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Using the COPES Acronym to Improve Nurses' Response Time in the First Three Minutes of a Code Blue: A Quality Improvement Project

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Abstract

Literature consensus indicates overall Cardiopulmonary Resuscitation (CPR) survival rates have remained unchanged despite equipment, drugs, and training improvements. Preparing and educating nurses for the inevitable Code Blue (cardiopulmonary event) is a sound and prudent practice. The purpose of this quality improvement (QI) project was to provide targeted CPR education, including timely Automated External Defibrillator (AED), and the COPES acronym as part of Basic Life Support (BLS) by improving nurses' focus and automaticity in the initial minutes of Code Blue events. Combining multiple teaching methods including active learning scenarios (mock codes), question and answer sessions, audio-visuals (technical and non-technical), and COPES acronym usage, learning and memory retention led to efficient and efficacious BLS delivery. With preparation and improvement in BLS delivery, the chances of return of spontaneous circulation (ROSC) in a timely fashion should lead to improved patient recovery to discharge.

The COPES acronym corresponds to BLS actions: C—Call the Code, get the Crash Cart, start Compressions; O—turn On defibrillator in AED mode, Oxygen; P—Place Pads (defibrillator), Plug-in Pads; E—Evaluate/Analyze; S—Shock Safely, if needed.

Keywords: in-hospital cardiac arrest, cardiopulmonary resuscitation, AED (automated external defibrillator) and Medical-Surgical nurses, mock code blue, use of acronyms for memory retention, learning curve, forgetting curve, adult learners, self-confidence in nurses, self-efficacy in nurses

Using the COPES Acronym to Improve Nurses' Response Time in the First Three Minutes of a Code Blue: A Quality Improvement Project

According to the American Heart Association (AHA), *Get With the Guidelines*, 46.3% of in-hospital cardiac arrests occur outside the Intensive Care Unit (ICU) (Benjamin, et al., 2018). With the advent of rapid response systems designed to respond to emergency situations, as well as identify and intervene when clinical deterioration of the patient arises as mandated by the 2008 Joint Commission National Patient Safety Goals (Edelson, 2010), the likelihood of the non-ICU Code Blue lessens. Thereby, the non-critical care nurse is less likely to gain experience or first-hand knowledge from participating in a cardiopulmonary emergency. The 2015 American Heart Association (AHA) Guidelines Update for CPR and Emergency Vascular Care specify that high quality BLS, including activation of the emergency response system, quality CPR, and rapid defibrillation, increases the chance of patient survival (Kleinman et al., 2015). Additionally, The Joint Commission (2017) recognized delay in getting emergency equipment to the bedside, unfamiliarity with items stored within the crash cart, and unfamiliarity with procedures for using the crash cart when responding to a life-threatening emergency as contributing factors to patient safety related events.

Intra-hospital cardiac arrest (IHCA) includes ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT) as the first recorded rhythm 25-35% of the time (Sandroni, 2007). According to Winslow et al. (2001), the overall CPR survival rate has remained relatively unchanged despite improvements in equipment, drugs, and training. The actual time of initiation of compressions, medication delivery, and/or defibrillation is often prolonged, resulting in poor patient outcomes and increased mortality (Chan, Krumholz, Nichol, Nallamothu, & American Heart Association National Reporting of Cardiopulmonary Resuscitation Investigators, 2008).

As quality delivery of BLS is the foundation of advanced cardiac life support (ACLS) and improves the chance of recovery to hospital discharge, preparing and educating Medical-Surgical (Med-Surg) nurses for the inevitable Code Blue is a sound and prudent practice. When responding specifically to Code Blue and cardiopulmonary emergencies, lack of experience and education, nursing attrition, and inadequate nurse/patient ratios contribute to the problem of timely delivery of care and failure-to-rescue on the part of the Med-Surg nurse (Kouatly, et al., 2018).

As a Rapid Response RN at a 300+ bed tertiary care hospital for the past 12 years and an ICU RN for 23 years prior to that, this RN has witnessed and participated in hundreds of Code Blue and cardiopulmonary events. Unfortunately, the failure-to-rescue scenario is often a result of lack of education and experience. Published articles speaking to the non-critical care Code Blue or cardiopulmonary emergency response, in addition to anecdotal experiences from non-critical care nurses, Code Blue debriefings, Rapid Response team anecdotal experiences, and ~~p~~personal experiences upon arriving to Code Blue events in progress served as a trigger to develop the COPES acronym. Providing focus and automaticity in the initial minutes of a Code Blue event using the COPES acronym should ultimately lead to improved patient outcomes.

Upon examination of the hospital's Code Blue QI data over the past year, it was recognized that defibrillation data transferred and recorded to spreadsheets only included whether the patient was defibrillated. Neither the time to first defibrillation nor whether AHA guidelines were met for defibrillation from a recognizable event was recorded (i.e., first defibrillation in less than three minutes or less than or equal to two minutes from a recognizable event). Anecdotally, from other Rapid Response RNs and from personal experience, Med-Surg nurses rarely employ the AED and are unfamiliar and often fearful of it. Given distance traveled

and time it may take ACLS providers to arrive to the location of a Code Blue, the prescribed three-minute defibrillation window will likely not be met.

Available Knowledge

Chan, Nichol, Krumholz, Spertus, and Nallamothu (2009) found that increased/decreased defibrillation times at initial onset of cardiac arrest were dependent on hospital size and whether the patient was in the ICU versus the non-ICU setting. They found delay in defibrillation times decrease survival to discharge numbers, and that improved response times may relate to improving access to early AED defibrillation and empowering staff.

In a study of on-site hospital high-fidelity simulations known as the SimCodes program, Kobayashi et al. (2010) determined sudden cardiac arrest (SCA) simulations functioned as realistic and acceptable alternatives to actual resuscitative situations for education and assessment purposes when compared with live resuscitation chart reviewed data.

A study by Woollard et al. (2006) set out to determine optimal refresher training intervals for lay volunteer BLS responders in the English National Defibrillator Programme who had previously taken a 4-hour class and refresher at the 6-month interval. While the lay volunteers had no significant skill retention in two versus three refresher classes, skill retention was greater in the 7-month versus 12-month class. While defibrillation improved by 17 seconds with refresher classes, other skills among laypersons remained poor. These skills included CPR skills, placement of defibrillator pads, and pre-shock safety tests. Refresher classes held more frequently and at shorter intervals, however, do increase the study subjects' self-assessed confidence, possibly indicating a greater preparedness or willingness to use an AED as determined by Woolard, et al.

Most articles were AED/BLS or cardiac event related. A few also dealt with nursing fears using an AED and/or cardiac event. These studies varied greatly in delivery and data collection from drop-in class demonstrations with question and answer sessions to high-tech simulation. Some reports followed up and measured retention of information at various intervals while others offered no follow-up. Consistently noted was that providing the proper tools, identifying learner expectations, and follow-up improved performance and retention of information. A compelling finding in Avis, et al. (2012) found passive learning resulted in 10-20% retention after six weeks while active learning, such as simulation, resulted in 70% retention. Inconsistent results were due to grading methods. One study passed students only if all actions were adequately performed. Participants could fail a single skill and fail the test in its entirety. While no contradictions among articles were found, the Hawthorne Effect and variations in methods and equipment could account for variation in results.

Articles that studied the effectiveness of acronyms and/or visual aids to enhance memory had little variation in results. Mnemonics, audiovisuals, and animation led to improved outcomes and were viewed positively by the participants (Lewis, et al., 2018; O'Day, 2007; Stalder, 2005). These articles, while similar in focus, differed in type and evidence level and included expert opinion, non-experimental, and quasi-experimental articles. The most compelling result was O'Day's (2007) finding that retention levels were 204-300% higher than expected based on the forgetting curve with educational materials containing animation and 79-83% higher when graphics were utilized.

Use of Acronyms

According to Lewis and Mulligan (2018), encoding new medical information into memory is enhanced through writing, case-based learning, and mnemonics. Retrieval cues, such

as the use of mnemonics, flashcards, and rehearsal through repetition reinforce the mnemonic device. Schwartz (2018) suggests that mnemonics such as acronyms and acrostics organize principles that may be lacking in the information itself and that these devices help us encode that information.

Rotter (2009) identifies connections, odds of success, meaningfulness of the materials, practice, organizational clarity, strategies, and emotional impact (COMPOSE) as elements needed to optimize recall for later application.

Rationale

Despite the improvements in BLS education and the inclusion of AED use as a fundamental core skill of the BLS-trained nurse, in-hospital cardiac arrest survival to discharge rates remain at 36% for VF/pVT and 11% for asystole or pulseless electrical activity (PEA) according to Heng et al. (2011). Since non-critical care nurses are often the first responders to these events, their timely, efficient, and efficacious reaction to these events is the first link of the patient's chain of survival scenario. Unfortunately, education and even competency are not enough in a high stress situation. According to Page and Meerabeau (1996), anxiety appears to affect the ability to learn and practice performance. Fontana (1981) states anxiety affects both the assimilation of knowledge and knowledge later recalled particularly under stressful conditions, as in a cardiac arrest. Instilling confidence and developing a sense of self-efficacy through frequent, deliberate practice in the face of a stressful, infrequent event, separate from the sanitized scenarios in BLS education or debriefing following an event, could lead to improved patient outcomes by providing tools that benefit both cognitively and emotionally to empower the nurse in a complex, tense situation.

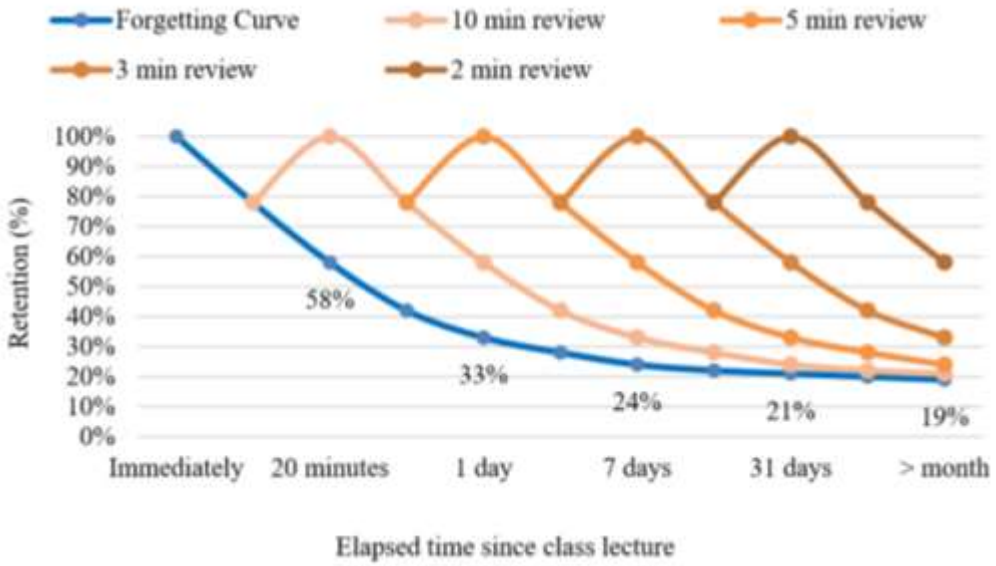
Theoretical Base

Forgetting Curve and Spaced Repetition

In the 1880s Hermann Ebbinghaus was the first person "to try to find a mathematical equation that describes the shape of forgetting" (Murre & Dros, 2015, p. 15). The soundness of his results has been tested and replicated over the years, and his "forgetting curve" is classic. Reintroduction of learned material at varying time intervals will not only decrease subsequent forgetting curves, but result in memory retention of information and an upsweep of the learning curve. While repetition is acknowledged as a memory enhancer, spacing of that repetition or length of time of review is not often considered when reviewing information. This QI project will use the forgetting curve intervals for mock codes to test the effectiveness of the COPES acronym. See Figure 1.

Figure 1

Overcoming the Ebbinghaus Forgetting Curve



Note. This figure illustrates a review study of forgetting of a basic science concept by medical students. Regular review in small time blocks illustrates retention of up to 80% of firsthand

information after a one-month time frame. From "Regular Self-Assessments in a Learning Management System Negates the Ebbinghaus 'forgetting curve'," by A.J. Swart and M. Venter, 2018, Proceedings of the 47th Annual Conference of the Southern African Computer Lecturers' Association (SACFA 2018), http://www.sacla.org.za/wp-content/uploads/2019/03/SACLA-2018-Proceedings.pdf#page=322 , p. 310. Copyright 2018 by A.J. Swart and M. Venter.

Bandura's Theory of Self-Efficacy

Bandura (1986) theorized self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p.391). Those who lack the requisite skills to perform a task would also experience low self-efficacy and would view those activities with a sense of futility (Bandura, 1977). While self-efficacy is a "belief" (Hernández-Padilla, et al., 2016, p. e11) and situational, deliberate practice and repetition can lead to mastery and confirmation of that belief.

Self-efficacy theory (SET) contends self-efficacy develops from mastery of experiences in which goals are achieved through overcoming obstacles and are expressed cognitively, motivationally, emotionally, and through choices or decisions (Nursing Theories, 2012; Positive Psychology Program, 2019).

Clinical Problem

The purpose of this QI project is to provide targeted CPR education using the COPES acronym to improve nurses' self-efficacy, focus and automaticity in initial minutes of Code Blue events. An evidence-based question was formulated using the Johns Hopkins Nursing Evidence-Based Practice Model (Dang & Dearholt, 2018). A literature search was conducted using key words derived from the EBP question: How effective is targeted BLS education including the

use of the COPES acronym in increasing confidence levels and response times of Med-Surg and new critical care nurses to in-hospital Code Blue events?

A PICOT was formulated:

P: non-critical care nurses on a medical/surgical floor and "new" critical care nurses at a 300+ bed hospital at a southeastern South Carolina medical center;

I: use of COPES acronym and BLS per AHA guidelines for cardiac resuscitation events;

C: use of no COPES acronym for cardiac resuscitation events which is the current practice;

O: Nurses will respond to mock Code Blue situations, including AED use, in <3 minutes per AHA guidelines post-COPES education 95% of the time;

T: Measurements taken at Day 0, Day 1, Day 3, and approximately Day 7, Day 30, and Day 60.

Project Aims

- Aim #1: Improve nurses' rescue responses to Code Blue events, including defibrillation with an AED when required;
- Aim #2: Identify problems in performing the steps of BLS and causes of failure to rescue during the initial minutes of a Code Blue event prior to COPES education to customize educational content;
- Aim #3: Increase application of AED pads and defibrillator rhythm analysis at onset of Code Blue recognition;
- Aim #4: Increase self-efficacy in nurses when responding to Code Blue events.

Project Objectives

- Objective #1: Non-critical care nurses will respond to mock Code Blue situations, including AED use, in <3 minutes post-COPES education 95% of the time;
- Objective #2: Observe performance during mock code from recognition through defibrillation to customize COPES/BLS education to meet learning needs;
- Objective #3: Nurses will correctly apply defibrillator pads, turn on AED, and apply rhythm analysis according to COPES acronym and AHA guidelines 80% of the time;
- Objective #4: Self-efficacy will increase in 95% of participants' post-COPES education.

Methodology

Context

This project was conducted at a 300+ bed hospital located in southeastern South Carolina, United States. Medical/Surgical nurses (N=10) and ICU nurses with less than one year's experience (N=6) were invited to participate in this project. The project was approved by the University Institutional Review Board and the hospital. There were no ethical considerations or conflicts of interest in implementing this Quality Improvement project.

Framework

Grol and Grimshaw

The Grol and Grimshaw Framework of Evidence to Practice (1999, 2003) for changing behavior through strategic implementation of a plan is the best fit for this project. The breakdown of theoretical approaches, intervention influencers, and strategies (see Figure 2) provides a comprehensive structure for interactive and continuous education. Grol and Grimshaw

(1999, 2003) acknowledge that best evidence to best practice is not always a simple step but requires strategies at different levels to remove obstacles. Change should involve interactive and continuous education while linking interventions to needs. Discussion of evidence, local consensus, feedback on performance, and personal and group learning plans serve as facilitators to develop a plan for change, implementation, and ultimately evaluation. This framework allows for the formation of a broad plan that advances implementation and ultimately toward achievement of project goals. Contemporaneous alteration, adjustment, or modification can occur throughout this framework.

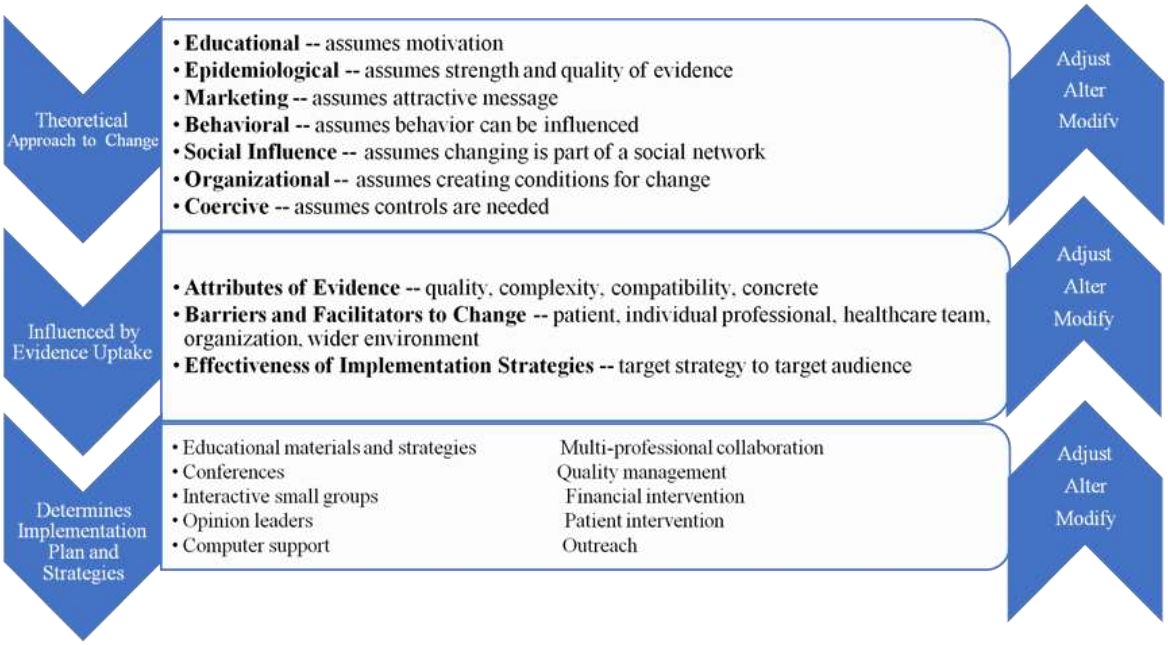
The framework involves identifying obstacles to change, developing a plan, implementing, and evaluating the plan through seven change approaches: educational, epidemiological, marketing, behavioral, social influence, organizational, and coercive. Grol and Grimshaw (2003) state the barriers to creating change in practice can arise at different stages in the healthcare system—patient level, the individual professional, the professional setting, the healthcare team, the healthcare organization, or the wider environment that includes healthcare processes, resources, leadership, or the political environment. They also suggest that as part of the change process to "define indicators for measurement of success and monitor progress continuously or at regular intervals" (p. 1229). Additionally, change requires a comprehensive approach at different levels based on "characteristics of the evidence or guideline itself and barriers and facilitators to change" (p. 1225).

Nurses, for the most part, are internally motivated to improve their knowledge and performance. By focusing on the target group, education delivery in multiple formats including the corporate computer education platform, face-to-face teaching with question and answer sessions, mock codes, debriefing, signage, and pocket cards, immediate feedback can lead to

further assessment and intervention. The need for change in Code Blue education already exists. Changes to regulations, policies, and procedures would ensure ultimate compliance if the COPES acronym is adopted. AHA evidence-based changes are updated regularly. The "front lines" must creatively implement them.

Figure 2

Grol and Grimshaw Framework of Evidence to Practice



Note. This figure is a visual representation of the Grol and Grimshaw Framework of Evidence to Practice as visualized by the author of this paper, Linda J.H. Baker, 2019. Copyright 2019 by Linda J.H. Baker.

Interventions

Pre-pilot

A pre-and-post-intervention design was used in this QI project. Once nurses agreed to participate, they were placed into groups of three, except for one group that had two nurses (n=16), according to their specialty. Prior to the start of the pilot project, some of the

participant's schedules were adjusted to ensure testing on Day 0, Day 1, Day 7, and approximately Day 30. A Day 60 was scheduled but was postponed due to COVID-19. Participants were from both the day and night shifts. Shifts are from 0700-1900 and 1900-0700.

Consent to participate and non-disclosure forms were sent to participants through the intra-hospital email system. A demographics survey was sent via Survey Monkey to participants' email addresses to ensure anonymous responses (see Appendix A). Once the necessary forms were completed, the participants were asked to choose an anonymous identifier to use on all testing materials and questionnaires. All participants were asked to complete a modified Basic Resuscitation Skills Self-Efficacy Scale (BRS-SES) pre-education questionnaire prior to their first educational session on Day 0 (see Appendix B). The same BRS-SES questionnaire was completed after the mock code on Day 7 as a post-education questionnaire.

Pilot Schedule

On Day 0 the groups performed a mock code and were observed using the checklist (see Appendix C). After completion of the code, the participants viewed an interactive PowerPoint presentation (PPT) that introduced the COPES acronym with key BLS refresher points. The presentation can be completed in less than five minutes. Following the PPT education, another mock code was performed. Upon completion of the mock code, the COPES Acronym Test was administered (see Appendix D).

A team of ACLS observers, who are also the QI project stakeholders, was created and consisted of this RN, the ICU Nurse Educator, and ICU Director. The ICU Director was used as a back-up observer in the event the nurse educator was unavailable.

An animated/interactive PPT was created that was shown on Day 0 and was placed into the nurses' individual online education platform where they could access it at will. Posters and a

banner were made from some of the slides, and double-sided pocket cards were given to every participant at the conclusion of Day 1 (see Appendices E and F).

The mock code, observation, and testing were then repeated on Day 7, Day 30, Day 100 or 130. On the final day, each participant was asked to fill out a questionnaire evaluating the project (see Appendix G).

Activities were as follows:

- Pre-Day 0: Modified BRS-SES filled out by participants.
- Day 0: mock code (pre-education) with observation checklist, COPES PPT education with question and answer, mock code (post-education) with debrief, COPES acronym written short-answer test, participants were informed in person and via email that PPT now available to them via online education;
- Day 1: mock code, COPES acronym written short-answer test, debrief, COPES signage (professional banner and posters) placed on participating floor, participants given COPES pocket cards (4"x6");
- Day 7: mock code, COPES acronym test, debrief, post-education BRS-SES;
- Day 30: mock code, COPES acronym test, debrief;
- Day 60: mock code, COPES acronym test, debrief, final questionnaire;
- Days 100 (ICU) and Day 130 (Med-Surg): mock code, COPES acronym test, debrief, modified BRS-SES, and final questionnaire.

Pilot study Days 0-30 were staggered by groups due to nurses' schedules but spacing for each group remained constant.

Methods

Basic Resuscitation Skills Self-Efficacy Scale

Hernández-Padilla et al. (2016) developed, tested, and validated this self-efficacy scale that "accurately measures nursing students' confidence levels in their capabilities when responding to a cardiac arrest" (p. e11). The questionnaire has 18 questions and measures skills all nurses are expected to master as first responders to a Code Blue or cardiopulmonary event: recognition and alertness, CPR, and safe use of an AED. For this QI project, the BRS-SES was modified by adding additional questions and changing some language to be more recognizable for American nurses and to meet AHA guidelines with the approval of Sage Publishing.

Observational Checklist

An observational mock code checklist was developed for the project from the modified BRS-SES questionnaire to correspond to the numbered questions in the survey. This checklist was used for each individual participant according to the task being performed during the mock code—discovery of unresponsive patient and chest compressions, Ambu bag and oxygen delivery, and defibrillator pad placement and AED implementation.

Observers

Observing the actions of the three nurses during the mock codes was accomplished by two observers. Consistently, one observer assessed the nurse who "found" the patient and initiated compressions, the other observer assessed AED actions, and both observers assessed the nurse responsible for oxygen and using the Ambu bag (bag-valve mask) to ventilate the patient.

COPES Acronym Test

The COPES acronym, consists of five letters and nine steps each corresponding to a letter. They follow the logical steps of the initial minutes of a code after a patient has been found in distress or unresponsive and are being done simultaneously by multiple people. The COPES acronym corresponds to BLS actions: C—Call the Code, get the Crash Cart, start Compressions;

O—turn On defibrillator in AED mode, Oxygen; P—Place Pads (defibrillator), Plug-in Pads; E—Evaluate/Analyze; S—Shock Safely, if needed.

Mock Code

The mock code was initiated at the nurses' convenience as it occurred during regular working hours. Participating nurses were available during the time frame to complete the mock code. The observers did not interfere in the mock code except to stop it at completion of three minutes. The mock codes were performed either in a standard patient room (as available) or in the Physical Therapy/Occupational Health exercise room.

Equipment

The equipment used was minimal. An established "educational code cart" was used and stocked with the same supplies as a usable cart except for drugs. Empty drug boxes and intravenous fluids such as normal saline, dextrose, et cetera occupied those drawers to simulate actual code cart drawers. The top of the cart had a defibrillator, a clear plastic bag with electrodes, defibrillator pads (plug-in), and defibrillator gel pads for use with paddles. An Ambu bag with face mask and tubing hung on the side of the cart within easy reach. Other equipment included:

- Adult CRiSis Patient Manikin (waist up)
- Armstrong Medical Industries, Inc. RhythmSIM® AA-750 Patient Simulator
- Medtronic LifePak 20 defibrillator/monitor
- PadPro Adult/Child Radiotransparent Electrode with Physio-Control QUIK-COMBO™ connector
- Ambu® SPUR® II Single-Use Disposable Resuscitator
- Motorola Android 9 cell phone (timer)

- Acer Aspire R laptop computer (PPT presentation).

Results

The demographics of the participants is shown in Table 1 (Appendix A). The majority (87%) of the nurses were female. The age range for the Med-Surg nurses was between 20 and 59 with the majority (40%) being age 30-39. The ICU nurses' ages were between 20 and 39 with 60% age 20-29 and 40% age 30-39. It was interesting to note that despite all the nurses working full-time with 46% having 1-5 years' experience and 40% having 5-10 years' experience, that 27% had never performed CPR in a real-life scenario.

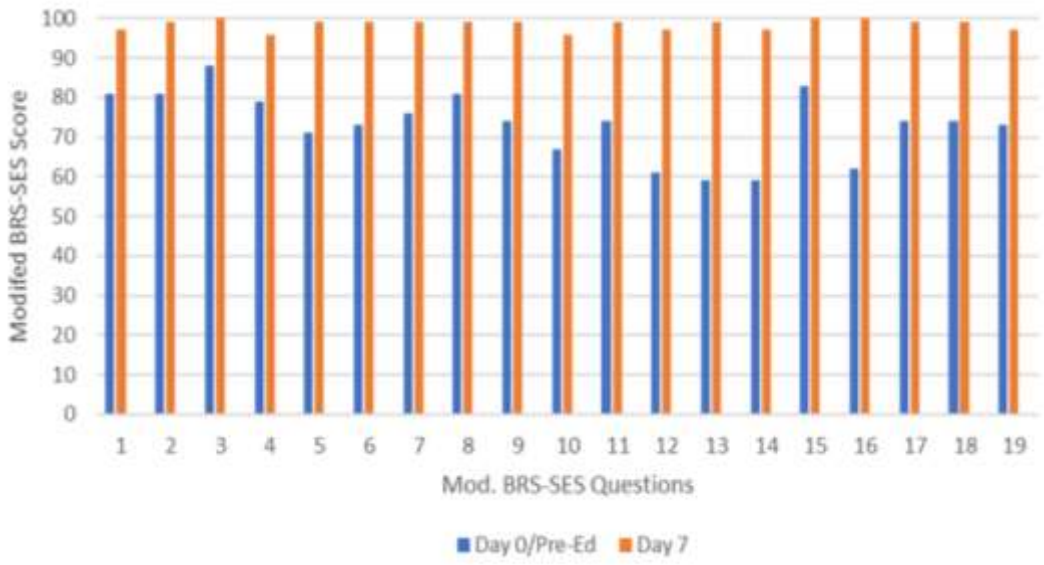
Modified BRS-SES

The Med-Surg and ICU nurses were surveyed using the modified BRS-SES at pre-education and following PPT education at Day 7. This timeframe included three post-education three-minute mock codes at Days 0, 1, and 7. (See Figures 3 and 4, respectively.)

These figures show the mean score for each group, by question, for Days 0 and 7. The Med-Surg nurses rated their self-efficacy between 59 and 88 on Day 0 with a score of 50 meaning "indecisive or uncertain" and 100 meaning "absolute confidence or belief in being able to accomplish the task." The ICU nurses rated themselves between 75 and 100 with over half of the questions being answered between 90 and 100 on Day 0. On Day 7, all 19 questions averaged between 90 and 100 for both groups.

Figure 3

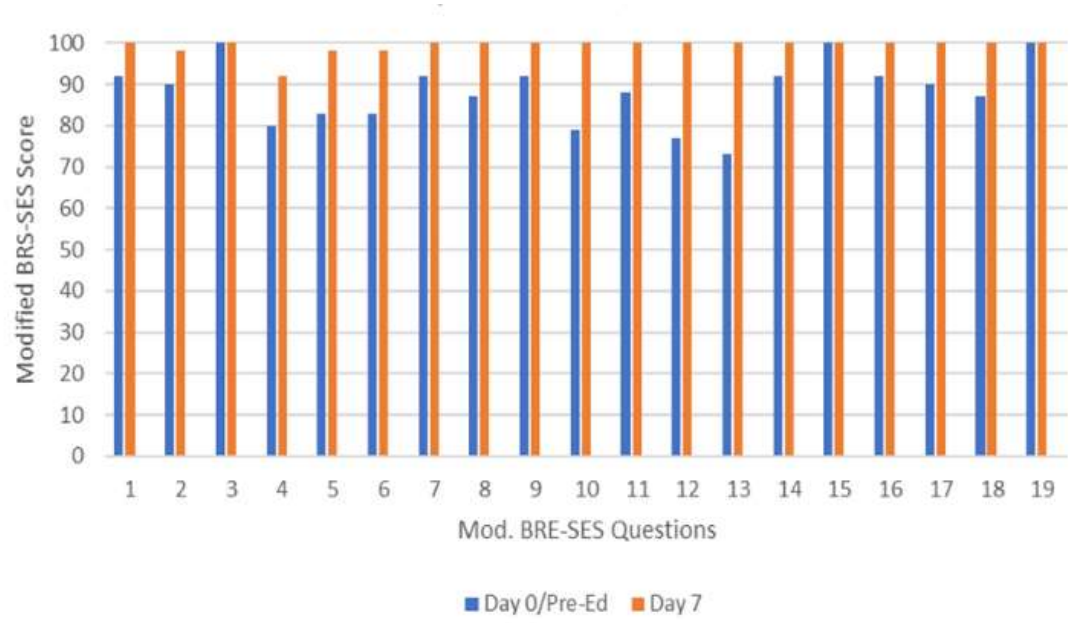
Medical-Surgical Nurses' Self-Efficacy Scores



Note. Mean scores for Medical-Surgical nurses by question at Days 0 and 7 on the Modified BRS-SES.

Figure 4

ICU Nurses' Self-Efficacy Scores



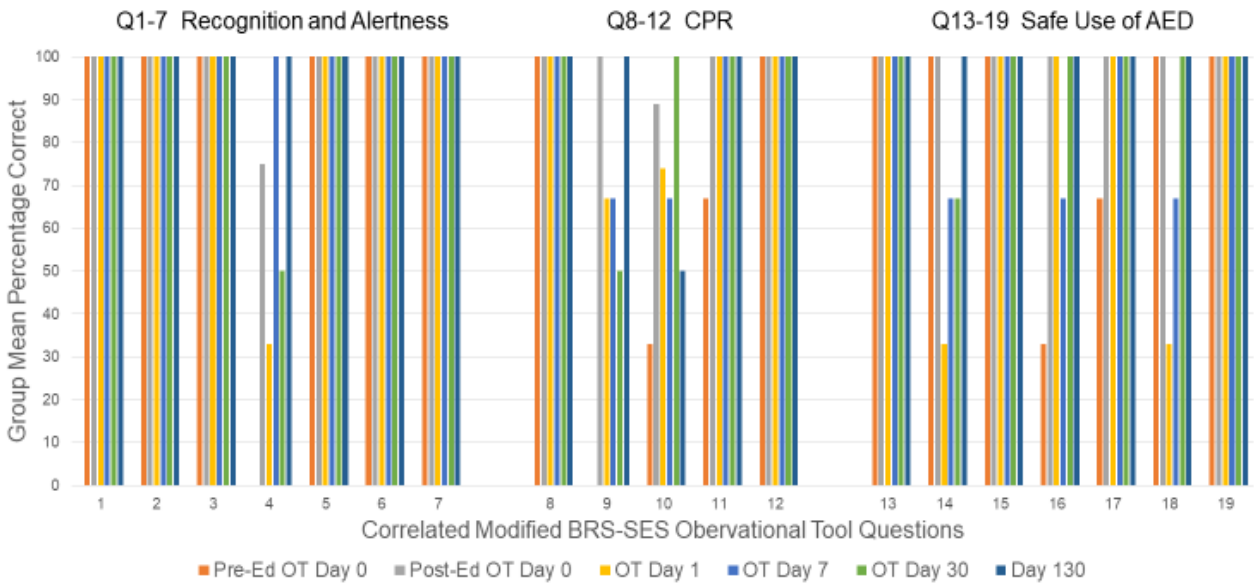
Note. Mean scores for ICU nurses by question at Days 0 and 7 on the Modified BRS-SES.

Mock Code Testing/Observational Tool

Mock code testing using the observational tool indicated deficiencies that were noted at Day 30 and at the final mock code testing day. The date of final testing and the inability to purposefully reintroduce teaching were affected by COVID-19. Results of mock code testing are shown in Figures 5 and 6 for Medical-Surgical and ICU nurses, respectively.

Figure 5

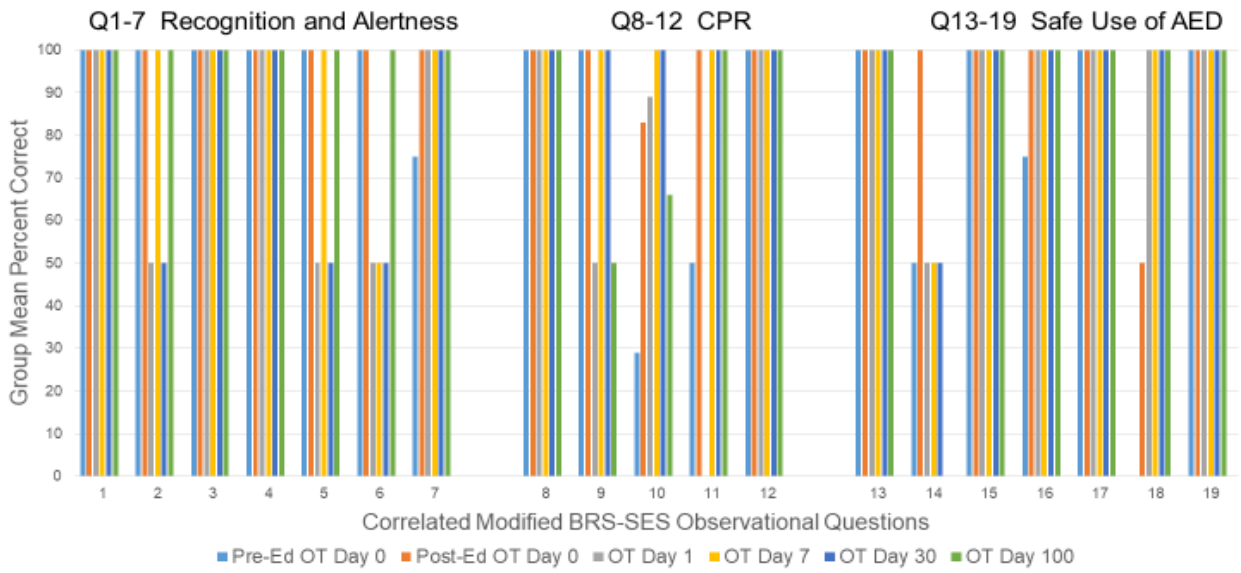
Observational Tool Results for Medical-Surgical Nurses



Note. This graph shows the average group score for the mock code each testing day. By the end of the pilot, the Medical-Surgical group scored 100% on all skills except volume and speed of rescue breaths (Skill/Question 10). At Day 30, opening the airway and providing effective chest compressions skills (Skills/Questions 4 and 9, respectively), scored at 50% or less. Participants only had to miss one of the compression requirements—hand placement, rate, depth, or recoil in order to not pass that question. Q = question on this graph.

Figure 6

Observational Tool Results for ICU Nurses



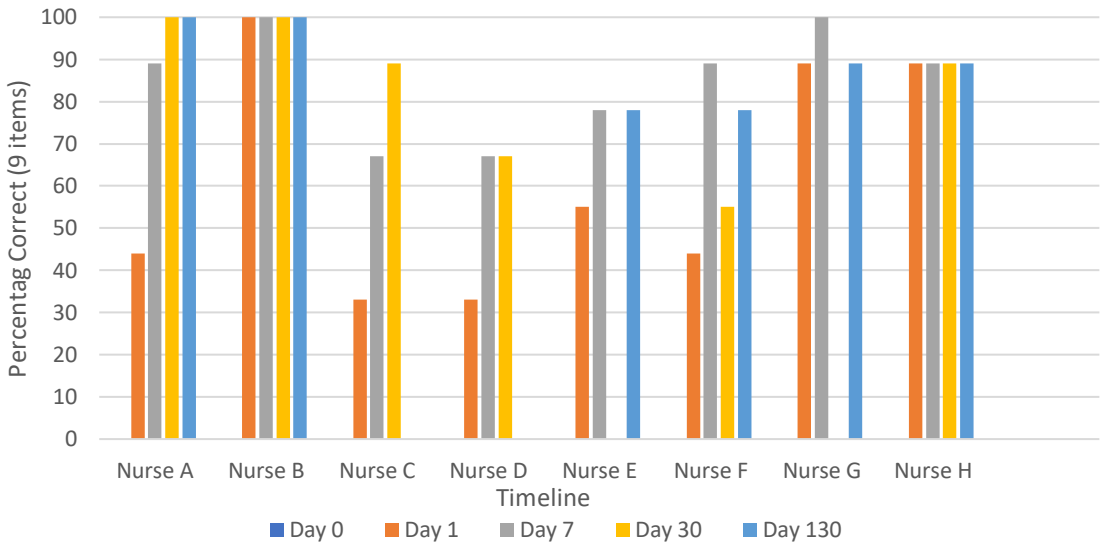
Note. The ICU group at Day 30 scored 50% or less on multiple skills regarding recognition and alertness (Skills/Questions 2, 5, and 6) in addition to pad placement/plug-in (Skill/Question 14). At Day 100, they scored 50% or less on chest compression skills (Skill/Question 9), and scored zero for defibrillator pad placement and plug-in (Skill/Question 14). Q = question on this graph.

COPES Acronym Test

The COPES acronym test was done at the end of each mock code. The Med-Surg nurses' and ICU nurses' test scores were vastly different. The group mean score for the Med-Surg acronym test was 78.6%. That is a score of 7 out of 9 correct answers as shown in Figure 7. The ICU nurses mean score was 54.3% which is less than 5 out of 9 correct answers as shown in Figure 8.

Figure 7

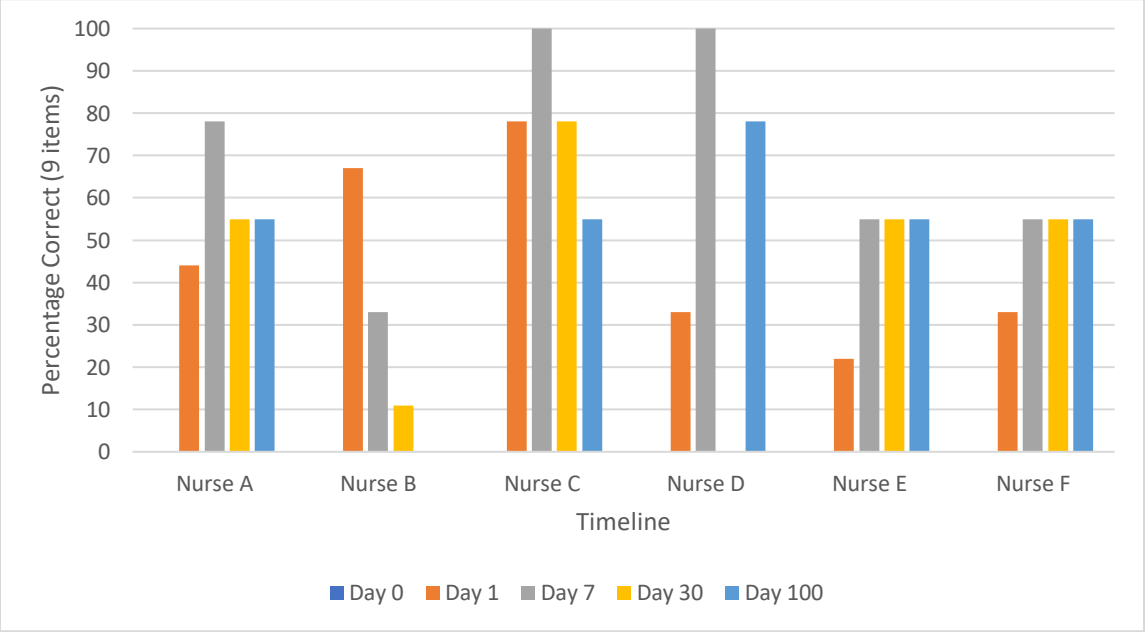
COPES Acronym Test Scores for Medical-Surgical Nurses



Note. Medical-Surgical COPES acronym test scores by nurse and day over the course of the pilot.

Figure 8

COPES Acronym Test Scores for Intensive Care Unit Nurses



Note. ICU COPES acronym test scores by nurse and day over the course of the pilot.

Nurses' Responses to COPES

According to the final questionnaire, the Med-Surg nurses were much more engaged with the education, accessed the online education, and found the pocket cards either "very" or "extremely" helpful. Both groups of participants provided positive feedback. Some comments included, "Thank you, I learned so much," "The COPES acronym is great. I'm not as afraid of codes now," and "I loved the pocket cards!" There were no negative comments.

Overall, the ICU nurses were less engaged and despite reporting that COPES did not (on average) increase their confidence during a code blue on the questionnaire, did score themselves between 90 and 100 on the BRS-SES. Two of the six ICU nurses rated the COPES education as "very" or "extremely" helpful. See Table 2.

Table 2

Partial Results of the Final Questionnaire

Question basics	Medical-Surgical responses	ICU responses
Aware COPES PPT available during Pilot?	Yes (7) No (0)	Yes (4) No (2)
Accessed?	Yes (4) No (3)	Yes (1) No (5)
COPES acronym helpful in remembering the steps to follow for a Code Blue event?	Moderately (1) Very (3) Extremely (2)	Not (2) Moderately (2) Very (1) Extremely (1)
How helpful was the COPES pocket card in remembering the steps in a Code Blue event?	Very (4) Extremely (3)	Slightly (2) Moderately (1) Very (1) Extremely (1)
Preferred format for COPES pocket cards?	Word (2) Picture (0) Both (4)	Word (1) Picture (3) Both (1)
How helpful was COPES in increasing your confidence during a Code Blue?	Very (4) Extremely (3)	Slightly (1) Moderately (2) Very (1) Extremely (1)

Note. The COPES PowerPoint was accessed five times by the Medical-Surgical nurses and zero times by the ICU nurses.

While the nurses had no comments or suggestions for the inclusion or deletion of any material from the PPT education, I believe the questionnaire was valuable in obtaining feedback on the project as a whole. For example, despite the nurses being notified both verbally and in writing that the PPT was available in their educational online platform, only 85% stated they were aware and only 38% accessed it. Additionally, most nurses (58%) viewed the pocket cards as "very" or "extremely" helpful while 25% viewed them as "moderately" helpful.

Discussion

Summary

Aim #1 of this QI project was to improve nurses' rescue responses to Code Blue events, including defibrillation with an AED when required. As the pilot progressed, all groups shocked consistently in <3 minutes per AHA guidelines. By the pilot's end, all groups shocked in <1 minute. The rhythm generator was only set to VF or VT, so a minimum of one and maximum of two shocks were performed by each group of participants in the allotted 3-minute timeframe. It was identified that in order to eliminate the possibility of "hinting" of the need for defibrillation during the mock code, the defibrillator pads wiring with plug should be removed and discarded, and the mannequin's electrodes and wiring should be incorporated onto the defibrillator pads.

Aim 2 was focused on identifying problems in performing the steps of BLS and causes of failure-to-rescue during the initial minutes of a Code Blue. Using the observational tool during the mock codes that were completed prior to the COPES education allowed for customization of the educational content to meet the needs of the participants. The ICU nurses were deficient in the areas of alertness/recognition and defibrillator pad placement/plug-in while the Med-Surg

nurses required more education with ventilation and defibrillator pads. While the nurses had the COPES PPT available to them in their personal educational accounts, very few took advantage of reviewing it during this QI project. Methods of communicating this information should be evaluated. Despite the flexibility of this format, the nurses did not "take ownership of their learning." Perhaps the education being optional versus mandatory conveyed a non-essential status. Presenting the material in a variety of ways—an interactive game, a practice quiz, or a supplementary video will help learners with diverse learning needs (Lieberman, 2020; Phillips, 2016).

Considering Aim #3, increasing proper placement and application of AED pads and defibrillator rhythm analysis at onset of Code Blue recognition, affirms the outcome of Aim #2 with ICU nurses completing the objective only 60% of the time and Med-Surg nurses completing the objective 73.4% of the time. Re-evaluation of this portion of the education is needed. Whether more hands-on defibrillator "play," simulation, or role play is needed to increase skills and preparedness should be determined to increase these numbers (Wehbe-Janek, et al., 2012).

Aim #4, increase the nurses' self-efficacy, defined as the belief that one can perform in a certain manner to attain certain goals through mastery of experience when responding to Code Blue events, was met by 100% of nurses. Al-Abri and Al-Hashmi (2007) contend that practicing and refining skills until they are internalized develops self-esteem and creates confidence when dealing with new challenges

The nurses' self-efficacy scores on Day 7 with all 19 questions averaged between 90 and 100 for both groups on the BRS-SES. Time and logistics did not allow for a follow-up BRS-SES on the final day of testing due to COVID-19.

One noteworthy observation that was identified during the mock codes was the teamwork approach evident with the ICU nurses. Although sometimes subtle, the interaction and banter between the nurses confirmed a cooperative and somewhat coordinated effort on those nurses' parts (despite their lower scores). This teamwork approach should be developed with the Med-Surg nurses as they tended not to speak to each other and were more isolated during the mock code. The notion that a Code Blue is a team effort should be emphasized.

Barriers and Limitations

There were a few barriers and limitations encountered prior to and during implementation of this project. A major barrier was finding willing unit directors that would allow the project to proceed as planned. Many unit directors placed restrictions on the project that were not conducive to the nature or spirit of this QI project. Two unit directors ultimately agreed to the plan. These units also had a smaller number of staff. For this reason, "new" ICU nurses were brought in as participants. This proved to be a positive factor when comparing the two groups of nurses.

The ultimate limiter of the project was COVID-19. This caused the timeline to be disrupted, interventions to be changed, and a nurse participant to be eliminated due to being furloughed.

Due to COVID-19, the Day 60 interval was cancelled. When hospital operations resumed, the ICU nurses completed the final mock code on Day 100, while the Med-Surg nurses' final mock code was completed on Day 130. The nurses had access to the online education during this time.

A Day 3 was also planned but was removed as nurses' schedules did not allow for inclusion. Considering nurses would not be willing to participate on their day off and directors would be unwilling to pay nurses to participate on a non-work day, Day 3 was removed.

In addition to the COVID-19 disruption, a change had to be made regarding the COPES signage placed on the floor of the participating units. For unknown reasons, one director opposed its placement. The signage was removed at Day 3. Whether this had a negative impact on the Med-Surg nurses' results is unknown. It could have acted as a visual reminder not only of the steps in the COPES acronym, but as a reminder of the available online education.

The generalizability of the information obtained in this project is limited as it reports on a small sample nurses (N= 14). Participant demographics were not diverse and favored females, 20-39 years of age. Since 73% percent of the nurses had Code Blue experiences, it is difficult to assess this impact on their COPES education and mock code experiences.

Recommendations

COPES education should be timed to the Ebbinghaus Forgetting Curve (Swart & Venter, 2018). Brief introduction of material at spaced intervals counteracts the curve with information being retained for longer periods of time. Active learning with the introduction of simulation or animation will also enhance learning and retention of materials.

The entire COPES program can be introduced and practiced in less than 30 minutes with PPT and practice sessions. Following the Ebbinghaus curve, reintroduction of the material in some form should be provided at Day 3, Day 7, Day 30, and each month via an online platform. In-person mock codes should be practiced quarterly and can be completed in less than 10 minutes testing three participants at a time. Laminated pocket cards should also be provided to nurses and personnel directly involved in patient care. According to Jeffries and Shah (2011),

when provided with a choice of different educational tools, clinicians preferred simple and readily accessible tools such as pocket cards and seminars.

As noted earlier, prior to the mock code, defibrillator pads wiring with plug should be removed and discarded. The mannequin's electrodes and wiring should be incorporated onto the defibrillator pads to create a single unit. These can be placed on the crash cart with the defibrillator and will eliminate the possibility of "hinting" of the need for defibrillation during the mock code.

While each nurse needs to be able to perform during a Code Blue, the teamwork demonstrated by the ICU nurses suggests an objective regarding "Teamwork and Collaboration" should be included in the COPES education. This could also reinforce self-efficacy in the nurses. Bumann and Younkin (2012) view is that key skills necessary for developing effectiveness in teamwork can be developed using Bandura's SET, and that working in teams facilitates sharing of expertise, maximizes individual contributions, and fosters autonomy.

In following the Grol and Grimshaw framework, the planning and implementation strategies should be adjusted to meet the needs of the target audience whether it be in a particular nursing area or with patient care technicians. For example, results of this project revealed a need for further education on recognition and alertness for the ICU nurses, ventilation for the Med-Surg nurses, and defibrillator pads education for both groups as demonstrated by results obtained from the observational tool.

Sustainability

The financial outlay for this project consisted of the costs for snacks for the nurses, a professional banner, COPES signage, and a modest gift card for each participant. These costs

more than cover the cost of delayed CPR, a round of emergency drugs, or an extended stay in the ICU; not to mention the survival of a patient as a result of early defibrillation.

COPES education can be conducted during a nurse's regular working hours or as part of a skills fair or education day. Introducing staff to the COPES acronym and education during onboarding will prepare them for upcoming continuing education on the subject in addition to the biannual BLS instruction.

COPES education does not have to wait to be introduced at the hospital setting. Preparing nursing students for the inevitable Code Blue during simulation training or clinical experiences with COPES education will not only increase self-efficacy but will introduce the concepts of teamwork and collaboration as healthcare professionals.

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Appendix A

Table A1

Participant Demographics

Baseline characteristic	Med-Surg		ICU		Full Sample	
	n	*%*	*n*	*%*	*n*	*%*
Gender						
Female	9	90	4	80	13	86.6
Male	1	10	1	20	2	13.3
Age, years						
20-29	2	20	3	60	5	33.3
30-39	4	40	2	40	6	40
40-49	3	30	0	0	3	20
50-59	1	10	0	0	1	6.7
Education						
LVN/LPN	1	10	0	0	1	6.7
ADN/ASN	6	60	1	20	7	46.7
BS/BSN	3	30	4	80	7	46.7
Plus, other degree	2	20	0	0	2	13.3
Nursing Experience						
<6 months	0	0	1	20	1	6.7
6 mo. -1 year	0	0	0	0	0	0
1 year -5 years	3	30	4	80	7	46.7
5 years - 10 years	6	60	0	0	6	40
>10 years	1	10	0	0	1	6.7
ICU Experience						
<6 months	0	0	2	40	2	13.3
6 mo. - 1 year	0	0	3	60	3	20

Baseline characteristic	Med-Surg		ICU		Full Sample	
	n	%	*n*	%	*n*	%
Work Schedule						
Full-time	10	100	5	100	15	100
Last BLS						
<6 months	1	10	3	60	4	26.7
<1 year	8	80	1	20	9	60
1 -2 years	0	0	1	20	1	6.7
CPR performed real scenario						
Yes	6	60	5	100	11	73.3
No	4	40	0	0	4	26.7
Used AED placed pads or shocked						
Yes	5	50	2	40	7	46.7
No	5	50	3	60	8	53.3

Note. Participant demographics for Medical-Surgical units and ICU (*n*=15). One Quality Improvement study participant did not complete the demographics survey.

Appendix B

Modified BRS-SES

Anonymous Code _____

PRE-EDUCATION (Modified BRS-SES)

On a scale of 0-100 with "0" meaning "no confidence at all," "50" meaning "somewhat confident" and "100" meaning "absolute confidence," please honestly assess your confidence for each step of the Code Blue process.

In an emergency situation, I am confident I can always…

1. Assess the safety of myself and the victim, in this order, before approaching _____

2. Assess the victim's level of consciousness within five seconds _____

3. Shout for help while continuing with the 'Primary Survey' _____

4. Open the airway by applying the most effective maneuver, depending on the situation _____

5. Assess for breathing and differentiate between effective and agonal respirations in no more than 10 seconds _____

6. Check pulse for no more than 10 seconds (while checking breathing)* _____

7. Alert the emergency services following set protocol and initiate CPR without

delay _____

8. Perform CPR according to current American Heart Association*

guidelines _____

9. Provide effective chest compressions (correct hand placement, depth, recoil,

and speed) _____

10. Give effective rescue breaths with Ambu bag* (correct volume of air and

speed of breaths) _____

11. Maintain correct CPR ratio of compressions to breaths until I have a valid

reason to stop _____

12. Switch on the AED and start using it as soon as it is available without delay _____

13. Follow the AED voice prompts in the right order without getting confused and/

or distracted _____

14. Attach AED pads in the correct positions taking into account possible

contraindications _____

15. Ensure nobody touches the victim while* rhythm is being analyzed _____

16. Deliver a rapid and safe shock to the victim keeping visual check and giving

verbal commands _____

17. Resume, without hesitation, appropriate post-shock actions according to current guidelines _____

18. Guarantee minimal interruptions in chest compressions during the resuscitation attempt _____

19. Continue as directed by voice and/or visual prompts from the AED _____

*(Modified BRS-SES questions)

Adapted from "Development and psychometric assessment of the Basic Resuscitation Skills-Self Efficacy Scale," by J. Hernández-Padilla, F. Suthers, C. Fernández-Sola, and J. Granero-Molina, 2016, *European Journal of Cardiovascular Nursing, 15*(3), p. e14. (doi: 10.1177/1474515114562130). Copyright 2014 by the European Society of Cardiology. Modified with permission from Sage Publishing.

Appendix C

Modified BRS-SES Observational Checklist

1a. Recognition and alertness: Anonymous code_____

ACTION	YES	NO	NOTES
Assess safety before approaching			
Assess: consciousness breathing pulse within 10 seconds			
Call the code (either by phone or code blue button)			
Shout for help and continue 'Primary Survey'			
Open the airway applying most effective maneuver			
Initiate CPR without delay			

1b. Cardiopulmonary resuscitation:

ACTION	YES	NO	NOTES
Perform CPR according current guidelines			
Effective chest compressions			

Hand placement Rate Depth Recoil			
Maintain correct ratio of chest compressions to rescue breaths (30:2)			

AED Charging Period:

Resumes compressions during AED charge phase			

Post-Shock:

resume post-shock protocol without hesitation			
Guarantee minimal interruptions in chest compressions			

2. Safe use of an AED Anonymous code_____

ACTION	YES	NO	NOTES
Switch AED on			

Follow AED prompts in the correct order without confusion or distraction			
Attach AED pad in correct positions			
Plug in AED pads			
Allow analysis ensuring nobody touches the patient			
Continue as directed from AED prompts			
Patient shocked within 3 minutes of code start			
Deliver rapid and safe shock (visual check with verbal commands CLEAR CLEAR CLEAR			
Press shock button without hesitation			

3. Rescue Breathing **Anonymous code_____**

Action	Yes	No	Notes
Retrieve Ambu from crash cart			

Properly assemble Ambu bag			
Properly attach flowmeter to wall			
Properly attach oxygen to flow meter			
Position patient's head			
Correctly apply facemask to patient			
Correct pressure to Ambu to avoid over inflation			
Observes for chest inflation			
Correct compression to breath ratio (30:2)			

Appendix D

COPES Acronym Test

COPES Test CODE_____

Number _____

What actions do the letters in COPES stand for?

C
O
P
E
S

Appendix E

Figure E1

COPES Poster "C"

Figure E2

Copes Poster "O"

Figure E3

COPES Poster "P"

Figure E4

COPES Poster "E"

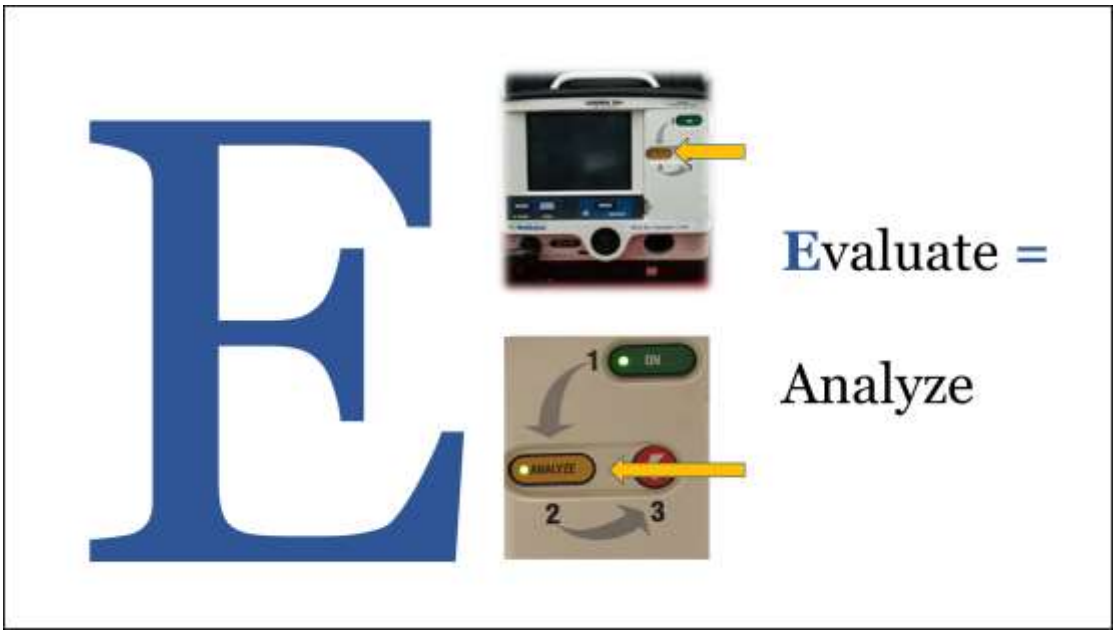

Figure E5

COPES Poster "S"

Appendix F

Figure F1

COPES Pocket Card Side A

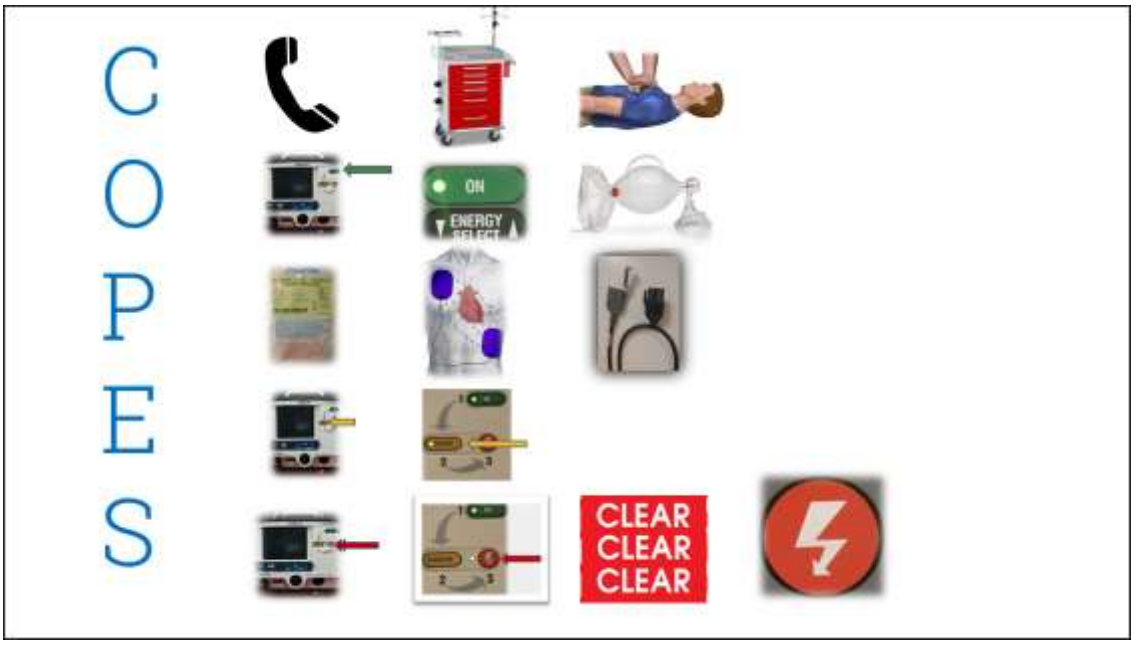

Figure F2

COPES Pocket Card Side B

Appendix G

COPES Quality Improvement Final Questionnaire

COPES Final Questionnaire

Were you aware COPES PowerPoint education has been available in Healthstream during the two months of this pilot? **Yes No**

Have you accessed the COPES PPT education as a refresher at any time? **Yes No**

If Yes, how many times did you access it to refresh your memory? _____

Was there anything in the COPES PPT education you found particularly helpful? **Yes No**

If Yes, what was it? **Don't remember**

Was there anything in the COPES PPT education you thought was **not** helpful? **Yes No**

If Yes, what was it? **Don't remember**

How helpful did you find the COPES acronym in remembering the steps for BLS in a Code Blue event?

Not at all helpful Slightly helpful Moderately helpful Very helpful Extremely helpful

How helpful was the COPES 4x6 postcard in refreshing your memory?

Not at all helpful Slightly helpful Moderately helpful Very helpful Extremely helpful

Which format did you find the most helpful with the COPES postcard?

Word side Picture side Both sides

How helpful were the mock codes for remembering the steps of BLS?

Not at all helpful Slightly helpful Moderately helpful Very helpful Extremely helpful

How helpful were the mock codes for increasing your confidence in performing during a Code Blue event?

Not at all helpful Slightly helpful Moderately helpful Very helpful Extremely helpful

Do you have any suggestions to improve the COPES PPT education, post card, or mock codes?

Other Comments?

Thank you for your participation.