient satisfaction surveys, case management and care coordination, policy and guidance development, benchmarking activities, Joint Commission visits and related activities, medical use evaluations, business planning and development such as cost-management analyses, underwriting, and similar activities.

2Any change made before, during, or after implementation that results in an intent to expand the knowledge base of a scientific discipline or scholarly field of study, or otherwise contribute to generalizable knowledge, constitutes research and must be submitted to an IRB or other pertinent review committee.

3Potential risks (including physical, psychological, social, financial, privacy, and confidentiality, and other foreseeable risks) associated with non-research operations should be evaluated and appropriate protections established to mitigate them.

4Please note it is the responsibility of this individual and/or each VA author and coauthor (in cases of publication) to retain a copy of this form signed by the IRB Chair or Co-Chair for a minimum of 5 years after publication and in accordance with any applicable records retention schedules. A copy will also be retained by Research Service.
Appendix F

Demographic Tool

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<tr>
<th>ID</th>
<th>Gender</th>
<th>Age</th>
<th>Height</th>
<th>Weight</th>
<th>Ethnicity</th>
<th>Work Unit</th>
<th>License</th>
<th>Education</th>
<th>CPR/Yr</th>
<th>RQI.1.Q1</th>
<th>RQI.1.Q2</th>
<th>RQI.1.Q3</th>
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Appendix G

RQI Infographic Brochure
Appendix H

VHA AHA RQI Poster

- Maintenance of Competency
- Quarterly Learning Events and Skills Practice for High-Quality CPR
- Perpetual Course Completion Card: Advances expiration date every time a quarter is successfully completed
- Automatic Science Updates: Participants are provided with expedited AHA updates to new science and guidelines changes