Evidence-Based Practice: the Registered Nurse’s Role in Robotics-Assisted Surgery

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**Abstract**

**Purpose**: To gather and critique evidence on a topic currently prioritized by perioperative and intraoperative nursing staff at the Department of Veterans Affairs Medical Center in Milwaukee, Wisconsin.

**Methods**: A multi-database search was performed as requested by the manager of the perioperative departments, on moderate sedation frequency; no directly relevant literature was found. Another search was performed on nursing considerations for patient safety in robotic-assisted surgeries.

**Results**: Nine articles were selected for critique. Seven are Level VII evidence; one is level IV, and one is level VI. None contradict another; many overlap.

**Implications for Practice**: A robotics program coordinator is recommended. Intraoperative registered nurses (RNs) must practice according to relevant standards, and should receive education on how to use and troubleshoot the equipment. The nurse should give attention to patient positioning; devices may differ by facility. Some facilities use a robotics-specifc timeout. One article asserts that patients undergoing robotics surgery should receive two IVs prior to surgical commencement. The postoperative nurse must perform standard physical assessments, with awareness of particular potential complications. This nurse should be aware that the patient may require less analgesia, and that shorter inpatient stays necessitate efficient teaching.

*Keywords* used in the search for the literature ultimately critiqued*:*

* Moderate sedation, conscious sedation, nurse sedation, procedural sedation
* nurse
* Frequency, often
* Outcomes, adverse events

**Evidence-Based Practice: the Registered Nurse’s Role in Robotics-Assisted Surgery**

**Introduction and Background**

The Department of Veterans Affairs Medical Center (VAMC) in Milwaukee, Wisconsin houses a 22 bed day surgery unit (Ambulatory Procedure Center, or APC), an eight bed post-anesthesia care unit (PACU), and eight operating rooms (ORs). The interim manager of APC and the PACU recently called for evidence on several subjects of interest. One relates to moderate sedation (MS) practices; another concerns the eventual integration of robotics-assisted surgeries.

Melnyk and Fineout-Overholt (2011) assert that, “priority should be given to those questions with the most important consequences or those that occur most frequently”p.12). They add, “[p]lanning practice changed for an EBP project includes evaluating current practice…Competing priorities within an area or organization can influence the timing needed to embark upon a successful EBP project” (p.217). Considering this, emphasis was placed on seeking evidence for the current issue, the frequency with which staff administers moderate sedation, over the future question, the new knowledge and practices staff will need to safely participate in robotics-assisted surgeries.

Currently, registered nurses (RNs) employed in the APC and PACU administer MS to patients undergoing bronchoscopies and transesophageal echocardiograms. All RNs in these departments maintain MS competency, completing yearly online learning modules with tests and are annually observed by another staff member. All RNs take turns performing sedation during these procedures, with an RN often administering MS less than once per year, up to a few times per year.

The interim manager questions whether this traditional practice is preferable, or whether evidence supports a change to maintaining a smaller group of nurses, who would administer MS more frequently. This change, should the evidence support it, finds its theoretical underpinning in Benner’s *From novice to expert,* which states that the nurse must possess experience and mastery to develop higher-level skills (Altmann, 2007).

A literature search on MS yielded several articles related to safe practices of the seditionist, but none directly addressing the frequency question. Consideration was given to drawing on literature related to the effectiveness of dedicated IV Teams, a specialized group of registered nurses who frequently perform a specific set of clinical tasks. However, dedicated IV Teams have been a common practice for a number of years; a quick search reveals that evidence publication seems to have tapered off, with less published within the past five years than prior to the past five years.

Therefore, the secondary topic was taken up. Sutton, Link, and Flynn Makic (2013) observe, that “[m]inimally invasive robotic surgery is rapidly becoming a common practice” (p.448). The other literature reviewed echoes this. The APC and PACU interim manager states, “We’re going to start having more robotics surgeries” (personal communication, June 3, 2013). This raises instantaneous questions, the most significant of which is, what new safety procedures will staff RNs need to perform? VAMC staff RN experience ranges from five years to more than thirty years; this group is deeply rooted in traditional practices, and, as Melnyk and Fineout-Overholt (2011) assert, “[l]ack of knowledge can create barriers to daily evidence-based care due to inadequate understanding of EBP principles, unfamiliarity with how evidence will improve patient outcomes, and lack of specific skills and knowledge needed to implement change” (p.210). The implication is that as staff RNs gain evidence-based knowledge, they will be better able to optimize outcomes among patients undergoing robotics-assisted surgery.

**The Questions**

Both questions searched use the PICOT format; PICOT is the acronym for Population, Intervention or Issue, Comparison, Outcome, and Time (Melnyk and Fineout-Overholt, 2011).

Initial question: Among (P) adults undergoing medical procedures with moderate sedation administered by a Registered Nurse, how do (O) patient outcomes differ in cases where the nurse performs moderate sedation (I) greater than once per month, compared to (C) less than once per month, (T) measured over a six month period?

Second question: In the (P) adult surgical population undergoing robotics-assisted surgery, what (I) knowledge and skills does the registered nurse need to obtain to (O) optimize outcomes and avoid adverse events in the (T) perioperative period, (C) compared to patients undergoing non-robotics-assisted surgery?

**Methods**

**Search strategy and criteria.**

 Regarding the sedation question, a preliminary search was made of Ebscohost, including databases CINAHL, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cochrane Methodology Register, and HealthSource. Medline and PubMed were also searched. Search limiters include English language and publication within past five years. Keywords used, with one word chosen from each list and the word *and* as a connector, were:

* Moderate sedation, conscious sedation, nurse sedation, procedural sedation
* nurse
* Frequency, often
* Outcomes, adverse events

Unfortunately, so few results were found that databases were again searched, using as keywords simply *sedation* and *nurse.* Again, the search revealed a few articles on safety procedures by the seditionist, plus articles on continuous sedation in the ICU, but only one article directly related to the nurse’s experience level, authored by [Dellon](http://www.ncbi.nlm.nih.gov/pubmed/?term=Dellon%20ES%5Bauth%5D), [Lippmann](http://www.ncbi.nlm.nih.gov/pubmed/?term=Lippmann%20QK%5Bauth%5D), [Galanko](http://www.ncbi.nlm.nih.gov/pubmed/?term=Galanko%20JA%5Bauth%5D), [Sandler](http://www.ncbi.nlm.nih.gov/pubmed/?term=Sandler%20RS%5Bauth%5D), and [Shaheen](http://www.ncbi.nlm.nih.gov/pubmed/?term=Shaheen%20NJ%5Bauth%5D) (2009). The search was submitted to the Milwaukee VA Medical Center (VAMC) Medical Librarian for confirmation of findings, with, again, no directly relevant articles found.

At this point, the decision was made to search the question of how the nurse should safely provide care in robotics-assisted surgeries. The same databases were used. Keywords were again searched, using one word from each of the following list, with the connector *and.*

* Robotic
* surgery
* Nurse
* Skills, interventions, practices
* Safe, avoid, adverse, outcomes

Twelve relevant articles published within the past five years were identified as having potential relevance, and were retrieved in full text from the University of St. Francis library website, and from the VAMC library. Nine articles were ultimately included. Reasons for exclusion were that the article did not focus on the RN’s role in robotic-assisted surgery, and that the article was actually published more than five years ago. Moore’s (2011) article was excluded because its focus is Australian operating rooms, and staff roles are not clearly explained for translation to the United States context.

 A Google search revealed some of the same articles, hospital websites discussing their robotic surgery programs, a robotic surgery credentialing program, discussion board topics, and other web-based, non-peer reviewed articles. None of the findings were selected for inclusion.

A strength of this literature search is its broad spirit of inquiry, which allows the search to be flexible both to the needs of the organization and to the availability of information. Melnyk and Fineout-Overholt (2011) assert, “it is critical to cultivate a spirit of inquiry (i.e., a consistently questioning attitude towards practice) so that clinicians are comfortable with and excited about asking questions regarding their patients’ care as well as challenging current institutional or unit-based practices” (p.11).

A weakness of this search is the searcher’s inexperience with database manipulation. Melnyk and Fineout-Overholt state, “Clinicians looking for answers to their questions can access many sources of evidence reviews, synopses, summaries, and primary studies to efficiently and effectively locate the nuggets; however, it is often like finding the proverbial needle in a haystack” (p.42). Another weaknesses is the relative novelty of the robotics topic; “[s]ystematic reviews are the type of reappraised synthesis of studies that is the heart of evidence-based practice....However, there is often not enough quality research to address all clinical issues with a synthesis; there may be only a few primary studies that exist” (p.42). Articles that rank at the top of the Hierarchy of Evidence for Intervention/Treatment Questions (p.12) are indeed lacking.

**Matrix of Evidence**

Most articles do not report on an experiment; seven report on the author(s)’ knowledge, which may be informed by experience and research. Most articles contain reference lists, however it is not clear to what extent the authors have synthesized previous writings; in any case, none of these seven articles is a metasynthesis or systematic review. Neither are they experiments. These articles could potentially fall into higher levels of evidence than they do, were the authors basing their conclusions on experiments. This literature review can potentially elevate the authors’ knowledge, opinions, and recommendations from Level VII evidence to Level V, through systematically reviewing and synthesizing the findings of multiple expert opinions. Two articles are based on experiments. A summary of each follows:

**Brenner, Z.R., Salathiel, M., Macey, B.A., Krenzer M. (2011 Jul-Aug). Postoperative care for the robotic surgery bowel resection patient.** The authors do include a literature review, and observe that evidence is “lacking on the postoperative care for patients who have undergone robotic surgery” (p273). The authors observe that healthcare professionals require education on the robotic equipment, and that, while surgery durations and time between surgeries initially increase, times improve as staff gains proficiency. Another major observation, echoed by other articles in this review, is that, because patient hospitalizations are shorter, postoperative teaching must start immediately after surgery and be conducted efficiently. For patients with new ostomies, fluid and electrolyte balance are among nursing concerns. The authors observe that patients seem to require fewer opioids, and generally report satisfaction with their experience.

**Murray S. (2009, Winter). Nursing care for patients undergoing transoral robotic surgery.** The authors recognize a lack of evidence regarding the nursing needs of patients undergoing transoral robotic surgery (TORS). The authors discuss preoperative patient education, but it is not clear that the education differs significantly for traditional surgeries and TORS. Postoperative care is similar to standard surgery, in that the “focused physical assessment of this specialized patient population involves airway observation, pain assessment, speech assessment and swallow assessment” (p.11). TORS patients face a risk for obstructive oral edema due to soft tissue trauma from robotic positioning in the mouth. Continuous pulse oximetry and other respiratory assessment are important. The authors emphasize the importance of staff education, including mindfulness that surgical complexity may be high, despite the absence of incision.

**Pittman, G. (2013, March). Robotic surgery tied to temporary nerve injuries.**  This article reports a chart review, which finds that between six and seven percent of patients awake from robotic-assisted surgery with a nerve injury, due to positioning. Pittman reports that, “[m]ore than half of the injuries resolved within a month” (para. 7). Therefore the nurse should educate the patient that nerve injuries are a risk, and that they are likely to resolve independently. Intraoperative nurses should be aware of patient positioning issues. This is one of two articles with a level of evidence higher than VII; Pittman’s research is Level IV.

**Ramsey. R. (2012, March). Robotic gynecologic surgery: trends and nurse involvement at a regional hospital.** Ramsey discusses the indications and advantages of robotic gynecologic surgery, about which a nurse can educate patients. Operating room nurses must be educated on the technology; Ramsey asserts that nursing staff has a role in troubleshooting equipment. The scrub RN or tech drapes the robot, “loads and visualizes the robotic instruments entering the abdomen, verifies the robot instrumentations’ lives, and monitors instruments and equipment” (p.43). The dual-function RN helps to drape the robot. Ramsey reaffirms that surgery length and OR turnaround time decreases as the surgical team gains experience, that patient positioning is a significant issue, and that less post-operative pain is reported.

**Stanton, C. (2010). Establishing a robotic surgery program.** The RN should ensure that the patient has two IVs upon starting surgery, because it may be difficult to get close to the patient once the robot is placed. Stanton discusses a second time-out, robotics-specific, to occur after anesthesia induction. Stanton also emphasizes the importance of patient positioning, particularly in cases when the patient is at a steep angle.

**Sutton, S., Link, T., Flynn Manic, M.B. (2103, April). A quality improvement project for safe and effective patient positioning during robot-assisted surgery.** The authors conducted a quasi-experimental study, with two comparison treatments – Level VI evidence, due in part to lack of a control, or “standard treatment,” and due in part to lack of blinding. The study compares air-inflated positioning device and foam-padding positioning assistance. No significant difference was found, even after factoring in cost, perioperative preparation tine, skin integrity, and intraoperative patient movement. Foam padding was ultimately selected, with surgeon preference as the deciding factor.

**Thell, C.G. (2011, Sep). Patient Advocacy in Robotic Surgery.** Nurses should recognize that patients undergoing robotic surgery may have greater preoperative anxiety, and should ensure that patients receive adequate preoperative education. Thell recommends a robotics-surgery educator or coordinator, who would have a preoperative appointment with the patient; the same nurse would greet the patient in the preoperative holding area, answer final questions, and address any remaining anxieties. The nurse can use non-robot-specific techniques to relieve anxieties, such as facilitating a comforting preoperative environment by playing appropriate music, and by protecting patient modesty. The nurse can introduce the patient to all members of the surgical team, remain by the patient’s side during anesthesia induction, and, postoperatively, providing a warm blanket, making the patient presentable again, and showing trust for the recovery nurse. Thell states that a second circulating nurse may be necessary due to the high technology level, especially to monitor patient positioning. The educator or coordinator should follow-up with the patient, perhaps through a phone call.

**Thomas, C.C. (2011 Sep). Role of the Perioperative Nurse in Robotic Surgery.** Any institution which initiates a robotic surgery program should have a coordinator. Nurses should receive technology training, and be willing to train colleagues. They should maintain awareness of standards of care. Demonstration of knowledge improves patient satisfaction. Thomas echoes other points: that surgery times and set-up time swill decrease as the team becomes more adept, that patients often require less analgesia, and that earlier discharge changes the education process. Intraoperative nurses would be aware of what equipment is reusable, and for how many uses.

**Ulmer, B. (2010, May). Best practices for minimally invasive procedures.** All operating room staff should be educated on how to use and troubleshoot equipment. Nurses should know that the most common complications are organ perforation, thermal injuries, equipment malfunction, and electrosurgery-specific risks. Nurses should remain aware of, and use, best practices according to professional standards.

Table 1 – Matrix of Evidence

| Citation | Level of Evi-dence | Hypothe-sis, question, or purpose | Design | Sample | Data Collection instruments and procedures | Statistical Results, findings | Implications and Conclusions |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Brenner, Z.R., Salathiel, M., Macey, B.A., Krenzer M. (2011 Jul-Aug). Postoperative care for the robotic surgery bowel resection patient.  | VII | None | Not an experi-ment | N/A | N/A | N/A | Healthcare professionals face a learning curve. Patients may require less opioid medication. Shorter inpatients stays necessitate efficient teaching and fluid and electrolyte management for new ostomies. |
| Murray S. (2009, Winter). Nursing care for patients undergoing transoral robotic surgery.  | VII | None | Not an experi-ment | N/A | N/A | N/A | Nurse must assess airway and other respiratory indicators, plus pain, speech, and swallowing. Nurse must be aware of potentially high surgical complexity, despite no visible incision. Nurses should receive education on robotics methods and rationales for care. |
| Pittman, G. (2013, March). Robotic surgery tied to temporary nerve injuries.  | IV | None | Descrip-tive, retro-spective | 334 robot-assisted urology procedures | Chart review | 6-7% of patients had nerve injury after procedures, with varying times to healing | Patient positioning is key to prevent injury. Patients should be educated on risk of nerve injury, and that it's usually transient. |
| Ramsey. R. (2012, March). Robotic gynecologic surgery: trends and nurse involvement at a regional hospital. | VII | None | Not an experi-ment | N/A | N/A | N/A | Circulating RN drapes robot, performs specified duties under surgeon's direction. The scrub nurse sets up and monitors equipment, including the robot. |
| Stanton, C. (2010). Establishing a robotic surgery program.  | VII | None | Not an experi-ment | N/A | N/A | N/A | Patients should have two IVs. Nurse should use specialized time-out, and test for secure patient positioning before initiating surgery. |
| Sutton, S., Link, T., Flynn Makic, M.B. (2103, April). A quality improvement project for safe and effective patient positioning during robot-assisted surgery.  | VI | None | Quasi-experi-mental with two compar-ison treat-ments | 59 proce-dures | Chart review | No significant difference in cost, preparation time, skin integrity, or intraoperative movement between positioning with air-inflated positioning device and high-density foam padding | Foam padding selected due to surgeon preference. |
| Thell, C.G. (2011, Sep). Patient Advocacy in Robotic Surgery. | VII | None | Not an experi-ment | N/A | N/A | N/A | Patients may have increased anxiety, should receive preop education. Nurse educator should greet the patient on day of surgery. To relieve anxiety, music can play, the nurse should maintain modesty, be comforting presence. Postop, RN should make patient presentable, provide blanket and quiet environment, and show trust for the recovery RN. |
| Thomas, C.C. (2011 Sep). Role of the Perioperative Nurse in Robotic Surgery.  | VII | None | Not an experi-ment | N/A | N/A | N/A | Nurses should understand the equipment, be willing to train future team members, be flexible in scheduling, and be knowledgeable in minimally invasive surgery and standards of care. Perioperative care is the same as for any minimally invasive surgery. Shorter stays mean less time for patient education. |
| Ulmer, B. (2010, May).Best practices for minimally invasive procedures.  | VII | None | Not an experiment | N/A | N/A | N/A | Nurse should understand equipment, and know that most common complications are organ perforation, thermal injuries, equipment failures, and others specific to electro surgery. |

**Results**

**State of the science: Summary and analysis.**

Again, consideration was given to the articles’ standing in the Hierarchy of Evidence (Melnyk and Fineout-Overholt, 2011). All articles are expert opinion, level VII evidence, except two: Pittman (2013) and Sutton, Link, and Makic, 2013). Pittman (2013) reports results of a descriptive, retrospective chart review. Sutton, Link, and Makic (2013) describe results of a quasi-experimental study comparing two positioning devices. Neither article, however, discusses statistical analysis of findings. This represents a weakness; the reader cannot independently verify or deny the findings. Clearly, there is a dearth of experimental research on what an RN needs to know and do to safely provide care to patients undergoing robotics-assisted surgery.

None of the articles presented information that conflicted with another article, or even presented inconsistencies. Authors agreed that robotics-assisted surgeries can lessen analgesic requirements and patient recovery time. Drawbacks of robotic-assisted surgery include potential organ perforation, thermal injuries, equipment malfunction, positioning injuries, and electrosurgery-specific injuries (Ulmer 2010).

Three articles emphasize that the registered nurse should receive education on the robotics equipment and/or develop competencies for troubleshooting the equipment. Three articles discuss the learning curve faced by all Operating Room (OR) staff. Two articles discuss that shorter inpatient postoperative hospitalizations indicate a need for efficient patient teaching. Murray (2013) points out that nurses should be aware that although there is no incision, small or large, the internal body structures may remain delicate, or have internal sutures. Two articles (Pittman, 2013, and Sutton, Link, and Makic, 2013) discuss the importance of patient positioning to minimize nerve injuries and skin ulceration, respectively. Stanton (2010) uniquely stated that the patient should have two IVs, “to help prevent difficulty gaining access during surgery, once the robot is placed” (S113-114). Stanton also uniquely discusses development of a robotics-specific time-out. Both are compelling points; loss of IV access during surgery can cause major problems, such as loss of anesthesia and delay of rescue drugs in emergency situations, and time out is the “last chance” to verify the surgical plan.

 Multiple authors discuss the need for a robotics-surgery coordinator. Thell (2011) is the only author who proposes that this coordinator minimize anxiety by greeting the patient upon arrival for surgery.

So, experts seem to agree on the basics of nursing care for robotic-surgery patients, but more experimental research would bring stronger evidence to support them.

**Assessment of the Practice Environment**

The specific setting at the Milwaukee VAMC is an adult population, mostly male. The staff is energetic, and it seems that there is always someone starting a new project. Nurses are used to serving on committees, and participating in studies. Nurses are allowed time to do committee work. However, as noted, the staff has experience ranging from five years to more than 30 years; each nurse has a body of experience upon which they draw, which may or may not be based upon the strongest evidence, as verified by literature. The staff certainly has all the personality styles described by Rohm and Curry, and Rogers’s theory of diffusion of innovations has been observed taking place when other evidence has been implemented (Melnyk and Fineout-Overholt, 2011).

 Patients are also used to participating in projects – the Million Veteran Program has been seeking information and blood samples from a broad spectrum of veterans for over a year.

**Change Team**

 Melnyk and Fineout-Overholt (2011) state, “Organizational context (i.e., the environment or setting), including resources and administrative support, has been linked to the diffusion of EBPs throughout an organization” (p.287). Melnyk and Fineout-Overholt (2011) also observe, “Evidence-based practice mentors are another key ingredient for the sustainability of EBP…These healthcare professionals typically have (a) a master’s degree, (b) in-depth knowledge and skills in EBP; and (c) knowledge and skills in individual, team, and organizational change strategies” (p.288).Considering this, the perioperative and intraoperative Clinical Nurse Specialist would be an integral part of the change team. The APC interim manager and OR manager will be asked to participate, but may delegate this role to another. At least one staff nurse from each department (the OR, APC, and PACU) will be asked to participate.

**Change strategy**

Implement a Plan-Do-Study-Act (PDSA) cycle to develop a robotics-competent staff.

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| --- | --- | --- | --- | --- |
| **Objectives** | **Method/Plan** | **Responsibility** | **Completion Date** | **Measurable Outcomes** |
| **Plan:**Define and approve competency tool for each department  | Consult literature, experts, and external and internal evidence; after Change Team approves, present pilot tool to Shared Governance practice group  | Change team | 8 months from first meeting | Approved written competency with skills check-off |
| **Plan:**Plan implementation of competency | Utilize Melnyk and Fineout-Overholt’s (2011) text to support implementation of EBP. | Change Team | 2 months from Shared Governance Approval. | Majority of Change Team agrees on written implementation plan |
| **Do:**Implement competency tool as pilot | Seek volunteers to get “checked off” first – called “Innovators” or “Drivers” by Melnyk and Fineout-Overholt (2011, p.283-5). | Change team, volunteers | 4 months from “roll-out” of competency. | 25% of RNs have been observed providing robotics care, >70% have satisfactorily performed >80% of the skills on the competency  |
| **Study:**Evaluate effectiveness of competency | Evaluate – does care provided according to competency meet or exceed care standards? Does it result in high patient satisfaction? Does it meet efficiency measures? Are any unexpected outcomes observed?  | Change Team, with feedback from volunteer observers. | 2 months from completion of observing >90% of RNs. | Evidence to support changes to tool |
| **Study:**Revise competency | Subcommittees revise different parts, majority of the Change Team agrees to changes, a representative presents the final revised tool to Shared Governance Practice group | Change Team, Shared Governance Practice group | 4 months (6 months total for evaluation and revision of competency) | Majority of team agrees on tool to present to Shared Governance, tool is approved by Shared Governance |
| **Act:**Present finalized competency tool to entire staff | Change team meets, represents to Shared Governance, presents to entire staff at Staff meeting | Change team | 4 months from approval by Shared Governance | >90% of RNs have been observed providing robotics care, >70% have satisfactorily performed >80% of the skills on the competency |

**Evaluation Plan**

|  |  |  |  |
| --- | --- | --- | --- |
| Measurable Outcomes | Method and Tools for Measuring | Responsibility | Timelines |
| Zero or one incident report related to nursing-sensitive factors in robotics-assisted surgery outcomes (positioning injuries, skin breakdown, robot set-up delays, medication errors/ postop narcotic reversals, patient readmissions due to knowledge deficit, inadequate time-out, patient complaints) | Incident reporting system, Performance improvement (PI) data, peer reviews or root-cause analysis reports | Change Team | 6 months after large-scale roll-out of competency |
| Repeat evaluation |  |  | 1 year after competency implementation, and yearly thereafter |

**Resources**

 For the initial PDSA process, the primary resource required by the change team will be time for meeting, teaching, and observing skills demonstrations. As the robotics program grows, the hospital may want to consider certifying some nurses. Also, the OR may want to budget for the salary of a full-time robotics coordinator. The cost of positioning devices should be considered.

 Potential cost savings include shorter postoperative hospitalizations, fewer analgesic medications, potentially fewer surgical site infections, and less postoperative therapy and rehabilitation.

|  |  |  |
| --- | --- | --- |
| Monetary Expenses | Monetary Savings | Nonmonetary Resources required |
| If program expands significantly, cost-benefit analysis of purchasing another robot and its accessories should occur | Shorter inpatient hospital stays | Time for planning stage - draft competency tool and robotics nursing policy |
| Robotics Coordinator Salary | Fewer analgesics | Time to conduct pilot (“Do” Stage)  |
| Nurse Certification sponsorship or subsidy | Fewer surgical site infections | Time to revise competency (“Study” stage) |
|  | Less rehabilitation, physical and occupational therapy |  |
| Positioning device costs requires further research to determine savings or additional expense | Time to conduct all-staff education |

**Conclusions**

 Robotic-assisted surgery is an emerging specialty, use of which is growing (Stanton, 2010). It carries benefits and risks, but a knowledgeable and well-trained nursing staff can minimize these risks. Nurses must have specialized knowledge and skills to educate patients, set up and troubleshoot equipment, position patients, and perform focused physical assessments – in addition to their other standard skills. Judicious use of principles for organizational change and adult education principles can contribute to development of a staff competent in providing safe care to patients undergoing robotics-assisted surgery.

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Appendix A

### Template for Asking PICOT Questions

|  |
| --- |
| INTERVENTIONIn adults undergoing robotics-assisted surgery (P), how does safety procedures performed by the registered nurse (I), as compared with procedures performed by the registered nurse in non-robotics-assisted surgery (C) affect avoiding adverse events (O) within the perioperative period (T)?  |
| ETIOLOGYAre\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (P), who have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (I) compared with those without \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(C) at \_\_\_\_\_\_\_\_\_\_\_\_ risk for/of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(O) over \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(T)?  |
| DIAGNOSIS OR DIAGNOSTIC TESTIn \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(P) are/is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(I) compared with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(C) more accurate in diagnosing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(O)? |
| PROGNOSIS/PREDICTIONIn \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (P), how does \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (I) compared to \_\_\_\_\_\_\_\_\_\_\_\_\_(C) influence \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (O) over \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (T)? |
| MEANINGHow do \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (P) with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (I) perceive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (O) during \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(T)? |

Short Definitions of Different Types of Questions:

**Intervention**: Questions addressing the treatment of an illness or disability.

**Etiology**: Questions addressing the causes or origins of disease (i.e., factors that produce or predispose toward a certain disease or disorder).

**Diagnosis**: Questions addressing the act or process of identifying or determining the nature and cause of a disease or injury through evaluation.

**Prognosis/Prediction**: Questions addressing the prediction of the course of a disease.

**Meaning**: Questions addressing how one experiences a phenomenon.

Appendix B

**PICOT Worksheet and Search Strategy**

Name\_\_Erica Linn\_\_\_\_\_\_

**1. Define your question using PICO by identifying: Problem, Intervention, Comparison**

**Group and Outcomes.***Your question should be used to help establish your search strategy.*

Patient/Problem: Adults undergoing robotics-assisted surgery

Intervention: nursing skills and safety procedures

Comparison: adults undergoing non-robotics surgery

Outcome: avoid adverse events, optimuize outcomes

Time frame: perioperative period

**2. Write out your question**:

**3.** Type of question/problem: **Circle one:** Therapy **Prevention** Diagnosis Etiology Prognosis

**4.** Type of studies (research design) to include in the search:

 **Check all that apply:**

**Meta-Analysis Systematic Review** Randomized Controlled Trial

**Cohort Study Case Control Study Case series or Case Report**

Editorials, Letters, Opinions Animal Research In Vitro/Lab Research

**5.** List main topics and alternate terms from your PICO question that can be used for your search

* **Robotic**
* **surgery**
* **Nurse**
* **Skills, interventions, practices**
* **Safe, avoid, adverse, outcomes**

**6.** List your inclusion criteria –gender, age, year of publication, language – **adult population, publication within the past five years, focus on nursing role, English language**

**7.** List irrelevant terms that you may want to exclude in your search: **pediatric**

**8.** List where you plan to search, i.e. EBM Reviews, **Medline**, AIDSLINE**, CINAHL, PubMed**