

**Implementation of Computer-Based Educational Modules: Improving Nurse Self-Efficacy
and Nurse Knowledge**

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Notes From the Author

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Abstract

Nurses' clinical knowledge and self-efficacy impact the quality of nursing care delivered, patients' healthcare experiences, and organizational outcomes. Educational opportunities that augment nurses' current knowledge enhance clinical competency and perceived self-efficacy. The purpose of this Quality Improvement (QI) project was to improve Heart and Vascular Progressive Care (HV PCU) nurse self-efficacy and knowledge of the care provided to post-surgical carotid artery endarterectomy (CEA) and carotid artery stenting (CAS) patients. A computer-based educational course including three modules was developed and implemented to advance nurses' knowledge and self-efficacy. The modules reviewed carotid vasculature anatomy and provided an overview of CEA/CAS and stroke. A knowledge-based test and the Modified General Self-Efficacy (GSE) Survey were administered to measure pre- and post-module competency and perceived self-efficacy. HV PCU pre-project Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey scores established baseline nurse-patient communication metrics, while post-CEA/CAS patient interview results evaluated post-project communication. An analysis of project data collected before and after course completion demonstrated increased HV PCU nurses' knowledge and self-efficacy. Overall, implementation of the educational modules integrated new information with previously acquired knowledge to improve HV PCU nurses' knowledge and self-efficacy, enhancing clinical competence, quality of nursing care, and post-CEA/CAS patients' hospital experience. Although the results cannot be generalized beyond the HV PCU setting, the QI project addressed HV PCU gaps in knowledge and provided a learning opportunity that has been added to the nurse orientation pathway.

Keywords: nurse self-efficacy, nurse knowledge, computer-based learning, educational modules, nurse-patient communication, discharge teaching

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Section I. Introduction

Background

There is a growing demand for nurses to provide high-quality care to complex patients receiving surgical services in the acute care setting. Because nurses spend a significant amount of time with patients, they impact patients' hospital experiences and outcomes. Kim and Sim (2020) explained that continuous quality improvements that promote nurse self-efficacy and nurse knowledge produce high-quality patient care. Additionally, Kim and Sim (2020) suggested that strengthening nurse competencies enhances nurse performance and that self-efficacy is a skill that is associated with the delivery of competent nursing care. Bandura (1977) identified self-efficacy as "the conviction that one can successfully execute the behavior required to produce the outcomes" (p.193). Self-efficacy can be augmented through educational endeavors that apply to the environment where the learned knowledge will be utilized (Luthans & Youssef, 2007). Continuous improvement of self-efficacy through education helps build nurse confidence which inherently satisfies patients' needs and fulfills the nurses' role and responsibilities (Kim & Sim, 2020; Ludwigson et al., 2020).

Since self-efficacy is improved through education, nurses' communication abilities to educate patients are also enhanced (Kim & Sim, 2020). Effective nurse communication includes the ability to discern patients' needs or problems, facilitate problem-solving, and cognitively utilize clinical judgment (Lee & Kim, 2010; Curtis et al., 2011). Nurse-patient communication significantly influences measurable outcomes about patients' satisfaction regarding the hospital experience and reflects the quality of care received (Lotfi et al., 2019). Furthermore, the quality of communication among the nurse and patient can influence the effectiveness of discharge

teaching, impact patients' post-hospitalization recovery, and prevent hospital readmission (Kang et al., 2020; Eloi, 2021).

Organizational Needs Statement

Nurses working in the Heart and Vascular Progressive Care Unit (HV PCU) routinely care for North Carolina triad area residents admitted to the hospital for carotid artery endarterectomy (CEA) and carotid artery stenting (CAS). The HV PCU nurses manage post-procedure patient care activities as prescribed in the hospital order sets established by vascular surgery, radiology, and cardiology providers. Pre-procedure care is managed in the hospital's short stay department since many of these patients are admitted for the sole purpose of having a carotid procedure (personal communication, July 9, 2021).

Currently, CEA/CAS education modules are not included in the HV PCU's nurse orientation pathway; as a result, nursing staff gain knowledge of CEA/CAS care primarily through hands-on tasks (personal communication, July 9, 2021). Although potential deficits in nurse knowledge have not contributed to poor patient outcomes, the director of HV PCU expressed a significant need to ensure there are no gaps in staff knowledge about CEA/CAS patient care (personal communication, July 9, 2021). The unit's director explained that CEA/CAS computer-based learning (CBL) modules must be available to current staff. The CBL should also be included in the nurse orientation pathway to provide a comprehensive review of post-procedure nursing care and pertinent patient discharge teaching to nurses new to the department (personal communication, July 9, 2021).

Improving health outcomes and the hospital experience of CEA/CAS patients cared for on the HV PCU aligns with the Quadruple Aim (Feeley, 2017). Improved nurse self-efficacy and the ability to formulate and execute a plan of action supported by training and continuing

education facilitate better patient and organizational results (Ludwigson et al., 2020). In addition, the Quadruple Aim recognizes that the healthcare workers' sense of triumph gained from their work is a significant priority (Feeley, 2017). Sharour et al. (2021) identified that self-efficacy is a powerful determinant and motivator for continued caring despite the challenges nurses encounter.

An objective stated in both Healthy People 2020, and 2030 supported immediate neurological assessment and intravenous (IV) reperfusion therapy within three hours of stroke onset (Office of Disease Prevention and Health Promotion, 2021a; Office of Disease Prevention and Health Promotion, 2021b). Rich et al. (2017) reported that CEA/CAS patients are at risk of having a stroke before and after these vascular procedures, and a nurse performed neurological assessment is essential to identify acute changes in patients. The HV PCU director stressed the importance that nursing staff feels confident performing neurological assessments and documenting accordingly in the electronic health record (personal communication, July 9, 2021).

Kim and Sim (2020) found that perceived self-efficacy correlates with how well the nurse communicates with patients and family members. The director of HV PCU explained that enhanced discharge teaching efforts and additional discharge content are needed to promote quality patient care (personal communication, July 9, 2021). The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) 29 question national, standardized survey helps measure the patients' perspective of the care they received, and the survey serves as a tool to measure nurse-patient communication about discharge information (Centers for Medicare and Medicaid Services [CMS], 2021a).

Problem Statement

Prior to the implementation of this Quality Improvement (QI) project the HV PCU nurse orientation pathway failed to provide a thorough educational framework that improved nurse self-efficacy and comprehensive knowledge about CEA/CAS patient care. To prevent gaps in knowledge, nurses require a thorough understanding of carotid vasculature anatomy, nursing management post-procedure, patient discharge teaching, and stroke. Omission of adequate education can hinder knowledge gain, have a negative impact on nurse self-efficacy and professional confidence, and impair the patient experience and health care outcomes.

Purpose Statement

The purpose of this QI project was to develop and implement a computer-based learning (CBL) course that included three educational modules aimed to improve HV PCU nurse self-efficacy and knowledge of the care for patients admitted for CEA/CAS procedures. The CBL course was assigned to HV PCU staff nurses and was added to the orientation pathway for review by new staff. Content covered in the three modules included carotid vasculature anatomy and an overview of CEA and CAS and stroke. Before reviewing the first module, nurses completed a self-efficacy survey that measured nurses' perceived self-efficacy and a pre-test that established baseline knowledge of vascular anatomy and patient care. The same self-efficacy scale and post-test were administered again after the third module to evaluate changes in perceived self-efficacy and knowledge post-education. At the end of the last module, participants were asked to identify their preferred learning style. These findings will help the unit's leadership develop future education. In addition, patient satisfaction HCAHPS scores collected prior to project implementation were used to establish a baseline reflecting nurse communication with

post CEA/CAS patients. Following staffs' completion of the learning activity, post CEA/CAS patients were interviewed and asked three questions to evaluate nurse communication.

Section II. Evidence

Literature Review

A review of the literature was completed to evaluate the intervention, methods, and tools used to implement this Quality Improvement project. Databases including PubMed, ProQuest, and Scopus were searched using keywords “education,” “continuing,” “nursing,” “nurse,” “self-efficacy,” “self efficacy,” and “nurse patient communication”. Inclusion criteria included peer-reviewed, scholarly journal articles published within the last five years, written in English, and found under the subject heading Nurses. The search identified 415 articles using this inclusion criterion after duplicates were removed. As an initial step, all article titles and abstracts were reviewed. Exclusion criteria included studies related to simulation education, academic self-efficacy of nursing students, and nursing students’ communication skills. After exclusion, a full-text review of the remaining 20 articles deemed all articles applicable for the Quality Improvement (QI) project. These studies were assigned evidence levels I-V based on their methodology represented in Johns Hopkins Nursing Evidence-Based Practice: Levels of Evidence appraisal tool (The Johns Hopkins Hospital/Johns Hopkins University, n.d.).

Current State of Knowledge

Researchers have consistently determined that nurses' perceived self-efficacy correlates with the nurses' ability to successfully perform general and specific patient care tasks (Ludwigson et al., 2020). Bandura (1977) explained that a person’s belief in their abilities determines how they will perceive the completion of a task. Boswell et al. (2020) reported that when nurses possess a stable foundation of self-efficacy, challenges and best practices are embraced in healthcare. This concept often results in the successful completion of new nursing tasks that are incorporated into care practices. In addition, enhanced levels of self-efficacy help

sustain nurses' motivation to manage various complex clinical situations and cope with rapidly changing and stressful work events (Boswell et al., 2020; Ludwigson et al., 2020).

It is clear from the research that concepts of self-efficacy and knowledge are intertwined. The level of self-efficacy significantly influences the ease at which knowledge obtained through various learning methods is transferred from the educational environment to the practical environment (Ludwigson et al., 2020; Sheikhbardsiri et al., 2019; van Houwelingen et al., 2021). Furthermore, much has been written about how knowledge gain increases competency, improving nurses' self-efficacy (Rosvall & Carlson, 2017).

Nurses' self-efficacy can potentially impact nurse-patient communication, which influences patient satisfaction. Hospitals' motivation to improve patient satisfaction scores has substantially increased since this measurement is linked to Medicare reimbursement (Mazurenko et al., 2017). Multiple research studies identified patient satisfaction as one of the hospitals' most essential quality measures (Kol et al., 2018; Lotfi et al., 2019). Higher patient satisfaction scores have been associated with increases in hospital cash flow, decreased malpractice lawsuits, and improved patient outcomes since feelings of satisfaction promote patients' involvement in their care (Alam et al., 2018).

Current Approaches to Solving Population Problem(s)

The research literature is replete with studies that identified a positive relationship between education and improved self-efficacy, knowledge, and motivation (Beasley, 2021). Providing educational opportunities that addressed patient care promoted healthcare professionals' confidence and maintained competence for effectively managing challenges within their roles (d'Ettorre & Pellicani, 2017; Kaddoura, 2010; Laine et al., 2019). The European Commission (n.d.) proposed that continuing education is a critical element of personal

development and advancement of professional skill sets. A study by Laine et al. (2019) found that health care professionals working in psychiatric facilities experienced statistically significant higher self-efficacy after completing a web-based patient course pertaining to patient education. The study concluded web-based training supported a positive association between educational initiatives and occupational self-efficacy (Laine et al., 2019).

Researchers have repeatedly discovered that implementing various educational methods enhances healthcare professionals' knowledge, self-confidence, and general or specific self-efficacy (Yu et al., 2021; Sharour, 2019). General self-efficacy denotes a person's universal level of self-confidence to handle an assortment of matters, while specific self-efficacy refers to an individual's confidence level or ability to cope with a distinct task (Bandura, 1982; Sherer et al., 1982). In the literature, modified versions of the General Self-Efficacy Scale (GSE) established by Schwarzer and Jerusalem (1995a) were consistently used to measure nurses' perceived belief in their ability to reach goals and solve problems. In addition, a pre-test was often administered before the educational intervention to evaluate nurses' baseline knowledge, and a post-test was used to assess knowledge gain.

Research literature has indicated that effective and professional communication displayed by healthcare professionals' increases hospital patients' level of satisfaction, particularly related to nursing care (Lotfi et al., 2019). Patients recognize effective communication as a form of patient-centered interaction, while nurses distinguish effective communication as patients' agreement for what has been discussed or patient acknowledgment of clinical goals (McCabe, 2004; O'Hagan et al., 2014). Yang et al. (2021) explained that a decreased sense of self-efficacy can significantly hinder the quality of nurses' work, including nurse-patient communication. In order for communication to be effective and intentional, nurses' must be competent and exhibit

confidence when conversing with patients and family members (Afriyie, 2020). Kounenou et al. (2011) proposed that nurse-related continuing education should produce expert knowledge resulting in proficient nurse-patient communication.

After reviewing the literature and discussing project objectives with the project champion, it was apparent that implementing targeted educational activities was the most appropriate intervention to improve nurse self-efficacy, nurse knowledge, and nurse-patient communication. Therefore, this project aimed to develop and implement computer-based learning modules to provide education that filled gaps in Heart and Vascular Progressive Care Unit (HV PCU) nursing knowledge of carotid artery endarterectomy (CEA) and carotid artery stenting (CAS) procedures, increase nurse confidence, and improve patient satisfaction regarding nursing care for this patient population.

Evidence to Support the Intervention

The project partner utilizes a web-based learning management system, HealthStream Learning Center (HLC), to conduct mandatory, required, and assigned compliance training for all employees (n.d.). Studies reviewed in the literature search supported web-based learning as well. Results of a randomized control trial (RCT) by Yoo et al. (2019) highlighted that computer-based pain management continuing education modules completed by post-anesthesia care unit (PACU) nurses were an effective method of learning. Yoo et al. (2019) found the experimental group that completed the modules had significantly increased self-efficacy and pain management knowledge compared to the control group who did not receive the education.

Computer-based learning (CBL) modules offer flexibility when participants can complete modules based on work and personal schedules (Yoo et al., 2019). In a study by Rosvall and Carlson (2017) a digital learning activity was implemented and available to RNs 24 hours a day.

Rosvall and Carlson (2017) explained that learning in a web-based environment allowed RNs to complete the activity at their own pace and promoted easier accessibility of the course compared to traditional classroom learning. Furthermore, the digital CBL platform can educate a large or small group of healthcare professionals and provide the most updated evidence-based practice information and guidelines for patient care (Rosvall & Carlson, 2017).

Results of a systematic review of 11 randomized control trials studies by Lahti et al. (2014) determined no differences in nurses' competency level when computer-based learning was compared to traditional face-to-face learning. However, Knowles et al. (2015) explained that computer-based education should be customized to successfully meet the skills, knowledge, and professional practice that the learning activity is intended to reinforce. Research by Lau et al. (2017) supported this finding. Lau et al. (2017) conducted a randomized control trial that included two web-based education tools: interactive scenario-based education and PowerPoint slides with narration. Lau et al. (2017) found that nurses were more engaged in interactive scenario-based education (i.e., dynamic learning) compared to the activity that included PowerPoint slides with narration (i.e., static learning). In addition, study results suggested that clinical education is more effective when directed towards a specific group of learners rather than presented in a standardized manner. Overall, Lau et al. (2017) recommended customizing educational activities to ensure learners' needs are met to change practice.

The way in which individuals receive and process information has been associated with learning styles or the modes of study that are most effective for the student (Pashler et al., 2009). Pashler et al. (2009) proposed that learning style refers to the way in which information is presented and the mental activities a person considers engaging. For example, visual presentation matches the learning preferences of a visual learner (Pasher et al., 2009). Learning style

questionnaires frequently include common learning options such as visual, auditory, read/write, or kinesthetic to establish effective modes of instruction.

Nurse-patient communication is an aspect of nursing care that influences how patients perceive their hospitalization. A systematic review of 41 studies conducted by Mazurenko et al. (2017) established that a growing amount of literature associated higher Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores with more favorable patient satisfaction and nurse-patient communication measures. Kang et al. (2020) interviewed 21 nurses from a surgical unit to gather qualitative data about discharge teaching key concepts, nurses' role in delivering discharge information, and perceived challenges in providing patient education. Kang et al.'s (2020) research results revealed that study participants identified the following as barriers to effective teaching:

- planning patients' discharge instruction based on their diagnosis
- supporting patients to engage in self-management after hospital discharge
- inconsistent resources from which discharge content was obtained

Increased recognition has been placed on the significance of discharge teaching to improve patients' outcomes (Kang et al., 2020). Consequently, it is imperative that nurses confidently and competently communicate high-quality health information to patients and families during patient discharge. As a result, continuing nurse education that addresses discharge needs for a targeted patient population has been identified as a critical element of nursing practice.

Evidence-Based Practice Framework

Bandura's Self Efficacy Theory was the main conceptual framework used to guide the Quality Improvement (QI) project's design and the collection and analysis of data. Bandura's Self-Efficacy Theory proposed that self-efficacy is an individual's ability to implement a

behavior to obtain specific goals or expectations (Bandura, 1977). Bandura identified four concepts that increase self-efficacy:

1. performance accomplishment or personal successes
2. vicarious experience or comparison to someone else
3. verbal persuasion or suggestion
4. emotional arousal or reducing avoidance behavior (Bandura, 1977)

Bandura's Self Efficacy Theory considered how self-efficacy affects human behavior (Bandura, 1977). Covington et al. (2019) utilized this theory in a QI project which implemented in situ simulation and online education to increase nurse and surgical technician self-efficacy and knowledge for airway emergencies. Bandura and Adams (1977) suggested there is a correlation between perceived self-efficacy and a person's reaction during a crisis or the ability to complete a task during a stressful event. Therefore, the project used Bandura's Self Efficacy Theory since it provided a foundation of measurement for self-efficacy and direction to interpret and modify nursing actions for patient care.

Haskell's Transfer of Learning framework was employed to complement Bandura's Self Efficacy Theory. This learning structure suggested that previous learning impacts "current and future learning when applied or adapted to similar or novel situations" (Haskell, 2001, p. 23). The framework presented a structure for achieving and understanding the transfer of learning resulting in the storage and integration of information (Haskell, 2001). The Transfer of Learning framework guided and supported the project's objectives of enhancing nurses' current knowledge and promoting nurse self-efficacy, competency, and nurse-patient communication.

Ethical Consideration & Protection of Human Subjects

HV PCU nurses were the QI project's target population. The HV PCU unit director assigned the educational modules to all current HV PCU staff nurses and new staff completing the orientation pathway. Completion of the CBLs was mandatory and no potential harm to HV PCU staff or patients occurred. HV PCU nurses' employment risk was not jeopardized if they did not complete the course; however, the unit's leadership strongly advised nurses to complete the learning activity. The project lead was responsible for monitoring nurses' course participation and completion.

Project participants' privacy was protected and was not made public. Participants accessed the course through the project site's HLC application which utilized controlled user access. Participants' names were not asked, and aggregate data was collected and analyzed for the project. All digital data was collected and stored in the project site's HLC management system. Furthermore, the paper data collection tool used to document post-CEA/CAS patient interview responses did not include any personal identifying information. Paper documents were stored in a locked filing cabinet and shredded after data analysis.

The project lead completed the Collaborative Institutional Training Initiative (CITI) basic program courses, Social/Behavioral Responsible Conduct of Research and Social/Behavioral Research Investigators and Key Personnel during the Masters of Science in Nursing program. A CITI Refresher Course, Social/Behavioral Research Investigators and Key Personnel, was completed before initiating this project. The courses intend to ensure quality standards are followed by individuals developing, implementing, evaluating, and disseminating research projects that include human research participants (Collaborative Institutional Training Initiative [CITI], 2021).

Written approval for the DNP project was granted by the HV PCUs executive nursing director and the site's education department (personal communication, July 14, 2021; personal communication, July 26, 2021). Completing the university self-certification quality improvement/program evaluation identified the project as a quality improvement initiative (see Appendix A). The project was approved by the project site's Nursing Research Council (NRC), and the Institutional Review Board (IRB) determined the project exempt from IRB review (see Appendix B).

Section III. Project Design

Project Site and Population

The Quality Improvement (QI) project was implemented at the main hospital campus of a healthcare system in the Piedmont Triad area of North Carolina. The medical center is a not-for-profit referral center and teaching facility. The hospital serves communities within a five-county region and offers comprehensive care for various medical conditions, including heart and vascular care. The hospital's Heart Health and Vascular (HV) Center provide disease prevention care, non-surgical treatments options, major cardiac surgeries, and cardiovascular procedures. The project population for the QI project consisted of full-time, part-time, and relief position Registered Nurses (RN) assigned to the Heart and Vascular Progressive Care Unit (HV PCU). RN staffing shortages resulting in increased nurses' workload and extra shifts were identified as possible barriers that could have affected the project's success.

Description of the Setting

The HV PCU is a 27-bed unit that cares for patients with cardiac diagnoses that require progressive or intermediate-level acute care. Vascular surgeries and procedures are the main conditions treated in the department. However, due to increased patient acuity and volume of admissions, various types of patients are now treated in the HV PCU, including myocardial infarction, chest pain, rapid atrial fibrillation, and COVID-19-positive individuals. The project specifically addressed nurses' educational needs for patients admitted for carotid artery endarterectomy (CEA) and carotid artery stenting (CAS) vascular procedures. The HV PCU director reported the average length of stay for patients admitted for CEA and CAS procedures is 1.7 days and 1.5 days respectively and approximately one to two CEA or CAS patients are admitted to the department daily (personal communication, October 10, 2021).

Description of the Population

During project implementation, HV PCU nursing staff included 44 RNs. A total of 42 nurses were employed as full-time RNs, one nurse was assigned a relief position, and one nurse was appointed a part-time night shift position. Nurses on HV PCU consistently collaborate with vascular surgeons, vascular radiologists, and cardiologists who perform CEA and CAS procedures for patients cared for on this unit.

Project Team

The project team included the unit's nursing director, who was the site champion for the project lead, the department's RN unit educator, and the DNP student, who served as the project lead. The site champion and unit educator provided a significant amount of content for the educational modules. These team members assisted the project lead in identifying appropriate course material that aligned with guidelines established by the Joint Commission, the Society of Vascular Nurses, and the organization's CEA/CAS procedure order sets and standards of care. In addition, the site champion and unit educator offered organizational guidance by identifying internal resources for computer-based course development, clinical persons with expert knowledge, and data gathering.

Additional project team members included representatives from the project site's nurse education department. An educational instructional designer was assigned to work with the project lead and assist with the digital development and design of the course. A nursing professional development specialist ensured the course activities met continuing nursing education (CNE) contact hour requirements established by the American Nurses Credentialing Center's Commission on Accreditation and North Carolina Nursing Association. In addition, the

HV PCU's medical director reviewed and approved the CEA/CAS course content developed by the project lead.

Project Goals and Outcome Measures

The project implemented an educational initiative to improve HV PCU nurses' perceived self-efficacy and knowledge of CEA/CAS surgical procedures. The course reviewed carotid vasculature anatomy, and it provided an overview of CEA/CAS and stroke. The learning activity consisted of one educational course that included three computer-based modules. The project's outcome measurements were evaluated using a pre- and post-method. A pre- and post-Modified General Self-Efficacy Scale (GSE) and knowledge-based test was included before the first module and after the last module. In addition, pre-project Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction national survey results were evaluated to establish baseline nurse-patient communication metrics. After staff completed the modules, the project lead interviewed post-CEA/CAS patients prior to their discharge to reevaluate nurse communication.

Description of the Methods and Measurement

Much of the content included in the computer-based learning (CBL) course titled *Carotid Artery Endarterectomy and Carotid Artery Stenting: Nursing Management and Patient Care* was derived from expert knowledge covered in PowerPoint slides developed by the organization's former neurology Clinical Nurse Specialist. The site champion, unit educator, and project lead collaborated to review material included in the slides. The project site's CEA and CAS procedure order sets, carotid flowsheets, vascular quality initiatives, and Joint Commission procedure standards of care were also reviewed, discussed, and considered valuable to the educational activity. Pertinent attributes from each of these initiatives were included in the computer-based

modules. Module one incorporated various topics to expand nurses' knowledge of carotid artery vasculature, including anatomy and atherosclerosis. The remaining two modules specifically addressed CEA and CAS post-patient care and education, post-procedure complications, review of cranial nerves, stroke prevention and identification, and neurology assessments (see Appendix C).

The nurse self-efficacy concept is an indicator influenced by nurses' capabilities, and it drives quality patient outcomes. The Modified General Self-Efficacy Scale is a survey adapted from the General Self-Efficacy Scale (GSE) developed by Schwarzer and Jerusalem (1995b). The GSE has been widely used to measure clinical learning environments and beliefs in abilities to cope with various challenging demands in life (Yu et al., 2021; Schwarzer & Jerusalem, 1995b). Extensive studies conducted by the instrument's developers have concluded the GSE has a good reliability with a Cronbach's alpha value ranging from 0.75-0.91 (Kameg et al., 2010; Diehl et al., 2006; Scholz et al., 2002). Modifications of the GSE for this project consisted of an introductory statement that asked participants to answer survey questions based on self-perceived coping and adapting abilities specifically related to the care of CEA/CAS patients. The original ten questions developed by Schwarzer and Jerusalem (1995b) were not modified for the project. Primary data was gathered at the beginning of module one and at the completion of module three using the ten-item Modified GSE (see Appendix D). A four-point Likert scale was used as the scoring method. Consistently true responses reflected greater self-efficacy, while rarely true answers had the potential to indicate lower self-efficacy.

A demographic data questionnaire was utilized to gather data that described the nurse participants, including age group, nursing years licensed as a RN, nursing years worked as a RN on HV PCU, highest nursing degree obtained, and nursing certification (see Appendix E). This

data did not contain any personal identifiers and was not directly linked to a nurse participant. Participants were required to complete this questionnaire prior to beginning module one of the course.

The concept of nurse knowledge is an indicator that captures the voice of the project participant. Measuring nurses' knowledge of post-procedure CEA/CAS nursing care was designed to assess baseline knowledge and evaluate new knowledge. This project implemented a 20 question, multiple-choice pre-test developed in collaboration with the unit's nursing director, the department's RN unit educator, and the project lead. The pre-test aimed to evaluate HV PCU nurses' knowledge prior to module one (see Appendix F). The same questions were included in a post-test after module three to evaluate knowledge gain. The knowledge-based test included questions that considered the following topics: carotid vasculature anatomy, nursing management of CEA, nursing management of CAS, patient discharge education, and stroke. Participants were allowed two attempts to achieve a passing score of 80% or higher on the post-knowledge-based test. The post-test included three additional questions as well. Two questions evaluated the HLC activity, and one question asked participants to identify their preferred learning style. This information will help the department's leadership develop future educational opportunities.

The computer-based assignment provided Continuing Nursing Education (CNE) contact hours for HV PCU nurses who completed all course activities. Project team members including the project lead, project champion, and unit's RN educator separately noted the time taken for each team member to complete the following learning activities: pre-module test, three CEA/CAS HLC modules, and post-test. The average time for project members to complete these activities was one hour; therefore, it was determined that nurses could earn one CNE contact

hour upon completion of the HLC course. One hour of stroke education was awarded as well since the course included neurovascular disease and stroke content. CNE planning documents were submitted to the project site's primary nurse planner who authorized the CNE. The project site is approved as a provider of nursing continuing professional development by the North Carolina Nursing Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation (personal communication, November 18, 2021).

Nurse-patient communication significantly influences measurable patient satisfaction of the hospital experience, specifically for discharge education (Lotfi et al., 2019). On one occasion, the project lead evaluated the results of three HCAHPS survey questions which appraised nurse-patient communication about discharge information (see Appendix G). Centers for Medicaid and Medicare Services (CMS) (2021b) reported that the HCAHPS survey instrument was developed in collaboration with the Agency for Healthcare Research and Quality (AHRQ) using a rigorous scientific process. The survey is randomly implemented to adult patients by telephone, interactive voice recognition, mail, or mail with telephone follow-up. The instrument is distributed 48 hours to six weeks after hospital discharge and is available in multiple languages (CMS, 2021b). Survey results are displayed through 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentile tables with "top box" scores indicating how patients choose positive responses about their hospital experience (CMS, 2021b). In addition, the higher the hospital's "top box" score, the higher the organization ranks among other hospitals (CMS, 2021b).

The Plan-Do-Study-Act (PDSA) cycle was utilized to alter the project's plan, execution, and evaluation during project implementation. The PSDA tool employed a four-step cycle to improve quality improvement processes (Institute for Healthcare Improvement [IHI], 2021). The tool intended to expedite the development, implementation, and evaluation of change in tangible

work environments (IHI, 2021). According to the IHI (2021), the PDSA model has successfully improved health care approaches and outcomes in multiple healthcare organizations worldwide. Therefore, the implementation of PDSA cycles helped guide and assess project modifications.

Discussion of the Data Collection Process

The CEA/CAS course was assigned to each full-time, part-time, and relief position HV PCU RN. Nurse participants accessed the course through the organization's electronic learning application or HealthStream Learning Center (HLC). The demographic questionnaire, pre- and post-Modified GSE survey, pre- and post-knowledge-based test, and the end-of-course survey were included in the HLC course to capture, store, and retrieve data.

The project champion added the project lead as a proxy to the project site's MyTeam Dashboard in the HLC which allowed the project lead to run a weekly report identifying HLC completions. During the implementation phase, the project lead exported this data to a Word table (see Appendix H) once a week to monitor staff participation. The project site's Learning Management System Administrator arranged for the project lead to receive automated, weekly reports of the demographic questionnaire, pre-and post-Modified GSE survey, pre-and post-knowledge-based test, and the end-of-course survey since the project lead did not have access to this data. The project lead reviewed these reports once a week to ensure the data was captured appropriately to support the review and discussion of project results. After project implementation, all data captured in the HLC course activities were exported to Excel spreadsheets for data analysis.

Before beginning module one of the course, participants completed the demographic data questionnaire, pre-Modified GSE, and pre-knowledge-based tests. After reviewing module three,

participants completed the post-Modified GSE, and post-knowledge-based test. In addition, HV PCU nurses were asked to identify their preferred learning style in the course evaluation.

The HV PCU HCAHPS survey results for the fiscal year 2021 were used as a baseline to measure patients' perceptions of their hospital experience. The project site's Patient Experience team extracted this data based on Diagnosis Related Group (DRG) codes assigned to CEA and CAS procedures. The team then shared the information with the project lead. The three HCAHPS survey questions previously mentioned specifically assessed nurse communication regarding explanations of care-related tasks and medications, and management of health after discharge.

The project's original design proposed that the unit's post-carotid procedure HCAHPS survey would be the tool used to evaluate changes in nurse-patient communication, thus reflecting if CEA/CAS education altered patients' perception of the following: understanding of nurses' explanation of things, responsibility for managing health, and understanding of medication(s). Unfortunately, HCAHPS real-time data was unavailable during the timeframe of the QI project. In order to evaluate post-CEA/CAS patients' perspectives of HV PCU nurse communication, the project lead, project champion, and project partner's Patient Experience team used the PDSA cycle to develop a different plan to gather this information.

Project changes included the project lead conducting face-to-face interviews to ask post-CEA/CAS patients three questions regarding nurse communication prior to their hospital discharge (see Appendix I). All the questions were open-ended, and patient responses were aggregated into themes: quantifiable measures were not used to rate the responses. The project partner's patient experience team approved the interview questions and updates to the project plan. The project lead informed the project partner's IRB of the change since obtaining

information directly from patients was warranted. Per the project partner's IRB requirement, an amendment was submitted to the previously approved project materials. The project lead was instructed to include consent language at the beginning of the patient survey, which informed participants of the purpose of the questions and explained they were not obligated to provide any responses. Updates were made to the data collection tool, and the IRB approved the project.

The project site's vascular clinic manager provided the project lead with dates and the number of CEA/CAS procedures scheduled weekly during the interview phase of the project. The project lead conducted one post-procedure interview with eligible patients prior to their discharge from the hospital facility. Collaboration with the clinic manager was critical to the success of the project which enabled the project lead to gather data promptly.

The project lead utilized the data collection tool to note patients' responses during the interview. The instrument included a waiver of consent, the date of the interview, and the type of carotid procedure. Only post-carotid patients were surveyed, and no patient identifiers were used or written on the tool. This qualitative data was gathered over a three-week timeframe, and utilization of the data was restricted to QI project purposes.

Implementation Plan

The site champion, unit educator, and project lead discussed preliminary implementation plans during project development meetings. The team outlined opportunities to introduce the computer based or HLC learning activity to RN staff to promote awareness and engagement of the educational initiative. The project lead composed an email that the project champion distributed to HV PCU nurses. The email included an HLC overview and explanation identifying the goal of the pre- and post-Modified GSE survey, pre- and post-test, and end-of-course survey.

This information was also shared with HV PCU nurses during two-unit huddles that included day and night shift RNs.

Based on the urgent need for CEA/CAS education, the project champion instructed the project lead to make the computer-based activity available to HV PCU nurses for only four weeks. The first day the course was launched, an automated email from the HLC platform was sent to nurses in their employee email account informing them an activity had been assigned to their HLC to-do list. Automated email reminders were then sent to RNs who had not completed the learning activity two weeks and one week before the end of the four-week implementation phase. The timeframe for CBL completion was extended by two weeks to ensure all HV PCU RNs had adequate time to complete the learning activity. The PDSA cycle was used once during project implementation to plan, apply, and observe changes necessary to interview post-CEA/CAS patients.

Timeline

Prior to the launch of the HLC, final versions and approval of the Modified GSE, pre- and post-test, end-of-course survey, and module material were completed. The project site's Nursing Research Council (NRC) approved the project, and the project champion and RN unit educator approved final versions of the learning activity, survey, and tests. The project was deemed exempt from IRB review. The project lead developed the following approved activities: demographic survey, pre- and post-Modified GSE evaluations, pre- and post-tests, and course evaluation. The project lead collaborated with the HLC instructional designer to ensure all activities were uploaded to the online course.

HLC material was launched February 11, 2022. An automated email was sent to HV PCU nurses informing them of the assigned HLC and the project champion distributed an email

composed by the project lead which outlined the computer-based modules and course activities. The project lead presented an overview of the HLC at two-unit huddles, each included day and night shift nurses. Completion of the HLC by all nursing staff was projected to be finished within four weeks of the launch date; however, this component of implementation was extended to six weeks and concluded March 25, 2022. The additional IRB review for the interview process was approved at week six of the project implementation and patient interviews were conducted over the following three weeks. The project timeline can be found in Appendix J.

Section IV. Results and Findings

Results

This Quality Improvement (QI) project aimed to improve Heart and Vascular Progressive Care (HV PCU) nurse self-efficacy and knowledge of the care provided to post-surgical carotid artery endarterectomy (CEA) and carotid artery stenting (CAS) patients. A computer-based learning (CBL) course was developed and implemented to advance nurses' knowledge and performance. HV PCU leadership firmly supported the initiative and made the completion of the course a mandatory requirement. All HV PCU nurses (n=44) were assigned the learning activity and 100% of the nurses completed the modules during the six-week online course implementation. Data collected before and after module completion were analyzed and results indicated increased nurse self-efficacy and knowledge gain.

Demographic Data Questionnaire

The respondents' demographic characteristics can be found in Appendix K and include age, years licensed as a RN, years worked as a RN on HV PCU, highest nursing degree, and nursing certification. Of the 44 nurses, 50% (22) were within an age range of 30 to 49 years, and 45.45% (20) had been licensed as a RN for less than five years. The majority responded having worked less than five years in the heart and vascular unit (72.72%) and held a Bachelor of Science Degree in Nursing (56.82%). In addition, 13.64% (6) had a Progressive Care Nursing Certification, and 2.27% (1) had a Cardiac Vascular Nursing Certification.

Pre-and Post-Knowledge-Based Test

Participants completed the pre-knowledge-based test before reviewing module one, and the post-test was completed after the review of module three. The pre-test consisted of 20 questions while the post-test included the same 20 questions in addition to three questions that

evaluated the course. A multiple-choice design was used to assess participants' baseline knowledge, knowledge gain, and course evaluation (see Appendix L).

All the HV PCU RNs completed both the pre- and post-tests. The average pre-module test score was 69.43%, compared to the 90.68% post-test score. The overall post-test scores increased by 21.25%. Participants were allowed two attempts to score 80% or higher on the post-test to be awarded continuing nursing education (CNE). The average number of attempts was 1.3.

Pre-and Post-Modified General Self-Efficacy (GSE) Survey

The pre-and post-Modified General Self-Efficacy Survey (GSE) was completed by 100% (44) of the nurse participants. A four-point Likert scale was used to evaluate participants' level of agreement of ten questions that determined confidence in caring for CEA/CAS patients. Highest areas of nurse self-efficacy corresponded with consistently true responses while rarely true responses potentially indicated lower self-efficacy. The pre-survey was completed prior to participants reviewing the course's three content modules and the post-survey was completed after review of the content. Both surveys included the same questions; however, instructions stated at the beginning of the post-survey directed HV PCU nurses to reevaluate perceived feelings of care for CEA/CAS patients. Pre- and post-results of the Modified GSE Survey are shown in Appendix M.

Important Modified GSE Survey findings demonstrated that consistently true post-module scores increased in nine out of ten survey questions. Results of survey question number two, "If someone opposes me, I can find the means and ways to get what I want," were meaningful since it was the only question that included rarely true answers for both the pre- and post-survey. Pre- and post-results of survey question number seven, "I can remain calm when

facing difficulties because I can rely on my coping abilities,” included the highest percentages of consistently true responses. Of the 44 HV PCU nurses, 30.43% (13) and 36.17% (16) responded consistently true on the pre- and post-survey, respectively. Results of survey question number nine, “If I am in trouble, I can usually think of a solution,” demonstrated the largest increase in consistently true responses with 15.91% (7) nurses answering consistently true on the pre-survey and 34.09% (15) responding consistently true on the post-survey.

HLC Course Evaluation

A four-point Likert scale design was utilized to evaluate HV PCU nurses’ perception of the course (see Appendix N). Of the 44 nurses surveyed, 88.64% (39) strongly agreed that the CEA/CAS course increased their knowledge about carotid procedures (i.e., intervention, nursing considerations, patient care, patient education), while 11.36% (5) somewhat agreed. No responses were identified for disagree and strongly disagree. While 90.91% (40) of the respondents felt the course was applicable to HV PCU nursing care and appropriate for the patient population, 9.10% (4) somewhat agreed. No responses were identified for disagree and strongly disagree.

Data on nurses’ preferred learning style is shown in Appendix O. Of the 44 nurse participants, 61.36% (27) preferred visual educational activities while 25% (11) favored kinesthetic type methods. Auditory and reading/writing approaches were participants’ least preferred learning styles at 6.82% (3) and 6.82% (3), respectively.

HV PCU HCAHPS Survey Results 2021

HV PCU HCAHPS Survey results for the fiscal year 2021 reflected patients’ perception of nursing care and satisfaction of discharge information shared during their hospital stay. Compared to other hospitals in 2021, the project site’s scores were within the 62.07 to 76.00

percentile related to nurse communication for explaining care-related tasks, health management, and medications. See Appendix P for survey results.

CEA/CAS Post-Procedure Patient Interviews

A total of ten HV PCU patients were interviewed post-procedure. The participants included six CEA patients and four CAS patients. The themes that emerged from the qualitative analysis are displayed in Appendix Q. Most patients felt they understood what nurses explained, were confident they could manage their care after discharge and understood the reason for their prescribed medications. Barriers identified included being hard of hearing, which made it difficult to understand what was being discussed, and some patients reported being disappointed with physician communication. Others stated that a family member would be assisting with daily activities and medication administration.

Discussion of Major Findings

This QI project improved HV PCU nurses' knowledge of carotid vasculature anatomy, post-CEA/CAS procedure nursing management, and patient discharge teaching. The nurses' knowledge gained was demonstrated by a 21.25% increase in post-module test scores compared to pre-module test scores. In addition, 88.64% of the project participants strongly agreed that the online course improved their knowledge of CEA and CAS surgical procedures.

The Modified GSE Survey evaluated the HV PCU nurses' belief in performing tasks and managing difficult situations when barriers were met and unforeseen events occurred. Consistently true post-module responses increased in nine out of ten survey questions. These results demonstrated that the educational modules improved participants' perceived ability to provide care to CEA and CAS patients (i.e., self-efficacy).

The CBL modules provided a review of post-surgical procedure complications and stroke. The modules also included an overview of CEA and CAS procedures to ensure nurses were aware of potential patient conditions or needs that could develop post-operatively. Pre- and post-survey responses indicated that HV PCU nurses consistently used coping skills to remain calm when facing challenging or unexpected situations. An increase in consistently true post-scores confirmed that HV PCU nurses' ability to manage difficult situations post-CEA/CAS improved. These findings support that the modules enhanced participants' clinical self-efficacy. Higher perceptions of self-efficacy have been associated with a person's ability to complete tasks during stressful events effectively.

Based on Modified GSE Survey responses, HV PCU nurses' ability to think of a solution during troubling situations showed the greatest improvement out of all the survey questions. These results suggested that CEA/CAS computer-based education provided knowledge that improved nurses' professional self-efficacy and ability to find a solution when issues emerged. Combining previously acquired knowledge with new learning facilitated the transfer of learning to the HV PCU environment. The results of this project highlight the value of continuing education which potentially impacts clinical judgment and strengthens nursing care.

Pre- and post-survey results consistently indicated that HV PCU nurses' experienced lower self-efficacy when opposition was met. These outcomes could be associated with inadequate clinical confidence. The online course was added to the nurses' orientation pathway to support the development of cognitive skills and behaviors enhancing self-efficacy. Current staff and newly hired HV PCU nurses can review the CBL activity as needed to gain greater knowledge of CEA/CAS content, post-surgical procedure care, and pertinent patient discharge

instructions. Improved knowledge and self-efficacy can influence nurses' confidence level for coordinating patients' care and collaborating with other healthcare professionals.

It was difficult to determine if increased nurse knowledge translated into improved nurse communication since tools used to measure nurse communication before and after project implementation differed. Although the unit's 2021 HCAHPS scores were within the 62.07 to 76.00 percentile compared to other health care systems, the lowest rating was associated with patients' understanding of health management. Data collected during the patient interviews were not consistent with the concern. Instead, themes gathered from the interviews demonstrated that most patients presumed they would be able to manage their health after being discharged from the hospital. Furthermore, most patients were pleased with the nurses' communication and discharge teaching.

The literature inferred that self-efficacy is enhanced when educational activities develop cognitive processes (Luthans & Youssef, 2007). This QI project provided an opportunity to deliver an educational endeavor in a specialized area of nursing to strengthen self-efficacy and nurse competency. The HV PCU nurses' transfer of new knowledge was integrated with previous learning to support clinical performance. Nevertheless, further research will be required to determine if this computer-based learning activity sustained long-term improvements in HV PCU nurses' self-efficacy.

Section V. Interpretation and Implications

Costs and Resource Management

Costs

This Quality Improvement project was associated with minimal monetary costs, including spending for printing copies of the HealthStream Learning Center (HLC) flyer and post CEA/CAS procedure interview questionnaire. More substantial costs included time devoted to developing the computer-based learning (CBL) course, which staff accessed through the organization's HLC platform. Developing the HLC and evaluation activities (i.e., surveys and tests) in PowerPoint format was time-intensive requiring 55.50 hours. The initial draft required multiple revisions based on input from the HV PCU nurse and provider leadership. The project partner's educational instructional designer converted the completed PowerPoint into a compatible HLC format that allowed nurses to access the learning activity in a web-based environment.

A significant portion of the project's cost was associated with the time required for HV PCU nurses to complete all the course requirements. Individually, each nurse expended approximately one non-staffing hour to complete the course. On average, a full-time (i.e., 36 hours per week) registered nurse (RN) with a Bachelor of Science in Nursing degree will earn approximately \$28.00 per hour (Payscale, 2021). The unit's total cost to pay 42 full-time RNs, one relief position RN, and one part-time RN for their time to complete the course was \$1267.20. The overall estimated cost for the project was \$2,886.56. See Appendix R for the project budget.

Resource Management

A significant portion of the modules' content was adapted from expert knowledge incorporated in PowerPoint slides developed by the project partner's former neurology Clinical

Nurse Specialist. Additionally, collaboration with the project partner's nursing professional development specialist provided guidance to ensure the course activities met Continuing Nursing Education (CNE) contact hour requirements, and the educational instructional designer developed the computer-generated HLC. One particularly valuable resource was the project partner's Learning Management System Administrator, a team member from the information technology analytics division. Due to administrative restrictions, the project lead could not obtain reports containing RN's responses for the course self-efficacy surveys, demographic survey, tests results, and course evaluations. Therefore, this administrator arranged for the project lead to receive this data automatically once per week during the project implementation phase.

Implications of the Findings

Implications for Patients

High-quality nurse-patient communication produces a hospital environment that fosters a positive patient experience. Kol et al. (2018) proposed that “although patient satisfaction is closely related to expectations and perceptions, it is the most widely used metric of healthcare quality” (p.51). Kol et al. (2018) explained that patients who felt they received clear communication from nurses about their disease, treatment, and medications reported greater satisfaction with their hospital experience. Furthermore, patients identified nurses’ professional and technical skills as a prerequisite for patient satisfaction. Overall, nurses substantially impact patients’ impression of their hospital stay (Kol et al., 2018).

The CBL modules provided education to fill gaps in HV PCU nurse knowledge. An increase in nurse knowledge has been associated with a positive impact on self-efficacy; therefore, as nurses gain greater self-efficacy, their ability to apply what has been learned increases as well (Covington et al., 2019; Ludwigson et al., 2020). This transfer of learning to the

bedside environment is evident in nurses' communication with patients and practice improvements. Information shared by nurses from the beginning of the patients' admission and continuing until discharge evokes a patient-centered approach and establishes a decision-making partnership between the nurse and the patient (McCabe, 2004). Ultimately, the quality of nurse communication directly impacts the patients' level of satisfaction with their hospital stay.

Implications for Nursing Practice

Continuing education strengthens the professional competency of nurses who apply informative material to clinical practice (Kim et al., 2018). The acquisition of new knowledge can be combined with current knowledge to help nurses better adapt to both familiar and new situations (Haskell, 2001). Self-efficacy is a significant concept augmented by knowledge gain that impacts a nurses' ability to utilize clinical judgment and problem-solving skills (Kim et al., 2018). Bandura (1977) proposed that those with higher self-efficacy consider their chance of success more positively and approach problems more logically. Therefore, self-efficacy is essential in today's complex healthcare environment that constantly changes and challenges nursing professionals.

Nurses have identified educational initiatives that provide current care standards as a priority among nurses (Price & Reichert, 2017). Price and Reichert (2017) explained that nurses perceive training and education as an investment in their careers, and professional development impacts the quality of care they provide to their patients. Organizations that support educational opportunities and professional development, including continuing education, are recognized as entities that prioritize nurse retention (McGillis et al., 2011).

The online course provided CEA/CAS education to HV PCU nurses to expand knowledge, enhance nurses' perceived ability to deliver high-quality care, and offer a continuing

education opportunity. The HLC established an educational foundation of carotid vasculature anatomy, stroke, the purpose of CEA/CAS, post-procedure care, and pertinent discharge instructions. The aim of the Quality Improvement project included increasing nurse knowledge and self-efficacy as HV PVU nurses routinely manage the care of this patient population. The learning activity served to fill a knowledge gap for current nursing staff and to benefit nurses hired in the future.

Impact for Healthcare System(s)

Medicare's Hospital Readmissions Reduction Program (HRRP) promotes value-based healthcare, which ensures quality patient care and outcomes (Centers for Medicare & Medicaid Services [CMS], 2021c). This initiative motivates hospital systems to deliver exceptional care coordination and discharge instruction to reduce preventable readmissions; otherwise, CMS can reduce payments to organizations that do not meet HRRP goals (CMS, 2021c). Vascular procedure readmissions are not recognized by CMS (2021c) as one of the six medical conditions included in HRRP; however, CEA has been identified as a surgical procedure resulting in the third-highest readmission rate and may be added to the HRRP soon (Lawson et al., 2011; Duwayri et al., 2016).

Unplanned readmission events related to CEA are not uncommon and contribute to high health care costs. Duwayri et al. (2016) reported that wound complications post CEA was the most prevalent cause of readmissions among this patient population, and on average, the readmission cost totaled \$27,723 U.S. dollars. Readmission length of stay and complications including bleeding and organ involvement resulting in respiratory, cardiac, and pulmonary events affected overall readmission costs.

Duwayri et al. (2016) found that compromised preoperative health, including anemia, pulmonary and renal insufficiencies, correlated with an increased risk of readmission. In addition, immediate postoperative surgical complications resulting in increased length of stay (i.e., blood transfusions, reoperations, wound complications) were associated with unplanned readmissions within 30 days from the post-procedure discharge date. Duwayri et al. (2016) recommended that both preoperative comorbidities and postoperative complications be considered when evaluating patients' risk for readmission.

In the past, quality of care was determined by the perspective of health care professionals (Kumah, 2019). More recently, a patient-centered approach has become an integral aspect of medical services (Groene, 2011). Kumah (2019) proposed that patients' opinion of service outcomes should be frequently assessed to evaluate patient-centeredness. These evaluations can directly impact the health care system's reputation, financial stability, and ability to recruit staff. Furthermore, it has been consistently reported that patients who are satisfied with their health care experience have greater adherence to treatment plans and remain loyal to care providers and health systems (Kumah, 2019).

The HV PCU learning modules are one of various interventions that can contribute to decreased hospital readmissions among the post-carotid patient population. The HLC increases nurses' knowledge of not only post-procedure considerations and complications, but patient-centered post-procedure education and discharge instructions as well. This focused education helps identify in-patient conditions that could precipitate readmission, establish goals of care management after discharge, and enhance patient-centered care.

Sustainability

The CEA/CAS education modules have been added to the HV PCU's nurse orientation pathway, and newly hired RNs will be required to complete the learning activity. The HLC will be listed in the project partner's education catalog and available to nurses system-wide until the course expiration date of March 7, 2024. No additional work from unit leaders is required to sustain the computer-based training; however, the leaders will need to update any content altered in the project site's CEA/CAS procedure order sets, carotid flowsheets, vascular quality initiatives, or Joint Commission's standards of care.

Dissemination Plan

Project findings were shared with the project site's leadership (i.e., unit director, RN IV) in July 2022 via email format. Results will be submitted and presented to the project partner's Nursing Research Council (NRC) members. The date of the presentation will be based on agenda availability. The final project paper was submitted to a digital, scholarly archive in July 2022. Project findings were shared with professors, mentors, and student colleagues during a poster presentation on July 12, 2022. An abstract will be submitted to the *Journal of Nursing Education*, a peer-reviewed journal dedicated to educational topics and programs.

Section VI. Conclusion

Limitations and Facilitators

The major limitations of the project were related to the short timeframe of project implementation. Post-implementation Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results were not available by the conclusion of implementation; therefore, patient satisfaction results were obtained using a different method. This circumstance made it difficult to objectively compare and identify positive or negative changes in patients' perceptions of their hospital admission, including nurse-patient communication.

Another limitation included administering the post-Modified General Self-Efficacy (GSE) survey in the same course as the pre-evaluation. Rather than requesting HV PCU nurses reevaluate self-efficacy at a designated time after module completion, the post-survey was included in the computer-based learning (CBL) course to prevent survey fatigue and ensure survey participation. Consequently, post-Modified GSE survey results were limited to nurses' perceived self-efficacy after acquiring new knowledge rather than the application of knowledge in the clinical practice setting.

The project site's vascular clinic manager, nursing education team, nursing research council, and HealthStream Learning Center (HLC) instructional designer were valuable resources that offered guidance that helped facilitate the project's progression. Other significant resources included the project champion, Heart and Vascular Progressive Care Unit's (HV PCU) unit educator, the vascular department's medical director, and the organization's former neurology Clinical Nurse Specialist. These individuals provided expert knowledge and pertinent information that was incorporated into the online educational modules. Some of these resources also reviewed the CBL to ensure content met staff, patient, and organizational needs.

The project lead collaborated with the project champion and HV PCU unit educator during each project phase, including planning and implementation. The project champion and unit educator promoted awareness of the online course and encouraged the nurses to complete the modules within a six-week timeframe. The project champion introduced the project lead to the Learning Management Specialist, who arranged for the module survey and test results to be automatically sent to the project lead weekly. These automated data reports were essential since data collection and analysis were needed to evaluate the project's purpose and opportunities.

Recommendations for Others

Several recommendations may help others who aim to use computer-based learning to improve nurse knowledge and self-efficacy. The project goal guides measurable outcomes and data to be collected; therefore, data collection tools should be carefully considered during project planning. Awareness of precisely how and when data is captured and delivered supports the project's purpose. A thorough review of data collection methods during project planning prevents delays in the implementation and conclusion of the project. Furthermore, the same measurement tool should be used when data is collected before and after project implementation. Consistent utilization of data collection devices provides an accurate review and evaluation of project findings. Also, real-time data collection captures variabilities in unexpected responses and participants' experiences, enhancing quality improvement projects.

Educational programs that address various learning styles often enhance knowledge transfer and long-term retention of what is learned (Pashler et al., 2009). Future online clinical courses should incorporate visual, auditory, and reading components to optimize the learning experience for various learners. In addition, cognitive processing techniques, particularly

problem-solving approaches, have benefited most types of learners and should be integrated into nurses' educational initiatives (Pashler et al., 2009).

Recommendations for Further Study

This project was limited to nurse participants from one unit in a healthcare system. A more extensive range of subjects and a comparison group are needed to substantiate the project results. Notably, this project should be extended to other nurses within the organization (i.e., post-anesthesia care unit) that care for post-procedure carotid artery endarterectomy (CEA) and carotid artery stenting (CAS) patients. Furthermore, simulation training or some form of synchronous education would allow interactive practice exercises and the opportunity to repeat content as needed and receive feedback to increase knowledge gain. Lahti et al. (2014) suggested that computer-based learning should not be utilized as a single entity but rather be combined with traditional learning methods. These learning alternatives would promote discussions among colleagues and offer opportunities to ask questions in real time.

Future efforts to improve nurse self-efficacy through online education should consider strategies that increase an individual's clinical practice confidence. Kim et al. (2018) reported that confidence in nursing practice is positively associated with general self-efficacy. Improving confidence for nurses with limited clinical experience is particularly important. Kim et al. (2018) explained that stress and tension in unfamiliar situations compromise learning abilities and delay gaining confidence. Efforts focusing on improving self-efficacy and confidence help the nurse utilize clinical judgment and problem-solving skills, enhancing their clinical practice.

Nurses' ability to anticipate patients' needs, engage in nurse-patient interactions and promptly acknowledge patients' concerns are additional aspects of nurse-patient communication that require further study. These studies should evaluate information sharing, including verbal

and non-verbal communication, to promote a more thorough assessment of factors that affect nurse-patient communication. Afriyie (2020) proposed that effective communication extends beyond verbal exchanges to include non-verbal expressions that produce communication and interpersonal relationships. Future studies should identify the patients' and nurses' perspectives of effective communication to elicit the desired result successfully.

Final Thoughts

Improvement in nurses' knowledge supports many links in the healthcare chain, starting with the patients, providers, interdisciplinary team, and healthcare system and ending with the nurse themselves. Increased knowledge and the ability to apply learned instruction impact a nurse's ability to produce desired results for general and population-specific patient care and it enhances a nurse's self-confidence. This confidence can help nurses' complete tasks competently and successfully, thus increasing their self-efficacy and improving patient outcomes and quality of care. High self-efficacy has been associated with nurses' ability to communicate and manage patient care despite the challenges nurses routinely encounter.

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Appendix A

University Qualtrics Results

Based on your responses, the project appears to constitute QI and/or Program Evaluation and IRB review is not required because, in accordance with federal regulations, your project does not constitute research as defined under 45 CFR 46.102(d). If the project results are disseminated, they should be characterized as QI and/or Program Evaluation findings. Finally, if the project changes in any way that might affect the intent or design, please complete this self-certification again to ensure that IRB review is still not required. Click the button below to view a printable version of this form to save with your files, as it serves as documentation that IRB review is not required for this project. 9/15/2021

Appendix B

Institutional Review Board



Greensboro, NC 27401 336.832.2330

1200 North Elm Street

OFFICE OF RESEARCH COMPLIANCE AND DEVELOPMENT
INSTITUTIONAL REVIEW BOARD (IRB)
COMMITTEE FOR HUMAN RESEARCH PROTECTIONS

DATE: November 23, 2021

TO: Angela Sheldon; Principal Investigator

FROM: Randy Absher, Pharm. D., BCPS; Chair, Cone Health Institutional Review Board (FWA00004507)

PROJECT TITLE: Implementation of Computer-Based Educational Modules: Improving Nurse Self-Efficacy and Nurse Knowledge

REFERENCE #: 1813624-1

ACTION: DETERMINATION OF EXEMPT STATUS

APPROVAL DATE: November 23, 2021

REVIEW CATEGORY: Exemption category #2 [Tests, Surveys, Interviews]

Thank you for your submission of New Project materials for this project. The Moses H. Cone Health System IRB has determined this project is **EXEMPT FROM IRB REVIEW** according to federal regulations.

The following items are acknowledged in this submission:

- Application Form - Form-LR-01 (Limited Review CIRB)UpdateSignature5 (1).pdf (UPDATED: 11/18/2021)
- Data Collection - Research Data Security Plan Form FINAL.CEA-CAS.pdf (UPDATED: 10/5/2021)
- Letter - Cone Health Education Dept Confirmation 2021.docx (UPDATED: 09/17/2021)
- Letter - Organizational_Support_Letter_HV_PCU_(002).docx.pdf (UPDATED: 09/17/2021)
- Other - NRC Project Presentation-CEA-CAS.Finalpptx.pptx (UPDATED: 11/3/2021)
- Other - CEA-CAS HLC Course Content.ppt (UPDATED: 11/3/2021)
- Other - CEA-CAS Pre-Module Test.docx (UPDATED: 11/3/2021)
- Other - CEA-CAS Post-Module Test.docx (UPDATED: 11/3/2021)
- Other - Sheldon.Angela.ECU-IRB-QISelf-CertificationTool9-15-21.docx (UPDATED: 09/17/2021)
- Questionnaire/Survey - CEA-CAS Modified General Self-Efficacy Scale.docx (UPDATED: 11/3/2021)
- Questionnaire/Survey - CEA-CAS Demographic Data.docx (UPDATED: 11/3/2021)
- Training/Certification - Sheldon.Angela.CITICompletionReport.pdf (UPDATED: 09/17/2021)

We will retain a copy of this correspondence within our records.

If you have any questions, please contact Tia Ferguson at (336) 832-2582 or tia.ferguson@conehealth.com. Please include your project title and reference number in all correspondence with this committee.

Appendix C

Course Overview

<p align="center">OVERVIEW OF HEALTHSTREAM LEARNING CENTER (HLC) COURSE <i>Carotid Artery Endarterectomy (CEA) and Carotid Artery Stenting (CAS) Modules</i></p>		
<p align="center">Module 1 Carotid Vasculature Anatomy</p>	<p align="center">Module 2 CEA and CAS</p>	<p align="center">Module 3 Stroke</p>
<ul style="list-style-type: none"> • Carotid arteries • Role of atherosclerosis in carotid artery disease <ul style="list-style-type: none"> ○ Patient evaluation • Goal of carotid procedures 	<ul style="list-style-type: none"> • Purpose <ul style="list-style-type: none"> ○ CEA ○ CAS <ul style="list-style-type: none"> ▪ TCAR (Transcarotid Artery Revascularization) • Implications of neuro assessment post-procedure <ul style="list-style-type: none"> ○ NIHSS ○ mNIHSS <ul style="list-style-type: none"> ▪ FLEAS Acronym • Post-procedure nursing considerations <ul style="list-style-type: none"> ○ Vital signs ○ Neuro assessment <ul style="list-style-type: none"> ▪ Cranial nerves ○ Activity level ○ Diet ○ Intake and output ○ Incision care ○ Other ○ Medications • Post-procedure complications <ul style="list-style-type: none"> ○ Hematoma/respiratory distress ○ Cranial nerve injury ○ Perioperative stroke ○ Hyperfusion syndrome • Post-procedure patient education/discharge instructions <ul style="list-style-type: none"> ○ Signs & symptoms of stroke 	<ul style="list-style-type: none"> • Stroke <ul style="list-style-type: none"> ○ What is stroke ○ Statistics • Stroke prevention <ul style="list-style-type: none"> ○ Risk factors • Stroke warning signs <ul style="list-style-type: none"> ○ FAST

	<ul style="list-style-type: none">○ New or recurrent symptoms○ MD follow-up○ Activity	
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Appendix D

Modified General Self-Efficacy Survey

Modified Self-Efficacy Survey (*pre-HLC*)

Before beginning the module, please take a few minutes and complete the following survey to evaluate your perceived feelings **when caring for Carotid Endarterectomy and Carotid Stenting patients**. Please choose the response that best describes you.

1= Rarely True 2= Sometimes True 3= Frequently True 4= Consistently True

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way.

Schwarzer, R., & Jerusalem, M. (1995b). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). NFER-NELSON.

****Introductory statement (*post-HLC*)****

Please take a few minutes and complete the following survey to *reevaluate* your perceived feelings **when caring for Carotid Endarterectomy and Carotid Stenting patients**. Please choose the response that best describes you.

Appendix E

Demographic Data Questionnaire

Demographic Data

Age

- 20-29 years
- 30-39 years
- 40-49 years
- 50-59 years
- 60-69 years
- 70-79 years

Nursing Years Licensed as a RN

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- 31+ years

Nursing Years Worked as a RN on HV PCU

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26-30 years
- 31+ years

Highest Nursing Degree Obtained

- Diploma
- Associates Degree in Nursing
- Bachelor of Science in Nursing
- Master of Science in Nursing
- Doctorate Degree in Nursing

Nursing Certification

- Cardiac Vascular Nursing Certification
- Progressive Care Nursing Certification
- Other

Appendix F

Pre- and Post Knowledge-Based Test

Pre/Post-Module Evaluation

Carotid Artery Endarterectomy (CEA) and Carotid Artery Stenting (CAS):

Pre-Test includes the first 20 questions

Post-Test includes 23 questions (3 additional questions to evaluate the HLC)

Please choose the best answer:

1. Most of the blood flow to the brain is supplied by the _____?
 - a. Vertebral arteries
 - b. Carotid arteries
 - c. Collateral arteries
 - d. Basilar artery

2. What two vessels does the common carotid artery split into?
 - a. The internal and external carotid artery
 - b. The superior thyroid artery and the ascending pharyngeal artery
 - c. The internal common and external common carotid artery
 - d. The internal and external jugular artery

3. 60% of all extracranial carotid lesions are caused by atherosclerosis. Atherosclerosis can effectively be prevented with lifestyle modifications and control of cardiovascular risk factors.
 - a. True
 - b. False

4. The primary goal for treatment of carotid atherosclerosis is which of the following?
 - a. Correct peripheral artery disease
 - b. Prevent an ischemic stroke
 - c. Prevent a hemorrhagic stroke
 - d. Treat chronic hypertension

5. A cardiac rehab nurse is teaching a carotid endarterectomy (CEA) and carotid stenting (CAS) class at the local Senior Resources Center. One of the most important class objectives is to ensure participants understand that 911 should be called immediately for which of the following:
 - a. Sudden slurred speech and arm weakness
 - b. Mild swelling in the lower extremities

- c. Chronic numbness and tingling in the fingers
 - d. Heart rate increases to 138 bpm when exercising
6. Mr. Dawson is a 72-year-old African American man with a history of hypertension and smoking who has recently experienced a TIA and is scheduled for a CEA in 2 weeks. In discussing the upcoming surgery with Mr. Dawson, which explanation would you use to describe carotid endarterectomy?
- a. A carotid endarterectomy reroutes blood flow through cerebral tissue
 - b. A carotid endarterectomy shoots pulses of water through the artery to widen the blood vessel.
 - c. A carotid endarterectomy removes atherosclerotic plaque from the carotid arteries.
 - d. A carotid endarterectomy uses a stent to enlarge the diameter of the carotid artery
7. What would be the MOST important assessment finding to notify the provider about post-carotid procedure?
- a. A. Slight oozing at incision/groin site
 - b. B. Complaints of hunger
 - c. C. Hypo/hypertension
 - d. D. Pain at incision/groin site
8. All CEA and CAS procedures completed at Cone Health are performed by vascular surgeons.
- a. True
 - b. False
9. You are precepting a newly hired heart and vascular PCU RN who asks if post-carotid procedural monitoring is the same regardless which physician service performs the procedure. Your answer would be the following:
- a. Yes, post-carotid procedural monitoring is the same per the post-carotid procedural order set
 - b. No, vascular, radiology, and cardiology each have their own post-carotid procedural order set which specifies monitoring criteria
10. The nurse is caring for a patient with a history of TIAs and moderate carotid stenosis who has undergone a CEA. Which of the following postoperative findings would cause the nurse the most concern:
- a. Mild neck edema
 - b. Difficulty swallowing
 - c. SBP 160

- d. Neck pain 5/10 (0 to 10 pain scale)
11. Mr. Dawson has returned from PACU post-CEA. What are the MOST important complications of CEA the nurse should monitor for?
- Cranial nerve injury, Stroke, and Temp >101 F
 - Cranial nerve injury, Stroke, Hyper/Hypotension, and Respiratory Distress
 - Cranial nerve injury, Stroke, and bleeding from groin incision site
12. A nurse on the heart and vascular PCU is providing care for a patient scheduled for carotid endarterectomy. The patient asks the nurse how carotid endarterectomy will help blood supply to the brain. What is the best response by the nurse?
- "The physician will remove the clot in your carotid artery either manually or by suctioning."
 - "The physician will insert a balloon into your carotid artery to make it wider and place a stent."
 - "The physician will establish a bypass around the plaque buildup in your carotid artery."
 - "The physician will remove plaque from your carotid artery, and this will improve perfusion to the brain."
13. When teaching about Clopidogrel (Plavix) the nurse will teach which of the following to the patient who has cerebral atherosclerosis:
- To monitor and record their blood pressure
 - Plavix will dissolve clots in the cerebral arteries
 - Plavix will reduce cerebral artery plaque formation
 - To call the health care provider if stools are bloody or tarry
14. Both an antiplatelet and statin medication should be included in the discharge medication list for all post-Carotid Procedure patients (unless different instructions are identified by the provider).
- True
 - False
15. The neurologic functions that are affected by a stroke are primarily related to:
- The amount of tissue area involved
 - The rapidity of onset of symptoms
 - The brain area perfused by the affected artery
 - The presence or absence of collateral circulation
16. CAS is being considered as the treatment for a patient who has had several TIAs. The nurse explains the following to the patient about this procedure:
- CAS involves a surgical procedure to remove an atherosclerotic plaque in the carotid artery to prevent an impending stroke

- b. CAS is used to open a stenosis in the carotid artery with a balloon and stent to restore cerebral circulation
 - c. CAS is used to open a stenosis in the basilar artery with a balloon and stent to restore cerebral circulation
 - d. CAS involves intracranial surgery to join a superficial extracranial artery to an intracranial artery
17. A patient experiencing TIAs is scheduled for a Transcarotid Artery Revascularization (TCAR). The nurse explains this procedure uses a device to:
- a. Prevent a stroke by removing atherosclerotic plaques blocking cerebral blood flow
 - b. Reduce the brain damage that occurs during a stroke in evolution
 - c. Decrease cerebral edema
 - d. Direct blood flow away from the brain and into a leg vein (reverse flow)
18. Mrs. Wilson is returning from PACU post-TCAR. The nurse is aware it is important to monitor for *(please choice the best answer)*:
- a. Stroke, cranial nerve injury, and neck incision site care
 - b. Stroke, cranial nerve injury, and groin and neck incision site care
 - c. Stroke, cranial nerve injury, and groin incision site care
 - d. Stroke, cranial nerve injury, and temp >100.5 F
19. The nurse is preparing to assess a patient's cognitive function. What should the nurse include in this assessment?
- a. Ability to smell items under the nose while eyes are closed
 - b. Orientation to time, place, and person, and ability to recall recent and past events
 - c. Ability to walk with a smooth, steady gait
 - d. Level of consciousness
20. The post-carotid procedure nurse flow sheet includes a carotid specific cranial nerve assessment. An appropriate assessment of these specific cranial nerves would include:
- a. Asking the patient to close both eyes, frown, and raise their eyebrows to assess the Facial nerve (Cranial Nerve VII)
 - b. Asking the patient to open their mouth and say "Ah" and protrude the tongue to assess the Glossopharyngeal/Vagus/Hypoglossal nerves (Cranial Nerves IX, X, XII)
 - c. Asking the patient to close their eyes and identify the light touch from a cotton ball to assess the Trigeminal nerve (Cranial Nerve V)
 - d. Asking the patient to detect a whispered voice while occluding one ear at a time to assess the Vestibulocochlear nerve (Cranial Nerve VIII)

The following three questions will assist in evaluating the HLC.

21. The CEA/CAS HLC course increased my knowledge about carotid procedures (i.e., interventions, nursing considerations, patient care, patient education).
- Strongly Agree
 - Somewhat Agree
 - Disagree
 - Strongly Disagree
22. Content included in the HLC was appropriate for the CEA/CAS patient population and applicable to nursing care provided for these patients.
- Strongly Agree
 - Somewhat Agree
 - Disagree
 - Strongly Disagree
23. Please identify your MOST preferred learning style (the way in which you learn best):
- Visual (charts, diagrams, graphs)
 - Auditory (listening to information that is presented)
 - Read/Write (written information)
 - Kinesthetic (Hands-on)

Appendix G

HCAHPS Survey Questions

3. During the hospital stay, how often did nurses explain things in a way you could understand?
 - a. Never
 - b. Sometimes
 - c. Usually
 - d. Always
21. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.
 - a. Strongly disagree
 - b. Disagree
 - c. Agree
 - d. Strongly agree
22. When I left the hospital, I clearly understood the purpose for taking each of my medications.
 - a. Strongly disagree
 - b. Disagree
 - c. Agree
 - d. Strongly agree
 - e. I was not given any medication when I left the hospital

Centers for Medicare & Medicaid Services. (2021). *HCAHPS survey*.

https://www.hcahpsonline.org/globalassets/hcahps/survey-instruments/mail/effective-december-1-2021-and-forward-discharges/2021_survey-instruments_english_mail_updateda.pdf

Appendix H**Participant Tracking Report**

PROJECT IMPLEMENTATION	# HVPCU RNS THAT HAVE NOT INITIATED THE HLC	# HVPCU RNS THAT HAVE PARTIALLY COMPLETED THE HLC	# HVPCU RNS THAT HAVE COMPLETED THE HLC
WEEK 1			
WEEK 2			
WEEK 3			
WEEK 4			
WEEK 5			
WEEK 6			

Appendix I

Patient Survey Data Collection Tool

The purpose of this survey is to evaluate nurse communication with patients who were admitted for a carotid procedure. Participation in the survey is voluntary and patients are not required to provide any responses

Date: _____

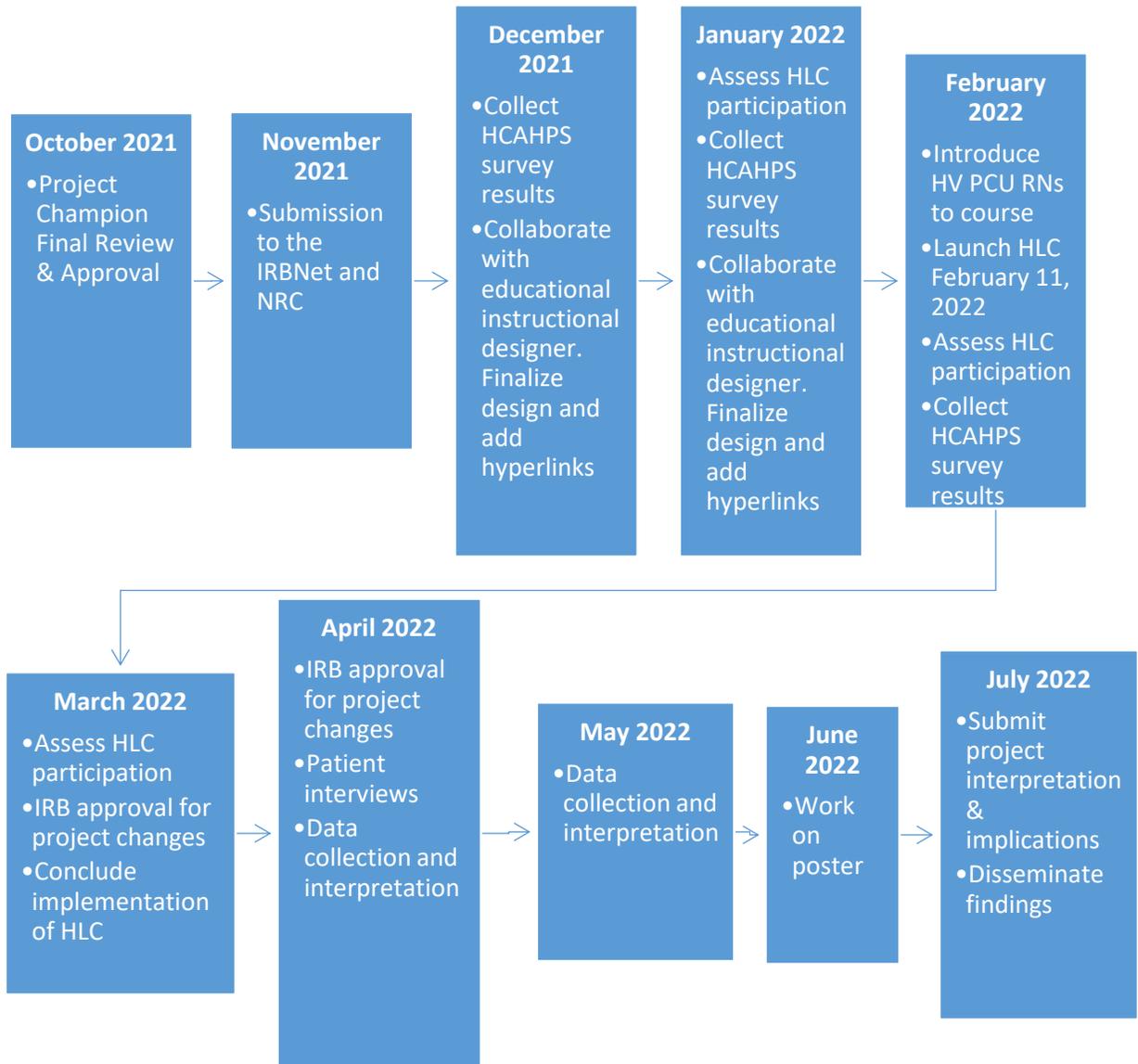
Surgery/Procedure:

CEA CAS TCAR

1. When nurses on this unit explained things related to your procedure or surgery, how often were their explanations clear to you?
2. Based on the information and education the nurses have discussed with you, how certain do you feel you are prepared to take care of your health after leaving the hospital?
3. How certain do you feel you understand the reason why the doctor prescribed the medications you will need to take after leaving the hospital?

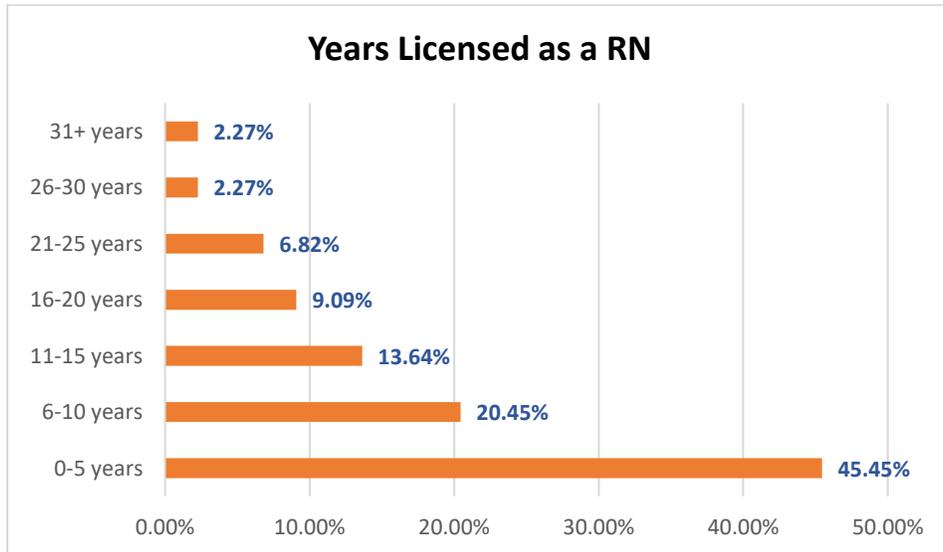
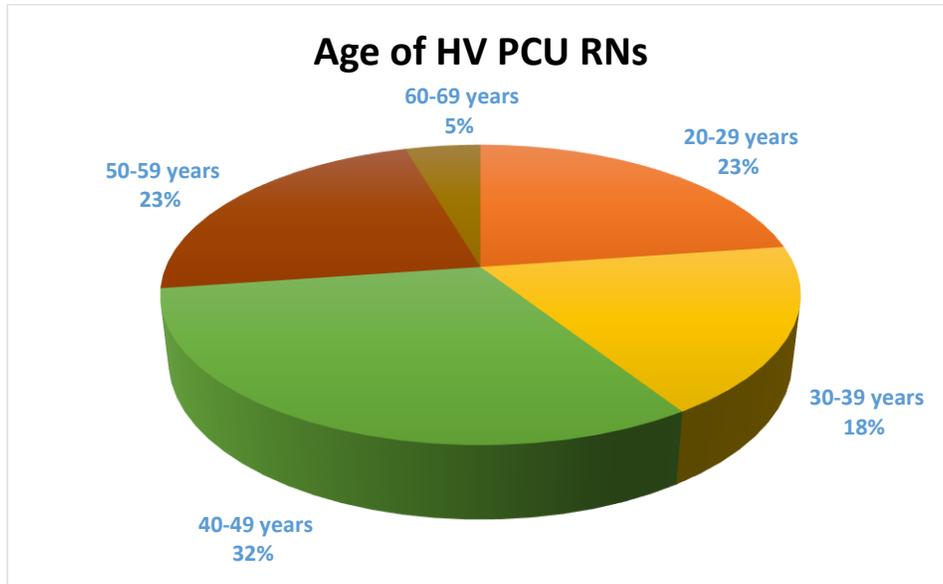
Appendix J

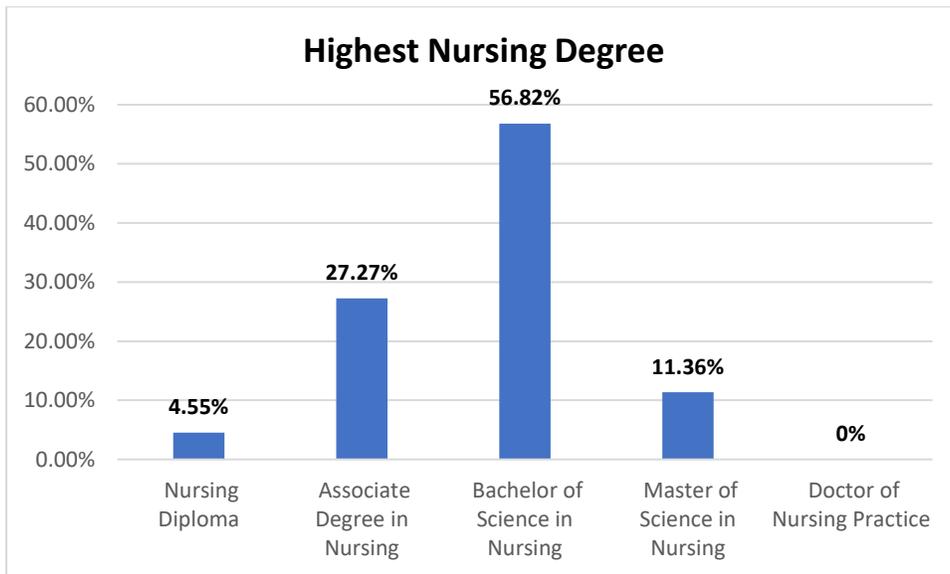
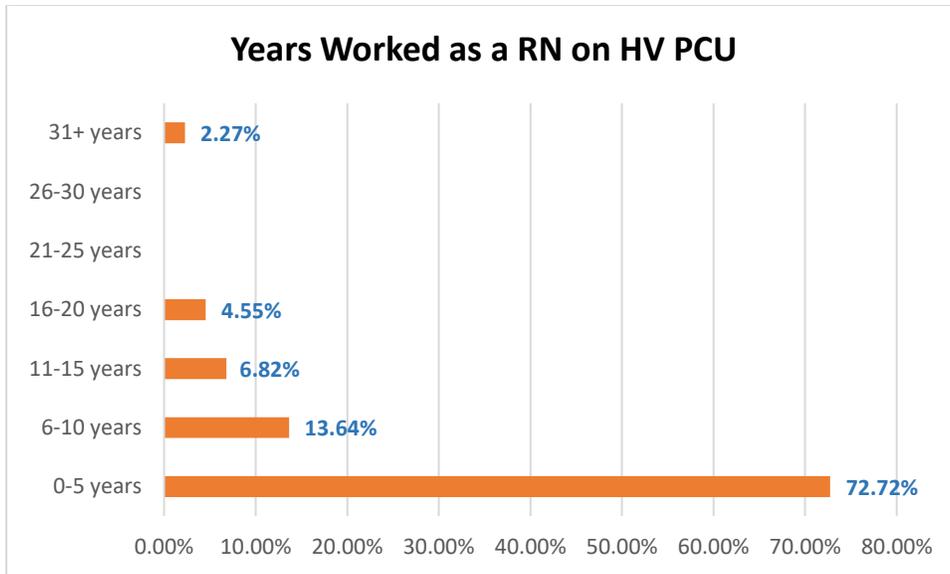
Project Timeline

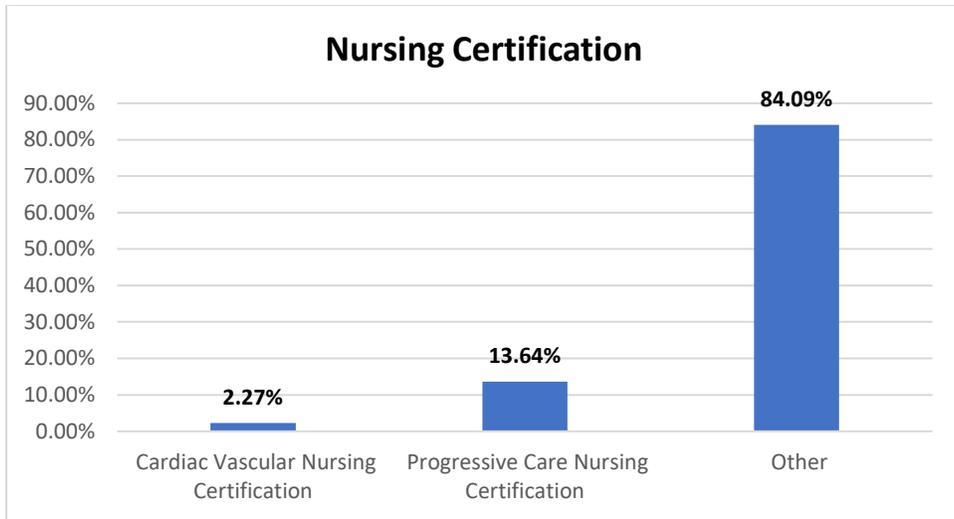


Appendix K

Demographic Characteristics

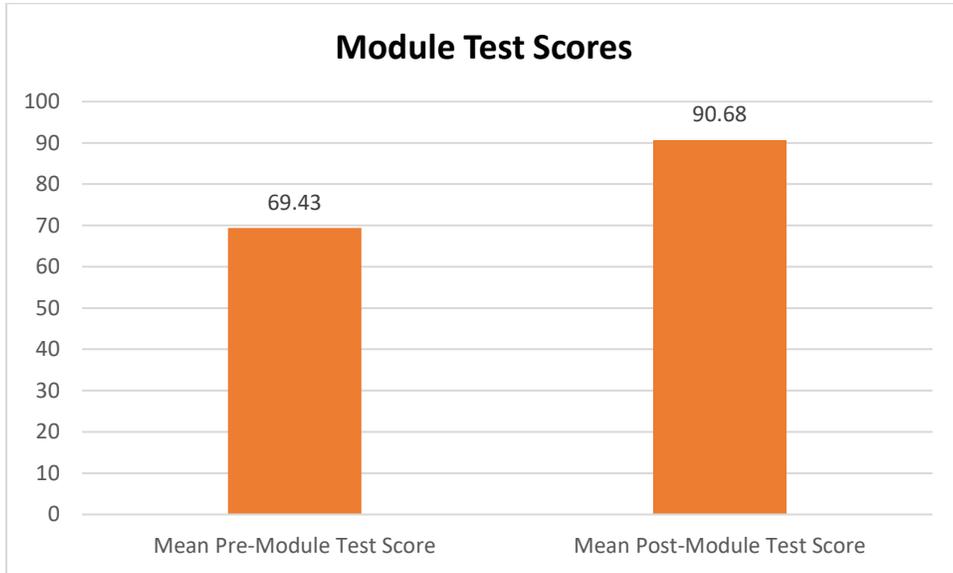






Appendix L

Pre- and Post-Module Test Scores



Appendix M

Pre- and Post-Modified General Self-Efficacy Survey Results

<i>Survey Question</i>	1. I can always manage to solve difficult problems if I try hard enough		2. If someone opposes me, I can find the means and ways to get what I want.		3. It is easy for me to stick to my aims and accomplish my goals.		4. I am confident that I could deal efficiently with unexpected events		5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
<i>Pre and Post Self Efficacy Survey Option</i>										
Rarely True	0.00%	0.00%	2.27%	4.55%	0.00%	0.00%	2.27%	0.00%	0.00%	0.00%
Sometimes True	15.91%	13.6%	50.00%	29.6%	13.64%	4.55%	6.82%	4.55%	9.10%	11.36%
Frequently True	56.82%	61.3%	40.91%	56.8%	65.91%	72.73%	75.00%	68.18%	70.45%	61.36%
Consistently True	27.27%	25.0%	6.82%	9.10%	20.45%	22.73%	15.91%	27.27%	20.45%	27.27%

<i>Survey Question</i>	6. I can solve most problems if I invest the necessary effort		7. I can remain calm when facing difficulties because I can rely on my coping abilities		8. When I am confronted with a problem, I can usually find several solutions.		9. If I am in trouble, I can usually think of a solution.		10. I can usually handle whatever comes my way.	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
<i>Pre and Post Self Efficacy Survey Option</i>										
Rarely True	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sometimes True	6.82%	2.27%	6.52%	4.26%	15.9%	11.36%	6.82%	6.52%	13.6%	4.55%

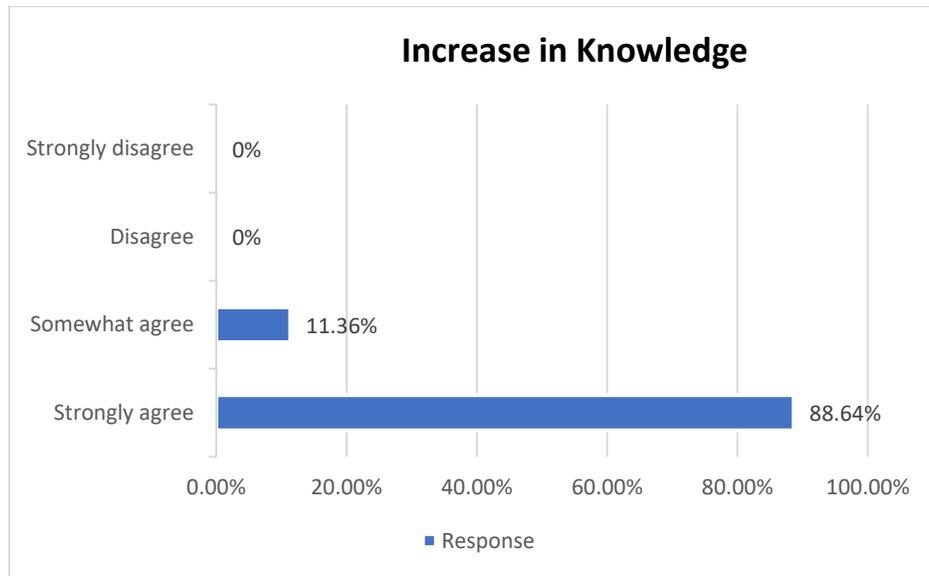
Frequently True	70.45%	65.91%	63.0%	59.57%	65.9%	63.04%	77.3%	59.09%	61.4%	68.18%
Consistently True	22.73%	31.82%	30.4%	36.17%	18.2%	25.00%	15.9%	34.09%	25.0%	27.27%

Note. n=44 survey responses

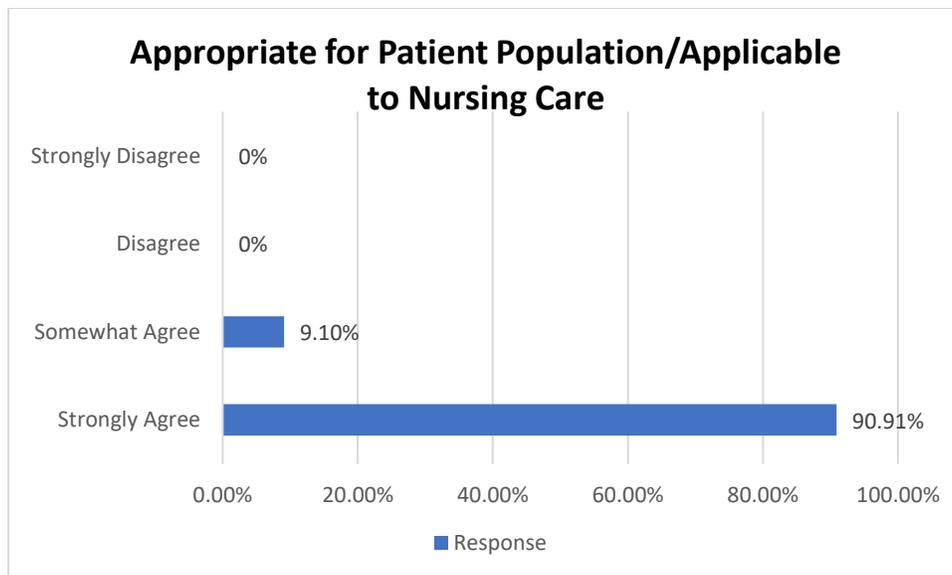
Schwarzer, R., & Jerusalem, M. (1995b). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). NFER-NELSON.

Appendix N

HLC Course Evaluation



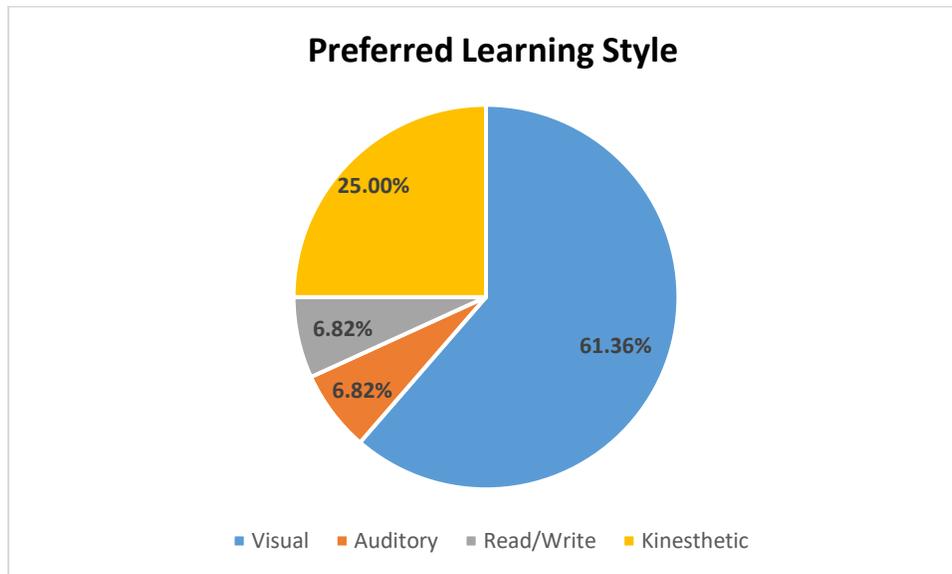
Note. Question on survey- The CEA/CAS course increased my knowledge about carotid procedures (i.e. intervention, nursing considerations, patient care, patient education).



Note. Question on survey- Content included in the HLC was appropriate for the CEA/CAS patient population and applicable to nursing care provided for these patients.

Appendix O

HV PCU Nurses Preferred Learning Style



Note. Question on survey- Please identify your MOST preferred learning style (the way in which you learn best).

Appendix P

HCAHPS Survey Results 2021

HV PCU HCAHPS Survey Results Fiscal Year 2021		
Question in Survey	Result/Percentile	Sample Size
3. During this hospital stay, how often did nurses explain things in a way you could understand?	75.86	29
21. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.	62.07	29
22. When I left the hospital, I clearly understood the purpose for taking each of my medications.	76.00	25

Appendix Q

CEA/CAS Post Procedure Patient Interviews

Patient Interview Questions and Responses	
Question	Theme
When nurses on this unit explained things related to your procedure or surgery, how often were their explanations clear to you?	<ul style="list-style-type: none"> • Most of the time • The nurses were excellent • I think so • No
Based on the information and education the nurses have discussed with you, how certain do you feel you are prepared to take care of your health after leaving the hospital?	<ul style="list-style-type: none"> • I will be • Sort of, I have family to help me • Yes, I feel prepared • I think so
How certain do you feel you understand the reason why the doctor prescribed the medications you will need to take after leaving the hospital?	<ul style="list-style-type: none"> • Good • Not really, but family will help • Fairly certain • I may need more explanation • The nurse explained things really well

Note. n=10

Appendix R**Project Budget**

Item	Quantity/Time	Cost	Total
Printing Paper for HLC Flyer	6 sheets	\$2.96	\$17.76
Printing Paper for Patient Interviews	10 sheets	\$0.32	\$3.20
Development of the HLC and evaluation activities	55.50 hours	\$28.80/hour	\$1,598.40
RN (full-time) completion of course	43 RNs/1 hour	\$28.80/hour	\$1,238.40
RN (part-time) completion of course	1 RN/1 hour	\$28.80/hour	\$28.80
Total			\$2,886.56

Appendix S

Doctor of Nursing Practice Essentials

	Description	Demonstration of Knowledge
Essential I <i>Scientific Underpinning for Practice</i>	<p>Competency – Analyzes and uses information to develop practice</p> <p>Competency -Integrates knowledge from humanities and science into context of nursing</p> <p>Competency -Translates research to improve practice</p> <p>Competency -Integrates research, theory, and practice to develop new approaches toward improved practice and outcomes</p>	<ul style="list-style-type: none"> • Literature review • Completed CITI refresher course • Development of computer-based learning (CBL) course • Analysis of DNP project data to evaluate changes in nurse self-efficacy and nurse communication
Essential II <i>Organizational & Systems Leadership for Quality Improvement & Systems Thinking</i>	<p>Competency –Develops and evaluates practice based on science and integrates policy and humanities</p> <p>Competency –Assumes and ensures accountability for quality care and patient safety</p> <p>Competency -Demonstrates critical and reflective thinking</p> <p>Competency -Advocates for improved quality, access, and cost of health care; monitors costs and budgets</p> <p>Competency -Develops and implements innovations incorporating principles of change</p> <p>Competency - Effectively communicates practice knowledge in writing and orally to improve quality</p> <p>Competency - Develops and evaluates strategies to manage ethical dilemmas in patient care and within health care delivery systems</p>	<ul style="list-style-type: none"> • Applied evidence-based practice and literature to develop CEA/CAS educational modules • Incorporated project site policy in educational activities • Writing of DNP paper to discuss development, implementation, and evaluation of project • Meetings with project stakeholders
Essential III <i>Clinical Scholarship & Analytical Methods for Evidence-Based Practice</i>	<p>Competency - Critically analyzes literature to determine best practices</p> <p>Competency - Implements evaluation processes to measure process and patient outcomes</p> <p>Competency - Designs and implements quality improvement strategies to promote safety, efficiency, and equitable quality care for patients</p> <p>Competency - Applies knowledge to develop practice guidelines</p> <p>Competency - Uses informatics to identify, analyze, and predict best practice and patient outcomes</p> <p>Competency - Collaborate in research and disseminate findings</p>	<ul style="list-style-type: none"> • Literature review • Developed and implemented CBL course for orientation pathway • Developed pre and post CEA/CAS test • CBL provided one CNE and one stroke hour • Utilized PDSA model • Used Modified General Self-Efficacy tool to measure outcomes

<p>Essential IV Information Systems – Technology & Patient Care Technology for the Improvement & Transformation of Health Care</p>	<p>Competency - Design/select and utilize software to analyze practice and consumer information systems that can improve the delivery & quality of care Competency - Analyze and operationalize patient care technologies Competency - Evaluate technology regarding ethics, efficiency, and accuracy Competency - Evaluates systems of care using health information technologies</p>	<ul style="list-style-type: none"> • Developed course in PowerPoint • Launched course in project site's web-based management system • Tracked and documented course completion weekly • CPT codes used to identify pre-project HCAHPS data • Patient interviews provided post-module outcomes • Project data entered in Excel for evaluation
	Description	Demonstration of Knowledge
<p>Essential V Health Care Policy of Advocacy in Health Care</p>	<p>Competency- Analyzes health policy from the perspective of patients, nursing and other stakeholders Competency – Provides leadership in developing and implementing health policy Competency –Influences policymakers, formally and informally, in local and global settings Competency – Educates stakeholders regarding policy Competency – Advocates for nursing within the policy arena Competency- Participates in policy agendas that assist with finance, regulation and health care delivery Competency – Advocates for equitable and ethical health care</p>	<ul style="list-style-type: none"> • Meetings with project stakeholders • Developed and posted a flyer to inform stakeholders of learning activity • Email provided to stakeholders
<p>Essential VI Interprofessional Collaboration for Improving Patient & Population Health Outcomes</p>	<p>Competency- Uses effective collaboration and communication to develop and implement practice, policy, standards of care, and scholarship Competency – Provide leadership to interprofessional care teams Competency – Consult intraprofessionally and interprofessionally to develop systems of care in complex settings</p>	<ul style="list-style-type: none"> • Collaborated with project champion and unit's RN IV to develop course content • Collaborated with instructional designer • Collaborated with Patient Experience team to develop post-procedure patient interview process • Collaborated with Learning Management System Administrator to establish automated data reports • Collaborated with vascular clinic manger to identify weekly CEA/CAS schedule

		<ul style="list-style-type: none"> • Collaborated with Nursing Professional Development Specialist to obtain approval for continuing nursing education (CNE) contact hour • Met Nursing Research Council project requirements • Frequent and consistent communication with faculty advisor and project site
Essential VII <i>Clinical Prevention & Population Health for Improving the Nation's Health</i>	<p>Competency- Integrates epidemiology, biostatistics, and data to facilitate individual and population health care delivery</p> <p>Competency – Synthesizes information & cultural competency to develop & use health promotion/disease prevention strategies to address gaps in care</p> <p>Competency – Evaluates and implements change strategies of models of health care delivery to improve quality and address diversity</p>	<ul style="list-style-type: none"> • Included stroke awareness in CBL • Referenced project specific Healthy People 2020, 2030 objectives • Identified CEA/CAS patient education considerations
Essential VIII <i>Advanced Nursing Practice</i>	<p>Competency- Melds diversity & cultural sensitivity to conduct systematic assessment of health parameters in varied settings</p> <p>Competency – Design, implement & evaluate nursing interventions to promote quality</p> <p>Competency – Develop & maintain patient relationships</p> <p>Competency – Demonstrate advanced clinical judgment and systematic thoughts to improve patient outcomes</p> <p>Competency – Mentor and support fellow nurses</p> <p>Competency- Provide support for individuals and systems experiencing change and transitions</p> <p>Competency – Use systems analysis to evaluate practice efficiency, care delivery, fiscal responsibility, ethical responsibility, and quality outcomes measures</p>	<ul style="list-style-type: none"> • Completed CITI refresher course • Completed project IRB approval process • Peer reviews for DNP project paper and poster • Provided recommendations for future interventions and research • Applied current research and best evidence-based practice to improve patient outcomes • Developed and led strategic plan to decrease nurses' gap in knowledge • Resource utilization contributed to project outcomes