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Implementation of a Staff Education Project for a Robotics Education Program in the Operating Room

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Proposal Submitted in Partial Fulfillment

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Abstract

Nurses who provide care in robotic surgery must have sufficient special training in the operation of the da Vinci robot to perform their roles with knowledge and confidence that can yield optimal patient outcomes. The local nursing practice problem in the project facility, and the focus of this doctoral project, was the lack of an evidenced-based robotics education program for registered nurses who participate in robotic surgery. The gap in practice was nurses' lack of knowledge, which interfered with the care provided to the robotic surgical population. The purpose of this project was to develop a staff robotics education program in order to answer the question if the implementation of an evidence-based robotics education program would improve nurses' knowledge in the practice of robotic surgery. The education program was developed using Knowles adult learning theory and information obtained from a comprehensive literature search. A planning team, consisting of local clinicians with expertise in robotic surgery, provided feedback and assisted with the development of the education program and accompanying competency checklist. Ten nurses received the education, and 90-100% of the nurses reported increased knowledge and confidence regarding practice in the specialty of robotic surgery following the education. Leadership at the project site have decided to require surgical nurses receive the robotic education upon their employment and annually thereafter. The social change resulting from the use of this evidence-based robotics education program could include increased nursing performance and therefore, decreased complications for patients undergoing robotic surgery.

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Dedication

I would like to dedicate this project to my wonderful husband, Jason, and my four amazing daughters, Taylor, Kayla, Hailey, and Megan, without whose love, support, and patience, I could never have achieved all that I have. I love you all!

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I would like to thank my committee members, who have been so generous with their time and expertise. A special thanks to Dr. Cassandra Taylor, my committee chair for all her countless hours of reading, editing, and encouragement throughout the entire process. Thank you to Dr. Jerald Wishner, for all your support and guidance over the years. I am in awe of your ongoing passion and expertise in robotic surgery. I would also like to thank Lois DeMaio, you have no idea how you helped me over the years, you had given me the drive and are the reason I have accomplished so much in my career. I am forever grateful to you!

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Section 1: Nature of the Project

Introduction

Robotic surgery remains on an exponential rise in all surgical fields, thereby, placing increased demands on the perioperative nursing team. The robotic surgical nurses must be proficient in operating and troubleshooting all robotic equipment. The operating room (OR) in a 240-bed community hospital in the northeastern part of the United States, the target facility for this study, did not have an evidence-based robotics education program for registered nurses (RNs) who participate in robotic surgery. The call for evidence-based quality improvement and healthcare transformation underscores the need for redesigning care that is effective, safe, and efficient (Stevens, 2013).

The robotic nurse must demonstrate a high level of professional knowledge and be an expert in robotic technology and dealing with robotic malfunctions (Abdel Raheem, Song, Chang, Choi, & Rha, 2017). The lack of an evidence-based robotics education program had led to the OR robotic nurses calling the bio-med engineer to troubleshoot robotic equipment on a frequent basis. This had led to feelings of frustration, anxiety, and negativity related to the robotics program. Nurses had stated that they “feel scared to go in there,” which had limited staff who worked in robotics.

Well-trained staff members are as important as the equipment and instruments needed when starting a robotics surgery program (Winthrop, Vane, & Merritt, 2003). Well-structured training programs should be offered to the robotic nurse to be well prepared, feel confident, and maintain high quality of care (Abdel Raheem, et al., 2017).

This robotics education program could have a social impact on society as this program could increase the nursing staff's knowledge, improve their performance, and thus benefit their patients by reducing complications associated with robotic surgery.

Problem Statement

The local nursing practice problem in this facility and the focus of this doctoral project was the lack of an evidence-based robotics education program for RNs who participate in robotic surgery. As evidenced by a mock site inspection for an accreditation of a center of excellence in robotic surgery, the operating room nurses were unable to answer questions effectively about the robotic set-up process, emergency safety features, and positioning of the intraoperative patient in robotic surgery. Nurses on the perioperative robotics team must have sufficient special training to perform their extended roles with confidence and provide optimal patient outcomes (Kang, De Gagne, & Kang, 2017).

Purpose

The purpose of this project was to develop a staff robotics education program to improve nursing perceptions related to their knowledge in the practice of robotic surgery. The gap in practice was robotic nurses' lack of knowledge. This lack of knowledge interfered with the care provided to the robotic surgical population. The gap in practice was addressed through implementation of an evidence-based robotics staff education program in the operating room of a 240-bed community hospital. In this facility, a newly appointed robotics associate director assisted the robotic nurses in the operating room with this evidence-based education. A biomedical engineer handled all the technical issues in the operating room.

However, the OR robotic nurses did not have a staff robotics education program in place and needed to call the biomedical engineer for technical questions frequently. Because of this frequent calling, the robotic nurses did not learn how to troubleshoot the robot themselves. The bio-medical engineer was called so frequently that the robotic surgeons always relied on him to be available, and only wanted *him* to troubleshoot the robot. This created animosity among the nurses because the nurses lacked this technical robotics education.

The lack of a robotics education program had led to very few nurses that would/could have worked in the robotics service. The lack of knowledge had created a feeling of powerlessness. The feeling of powerlessness created job dissatisfaction, stress, and burnout that had led to ineffective nursing which compromises patient safety and the nurse's role as patient advocate (Dempsey & Reilly, 2016). This issue also placed the biomedical engineer in difficult situations as patient care was not in his scope of practice. The problem question was: Will the implementation of an evidence-based robotics education program improve nurses' knowledge in the practice of robotic surgery? The participants were asked to complete a hospital-validated evaluation tool (Appendix A) at the end of the robotics education class.

Nature of the Doctoral Project

The nature of this staff education project was to develop and implement an evidence-based robotics education program. This project was developed with the input from a team of expert stakeholders including the physician robotics director, the robotics program associate director, the surgical services director, the OR manager, the OR nursing educator, the robotic nurse service manager, and the representative from Intuitive Surgical. Before implementation, the educational program was reviewed by the robotics committee for final approval.

First, a literature search was conducted on improving robotics education, the importance of nursing competencies to improve outcomes, proper positioning in surgery, and improvement of self-efficacy of the OR nurses. Then, an initial draft of the robotics education program and plan for implementation were presented to the team of expert stakeholders for their feedback and support. The team's feedback was incorporated into the program. After gaining approval from the robotics committee, a date was set for the robotics staff education classes to be implemented. This robotics education program was then implemented by the DNP student to the 10 robotic nurses in the OR of this 240-bed community hospital. The evaluation of the robotics educational program was supported by a hospital-validated evaluation tool (Appendix A).

An evidence-based robotics education program would provide the OR robotic nurses with the specialized robotics knowledge that is required to guide their interventions and improve their knowledge in the practice of robotic surgery. The gap in practice was a lack of knowledge of the robotic nurses. Evidence suggested that a robotics education program would lead to increased quality of patient care (Kang, De Gagne, and Kang, 2016).

The evidence-based robotics staff education program took place in the robotics OR utilizing the da Vinci Xi robot. There was full support from both nursing and medical departments. The physician director of robotics and chief of urology supported this staff education program for the robotics center at this facility. The chief of colorectal surgery, who specialized in colorectal and general robotic surgery, was in full support of this robotics educational program.

Significance

Robotics staff education is the foundation of a successful robotics program. The American Nurses Association (ANA) states that competence is the responsibility of the profession, the individual nurses, the professional organizations, credentialing and certification entities, regulatory agencies, employers, and other key stakeholders (Strong, 2016). Many stakeholders were affected by the introduction of an evidence-based robotics education program in the OR. Stakeholders involved in the process are more likely to actively use and disseminate the information that they helped produce (AHRQ, 2018).

Hospital administration consists of stakeholders who support better decisions made through education at an institutional level to improve health outcomes. The providers and nurses are stakeholders who support the evidence required for guidelines or practice pathways that would improve the quality of care of the robotic patient population. Intuitive Surgical has an interest as a stakeholder that manufactures and provides this robotic technology. Patients and caregivers are stakeholders who have the greatest importance as they want the best possible outcomes.

By improving the knowledge of the robotic nurses, this educational program may have a social impact by reducing complications associated with robotic surgery and may provide cost savings in post-operative care and length of stay.

Summary

The OR in a 240-bed community hospital in the northeastern part of the United States did not used an evidence-based robotics staff education program where specialized robotics knowledge is required. The gap in practice was a lack of knowledge of the robotic nurses. Evidence suggested that an evidence-based robotics education program could improve the robotic nurses' knowledge in the practice of robotic surgery. After the development of the robotics education program and achieving approval through the robotics committee, the robotics staff education program was implemented in the operating room by the DNP student. As evidenced by the system evaluation tool, the robotics education program was evaluated to demonstrate improvement in nurses' knowledge in the practice of robotic surgery (Appendix A).

Section 2: Background and Context

Introduction

The purpose of this project was to develop a staff education program to improve nursing knowledge in the practice of robotic surgery. As robotic technology advances, the robotic nurse must keep up with their knowledge and expertise in robotic surgery. The robotic nurse must be as proficient as the robotic surgeon providing the surgery (Connor, 2001). Proficiency is required, not only in patient care, but also in the understanding, operating, and troubleshooting of video systems, computers, and cutting-edge medical devices, enabling staff members to deliver excellent patient care with a high degree of confidence in themselves and the robotics technology (Connor, 2001). This proficiency in the robotic nurses helps to create a less stressful environment that benefits nursing practice and robotic patient outcomes.

The problem in this facility was the lack of an evidence-based robotics education program for RNs who participate in robotic surgery. The gap in practice was the robotic nurses' lack of knowledge which interferes with the care provided to the robotic surgical population. The problem question was as follows: Will the implementation of an evidence-based robotics education program improve nurses' knowledge in the practice of robotic surgery?

Concepts, Models, and Theories

Adults are independent and self-directed, therefore, they need to know why they should learn and learn best when the value of the topic is immediately apparent. An American educator, Malcolm Shepherd Knowles (1913 – 1997) was known for the term andragogy as synonymous with adult education. According to Knowles, andragogy is the art and science of adult learning (Kearsley, 2010).

The Knowles adult learning theory was used because it works best when instruction is task-oriented and problem solving is emphasized. According to Knowles (1980), andragogy makes five assumptions about the characteristics of adult learners: (a) Self-concept: Adults need to know why they need to learn something, (2) Adult learner experience: Adults need to learn experientially, (c) Readiness to learn: Adults approach learning as problem-solving, (d) Orientation to learning: Adults learn best when the topic is of immediate value, and (e) Motivation to learn: Adults are self-motivated. The following discussion describes the five assumptions and the four principles of the theory and how they relate to the robotics education project.

Assumption 1: Self-Concept

Since adults are more independent than children, creating a learning experience that offers minimum instruction and maximum autonomy worked best when creating a robotics education program. Since adults are able to self-direct, this educational program had given the adult learner the tools for guidance so they could learn on their own terms with minimal instruction.

Mature adults feel responsible for, and in control of, their own decisions and, indeed, their own lives, thus, the shift from dependence on others to self-direction and self-reliance (Misch, 2002). This robotics education provided nurses with ample resources while leaving them relatively autonomous to learn and incorporate the information they needed.

Assumption 2: Adult Learner Experience

An adult has experience and memory to draw upon during the learning process. As a person matures, their readiness to learn becomes increased as their life experience and knowledge base grows. In relation to robotics education, the robotics team is diverse. Having a strong knowledge base of the adult learner and their actual experience level is an important consideration when designing an education program. Each robotic nurse has a different background, skill set, and experience, which was considered when designing this robotics education program. The nurses were surveyed beforehand to assess their robotics education level and determine any technical knowledge limitations.

Assumption 3: Readiness to Learn

Adults become ready to learn the things they need to know and be able to do in order to cope effectively with their real-life situations. In relation to the adults' social and professional development, they are more willing to learn task-specific material. The timing and learning experiences coincide with their developmental tasks and social roles. Adults have a sense of being responsible for their own decisions, therefore, they develop a deep psychological need to be seen by others and treated as being capable of self-direction (Knowles, Holton, and Swanson, 1998).

As the developmental needs evolve, that itself produces 'a readiness to learn" which at its peak presents a "teachable moment" (Knowles, 1980). This teachable moment is what this robotics education program is reaching for. Creating a robotics education program that is relevant to the nurses' social and professional development will enhance their desire to participate. This robotics education program had helped the robotic nurses see a social benefit to the learning. They became more engaged and had gained a sense of responsibility which provided them with the confidence they needed.

Assumption 4: Orientation to Learning

Assumption four emphasizes the immediate need for knowledge that the adult has. The robotics education program will provide the nurses with a more problem-focused learning related to applications that the robotic team regularly encounters. The nurses understood why they needed to acquire this education and how it applied to their program. Ensuring the robotic nurses were clear on the education had guaranteed their buy-in.

Assumption 5: Motivation to Learn

Motivation is key with adult learners. The robotics education program will be meaningful, engaging, and fun. When the nurses saw how they were able to apply the knowledge they received to real life situations in robotic surgery, their internal motivation was engaged. This experience had made the robotic nurses feel like they were a part of the whole process of building this robotics education program together.

Knowles' Four Principles

In taking Knowles' five assumptions into account, he then postulated four principles that are essential to understand what is needed for a successful adult learning experience. The first principle of andragogy states that adults must have a hand in the design and development of their learning experience. The robotic nurses were an integral part of the development and implementation of the program. Feedback from the robotic nurses were incorporated into the educational materials and activities based upon the educational and technical needs.

The second principle states that experience should be at the root of all learning tasks and activities. The robotics education program offered exercises in technical training and troubleshooting so that the learner could learn from their errors and master their skills sets through first-hand experience. They used their knowledge in robotics to take on their own approach when solving problems. Through trial-and-error, the learning experience became more meaningful and effective.

The third principle takes real life applications and benefits and ties it to the learning. The robotic nurses had experienced how the robotics education program tied into their job and how it applied to their everyday clinical situations. The fourth principle gives the adult learner the opportunity to absorb information, rather than memorizing it through simulation will increase knowledge in robotics education. The robotics education offered the learner the experience to see immediately how the instructions helped them to solve issues they may have encountered within the robotic environment. Activities were created to allow the robotics team to learn specific tasks, such as simulations, which enabled them to store the information in their long-term memory through repetition and experience.

Bandura's Social Cognitive Theory

As Knowles' adult learning theory is applied in helping adults learn, the adult also has professional and social experience to reflect on as well. The social aspect of learning plays an important part of adults taking on new skills. The concept of self-efficacy is central to psychologist Albert Bandura's social cognitive theory, which emphasizes the role of observational learning and social experience.

According to Bandura (1977) a person's attitudes, abilities, and cognitive skills comprise what is known as the self-system. Self-efficacy is the belief in one's capabilities to organize and execute the courses of action required to manage prospective situation (Bandura). Self-efficacy evolves throughout life as people acquire new skills, experiences, and understanding.

Bandura (1977, 1994) proposed that self-efficacy related to an individual's belief in his or her own ability to carry out specific actions. Bandura identified mastery experiences (performing an action successfully), social persuasion (provision of positive comments), social modeling (observing others engage in a behavior), and one's own psychological responses, as sources of information that could influence an individual's perceived self-efficacy for a specific action (Bandura, 1977, 1994).

According to Bandura (1977) the most effective way of developing a strong sense of efficacy is through mastery experiences. Having the robotic nurses do hands on training with the robot, tower, console, and bed was essential in helping overcome their anxiety. The robotic nurses' performances on competencies strengthened their sense of self-efficacy.

Bandura (1994) stated, "Seeing people similar to oneself succeed by sustained effort raises observers' beliefs that they too possess the capabilities to master comparable activities to succeed" (p.3). Another important source of self-efficacy was when the robotic nurses witnessed other nurses successfully completing the robotic competencies. Bandura asserted that people could be persuaded to believe that they have the skills and capabilities to succeed. Through encouragement and positive feedback, these robotic nurses can overcome self-doubt and be persuaded to believe they can learn the robotic technology.

Bandura (1994) noted "it is not the sheer intensity of emotional and physical reactions that is important but rather how they are perceived and interpreted" (p. 2). Emotions and stress levels could impact how the robotic nurses perceived they felt about learning robotic technology, therefore, it was important to help these nurses alleviate stress and elevate their moods when dealing with the new task of learning this technology. The self-efficacy of the robotic nurses was improved as their beliefs in their capacity to execute behaviors that were necessary to produce specific robotic performance attainments.

Relevance to Nursing Practice

Importance of Robotics education Programs

In a descriptive qualitative study by Kang, De Gagne, and Kang (2016) using perioperative nurses' focus groups based on work experiences with robotic surgery, the new robotic technology strongly affected the intraoperative nursing roles. According to Kang, De Gagne, and Kang, nurses must be proficient in robotic patient care, patient positioning, robotic room set up, and emergency procedures. The 15 participants in this study group were experienced robotic nurses interviewed between 2012 and 2013. Four themes emerged from this study. (a) Checking and rechecking patient safety, (b) unexpected robotic machine errors/malfunction, (c) feelings of burden on robotic team, (d) need and desire for more information and education. This study concludes that more educational programs on robotic surgery for nurses are urgently needed to empower nurses to work with confidence to lead to increased quality of care (Kang, De Gagne, and Kang).

In a retrospective chart review by De Lambert et al., (2013), on how to successfully implement a robotic pediatric program, the author suggests that the 97% success rate of the 96 robotic surgical procedures are due to the motivation of the surgeon, anesthetists, and the nurses. Lambert asserts that in order to succeed, the nurse teams must be properly trained, and teamwork is required for a smooth-running robotics program. The team works hand in hand to standardize procedures which overall builds team confidence. Robotic surgery can be a fantastic human experience for the robotic team as every operator is proud to use the tools associated with robotic technology to create a true entrepreneurial spirit among the team (Lambert).

In an article Raheem et al. (2017), the author asserts that the robotic nurse has an essential role in robotic surgery. The robotic nurse must be an expert in robotic technology, malfunctions, and emergency procedures as well as maintain optimal use of robotic equipment, instruments, and supplies. A new robotic nurse undergoes basic training procedures for four hours a day for two weeks. The nurse then scrubs into robotic cases daily for 6 weeks to learn robotic procedures and instrumentation. The competencies are completed and final recommendation by robotics coordinator is made. After recommendation, the nurse then becomes part of the robotics team. The accomplishment of successful robotic surgery requires harmonious teamwork like an orchestra symphony while maintaining maximum safety and quality patient care (Raheem).

Education on positioning in robotic surgery is an important factor in overall robotics education for patient safety. According to Hortman and Chung (2015), the surgical robotic platform creates unique and innovative challenges for the surgical team who must understand positioning requirements to provide optimal patient safety and perioperative team access to the surgical patient. The use of the Trumpf bed in robotic surgery creates an additional challenge for robotic nurses as this bed has the capability to be repositioned during robotic surgical procedures to allow for optimal exposure and access to the patient’s anatomy. The robotic nurse needs to be prepared throughout surgery for these changes in position.

The length of robotic procedures can vary from 60 minutes to up to 7 hours. Correct positioning during robotic procedures results in maintained circulation; protection of nerves, muscles, and bony prominences from pressure injury; provide adequate exposure of the operative site; and provide anesthesia access to maintain a functional airway, IV lines, and monitoring equipment (Hortman & Chung, 2015). In some robotic procedures, extreme positioning is used to gain maximum exposure to the surgical site, which requires a collaborative effort from the entire surgical team for patient safety. Throughout all robotic procedures, the nurses need to perform safety checks as the patient can move during steep Trendelenburg, or reverse Trendelenburg, and the patient needs padding checked to avoid injury from the robotic arms. To promote patient safety and prevent injury to the robotic patient, the surgical team should carry out patient positioning according to positioning guidelines from the Association of Operating Room Nurses (AORN, 2014).

Correct patient positioning to prevent patient injury and provide access to surgical site and anesthesia should be a focus in education for the robotic nurses. Education on anatomy and nerves affected by each position can help prevent patient injury such as airway complications, tissue necrosis, paralysis, blindness, burns, rhabdomyolysis, fractures, and even death (Woodfin, Johnson, Parker, Mikach, Johnson, and McMullan, 2018). The article by Woodfin et al. (2018) using a memory aid to educate proper positioning technique would benefit the robotic nurses goal in safe positioning. Mnemonics can help the robotic nurses remember key safety aspects of each surgical position used in robotics. Supine position is used in all robotic surgical services. The Mnemonic BACKS is used for (B) back of head; (A) arms abducted <90 degrees, (C) cover olecranon process to reduce ulnar nerve injury; (K) knees supported on pillows to prevent hyperextension of knees and reduce popliteal vein compression and heels elevated to reduce pressure injury; (S) secure arms if tucked palms should be facing thighs and check IV access integrity (Woodfin et al.).

In robotic surgery, steep Trendelenburg is often used for optimal visualization and access in gynecology, urology, and general surgeries. To prevent the patient from slipping off the bed, pink pad will be utilized for all robotic procedures that require bed movement. The mnemonic for Trendelenburg position is TILT, (T) trial position to check for slippage; (I) initiate auscultation to check endotracheal tube placement; (L) loss of vision can occur as ischemic optic neuropathy can occur in lengthy procedures; (T) tilt minimized as much as possible (Woodfin et al.). For Reverse Trendelenburg, used in general and bariatric robotic cases, the mnemonic RTILT is used. (R) Raise head; (T) Toes protected, this is accomplished with pink pad; (I) impact on cerebral perfusion as this can result in a 20mm Hg lower systolic blood pressure; (L) locate pressure points; (T) tilt minimized (Woodfin et al.).

Lateral position is used in thoracic and urology surgeries. The mnemonic is SIDESS, (S) stabilize and support the neck; (I) insert axillary roll to prevent brachial plexus injury; (D) do not abduct arms >90 degrees; (E) eyes and ears free of compression; (S) superior leg remains straight; (S) support dependent leg in bent fashion (Woodfin et al.). The lithotomy position is used in urology, gynecology, and general surgeries. The mnemonic for this position is LEGGS, (L) leave the head in neutral alignment; (E) elbows padded; (G) gently raise legs at same time; (G) get fingers away from bed; (S) support the common peroneal nerve (Woodfin et al.).

Staff Competencies

Competency is "an expected level of performance that integrates knowledge, skills, abilities, and judgment" (American Nurses Association, 2015, p. 86). Competence is gained in the healthcare profession through preservice education, in-service training, and work experience. Competency assessment has been reported to promote collegiality, identify clinical experts, identify areas of variation, improve confidence, decrease patient complaints, and decrease reported safety concerns (Carreon, Sugarman, Beener, & Agan, 2013; Overman, Hauver, McKay, & Aucoin, 2014)

In the study based on peer-review of competency assessment by Mangold, Tyler, Velez, & Clark (2018), RNs were assessed on competencies related to performance of sound practice related to anticoagulation medication, pressure injuries, and pain management. The three competencies were completed by 93 clinical RNs in which 82 (88%) peer reviewed at least one other RN's competency. Sixty-four percent of RNs were peer reviewers for the anticoagulation safety competency, 61% for the pain management competency, and 61% for the pressure injury competency (Mangold et al., 2018). A 4-point Likert scale was used, with scores ranging from 1 (*strongly disagree)* to 4 *(Strongly agree)* to rate the competencies. In this study attaining knowledge was not a factor of the competency process, however, staff expressed that the collaborative process allowed them to learn from their peers through idea sharing. Through communication, education, and feedback, RNs had become comfortable giving feedback to one another and strengthened professional relationships (Mangold et al., 2018).

Corrigen (2014) states robotics competencies is an ideal way to evaluate individual readiness for autonomy in staffing robotic procedures. Competencies should include knowledge of the use and location of instrumentation and specialized equipment; care, handling, and proper use of the robot and accompanying consoles and video equipment; tracking and troubleshooting for equipment problems; documentation of inventory management; demonstration of docking and undocking the robot after port placement has occurred; and most importantly, the rapid recognition and management of emergency situations, such as bleeding, that while rare, require an immediate response (Corrigen, 2014).

In a study by Tan, Chong, Subramaniam, and Ping (2018), a systematic review appraised six studies published between 2009 and 2016 to investigate the effectiveness of outcome-based education (OBE) and competency-based education (CBE) on nursing students. According to Tan, et al (2018) OBE offers an appealing way of reforming nursing education based on results and outcomes. The methodological quality of four of the studies with quality scores ranging from 50–54% were considered moderate and two of the studies with quality scores of 75–79% were considered high quality. This systematic review has demonstrated that OBE/CBE approaches in nursing education may contribute to the improvement in nursing competencies in the areas of knowledge, skills performance, and in contributing to higher learning satisfaction and achieving higher order thinking processes (Tan et al., 2018).

The findings from this review suggest that OBE/CBE approaches in nursing can have a positive effect on nursing education in terms of knowledge acquisition, skills performance and attitude, in addition to improving higher thinking abilities, reducing cognitive load and achieving higher learner satisfaction. According to Tan et al, although OBE/CBE approaches does show encouraging effects towards improving competencies, a more robust experimental study design with larger sample sizes and patient outcomes are needed. It was noted that selected participants were senior undergraduate nursing students and post registration nursing students undergoing specialized training. It could suggest that due to the level of maturity and greater learning experiences, these learners could adapt to the outcome-based approach of learning better.

The study by Fan, Wang, Chao, Jane, and Hsu (2015) examined the effects of competency-based education on the learning outcomes of undergraduate nursing students. This study used a quasi-experimental design with a convenience sample of 312 second-year undergraduate nursing students from northern and southern Taiwan from November 2011 to October 2012 (Fan et al., 2015). The experimental group (n = 163) received competency-based education and the control group received traditional instruction (n = 149) in a medical–surgical nursing course. Outcome measures included students' scores on the Objective Structured Clinical Examination, Self-Evaluated Core Competencies Scale, and Metacognitive Inventory for Nursing Students questionnaire, and academic performance.

Knowledge was demonstrated by students who received CBE had significantly higher final grades in their medical-surgical nursing course than the control group. This study investigated the metacognitive abilities, which involved the evaluation of mental processes such as critical inquiry, reasoning, judgment, and creativity in solving problems. The study results revealed that there was a significant increase in the metacognitive inventory post-test scores from the pre-test scores of the experimental group (5.14 vs. 4.92, $p < 0.001$) as compared to the control group. This study resulted in core competencies and metacognitive abilities which improved significantly in the competency-based education group as compared to the control group, therefore, competency-based education is worth implementing and may close the gap between education and the ever-changing nursing work environment (Fan et al., 2015).

Self-Efficacy

Innovative learning environments can empower nurses to improve their critical thinking and decision-making skills so that they can feel confident in practice. Ortiz (2016) used a descriptive qualitative study to explore new graduate nurse's experiences with lack of professional confidence and how it had developed over the first year of practice. 12 nurses participated in this study to capture their lived experiences to help understand this phenomenon. This study found that professional confidence occurs throughout the first year of practice. To achieve this, the nurse must experience both positive and negative experiences. This study demonstrates that educators can help in the transitioning and development in professional confidence.

In a study by Babenko-Mould, Ferguson, Riddell, Hancock, and Atthill (2015), nursing students were assessed for empowerment during simulated learning and actual nursing practice. They were also assessed for self-efficacy for public health nursing (PHN) competencies after involvement in a mass influenza vaccination clinic as a community practice experience (Babenko-Mould et al., 2015). A non-experimental survey design was used with a sample of 228 third year baccalaureate nursing students. These nursing students were assessed for perceptions of empowerment after being involved in the simulated and actual clinic settings, and self-efficacy was assessed after the actual clinic experience.

Students rated their self-efficacy for PHN at 83.96/100. Students' overall post simulation clinic and post-actual vaccination clinic empowerment scores were significantly correlated ($r = 0.452$, $p \leq .01$). Moderately strong and significant correlations were evident between students' post-actual vaccination clinic overall empowerment scores and their self-efficacy for PHNC ($r = 0.421$, $p \leq .01$). Completion of the simulated learning session provided students with confidence in their cognitive and psychomotor skills to execute the steps involved in the safe administration of influenza vaccine. Students believed they could successfully carry out vaccination procedures as outlined by the Public Health Unit policies with the outcome of safe assessment, administration and post vaccination teaching for members of the public who attended the mass vaccination clinics.

In examining students' empowerment and self-efficacy during simulated learning and actual nursing practice, students perceived themselves as structurally empowered after completing the simulated and actual community vaccination clinics. Students reported a high level of self-efficacy for PHNC after their actual community vaccination clinic involvement. There was a significant correlation between empowerment and self-efficacy, which suggests that when students have access to empowering structures, they feel more confident to enact PHNC that align with practice in the clinics. This study suggests that nursing students acquired the necessary knowledge and skills for safe vaccination administration through the combination of simulated practice and participating in an actual public health vaccination clinic.

Local Background and Context

The robotics education program was implemented in a 240-bed community hospital located in the northeastern part of the United States. This OR did not have an evidence-based robotics education program for nurses who participate in robotic surgery. The gap in practice was the lack of knowledge of the robotic nurses. This lack of knowledge interfered with the care provided to the robotic surgical population. This facility had become aware of this problem during a mock site inspection as they were preparing to attain a center of excellence in robotic surgery designation. In this facility there was a bio-medical engineer who handled all the technical issues in the OR. The lack of an evidence-based robotics education program had led to the OR nurses calling the bio-med engineer to trouble shoot equipment on a frequent basis. This had led to the robotic nurses feeling frustrated and anxious related to the robotics program with statements such as “I feel scared to go in there!” This has limited staff who worked in robotics which had hindered coverage and the growth of the robotics program. This knowledge deficit and feelings of negativity had created job dissatisfaction and burnout. This issue had also placed the bio-med engineer in difficult situations as patient care is not in his scope of practice. The problem question was: Will the implementation of an evidence-based robotics education program improve nursing knowledge in the practice of robotic surgery? This gap in practice was addressed through the implementation of an evidence-based robotic staff education program.

This facility was seeking a designation to be a Center of Excellence in Robotic Surgery. This designation demonstrates a best in class robotic facility focused on improving safety and quality of care including lowering overall costs in the facility. Well trained staff dedicated to a culture of excellence is mandatory and an institutional goal for maintaining a robotic center of excellence. The robotics education took place in the OR suite that houses a Da Vinci XI robot. The robotic nursing staff consisted of 10 nurses, all female, that have educational levels that ranging from diploma, associate degree, baccalaureate degree, and master's degree. Their experience as RNs range from one to twenty-five years. Regardless of the level of education, all 10 nurses were considered to be a novice to this robotics education program.

Role of the DNP Student

The DNP is an expert in translation of evidence into practice (White, Dudley-Brown, & Terhaar, 2016). As the DNP student, I created and facilitated a robotics education program guided by evidence. I had been in a nurse practitioner role and a surgical first assist for 10 years at this facility. My role at this facility at the time of this project was the Associate Director of Robotic Surgery. My first assignment as the Associate Director of Robotic Surgery was to attain a Center of Excellence in Robotic Surgery through an international credentialing body for this facility. I am still passionate about robotic surgery and I wanted our robotic nurses to feel empowered. My motivation for this project was to incorporate the evidence and create a robotics education program to increase the knowledge of our robotic nurses. My goal was for the robotic nurses to troubleshoot the robot themselves, so they can feel they have the knowledge to handle emergency procedures, and do not have to call the bio-medical engineer for help.

Role of Project Team

The DNP student was the project lead in developing, implementing, and evaluating the staff robotics education program. The DNP Student coordinated all program activities, project meetings, and had overseen activities necessary to implement the program and provide leadership to the inter-professional collaborative team. The DNP student conducted evaluation of the outcomes of the staff education program through the use of a hospital validated evaluation tool (Appendix A). The DNP student assembled a project team to help support the project and provide feedback. The project team's input was used to help support the development, implementation, and evaluation of this staff robotics education program in the operating room of a 240-bed community hospital in the northeast part of the United States. The project team included the physician robotics director, the robotics program associate director, the surgical services director, the OR manager, the OR nursing educator, the robotic nurse service manager, and the representative from intuitive surgical. The DNP student presented the project to the team via a power point presentation describing the robotics education program and provided the evidence on the importance of robotics education, staff competencies, and self-efficacy. During the robotic team meetings held quarterly, the team members were provided opportunities to share their expertise and contextual insight relative to the doctoral project. The robotic team provided feedback and the DNP student responded via quarterly meetings and email over the course of the development, implementation, and evaluation of the robotics education program.

Summary

The practice problem was the lack of an evidence-based robotics education program for RNs who participated in robotic surgery. The gap in practice was the lack of knowledge of the robotic nurses. This lack of knowledge interfered with the care provided to the robotic surgical population. The literature reviewed from evidence-based studies and articles demonstrated the need for a robotics education program. The purpose of this project was to develop a staff robotics education program to improve nursing knowledge in the practice of robotic surgery.

Section 3: Collection and Analysis of Evidence

Introduction

The role of the DNP student was to translate evidence into practice (White, Dudley-Brown, & Terhaar, 2016). The practice problem was the lack of an evidence-based robotics education program for RNs who participate in robotic surgery. The nurses had expressed feelings of angst working in the robotic rooms due to their lack of knowledge about robotic surgery. The robotic nurses had not been able to answer safety questions about robotic emergency procedures. The biomedical engineer had been called on a frequent basis to troubleshoot the robot. The need for robotics education was imperative for the functioning and safety in the robotic rooms. The purpose of this project was to develop a staff robotics education program to improve nurses' knowledge in the practice of robotic surgery. The following sections will review the sources of evidence and the process for development of the robotic staff education program.

Practice-Focused Question

The gap in practice was the lack of knowledge of the robotic nurses. This lack of knowledge interfered with the care provided to the robotic surgical population. An evidenced-based robotics education program could improve the robotic nurses' knowledge in the practice of robotic surgery. The practice-focused question was: Will implementation of an evidence-based robotics education program improve nurses' knowledge in the practice of robotic surgery?

Sources of Evidence

The evidence for this robotic staff education program was collected via multiple databases: Science Direct, Medline, Pro-Quest Health, CINAHL, Allied Health Source, PubMed, Ovid, and Cochrane. The search dates ranged from 2012 to the present. The selected evidence included peer-reviewed journal articles, studies, and guidelines. Search terms included *robot, robot education, robotic emergencies, competencies, checklists, nursing anxiety, nursing confidence, nursing knowledge, nursing education, nursing theories,* and *patient positioning*.

This robotics education program was developed with documented evidence on robotic troubleshooting and nursing education. Education guidelines was included by Intuitive Surgical on robotic functions, emergency procedures, and competencies (Intuitive Surgical, 2018). A key element that was developed for this education program was AORN's practice standards on safe patient positioning in surgery (AORN, 2018). Another relevant source of evidence was the input of the robotic team. Using this evidence helped in the development of this robotic staff education program.

Analysis and Synthesis

Participants in this robotics education program included 10 robotic nurses. This staff robotics education program was evaluated by a hospital-validated tool (Appendix A). The results of the evaluation tool was reported by descriptive analysis. An application to obtain continuing education credits will be sought out for this robotics education program to improve continued attendance. The goal and objectives of the program are to improve the knowledge of the robotic nurses during the practice of robotic surgery.

The purpose of this project was to develop a staff robotics education program to improve nursing perceptions related to their knowledge in the practice of robotic surgery. The Malcolm Knowles theory was used as a guide in the development and implementation of this project. Approval was requested by the robotics committee prior to implementation of the robotics education program. The Site Approval Documentation for Staff Education Doctoral Project (Appendix B) was authorized by the facility. The participants selected for this staff education project included 10 robotic nurses. IRB approval from Walden University was attained prior to the robotics education program implementation. After site approval and IRB approval were obtained (Approval No. 11-21-18-0663845), the robotics education program was implemented. After implementation, participants completed an anonymous hospital validated evaluation tool (Appendix A) to evaluate the robotics education program.

Summary

The practice problem was the lack of an evidence-based robotics education program for RNs who participate in robotic surgery. Because a robotics education program was not utilized, the nurses expressed they had a lack of knowledge related to robotic surgery and feared working in the robotic rooms. The purpose of this project was to develop a staff robotics education program to improve nursing knowledge in the practice of robotic surgery. Evidence has shown that nursing education improves patient outcomes. This robotic staff education program translated evidence into practice and improved nursing knowledge.

Section 4: Findings and Recommendations

Introduction

An evidenced-based robotics education program for RNs who participate in robotic surgery was lacking in this acute care facility. This staff education project involved the development of a robotics education program based on knowledge of competencies for use in the operating room. The practice-focused question was as follows: Will implementation of an evidence-based robotics education program improve nursing knowledge in the practice of robotic surgery? The participants completed a hospital-validated evaluation tool (Appendix A) at the completion of the robotics education program. The purpose of this project was to develop a staff robotics education program to improve nursing knowledge of the practice of robotic surgery.

The robotic staff education project was developed using Intuitive Surgical education guidelines for the robotic nurses in the operating room. Intuitive Surgical has provided and published these modules to help in training all who use the da Vinci XI robot. Education guidelines were included by Intuitive Surgical on robotic functions, emergency procedures, and competencies (Intuitive Surgical, 2018). Professional organization guidelines were also used in developing this education program, including the Association of Operating Room Nurses (AORN, 2014) and the American Nurses Association (ANA, 2015). A key element developed for this education program was AORN’s practice standards on safe patient positioning in surgery (AORN, 2018). Another source of evidence was the input of the robotic team. Using the above evidence and feedback from the robotic team helped develop this robotics staff education program.

The John Hopkins' evidenced-based practice model (Dearholt, et al., 2012), was utilized to analyze the evidence. Five levels of evidence provided the strength of recommendation. Level I analyzed evidence from experimental studies, systematic reviews and randomized control trials, with or without meta-analysis. Level II analyzed evidence obtained from quasi-experimental studies, with or without meta-analysis, or systematic review of a combination of randomized controlled trials and quasi-experimental. Level III analyzed evidence obtained from non-experimental studies and qualitative studies. Level IV analyzed evidence from opinions of respected authorities which include clinical practice guidelines and expert panels. Level V was based on experimental and non-research evidence which includes literature reviews, quality improvement reports, case reports, and other opinions.

Findings and Implications

This staff education project for a robotics education program was based on evidence-based literature and feedback from the robotic team. In the initial team meeting to discuss the robotics education program, all agreed that the nurses needed to learn how to operate and manage the da Vinci XI robot themselves, so there would be no need to call the biomedical engineer. All agreed that by learning all the functions and how to troubleshoot the robot through simulation, these 10 nurses would build their knowledge and confidence in the practice of robotic surgery. Through this evidence and feedback from the team, it was decided to use robotic competencies as a guide for this education to help increase the robotic nurses' knowledge.

The team had agreed upon using the Intuitive Surgical modules as a foundation for the education program followed by a class that would offer the education based on the competency checklist. We all agreed that this checklist would go through the basics of powering up the robot through what every function is on the patient cart, tower, and monitor. During the team meetings we had agreed that the classes should be held in the operating room that housed the DaVinci XI robot. We also discussed the use of a simulator for hands on experience. Through our continued team meetings and discussions, the feedback was to also divide the education into three sections; pre-operative, intra-operative, and post-operative. Based on our discussions of the evidence, we decided to revise the education and add in simulation of patient scenarios with instrumentation and emergency procedures.

There were no unexpected team interactions or unanticipated limitations. The robotics education program was fully supported by all team members. An anticipated limiting factor was scheduling the 10 robotic nurses for the robotics education program due to the times the nurses and the robot was available. To resolve this limiting factor, four sessions were scheduled over a span of two weeks to complete the program.

Ten robotic nurses participated in the robotics education program and completed a paper evaluation on perception of knowledge and learning (Appendix A) immediately after the education session. All 10 robotic nurses provided the evaluation data on perception of knowledge (Table 1): 100% of participants answered yes, their knowledge increased in the operation of the da Vinci XI robot patient cart and tower.; 90% of participants answered yes, their knowledge had increased on positioning robotic patients;

100% of participants answered yes, their knowledge increased on troubleshooting the robotic patient cart and tower;100% of participants answered yes, they perceived increased confidence in working in robotic procedures. After taking the robotics education program, 100% of participants answered yes, they felt the program was beneficial in helping them gain knowledge in the practice of robotic surgery.

Table 1

Results of survey on learning outcomes provided to robotic nurses

	Response 1	Response 2	Response 3
Outcome 1	0	0	10
Outcome 2	0	1	9
Outcome 3	0	0	10
Outcome 4	0	0	10
Outcome 5	0	0	10

Note. Legend = 3 (yes), 2 (somewhat), 1 (no).

All 10 robotic nurses provided the evaluation data on learning (Table 2): 20% of nurses stated their knowledge of topic before the robotics education class was somewhat good. 80% of the nurses stated their knowledge before the education was good; 10% of the robotic nurses stated their knowledge after the workshop was very good; 90% of the nurses stated their knowledge after the workshop was excellent.

Table 2

Results of survey on knowledge provided to nurses

	Response 5	Response 4	Response 3	Response 2	Response 1
Knowledge before robotics education	0	0	8	2	0
Knowledge after robotics education	9	1	0	0	0

Note. Legend = 5 (Excellent), 4 (Very Good), 3 (Good), 2 (Somewhat), 1 (Little/None).

The participants perceived that their knowledge has increased, which should lead to increased confidence as they perform their patient care. The nurses' increased knowledge and confidence may improve the working conditions for the surgeon, increasing his/her focus on the surgical aspects of care. There could be influences to increased teamwork and collaboration among in the operating room, leading to increases in efficiency, quality, and reduction of preventable errors. The education provided in this project has the potential to improve many aspects of robotic surgery, including turnover time, which then permits more robotic cases to be done. With improved robotic surgery the institution could choose to increase their investment in providing these surgical services, thus improving the care choices for members of this community.

Recommendations

It was recommended that the robotics education program would utilize a list of competencies to guide the development of the education. This education program had begun with the completion of Intuitive Surgical online modules. After completing the online modules, the robotic nurses printed and handed in their certificates as proof of completion for the XI robotic system. The robotics education program took place over the span of two weeks where four classes were offered for the morning and evening shifts. Each class took approximately three hours to complete.

The robotics education presented during these classes was based on pre-operative, intraoperative, and postoperative functions of the XI robot. In the pre-operative phase, I educated the nurses on the basics of the plugs, cables, and powering up the system. Then I discussed the functions on the patient cart and tower. I educated the nurses on the Trumpf bed and how to pair the bed with the robotic system. I reviewed the differences in surgical procedures, how the patient is positioned on the bed, and where the robot is positioned near the patient. I discussed proper draping technique for the patient cart and robotic arms.

In the intraoperative phase, I discussed the robotic arm functions and instrumentation. I demonstrated all functions and had the nurses' repeat back techniques for all instrument exchanges and robotic functions. I discussed how to trouble shoot the robot and gave the nurses different scenarios in which troubleshooting may occur. I then educated the nurses on emergency procedures including the use of the emergency release kit. I also simulated the robotic faults and demonstrated what steps to take when these occur.

In the postoperative phase, I demonstrated the proper removal of instrumentation, how to undock the robot, where to find how many uses are left on the instruments, how to drive the patient cart out, how to undrape the robot, and how to power down the system. Upon observing the nurses return demonstration, it was established that a standard was met to establish competency. An evaluation form was given to each of the robotic nurses to complete at the end of the robotics education program. It is recommended to utilize this robotics education program as a standard in practice and utilized on an annual basis and for all new hires in this facility.

Contributions of the Project Team

A project team was assembled to help support the development, implementation, and review the final draft of this staff robotics education program in the operating room of a 240-bed community hospital in the northeast part of the United States. The purpose of this project was to develop a robotic staff education program to help increase the robotic nurse's knowledge and gain confidence in the practice of robotic surgery. The project team included the physician robotics director, the robotics program associate director, the surgical services director, the OR manager, the OR nursing educator, the robotic nurse service manager, and the representative from intuitive surgical.

Each person on the team added value to this staff education project. The robotics program associate director was the lead of this project in which the team was assembled, the idea of utilizing the intuitive modules as a foundation, and the use of a competency checklist as a guide to the education was presented to the team. The project was presented via power point presentation describing the robotics education program. The evidence on the importance of robotics education, staff competencies, and self-efficacy was provided to the team members. During the robotic team meetings held quarterly, the team members were provided opportunities to share their expertise and contextual insight relative to the doctoral project. The surgical services director provided guidance and financial support for the project. The OR manager was in full support of the nurses and helped in the scheduling of the nurses to receive the robotic training. The OR educator reviewed the literature provided and agreed upon utilizing the competency checklist as a guide to this education. The robotic nurse service manager helped in scheduling and setting up the equipment used in the robotics education classes. The Intuitive representative provided the team with assistance on all robotics education needs and was there to answer any questions had throughout the process. The physician robotics director fully supported this staff education project and provided the team with knowledge in robotics and guidance.

The robotic team added much value to this project and was in agreement with the robotics education suggested. The team corresponded via email over the course of the development, implementation, and evaluation of the robotics education program. There was one revision made to this project with the addition of simulation of emergency procedures. All team members were in agreement of revision. The plan for this robotics education program is to become an annual requirement for all nurses in the operating room and expand beyond this DNP doctoral project to the health system.

Strengths and Limitations of the Project

The strengths of this project include the support from senior management and administration at the hospital where the project had taken place. The support from the project team was integral to the success of the program. Financial support had been provided by surgical services which was needed for the implementation of the robotics education program. Full support had been provided by nursing education for implementation of the robotics education program. The challenges that I encountered were mainly due to timing of the robotics education training classes due to the different shifts the nurses work. A solution would be to train robotic champions to help with day, evening, and weekend shift classes.

Support from administration, the project team, and nursing education is an important aspect of this staff education project which will support the dissemination of the robotics education program. The robotic nurses provided support for this education program and expressed the continued need and implementation of annual competencies in robotics. It is suggested to apply this process in training to surgical techs, first assists, medical students, and surgeons. Another suggestion would be to simplify the training to just the operation of the tower and patient cart for the orderly staff, so they can have a better understanding on driving and storing the robot during cleaning and set up procedures.

Section 5: Dissemination

Dissemination Plan

This project could be presented to this facility's Institute of Robotic and Minimally Invasive Surgery committee, which is a performance improvement coordination group that meets quarterly to discuss quality, data, new technology, education, and any items related to robotics. This project could also be presented to the operating room committee, which meets monthly to discuss all issues in relation to surgical services. It could be presented to the advanced nursing leadership council, which meets quarterly to discuss all news and events, new policies, legislation related to advanced practice, and new research or projects developed by any members. This staff education project could also be presented in front of the board of trustees and the board of medicine, as these are the governing bodies that make strategic planning and long-term goals. In the future, this project could be presented to the healthcare system robotics committee to facilitate this education program throughout the system. Finally, this project could be presented at robotics surgery conferences, which would enable this project to be disseminated to the robotics community nationally.

Analysis of Self

As a nurse practitioner and surgical first assist in robotics, I am considered an expert in my field of robotic surgery. I currently run a robotic epicenter and help train surgeons and robotic surgical teams from all over the United States in best practices in robotic general surgery. This journey has enabled me to advance my knowledge even further and the knowledge of others in the practice of robotic surgery. Through this process, I have learned the proper way to teach nurses effectively how to troubleshoot the robot and how to manage emergency procedures when they occur. I have been able to fine tune my skills not only as an expert in robotics, but as an educator and mentor. It is a powerful feeling to enable nurses to achieve advancement in their own careers. By embracing this robotics education program, the robotic nurses may increase meaningful use for the robotic technology and it may enhance the value of the care they provide to the robotic patient population.

This experience has enabled me to become an effective leader who was able to carry out the project plan in order to achieve my project objectives. As a project manager, I was in charge and a key player in the planning and execution of this robotics educational program. I was able to build a team by connecting key players which enabled the communication to achieve the goal of the presentation of this program. This experience has enabled me to strengthen my communication skills, delegation skills, goal setting, organizational skills, and effective leadership.

Through advanced scholarship, I discovered that I could incorporate the evidence into a robotics education program that could be disseminated and integrated into patient care that could improve patient outcomes. This robotics education program applied knowledge, provided tools and thus enhanced skills in robotic surgery for novice nurses. It has been exciting to be an active educator and share my knowledge with these 10 nurses to help them overcome their fears of working in robotics and overcome their lack of knowledge in the practice of robotic surgery. I feel privileged to have gone through this process to promote the importance of a robotics training program that helps robotic nurses gain knowledge and confidence in the practice of robotic surgery.

This doctoral project has helped me become a more effective educator not only to the robotic nurses, but to the surgeons and robotic surgical teams that come to our epicenter. I have gained insight that establishing a standardized training competency robotics program will help the nurses to use the robotic tools and techniques most effectively. I am currently the chair of the institute for robotic and minimally invasive surgery and a member of the system wide robotics committee. I am currently asked to speak at robotic conferences on building a robotic team. In the future, I would love to apply this experience to help build robotic programs for other institutions and systems globally.

Summary

The local nursing practice problem in this facility and the focus of this doctoral project is the lack of an evidence-based robotics education program for RNs who participate in robotic surgery. The gap in practice is a lack of knowledge of the robotic nurses. This lack of knowledge interferes with the care provided to the robotic surgical population. The gap in practice has been addressed through the implementation of an evidence-based robotic staff education program in the operating room of this 240-bed community hospital setting. The purpose of this project was to develop a staff robotics education program to improve nursing knowledge in the practice of robotic surgery.

Throughout the planning process, the practice problem and gap in practice was identified, key players and end users were also identified, and the project team was created. The educational program based on evidence was developed and presented to the project team for feedback, then delivered to the robotics nurses. The learning needs and the effectiveness of the education program was then assessed utilizing an evaluation tool. The evaluation demonstrated this robotics education program was effective in increasing the perceived knowledge of delivering robotic care.

This robotics education program helped change the existing pattern of training for robotic nurses and helped reshape the learning curve of new nurses entering the robotic practice field. This program may provide the opportunity for positive social change which can be obtained through changing the attitudes, behaviors, and culture of the novice nurse by enhancing their knowledge. To keep pace with the evolving and complex demands of robotic technology, this program may alter the structure of robotic educational needs leading to lasting change in the way the robotic nurses perform in the practice of robotic surgery.

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Appendix A: Evaluation Form

Activity Name:
Activity Date:
Legend: 3—Yes 2—Somewhat 1—No

CIRCLE THE NUMBER YOU THINK BEST EVALUATES THIS ACTIVITY

Teaching Effectiveness of Individual Facility Member/Presenter: 3 2 1
Presenter Name:

ENABLED ME TO ACHIEVE THE LEARNING OUTCOMES:
OUTCOME #1: Increased knowledge in the operation of the DaVinci XI robot patient cart and tower 3 2 1

OUTCOME #2: Increased knowledge of positioning patient in robotic procedures 3 2 1

OUTCOME #3: Increased knowledge to troubleshoot the robot patient cart and tower 3 2 1

OUTCOME #4: Increased confidence working in robotic procedures 3 2 1

OUTCOME #5: Feel this program was beneficial to help me gain knowledge in the practice of robotic surgery 3 2 1

EFFECTIVELY USED TEACHING METHODS AND LEARNING AIDS: 3 2 1

PROVIDED PHYSICAL FACILITIES CONDUCIVE TO LEARNING: 3 2 1

ENABLED ME TO MEET MY PERSONAL OBJECTIVE(S) FOR ATTENDING: 3 2 1

FREE OF COMMERCIAL BIAS: 3 2 1

5=Excellent;4=Very Good;3=Good;2=Somewhat;1=Little/None
ON A SCALE OF 1-5 KNOWLEDGE OF TOPIC BEFORE WORKSHOP: 5 4 3 2 1

ON A SCALE OF 1-5 KNOWLEDGE OF TOPIC AFTER WORKSHOP: 5 4 3 2 1

ADDITIONAL COMMENTS/ WORKSHOPS I WOULD LIKE TO ATTEND:

Appendix B: Site Approval Documentation

The doctoral student, Doreen Sicotte, is involved in Staff Education that will be conducted under the auspices of our organization. The student is approved to collect formative and summative evaluation data via anonymous staff questionnaires, and is also approved to analyze internal, de-identified site records that I deem appropriate to release for the student's doctoral project. This approval to use our organization's data pertains only to this doctoral project and not to the student's future scholarly projects or research (which would need a separate request for approval). I understand that, as per DNP program requirements, the student will publish a scholarly report of this Staff Development Project in ProQuest as a doctoral capstone (with site and individual identifiers withheld), as per the following ethical standards: a. In all reports (including drafts shared with peers and faculty members), the student is required to maintain confidentiality by removing names and key pieces of evidence/data that might disclose the organization's identity or an individual's identity or inappropriately divulge proprietary details. If the organization itself wishes to publicize the findings of this project that will be the organization's judgment call. b. The student will be responsible for complying with our organization's policies and requirements regarding data collection (including the need for the site IRB review/approval, if applicable). c. Via a Consent Form for Anonymous Questionnaires, the student will describe to staff members how the data will be used in the doctoral project and how the stakeholders' autonomy and privacy will be protected. I confirm that I am authorized to approve these activities in this setting.

Signed,

Fay Wright PhD, RN, APRN-BC

Appendix C: Robotic Competencies for Robotics Education Program

XI Competency Checklist

Staff member name: ____ Date: ___________

Robotic XI Competencies			
Competency- Prerequisite	**Check**	**Initials**	**Preceptor**
Completes Intuitive modules for XI system and prints out certificate			
Pre-Operative Competencies			
Demonstrates robotic system is: • plugged in • blue fiber cables are connected from patient cart to console to tower appropriately.			
Powers up system and demonstrates how to verify correct system settings.			
Demonstrates understanding of: • patient cart power button • emergency stop button • battery level indicator • cable hook • cart drive activation switches • boom height joystick • boom position joystick • patient cart touchpad home menu • target anatomy • driving robot			
Demonstrates: • Knowledge of where room set up guide is for placement of robotic patient cart, tower, bed, and target anatomy per procedure.			
Demonstrate knowledge of touchscreen monitor menus including: • home tab • settings tab • guided set-up tab • arm, instrument, and endoscope status.			
Demonstrate ability to: • power on Erbe Vio generator • input correct settings			

• Placement of bipolar/monopolar/vessel sealer • grounding pad connections			
Demonstrates knowledge of: • connection of Trumpf bed to patient cart • ability to pair Trumpf bed • turn on/ off integrated table motion (Only applicable if facility has Trumpf bed)			
Demonstrates knowledge of patient positioning for robotic surgery			
Demonstrate proper draping of: • patient cart • robotic arms • column			

Intraoperative Competencies

Competency	Check	Initials	Preceptor
Demonstrate knowledge of patient cart Boom LED and arm components including: instrument carriage, instrument clutch button and LED, insertion axis, cannula mount, cannula mount lever, port clutch button and LED, and patient cart arm LED			
Demonstrate FLEX joint range of motion and point out the slide range indicators and demonstrate the slide joint range of motion			
Demonstrate extended port clutch function- press and hold port clutch button on any arm and move it to its upper and lower limit. Understand the significance of the 3 beeps which allows for boom to be raised or lowered			
Demonstrate understanding of instrument clutch button including hold activation vs. quick click activation			
Understand grab and move feature on patient cart arm (grab a patient cart arm			

along the gray handle behind the insertion axis and pull gently to unlock the arm)			
Demonstrates knowledge of robotic instrumentation and proper insertion and removal of instruments			
Demonstrate ability to advance instruments with visual guidance			
Demonstrate the ability to advance instruments using guided tool change			
Demonstrate proper ability to use the "repeat back" technique for instrument exchanges			
Demonstrate knowledge of where instrument release kit is kept and how to utilize			
Verbalize difference between recoverable and non-recoverable faults and what steps to take if the faults occur			
Demonstrate ability to trouble shoot problems that arrive during procedures (expired instruments, internal and external collisions, system does not recognize instrument)			
Demonstrate knowledge of Number to call for Intuitive to trouble shoot remotely			
Demonstrates knowledge of emergency procedures			

Post-Operative Competencies

Competency	Check	Initials	Preceptor
Demonstrate proper removal of disposable robotic items at end of case including scissor tip cover, cannula seals, stapler sheath and single use instruments.			
Demonstrates ability to verify instrument uses left			
Demonstrate ability to un-drape PT cart and dispose of drapes properly			
Demonstrate ability to move PT cart arms in a manner that protects the system			

Correctly powers down the system			

Staff member: ____ Date: ________

Robotic Preceptor: ____Date: ________

OR Manager: ____ Date: ________

Clinical Educator: ____ Date: ________