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Robotic Team High Reliability Organization's Communication Evaluation Tool

Joanne F. Mercurio
Regis University

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Department of Nursing, Regis University

NR 706C DNP Project

Dr. Carol Wallman

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Abstract

Multidisciplinary team communication in robotic surgery presents several safety considerations for the intraoperative surgical patient. It is an important consideration since the surgeon and the operating room team are geographically distanced with the surgeon at the console, and the other team members situated at the patient bedside. Scrubbed team members are performing such functions as positioning the robotic arms as well as exchanging instruments, while the remaining interprofessional team members are coordinating multiple patient care activities. It therefore becomes imperative that the recognition of the potential for miscommunication is of paramount importance, and strategies need to be generated that will provide data to keep our patients safe. A Robotic Team High Reliability Organization's Communication Evaluation Tool was formulated by incorporating a previously purchased High Reliability Organization's (HRO) program at a North-East Level 1 Trauma Center in New Jersey and combining and implementing a previously valid reliable Interpersonal and Cognitive Assessment for Robotic Surgery or ICARS tool to construct a communication program that would improve the robotic team's safety culture. The project population sample included 11 gynecologic surgical residents and 12 robotic staff team members consisting of 2 surgical technicians, 5 nurses and 5 Registered Nurse First Assistants (RNFA's). Each participant provided demographic data via a questionnaire, a 15-question multiple choice pretest, observed and participated in an educational power point presentation, completed a posttest which consisted of the same 15 question pretest, and was evaluated by both the DNP student and surgeon who scored the participants on an ICARS tool Likert scale by recording 28 components of observational data from a provided scenario. A t-test was run for both residents and staff to document aggregate pre/posttest documentation indicating a statistically significant improvement in mean scores for both populations. Reliability statistics provided high Cronbach's Alpha scores for the Pre/posttest tool, and a high interrater reliability between the DNP student and surgeon evaluator. Paired samples t-test for the ICARS aggregate were split for staff robotic cases to compare the DNP student or Principal Investigator (PI) and the Surgeon Co-Principal Investigator (Co PI). The staff t-test that was run on number of robotic cases which indicated that the number of robotic cases completed by the staff was statistically significant since all staff completed 21 or more cases. A split t-test on the ICARS for the residents for years in program and number of robotic cases revealed a statistically significant difference. This was run on year two residents only due to number of cases. Since ICARS staff evaluation was performed first on a Wednesday and the residents on Friday by PI and Co-PI, results indicated improved interrater reliability between the testing of staff and residents. Thematic analysis revealed themes related to interprofessional teamwork and communication, safety measures unique to robotic surgery, and the importance of an HRO program. Limitations of the study included sample size, use of a simulated operating room (OR) rather than live surgery, only gynecologic surgical residents, all of the robotic OR staff who had participated in the project had been involved in 21 or more robotic cases, as opposed to the residents who had a varied number of cases, SPSS only analyzing residents in year 2 of the program, and finally, in the ICARS observational evaluation, an anesthesia provider was not part of the team participating in the study. The findings of the project supported instituting a formalized program on robotic team communication utilizing this project since it's statistically significant data, along with evidence-based practice supporting education, has provided proactive solutions to eliminating communication barriers leading to best practices.

Keywords: Robotic surgery, Communication, High Reliability Organization, Teamwork, Communication tool, Safety, Leadership, HRO

Executive Summary

Project Title: Robotic Team High Reliability Organization's Communication Evaluation Tool

Problem: The need to improve surgical communication was identified to minimize serious adverse outcomes. The Perioperative community needs to be proactive in finding solutions and eliminating communication barriers leading to best practices (Etherington et al., 2019, p. 1251).

PICO Statement: **Population:** Robotic team consisting of gynecologic surgical residents, Registered Nurse First Assistants (RNFA's), Registered Nurses, and surgical technicians, **Implementation:** Implementation of Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS)/High Reliability Organization (HRO) communication tool, **Comparison:** Review of standard HRO communication techniques, **Outcome/Goal:** To improve robotic team's safety culture. Project goals are that the multidisciplinary robotic team's safety culture will improve after learning HRO communication techniques.

Purpose: The purpose of this Quality Improvement project is to determine if utilizing a previously proven ICARS tool, while incorporating the organizations HRO Communication program for education, can improve the intraoperative robotic program's safety culture at an Academic Level I Trauma Center.

Objectives: The objective for this project is improved communication and safety as evidenced by the ICARS scores, and pre and post assessment scores. The need for the project is identified as a necessity of standardization of specialized effective robotic communication utilizing HRO communication techniques and the ICARS tool which will eliminate potential for breaches in safety.

Plan: The project is designed as a Quality Improvement project using convenience sampling from a group of multidisciplinary robotic team members including 11 Gynecologic surgical residents and 12 robotic Operating Room staff consisting of surgical technicians, Registered Nurses, and Registered Nurse First Assistants. Demographics and Pre assessments were obtained using a 15-question multiple choice test. This was followed by a presentation utilizing the ICARS tool, and the organizations HRO communication program followed by a post test. Lastly, the ICARS observational tool was then utilized by the DNP student and surgeon to evaluate all participants on a Likert scale.

Outcomes and Results: Statistically significant result outcomes included: Paired sample t-test for the residents (t: -4.481, $p<.001$) and a paired sample t-test for the staff (t: -5.448, $p<.001$). Staff number of robotic cases completed with the results indicating there was a difference and was statistically significant ($t = 2.887$, $p = .016$). Staff Demographics compared to the pretest with 1 correlation noted between age and degree ($r = .629$, $p = .029$), revealing a moderate to high level of correlation. Interrater reliability between the DNP student and surgeon facilitator revealed a Cronbach's Alpha for the Staff: .962 and .976, and the Cronbach's Alpha for the Residents: .679 and .681.

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To the Regis team who unselfishly dedicate their time and who are available day or night to guide and answer any questions. With their valuable guidance and support, I was able to produce a project that will hopefully enhance patient safety outcomes. Dr Carol Wallman my advisor, who was always there for me whenever I needed her, with her calm and reassuring attitude. Without her ongoing and constant support and encouragement, I would not have been as organized in all of my academic accomplishments. The tranquil nature of Dr Cheryl Kruschke who assisted me statistically in proving that my project provided significant data which supported an already valid and reliable tool. I am truly grateful that the Project site already incorporated the High Reliability Organization’s communication program which enhanced my ability to formulate a specific robotic evaluation tool.

Finally, I dedicate this project to my family: my husband Rich, my children Joe and Deanna, and my parents who encouraged me to strive for excellence in all of my scholastic endeavors. Their love and support the past three years, have provided endless moments of understanding and guidance that helped me achieve my dream.

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Robotic Team High Reliability Organization's Communication Evaluation Tool

Robotic communication among the interdisciplinary Operating Room (OR) team is vital to achieve optimal patient surgical outcomes. The ability to communicate in the OR has always presented with potential safety risks due to the unique intraoperative challenges due to masks being worn, multiple team members with varied roles performing multiple functions, as well as distractions from machine noises. The Joint Commission has specifically addressed Robotic surgery safety actions to consider, regarding improving OR team communication and recognizing that the OR team must communicate in different ways since the surgeon is positioned at a console away from the operating table, and the team members cannot see what the surgeon sees at the console (Joint Commission, 2021). This project's goal is to improve the robotics team communication techniques which impact patient safety.

Problem Recognition and Definition

Problem Recognition

Intraoperative communication is crucial to safe surgical outcomes. Little is known regarding robotic team safety enhancement outcomes while implementing a communication tool utilizing HRO communication techniques. Mathew et al. (2018) states that "intraoperative communication was identified as a factor affecting patient safety during robotic assisted and laparoscopic surgery while defining intraoperative communication as the communication and interaction between all members of the surgical team during the procedure from incision to skin closure" (Sevdalis et al., 2012, p. 6). To improve operating room team communication for robotic surgery, the team must communicate in different ways, since the surgeon is at the console and the OR team is at the patient bedside. This is an important consideration for this project to emphasize the communication barrier that exists since both roles are geographically distanced.

Purpose

The purpose of this Quality Improvement initiative is to determine if utilizing a previously proven ICARS tool, while incorporating the organizations HRO Communication program for education, can improve the intraoperative robotic program at a North-East Academic Medical (AMC) Level 1 Trauma Center in New Jersey, thereby improving safety. ICARS is an acronym for Implementation of Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS) and (HRO) is the High Reliability Organization (see Appendix A, C).

The project's facility includes a 24-room operating suite which utilizes four operating rooms specifically designed for robotic surgery. Approximately 2-4 robotic cases are scheduled per day in each room. Due to the large robotic surgery case volume, and the uniqueness of the surgical procedure, performance must be evaluated with a customized communication tool that will optimize patient outcomes. A major concern is the distance of surgical team members, and the potential for ineffective communication which has been reported to be higher in the robotic specialty. Tørring et al. (2019) cites "evidence-based team training concepts are used in many hospitals to train health professionals and improve surgical teamwork. Implementation of these programs improves communication and interdisciplinary collaboration in the operating room" (p.2).

The North-East Academic Medical (AMC) Level 1 Trauma Center had purchased and had previously taught a patented "HRO Safety Together Program", which specifically addresses successful communication techniques. "Healthcare organizations should adapt the learning tools used in HRO's following safety incidents; however, the way these tools or initiatives are implemented is critical, with studies indicating that poor non-technical skills being identified as contributing to patient safety incidents especially in the operating room" (Serou et al., 2021, p. 7).

Problem Statement

Surgical miscommunication is vitally important because it can potentially lead to serious adverse outcomes. The Perioperative community needs to be proactive in finding solutions and eliminating communication barriers leading to best practices (Etherington et al., 2019, p. 1251). As identified in this project, strategies need to be formulated that will provide data to keep patients safe.

PICO

PICO stands for population, intervention, comparison, and outcome. According to Terry (2018) "in order for the researcher to keep these elements in mind while developing a research question, PICO is frequently utilized" (p. 22). The PICO for this project is defined: Population (P): Robotic team consisting of gynecologic surgical residents, Registered Nurse First Assistants (RNFA's), nurses, and surgical technicians

Intervention (I): Implementation of Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS)/High Reliability Organization (HRO) communication tool

Comparison (C): Review of standard HRO communication techniques, and

Outcome (O): To improve the robotic team's safety culture

Project Question

Will the utilization of previously taught HRO communication techniques, improve the multidisciplinary robotic team's safety culture as evidenced by the ICARS communication tool?

Project Significance and Scope

The significance of the project is that robotic surgery is expanding and will require adaptation of the interaction of the interdisciplinary team, acknowledging that technical competency alone does not guarantee success without a combination of nontechnical skills (Wood et al., 2017).

The scope is a small sample consisting of those twenty-three interdisciplinary team members. There is anticipation of long-term progression to expand to not just gynecologic surgery residents, but to also include General, Urologic, Thoracic, and Bariatric specialties who perform robotic surgery.

Theoretical Foundation

Two theoretical foundations have been chosen as the framework for this project. Locsin's Technological Competency as Caring in Nursing and Transformational Leadership both contributed significant support to project processes. Locsin's theory was chosen because it is the only middle-range nursing theory that specifically addresses technological knowing within the coexistence of nursing, technology, and caring (Locsin & Purnell, 2015, p. 50). This theory focuses on technological creativity to express caring in nursing practice, with the goal of patient's wellness. "This theory bridges between Watson's Human Caring Theory and the phenomena of nursing technologies creativity in nursing practice that consists of elementary ideas stemming from Watson's theory" (Bahari et al., 2021, p. 8).

This communication tool will directly impact quality of care by keeping the patient safe through a regimented routine, and review of patient information as well as the technological aspect directly related to the surgical procedure. Since the World Health Organizations "timeout" is a process already occurring in the operating room, team communication has already been initiated prior to the commencement of surgery, and at the debriefing at the completion of the surgical procedure. This aspect becomes part of the PICO and affords natural progression of techniques throughout the project.

Transformational Leadership theory was chosen to support the project because "technology was found to mediate the relationship of team-building with personal effectiveness and job satisfaction" (Misra & Srivastava, 2018, p. 109).

Technology can be related to three variables noted in the Misra & Srivastava (2018) study:

1) Interdependence- the extent to which employees depend on others in their work group to perform their jobs
2) Routinization- the degree to which jobs in an organization are repetitive
3) Standardization- the degree of uniformity regarding procedures and material (p. 112).

These three interactions directly impact intraoperative team communication and must be examined during project education and evaluation.

Review of Evidence

Literature Review

The recurrent theme in the literature review was “the complexities with teamwork, intraoperative communication and disruptions during robotic assisted surgeries all pose a threat to patient safety, therefore outcomes” (Mathew et al., 2018, p.7).

To incorporate all aspects of the project, a literature review searching key terms included robotic surgery, communication, teamwork, safety, High Reliability Organization (HRO), communication tool, safety, and leadership. The initial search began with over 7,000 articles. Over 90 articles were narrowed to the time frame 2017-2022 with a search comprised of these key terms. The ICARS tool was found through this search. The primary database utilized was Google Scholar, with the Regis library being linked to the site, which provided full text articles through OVID, EBSCO Host, and CINAHL. At least three articles were listed as a reference from a previous article. Inclusion requirements focused on publications within five years, which was easily obtained through a custom year range at Google Scholar. It was important that the search culminated with a reliable valid tool specific to the project, which would support replication. Exclusion criteria included articles greater than five years and non-English. Thirty articles were incorporated with the highest priority focus on robotic communication. In the Systematic Review of the Literature, the final fifteen pertinent articles were chosen due to their Level of Evidence, and the incorporation of key themes such as robotic communication, HRO, teamwork and safety (Table 1).

Table 1

Systematic Review of the Literature

	Systematic Methods Used to Search Evidence
Key Search Terms/Phrases	Robotic surgery, Communication, High Reliability Organization, Teamwork, Communication tool, Safety, Leadership, HRO
Databases	Google Scholar, Ovid, EBSCO Host, CINAHL
Inclusion	• Publication last 5 years • Reliable Valid tools • Concentration on Level I systematic reviews • Surgical population • English language (tool from England)
Exclusion	• Articles > than 5 years (exceptions seminal theorist articles) • Non-English
Number of Articles Reviewed/Final Number	30 articles (Highest priority robotic communication) 15 final pertinent to project-Final refinement based on: • Level of Evidence • Ability to incorporate articles directly to project with themes such as: Robotic communication, HRO, Teamwork and Safety • Tried to find articles that included as many key terms as possible

The Summary of Evidence Levels Review (Table 2) demonstrates the wide variety of articles in each level. Although it is typically advantageous to search for the highest Level I articles (Systematic Review or Metanalysis), there were major contributions in the lower-level evidenced studies in this review. Key guidelines related to optimal project design were found in the Level VI

(Qualitative or Descriptive Study) articles. The two articles that provided the most pertinent supportive data for the project were: Raison et al. (2017), and Mathew et al. (2018).

Raison et al. (2017) provided the tool that was utilized for the project, and Mathew et al., (2018) focused on safety outcomes related to robotic surgery. Combining the literature in both articles contributes to the purpose statement in that the ICARS tool incorporates communication in a valid reliable tool, and the second article focuses on safety outcomes which is supported by teaching the “Safety Together” HRO education.

The other supporting articles detailed the separate themes of the success of HRO programs as well as studies examining safety and communication, with unique instances applying these themes specifically to robotic surgery.

Table 2

Summary of Evidence Levels Review

Levels of Evidence	Article Total	Article Author Year
Level I Systematic Review or Metanalysis RCTs	7	Carpenter & Sundaram (2017) Naresh et al. (2021) Cantu et al. (2021) Kiessling et al. (2017) Blackmore et al. (2018) Mathew et al. (2018) Granheim et al. (2018)
Level II Randomized Controlled Trial	3	Dubin et al. (2017) Raison et al. (2017) Stucky et al. (2020)
Level III Controlled Trial without Randomization	3	Tschannen (2018) Tanioka et al. (2019) Onler et al. (2018)
Level IV Case-control or Cohort	4	Aghazadeh et al. (2015) Tabak & Lebron (2017) Lacerenza et al. (2018) Azadi et al. (2021)
Level V Systematic Review of Qualitative or Descriptive Studies	5	Moit et al. (2019) Monje et al. (2020) Tschannen & Tedesco (2018) Donnelly (2017) Etherington et al. (2019)
Level VI Qualitative or Descriptive Study	7	Collins et al. (2018) Fineout-Over (2019) Tørring et al. (2019) Locsin (2017) Fernandez et al. (2017) Pepito & Locsin (2019) Aveling et al. (2018)

Level VII Opinions or consensus	1	Johnson (2019)

Melnyk & Fineout-Overholt, (2015)

Thematic Analysis

Recurrent themes presented throughout the literature review process. This was primarily due to the common word search. For this project, the recurrent themes were evidenced by searching such words as: teamwork, communication, leadership, High Reliability Organization, robotic surgery, and safety. Due to the more finite points in the project, utilizing a full complement of pertinent terms revealed higher quality, and more significant specific articles to the project. For instance, implementing a communication tool for the project, necessitated the search for not only the best tool reviewed, but also tools that were specific to robotic surgery and teams. This then progressed to the value of teamwork. This information guided implementation of the tool while incorporating HRO techniques, and ultimately improving the robotic team's safety culture. Although robotic assisted surgery is generally seen as safe and effective, literature repeatedly expressed "the need for education and training that focuses on non-technical skills development, disruption prevention and alertness in anticipating and minimizing risk" (Mathew et al., 2018, p. 1).

Building upon the increased terminology, identification of a wider array of articles revealed patterns within the data necessary to support the project. Common themes revealed in the systematic review included: Teamwork and Communication, Leadership and HRO, and Robotics and Safety.

Teamwork and Communication

Teamwork and communication are the focus of the project, and the other themes revolve around these key concepts. Articles regarding teamwork and communication provided guidance on how to assess effective communication for teams. The most valuable article that provided the valid reliable ICARS tool was incorporated into two thematic categories and in this theme focused on non-technical skills evaluation through team interaction and communication. Teamwork and communication unique to the operating room was specific to this aspect of the project. The articles that provided the most pertinent supportive data in this themed category were: Kiessling et al. (2017), Raison et al. (2017), and Tørring et al. (2019).

Robotics and Safety

Robotics and safety are once again revealing themes related to the ICARS article. The second article that provided the most valuable support of the project was the systematic review article by Mathew et al. (2018). This article included not only the robotic and safety themes, but also incorporated teamwork and communication. The article by Stucky et al. (2020) included the multidisciplinary team members and their connection and interactions regarding communication effectiveness. The three articles that provided the strongest support for robotic and safety themes were: Mathew et al. (2018), Raison et al. (2017), and Stucky et al. (2020).

Leadership and High Reliability Organization

A major trait of a DNP candidate is being an effective leader. This trait bodes well for this project since the coordination of tasks and the ability to teach a certain population must be customized to the robotic operating room team. The themes of Leadership and HRO focused on the relationship between effective interventions between the leader and High Reliability Organizations. It further detailed how the leaders communicates with the interprofessional team, and how a HRO impacts communication. This correlates with the theory of Transformational Leadership related to the project. The three articles that each contributed important insight to guide the project with themes of leadership and HRO were: Cantu et al. (2021), Tabak et al. (2017) and Tschannen et al. (2018).

The project directly relates to the DNP role since it incorporates Essential VI related to interprofessional collaboration for improving patient and population health outcomes. A DNP prepared Advance Practice Nurse would refer to other providers who in this project include the residents. The project will ultimately impact the resident's current practice, as well as their future as independently practicing surgeons (Zaccagnini & Pechacek, 2021).

Market Risk Analysis

SWOT Analysis

The acronym SWOT stands for strengths, weaknesses, opportunities, and threats. The SWOT analysis assists in formulating an organized plan for the project. Jackson (2021) states that "a SWOT analysis is a high-level strategic planning model that helps organizations identify where they're doing well, and where they can improve, both from an internal and an external perspective" (p.1). The SWOT analysis for this project (Appendix B) revealed strengths such as the interdisciplinary robotic team, an identified need, and a previously established robotic program. It is cost effective due to the availability of protected educational time for residents and staff. Other added strengths include the DNP student who is an experienced robotic RNFA along with the Gynecology surgeon as evaluators for the project, as well as utilization of a valid reliable tool, and the importance of a preestablished HRO program. Weaknesses reveal an absence of availability of a structured robotic communication guide, as well as multiple robotic specialties, and an absence of a structured robotic curriculum related to communication. Opportunities are foreseen as the potential to incorporate the project into the surgical robotic curriculum, to improve safety in all specialties outside of robotics, and access to the program via the scheduled educational reserve time. The final consideration were threats to the project which include the gynecology surgical residents in the program who will not be specializing in robotic surgery after graduation, failure to "buy in" to the hospitals HRO program, and the OR staff being hesitant to take the initiative to voice their concerns.

Driving and Restraining Forces

The driving forces include support from the Vice President (VP) of Quality, the VP of Perioperative Services, and the Gynecological Surgery Division. Other driving forces include structure to the Robotic curriculum, and an HRO program specifically correlating with the ICARS tool for intraoperative safety.

Restraining forces identified include “buy in” from the OR staff and gynecology surgical residents, as well as residents’ unfamiliarity with the HRO program, (Residents currently utilize the TeamStepps program), and structure change intraoperatively.

Need, Resources, and Sustainability

The need for the project is a standardization of specialized effective robotic communication utilizing HRO communication techniques and the ICARS tool which will eliminate potential for breaches in safety. Resources included eleven Gynecology surgical residents, five RNFA’s, five nurses, two Surgical technicians. Additional resources included mandatory protected education time for the OR staff on Wednesday morning, for Residents on Friday morning, the OR Davinci robot, and Davinci robot availability in the Ambulatory Surgery operating room. Sustainability of the intervention indicated incorporation of a structured intraoperative communication initiative, and incorporation of the program into the robotic curriculum.

Feasibility, Risks, and Unintended Consequences

Feasibility- the implementation of this quality improvement project design was feasible and was appropriate due to anticipated improvement in patient outcomes, system performance, and professional development that results from a combined multidisciplinary approach in how the care is delivered (Backhouse & Ogunlayi, 2020).

Risks- included mild discomfort related to training and potential for anxiety.

Unintended Consequences- There were no unintended consequences identified during the implementation of the project.

Project Team/Stakeholders

The Project team reveals one Project Lead, the Surgeon Chief of Gynecology, fifteen Gynecology surgical residents, five RNFA's, five Nurses, five Surgical Technicians. Project support will be provided by the DNP student's mentor.

Stakeholders include gynecology patients requiring robotic surgery, Perioperative leadership, the Department of Gynecologic Surgery, the Quality Improvement and Safety team, the Robotic Committee, and of course the robotic team.

Cost-Benefit Analysis

The cost included the Nurse and Staff education, and the Gynecologic Surgical resident's education. Benefits include a decrease in never events, improvement of robotic teamwork, increased team satisfaction, and improved safety communication.

Project Objectives

Mission, Vision, and Goals

The Mission Statement for the project is to implement an evidence-based robotic surgery communication tool based on HRO techniques and evaluated by the ICARS tool to prevent miscommunication and promote intraoperative safety at the North-East AMC Level 1 Trauma Center.

The Vision Statement is that the robotic team at the North-East AMC Level 1 Trauma Center will utilize the Communication Safety Program as part of the robotic curriculum to prevent near misses by improving safety.

Project Goals were that the multidisciplinary robotic team's safety culture would improve after learning HRO communication techniques.

Process and Outcome Objectives

The objective for this project was improved communication and safety as evidenced by the ICARS scores. The outcome was that robotic communication safety would be measured by the ICARS scores. The need for the project was identified as a necessity of standardization of specialized effective robotic communication utilizing HRO communication techniques and the ICARS tool which will eliminate potential for breaches in safety. Availability of resources included the eleven gynecology surgical residents, five RNFA's, five nurses, two surgical technicians, mandatory protected education time which for the OR staff was on Wednesday mornings, and the residents on Friday mornings. Other resources included the Operating Room Davinci robots, and the Davinci robot availability in the Ambulatory Surgery Operating Room. Sustainability of the intervention involves incorporating a structured intraoperative communication initiative, as well as inclusion of the program into the robotic curriculum. Table 3 itemizes necessary Project Processes, Outcomes and Time Sequence organized and formulated for the project.

Table 3

Project Processes, Outcomes, & Time Sequence

Steps	Intervention	Timeline 2022
Step 1	Collect RNFA, Nurses, Surgical Technician Consent, Pre-education presentation survey/assessment	September 2022 Wednesday 7am-9am
Step 2	Collect Gynecologic Surgical Residents Consent, Pre-education presentation survey/assessment	September 2022 Friday 8am-12pm
Step 3	Present educational program ICARS Domains and HRO safety program	September 2022 Wednesday 7am-9am Friday 8am-12pm
Step 4	ICARS Assessment DNP Student/Gynecologic Surgeon mentor evaluators Observational	September 2022 Wednesday 7am-9am Friday 8am-12pm

Step 5	Post-education/ICARS evaluation assessment	September 2022 Wednesday 7am-9am Friday 8am-12pm
Step 6	Complete program evaluation	September 2022 Wednesday 7am-9am Friday 8am-12pm

Logic Model

The projects Logic Model (Appendix D) as well as its development is depicted in the Conceptual Diagram provided in Appendix E. To summarize the Logic Model for this project: Resources would include utilizing the HRO and ICARS tools, and sites such as the Operating Room and Ambulatory Surgery Unit robotic rooms. Activities include a program to be incorporated into the robotic curriculum with the ICARS tool that will be sustainable. Another activity incorporates teaching interactive HRO communication techniques “Safety Together” (Appendix C) and to schedule sessions acceptable to the populations and evaluators. Anticipated Outputs would be approval from the Vice Presidents, project time approval, presentation formulation, and improved communication as evidenced by ICARS results. Short term outcomes would reveal that the population will understand HRO communication techniques to impact safety. Anticipated Long term outcomes are to include the potential for utilization of HRO communication techniques to be implemented in the OR during all robotic surgeries, and that techniques will continue to be utilized in all surgeries after education. The project will be considered and approved as a mandatory program and reviewed quarterly. The Impact would be that communication will be improved compared to pre-education, sustainability will be accomplished, and incorporation of safety measures in post operative debriefings.

Population and Sampling

The population included the robotic team comprised of participants which are identified as the eleven gynecologic surgical residents, five RNFA's, five nurses, and two surgical technicians. There was a projected power analysis of .90 and α of 0.05, and an effect of .80 with a sample size of 30; whereas the actual results included a power analysis of .80 and α of 0.05, effect of .85 and sample size of 23 (Polit, 2010, p. 421). Inclusion criteria incorporated all available gynecologic surgical residents in the current program at the time of the project, as well as the robotic team consisting of RNFA's, nurses and surgical technicians. Exclusion criteria included all other specialty residents and perioperative staff that do not participate in Gynecologic robotic surgery.

Setting

The setting for the DNP project was in the Perioperative Department Operating Room and Ambulatory Surgery units at the North-East AMC Level 1 Trauma Center in New Jersey.

The organization's history reveals a small community hospital in 1958 transforming into a Level 1 Trauma Center serving all of Central New Jersey. It is a non-profit hospital affiliated as the principal hospital of one of the state's Medical School's. Services include standard American College of Surgeons with 965 beds complete with helipad. This Level 1 Trauma Center is identified as a prestigious cancer hospital in the state of New Jersey. "This hospital is a 600- bed facility that has 5,181 employees, 601 volunteers, 1,522 physicians, 450 Medical residents, 1,868 nurses, with 31,379 admissions, 2,553 births and 90,808 Emergency Room visits as well as 165,042 Outpatients" (Level 1 Trauma Center, 2021). "The organization functions as the leading academic health system in New Jersey known for advancing innovative strategies in high quality patient care, education, and research to address both the clinical and social determinants of health" (Level 1 Trauma Center, 2021). The volume of surgical robotic cases amounted to 1300 cases in 2021 which was attained by the utilization of four robotic rooms in the main operating room.

Methodology and Evaluation Plan

Research Design and Objectives

The project was conducted as a Quality Improvement design and is appropriate due to anticipated improvement in patient outcomes, system performance, and professional development that results from a combined multidisciplinary approach in how the care is delivered (Backhouse & Ogunlayi, 2020, p. 1).

Independent variables included implementing the ICARS tool and HRO program. Dependent variables included the robotic team members communication and knowledge of patient safety measures. The extraneous variables were documented to include pre-assessment, age, education, years in residency program, OR staff, and Novice to Expert pre-assessment. Sustainability is a key element when evaluating a quality improvement initiative and is anticipated for the project's future. The ICARS tool is appropriate because it has already been proven as a valid and reliable tool (Raison et al., 2017). Utilizing the organizations purchased HRO program allowed for easy transition.

The education proceeded with implied consent being obtained with demographic data form along with education. The pre-test was formulated utilizing the ICARS tool as a guide, in addition to the incorporation of the HRO communication techniques to be taught in the education session. HRO education on communication and safety supported the implementation of the ICARS tool (Appendix A).

Expected outcomes and ICARS components were the focus of the presentation. Both the DNP student and Gynecology surgeon evaluated every project participant for both sessions. A course evaluation was conducted to assess teaching and learning, and potential for future curriculum utilization.

Protection of Human Subjects

The Level of Institutional Review Boards (IRB) approval was identified as a QI project, with documentation approval from the North-East AMC Level 1 Trauma Center obtained regarding Letter of Intent and Organizational Letter of Agreement. IRB approval from Regis University was obtained once the proposal was accepted. CITI Program Training was complete (Appendix H), and confidentiality along with voluntary participation was obtained and documented the day of the project. Risks included mild discomfort related to training, and the potential for anxiety. Anticipated Benefits included education would be increased and would support patient safety. Recruitment was achieved by securing a Wednesday service line meeting day for the OR staff for education and project completion. This process was also applied to recruitment of the Gynecologic surgical residents attending their mandatory education meeting on Friday mornings. Enrollment consisted of any members of the robotic team that participate in Gynecologic robotic surgical procedures, and was offered to RNFA's, nurses and surgical technicians attending the mandatory education meeting the day of the project. Enrollment of the residents included all gynecologic surgical residents attending Friday morning mandatory education.

Treatment Protocol and Data Collection

The quality improvement project was implemented after the DNP student obtained approval from the project site's Chief Nursing Officer, Vice President of Perioperative Services, and with Agency Letter of Agreement (Appendix F) and Regis University Institutional Review Board (IRB) (Appendix G). Recruitment and enrollment involved networking with a Chief Gynecology resident and the DNP student's Surgeon CoPI evaluator to set up and schedule the project during a Friday morning allotted education time for the gynecologic surgical residents which included multiple networking sessions. Staff participation and coordination included securing a date with the VP of Perioperative Services for a Wednesday morning for the OR robotic staff during their protected Service Line education time. Enrollment for the residents included the entire residency team enrolled in the program at the time of the project, and those who were available to attend the meeting on the project day. The project was available to the robotic staff that Wednesday morning scheduled for the project.

Instrumentation: Description Reliability/Validity

The data collection process was vital to this project because it incorporated various levels of evaluative tools to produce statistically significant data for both populations. Each participant provided the following:

1) Demographic questionnaire (Appendix K)
2) A pretest (15 question multiple choice test) (Appendix L)
3) Observed and participated in an educational power point presentation
4) Posttest (same 15 question multiple choice test as pretest) and
5) Participated in the ICARS Observational component evaluated and recorded by the DNP student, who was the Principal Investigator or PI and the surgeon Co-Principal Investigator, Co-PI. (Appendix M)

Demographic Data, Power Point Education, Pre/Post test

The Demographic Data (Appendix K) was collected for both staff and residents on their recorded education day as previously described. Examples recorded were gender, age and education, and number of robotic cases that each group had participated in. This data was collected for all multidisciplinary participants in the project. This important demographic data for both robotic staff and gynecologic surgical residents were collected as the initial paperwork at the commencement of the project.

A fourteen-slide educational presentation was constructed by the DNP student utilizing the ICARS tool and the organizational HRO program at the project site.

The pre/posttest was formulated utilizing the ICARS tool as a guide, in addition to the incorporation of the HRO communication techniques taught in the education session. A fifteen question pre/posttest multiple choice test was constructed by the DNP student (Appendix L). This multiple-choice assessment was administered as a pretest after the collection of the Demographic data, as well as being administered as a posttest after the educational power point. Participants answered the post test questions, which was proctored, during or prior to the ICARS Observational portion of the project while the DNP student and surgeon conducted the ICARS portion.

ICARS Validity/Reliability

The ICARS tool (Appendix A, M) was utilized by both the DNP student and the Gynecology surgeon mentor. Both assessors evaluated the Nursing staff on Wednesday morning, and the Resident group on Friday morning. The teaching and evaluation all took place on the same day of education for each group. Validity and Reliability for this tool has already been proven (Raison et al., 2017). The education, pre and posttests, and the actual assessment utilized the tool as a guide. The tool also gathered necessary statistical data via the Likert scores for each project participant utilizing the 4 Domains, 7 Categories, and 28 Components. N/A applied on the Likert evaluation in appropriate categories, for instance, the console adjustments which the OR staff do not perform.

Project Findings and Results

Resident and Staff Pre/Post test

For the residents aggregate pre/posttest document, a t-test was run, and the results indicated that there was statistical significance (t: -4.481, p< .001). The pretest mean score was 1.87 and the posttest mean score was 1.98. For the staff aggregate pre/posttest document a t-test was run, and the results indicated that there was statistical significance (t: -5.448, p<.001). The pretest means score was 1.80 and the posttest mean score was 1.97. The paired t-test supports statistical significance in both paired samples pre/posttest means. These results answer the research question indicating there was improved results following completion of the intervention.

Table 4

Resident and Staff Pre/Post Tests

Paired Samples Test

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	aggrespre - aggrespost	-.109	.313	.024	-.157	-.061	-4.481	164	<.001	<.001
Pair 2	aggstaffpre - aggstaffpost	-.178	.438	.033	-.242	-.113	-5.448	179	<.001	<.001

Reliability statistics for the residents and staff presented with values for Cronbach's Alpha ranging between .679 and .976: moderate to high, and were documented as follows:

Table 5 ***Reliability Statistics Residents and Staff***

Reliability Statistics	Cronbach's Alpha	N of Items

Residents PI	.679	11
Residents Co-PI	.681	11
Staff PI	.962	12
Staff Co-PI	.976	12
PreResident (prepost tool)	.887	11
PreStaff (prepost tool)	.830	12

The pre/posttest tool which was formulated by the DNP student revealed a very high Cronbach's Alpha due to similar scores which indicated that the tool or test questions were highly reliable. The Cronbach's Alpha which measures internal consistency, indicated how closely related the sets of items are as a group (PI= DNP student, Co-PI, surgeon). Interrater Reliability indicated agreement between the raters, for example the extent to which the ratings of the two independent raters were intercorrelated.

Split Test- the T-Test ICARS: Staff Robotic Cases

Results of the split test of t-test ICARS for staff robotic cases provided the following results:

1) Statistically repeated a paired samples t-test for ICARS aggregate for PI and Co-PI
2) The t-test results were split for the staff robotic cases to compare PI and Co-PI
3) For the staff the t-test was run on the number of robotic cases with the results indicating a difference that was statistically significant ($t=2.887$, $p=.016$). This indicated that the number of robotic cases completed by the staff was statistically significant
4) The mean score for the staff PI was 4.91, and the mean score for staff Co-PI was 4.45

5) It should be noted that all staff completed 21 or more robotic cases: this indicates the more cases that were completed, the better the results

Split Test the T-test ICARS: Resident Years in Program and Robotic Cases

Results of the split test of t-test ICARS resident's years in program and robotic cases provided the following results:

1) A repeat paired samples t-test was run for ICARS aggregate PI and Co-PI
2) Statistically split the file by years in program which did impact the mean scores pre/post tests for residents
3) A split file was run for number of robotic cases for the residents
4) A t-test was run for aggregate residents pre/posttest file and was then split for number of robotic cases indicating there was a difference between pretest mean score and posttest mean score which was statistically significant ($t= -4.500$, $p <.001$)
5) The t-test results were split for residents in year 2 only due to differences in number of robotic cases.
6) Results indicated there was no difference between PI and Co-PI observation results.
7) Interrater reliability of PI and Co-PI was established

The conclusion of this data revealed that the staff ICARS observation day (Wednesday) was performed first by the PI and Co-PI, followed by the resident ICARS observation day (Friday) performed by the PI and Co-PI, and these results indicated improved interrater reliability between the testing of staff and residents.

Limitations, Recommendations, Implications for Change

Limitations

There were limitations to the study. Some of the limitations noted included a sample size of 23 participants, and the use of a simulated operating room rather than live surgery. Only gynecologic surgical residents were part of the resident population which did not include other specialty residents. Another limitation was that all of the robotic OR staff who had participated in the project had been involved in 21 or more robotic cases, as opposed to the residents who had a varied number of cases. A limitation that also occurred in the statistical analysis revealed that SPSS was only able to analyze residents in year 2 of the program.

In the ICARS observational portion of the project, an anesthesia provider was not part of the team participating in the study; however, it should be noted that anesthesia interaction was identified in the scenario part of the ICARS tool component by the residents and staff who acknowledged their presence while being evaluated on the Likert.

Recommendations

Recommendations would include offering the program to other robotic specialty residents, and to involve staff that are new to robotics with less than 21 cases. As indicated in the limitation section it would be important to have an anesthesia provider participate in the program as well. It would be meaningful to be able to have the opportunity to recommend utilization of the program to be incorporated in the Robotic curriculum.

Implications for Change

It is essential that the use of the valid reliable ICARS tool be recognized as "supporting structured non-technical skills (NTS) training and the standardized assessment it provides will enable further research into improving safety and performance in robotic surgery" (Raison et al., 2017). With the imminent and ongoing advances in robotic surgery, it is also important to note that the ICARS tool will be applicable to all robotic training, allowing the robotic team to directly compare and assess their NTS not just while utilizing the Davinci robot, but can be applied to other robotic systems as well, as cited by Raison et al. (2017).

Timeframe

The project timeline is updated and itemized for each phase of the project and is all inclusive up to and including the final project defense (Appendix I). As previously depicted under Project Objectives, Table 3 details the project processes, outcomes, and time sequence for the project detailing chronological Steps, Interventions, and a specific Timeline for the project. A preliminary Context Data Base and Dictionary included identifying the objectives, as well as all data elements that were collected. This assisted in preparing for data collection, entry, and analysis.

Budget/Required Resources/Projected Costs

The first resource item for this project budget is the resident protected time provided by the Medical school, with the cost being incorporated in the resident's tuition. The second resource is the staff consisting of the RNFA's, nurses and surgical technicians' education time which is provided by the hospital since they are all employees. The cost varies according to the job title, education, years of experience, and certifications. Another resource would be the cost for demographic survey's, pre and post assessments, and post course evaluation. This cost was paid by the organization (Appendix J) and DNP student. It should be noted that if this project is replicated at other sites, education time may not be available as it is at the Level 1 Trauma Center; therefore, cost may potentially increase and vary.

Conclusion

In summary, this quality improvement project provided statistically significant data which determined that the utilization of previously taught HRO communication techniques, will improve the multidisciplinary robotic team's safety culture as evidenced by the ICARS communication tool as well as a pre/posttest. According to Almeras & Almeras (2019) "a system of intercommunication that is necessarily verbal and safe should be systematically taught, reinforced throughout the training phases, and can thereafter be maintained but relaxed as skills, experience, habits and a certain team dynamic are acquired" (p. 403). It is anticipated that since a formalized program on robotic team communication, in addition to its correlation to patient safety had not been formulated at the Level 1 Trauma Center, that this project be considered and offered since it provided statistically significant data, along with evidence-based practice to support education and evaluation of all robotic team members. It is the DNP student's goal that the project be incorporated into the robotic curriculum for all residents and all robotic team members practicing at the Level 1 Trauma Center, now and in the future. This will ultimately assist in the organization's goal of providing safe surgical patient care, therefore optimizing patient outcomes.

References

Almeras, C., & Almeras, C. (2019). Operating room communication in robotic surgery: Place, modalities and evolution of a safe system of interaction. *Journal of Visceral Surgery*, *156*(5), 397–403. https://doi.org/10.1016/j.jviscsurg.2019.02.004

Backhouse, A., & Ogunlayi, F. (2020). Quality improvement into practice. *BMJ*, m865. https://doi.org/10.1136/bmj.m865

Bahari, K., Talosig, A. T., & Pizarro, J. B. (2021). Nursing Technologies Creativity as an Expression of Caring: A Grounded Theory Study. *Global Qualitative Nursing Research*, *8*, 233339362199739. https://doi.org/10.1177/2333393621997397

Booth, A., Noyes, J., Flemming, K., Moore, G., Tunçalp, Ö., & Shakibazadeh, E. (2019). Formulating questions to explore complex interventions within qualitative evidence synthesis. *BMJ Global Health*, *4*(Suppl 1), e001107. https://doi.org/10.1136/bmjgh-2018-001107

Cantu, J., Tolk, J., Fritts, S., & Gharehyakheh, A. (2021). Interventions and measurements of highly reliable/resilient organization implementations: A literature review. *Applied Ergonomics*, *90*, 103241. https://doi.org/10.1016/j.apergo.2020.103241

Etherington, C., Wu, M., Cheng-Boivin, O., Larrigan, S., & Boet, S. (2019). Interprofessional communication in the operating room: A narrative review to advance research and practice. *Canadian Journal of Anesthesia/Journal Canadien d'anesthésie*, *66*(10), 1251–1260. https://doi.org/10.1007/s12630-019-01413-9

Jackson. T. (2021). How to do a SWOT Analysis with examples. *ClearPoint Strategy*. Retrieved: https://www.clearpointstrategy.com/swot-analysis-examples/#sect1

Joint Commission. (2021, March). *Quick Safety Issue 3: Potential risks of robotic surgery.* Retrieved: https://www.jointcommission.org/resources/news-and-multimedia/newsletters/newsletters/quick-safety/quick-safety-issue-3-potential-risks-of-robotic-surgery/#.YpJeCy-cbUo

Kiessling, C., Tsimtsiou, Z., Essers, G., van Nuland, M., Anvik, T., Bujnowska-Fedak, M. M., Hovey, R., Joakimsen, R., Perron, N. J., Rosenbaum, M., & Silverman, J. (2017). General principles to consider when designing a clinical communication assessment program. *Patient Education and Counseling*, *100*(9), 1762–1768. https://doi.org/10.1016/j.pec.2017.03.027

Locsin, R. C., & Ito, H. (2018). Can humanoid nurse robots replace human nurses? *Journal of Nursing*, *5*(1), 1. https://doi.org/10.7243/2056-9157-5-1

Locsin, R.C. (2022). Technological Competency as caring in nursing: A model for practice- Poster. *Florida Atlantic University: Christine E. Lynn College of Nursing*. Retrieved: https://nursing.fau.edu/uploads/docs/852/Locsin_Technological%20Competency%20Jerusalem(5).pdf

Locsin R. & Purnell M.: Advancing the Theory of Technological Competency as Caring in Nursing : The Universal Technological Domain. International Journal for Human Caring 19 (2) : 50-54, 2015

Mathew, R., Markey, K., Murphy, J., & Brien, B. O. (2018). Integrative Literature Review Examining Factors Affecting Patient Safety with Robotic-Assisted and Laparoscopic Surgeries. *Journal of Nursing Scholarship*, *50*(6), 645–652. https://doi.org/10.1111/jnu.12437

Misra, S., & Srivastava, K. B. L. (2018). Team-building Competencies, Personal Effectiveness and Job Satisfaction: The Mediating Effect of Transformational Leadership and Technology. *Management and Labour Studies*, *43*(1–2), 109–122. https://doi.org/10.1177/0258042X17753178

North-East Academic Medical Level 1 Trauma Center. (2021, November 9). *Wikipedia.* Retrieved at organization site.

North-East Academic Medical Level 1 Trauma Center. (2020). Patented Safety Together Program. ***Non-transferrable: for classroom use only with permission from system VP of High Reliability.***

Polit, D. F. (2010). *Statistics and data analysis for nursing research* (2nd ed). Upper Saddle River, NJ: Prentice Hall.

Raison, N., Wood, T., Brunckhorst, O., Abe, T., Ross, T., Challacombe, B., Khan, M. S., Novara, G., Buffi, N., Van Der Poel, H., McIlhenny, C., Dasgupta, P., & Ahmed, K. (2017). Development and validation of a tool for non-technical skills evaluation in robotic surgery—The ICARS system. *Surgical Endoscopy*, *31*(12), 5403–5410. https://doi.org/10.1007/s00464-017-5622-x

Regis University. (2022). *University Assessment and Outcomes: The Regis Nine.* Retrieved: https://www.regis.edu/about/offices-services/office-of-the-provost/assessment-outcomes

Serou, N., Sahota, L. M., Husband, A. K., Forrest, S. P., Slight, R. D., & Slight, S. P. (2021). Learning from safety incidents in high-reliability organizations: A systematic review of learning tools that could be adapted and used in healthcare. *International Journal for Quality in Health Care*, *33*(1), mzab046. https://doi.org/10.1093/intqhc/mzab046

Sevdalis, N., Hull, L., & Birnbach, D. J. (2012). Improving patient safety in the operating theatre and perioperative care: Obstacles, interventions, and priorities for accelerating progress. *British Journal of Anaesthesia*, *109*, i3–i16. https://doi.org/10.1093/bja/aes391

Springer Nature. (2022). Academic Permission to use ICARS Tool. *Nature Portfolio*. Retrieved: https://www.nature.com/info/additional-terms

Stucky, C. H., De Jong, M. J., & Kabo, F. W. (2020). Military Surgical Team Communication: Implications for Safety. *Military Medicine*, *185*(3–4), e448–e456. https://doi.org/10.1093/milmed/usz330

Tabak, F., & Lebron, M. (2017). Learning by Doing in Leadership Education: Experiencing Followership and Effective Leadership Communication Through Role-Play. *Journal of Leadership Education*, *16*(2), 199–212. https://doi.org/10.12806/V16/I2/A1

Tschannen, D., Dorn, R., & Tedesco, C. (2018). Improving knowledge and behavior of leadership and followership among the interprofessional team. *International Journal of Medical Education*, *9*, 182–188. https://doi.org/10.5116/ijme.5b30.9a84

Thomas, S. (2020*). DaVinci Xi surgical robot system.* Retrieved: https://drsherrythomas.com/2014/10/da-vinci-surgical-robotic-system/

Tørring, B., Gittell, J. H., Laursen, M., Rasmussen, B. S., & Sørensen, E. E. (2019). Communication and relationship dynamics in surgical teams in the operating room: An ethnographic study. *BMC Health Services Research*, *19*(1), 528. https://doi.org/10.1186/s12913-019-4362-0

W.K. Kellogg Foundation. (2004). *Logic Model Development Guide: Using logic models to bring together planning, evaluation, and action.* Retrieved: https://worldclass.regis.edu/content/enforced/281841-DN_NR707-XIN_XH40_22S8W1/Content/pdfs/LogicModel.pdf?_&d2lSessionVal=OiIcyqVnTVfrssMjVOdGxBAw2&ou=281841

Wood, T. C., Raison, N., Haldar, S., Brunckhorst, O., McIlhenny, C., Dasgupta, P., & Ahmed, K. (2017). Training Tools for Nontechnical Skills for Surgeons—A Systematic Review. *Journal of Surgical Education*, *74*(4), 548–578. https://doi.org/10.1016/j.jsurg.2016.11.017

Zaccagnini, M. E., & Pechacek, J. M. (Eds.). (2020). *The doctor of nursing practice essentials: A new model for advanced practice nursing* (Fourth edition). Jones & Bartlett Learning.

Appendix A

Measurement Tool/Instrument
ICARS Tool

ICARS Evaluation Tool

Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS)

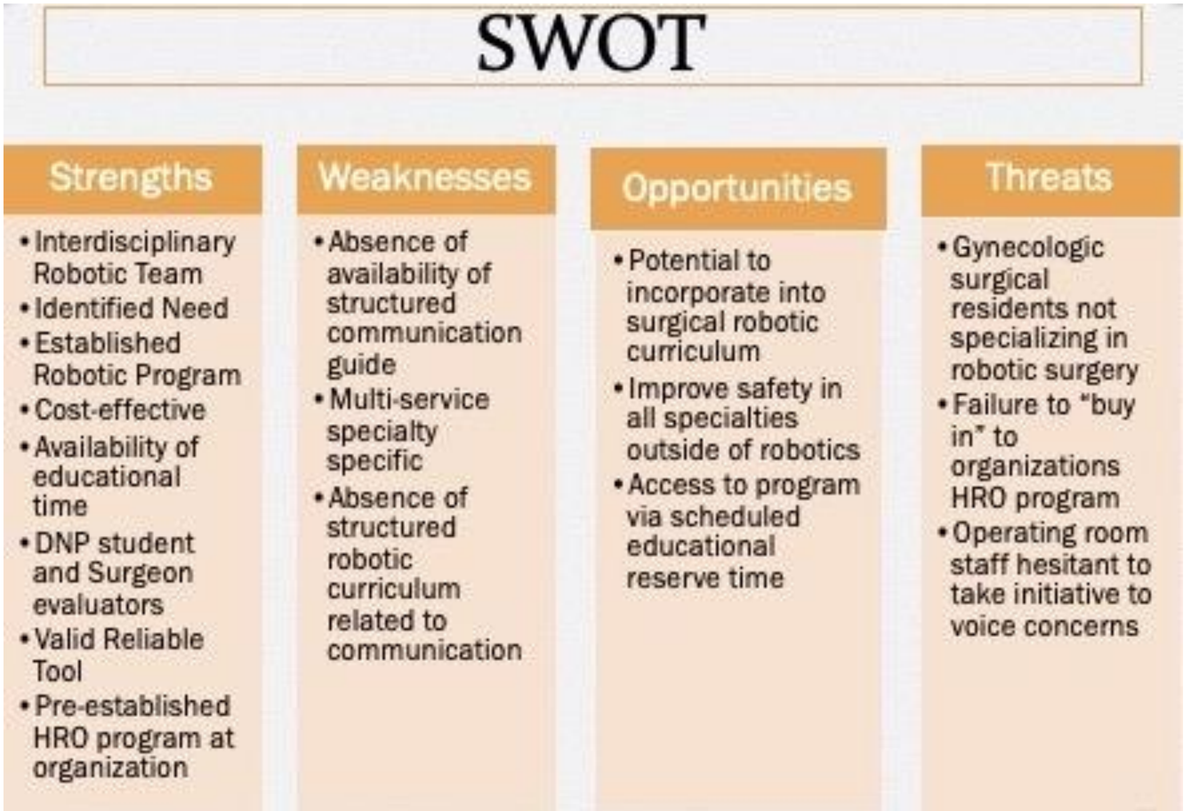
Candidate Name: .... Candidate Level: .... Date: ...... /..... /.........
Assessor's Name: .... Centre: ....

Domain	Category	Component	Score N/A	1	2	3	4	5
Checklist and Equipment	Checklist	Completes WHO surgical checklist	N/A	1	2	3	4	5
	Console	Appropriate robot settings and console adjustments set	N/A	1	2	3	4	5
Interpersonal Skills	Communication & Team skills	Effective verbal communication whilst at the console	N/A	1	2	3	4	5
		Appropriate Interaction with bedside assistant surgeon	N/A	1	2	3	4	5
		Appropriate interaction with anaesthetist and theatre staff	N/A	1	2	3	4	5
		Engages/ initiates in confirmatory feedback with theatre staff	N/A	1	2	3	4	5
	Leadership	Instructs the team accordingly and politely	N/A	1	2	3	4	5
		Effective management of workload and resources	N/A	1	2	3	4	5
		Co-ordination of activities and team from console	N/A	1	2	3	4	5
		Co-ordination of activities and team whilst at patient bedside	N/A	1	2	3	4	5
		Comfortable delegating tasks to team members	N/A	1	2	3	4	5
		Maintenance of professional standards	N/A	1	2	3	4	5
Cognitive Skills	Decision-Making	Appropriate decision in the event of equipment failure	N/A	1	2	3	4	5
		Appropriate decisions made at the bedside	N/A	1	2	3	4	5
		Prompt diagnosis of unforeseen/ unexpected patient event	N/A	1	2	3	4	5
		Fast decision making in emergency situation	N/A	1	2	3	4	5
		Generation, selection and implementation of solution option(s)	N/A	1	2	3	4	5
		Outcome review of management decision	N/A	1	2	3	4	5
	Situational Awareness	Awareness of patient status throughout the procedure	N/A	1	2	3	4	5
		Ability to deal with patient at the bedside when necessary	N/A	1	2	3	4	5
		Ability to adapt quickly if a problem arises	N/A	1	2	3	4	5
		Anticipation of potential problems/ difficulties	N/A	1	2	3	4	5
		Role awareness of surrounding team members whilst at the console	N/A	1	2	3	4	5
Resource Skills	Stress and Distractors	Understands personal limitations and asks for help if necessary	N/A	1	2	3	4	5
		Identification of stressor/distraction	N/A	1	2	3	4	5
		Maintenance of cognitive and interpersonal skills	N/A	1	2	3	4	5
		Maintenance of technical skills	N/A	1	2	3	4	5
		Professional and appropriate choice of resolution	N/A	1	2	3	4	5
Scoring Key	[N/A] Not Applicable	[1] Unacceptable	[2] Poor	[3] Acceptable	[4] Good	[5] Excellent		
Overall Score	[1] Unacceptable	[2] Poor	[3] Acceptable	[4] Good	[5] Excellent			

(Raison et al., 2017)

Appendix B

SWOT Diagram



Appendix C

HRO Program

(North-East Academic Medical Level 1 Trauma Center, 2020)

HRO Program Safety Sheet
Appendix C (cont)

Safety Together Cheat Sheet 2

Behavior Expectations	Techniques and Tools	Cheat Sheet
Speak Up for Safety *I will speak up and listen when there is a concern.*	1. **Escalate concerns using ARCC** (Ask a question; Request a change; voice a Concern; use Chain of Command) 2. **Stop the Line when uncertain**	1. Use **ARCC** to escalate safety concerns: Using the lightest touch when possible… **A**sk a question Make a **R**equest Voice a **C**oncern If no success… Use **C**hain of Command 2. **Stop the line** if you are uncertain about what you are about to do, if you have questions, if someone else raises a concern or question… **STOP** • Review your plan • Resolve the concern • Reassess your actions

(North-East Academic Medical Level 1 Trauma Center, 2020)

HRO Program Safety Sheet
Appendix C (cont)

HRO Program Safety Sheet (continued)

Accurately Communicate *I am responsible for clear and timely communication.*	1. **SBAR** for communicating problems (Situation, Background, Assessment, Recommendation) 2. **Repeat-and Read-Backs** 3. **Number and Letter Clarifications** 4. **Structured Handoffs**	1. **SBAR**: when you need to communicate about a problem or issue, provide the following information: **S**ituation: Who you're calling about, the immediate problem, your concerns **B**ackground: Review of pertinent information (task to be done, patient information, other conditions) **A**ssessment: • Your view of the situation ("I think the problem is..." or "I'm not sure what the problem is.") • Urgency of action ("The patient is deteriorating rapidly; we need to do something.") **R**ecommendation: Your suggestion for or request of the other person 2. **Repeat Back and Read Back (3-way communication):** Sender provides; Receiver repeats or writes down and reads back; Sender confirms accuracy by saying, "That's correct," or if receiver's response was not accurate, sender corrects the receiver and the communication loop begins again. 3. **Number and Letter Clarifications**: Avoid mistakes with sound-alike words or numbers (e.g. "C as in Charlie" or "15... that's one-five"). Use NATO phonetic alphabet as much as possible.
Focus on the Task *I will act with intention and focus.*	1. **Self-Check Using STAR** (Stop, Think, Act, Review)	Use **STAR** to self-check (bring forward your conscious attention) when you are in skill-based or auto-pilot mode and performing an action that is critical to reliability. **S**top: Pause one to two seconds to focus attention on task at hand. **T**hink: Think about what is to be done. Visualize action(s). **A**ct: Concentrate and perform the task. **R**eview: Check for the desired result(s).

(North-East Academic Medical Level 1 Trauma Center, 2020)

Appendix D

Logic Model

Logic Model Development
Robotic Team HRO Communication Evaluation Tool

RESOURCES	ACTIVITIES	OUTPUTS	SHORT & LONG-TERM OUTCOMES	IMPACT
In order to accomplish our set of activities we will need the following:	*In order to address our problem or asset we will accomplish the following activities:*	*We expect that once accomplished these activities will produce the following evidence of service delivery:*	*We expect that if accomplished these activities will lead to the following changes in 1-3 then 4-6 years:*	*We expect that if accomplished these activities will lead to the following changes in 7-10 years:*
Access HRO Safety Together program Utilization and customization of Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS) system to evaluate outcomes Obtain approval by VP of Perioperative Services and Chief of GYN to utilize paid education time for project. Obtain organizational approval for project: from Emily Halu MSN RN VP of High Reliability Explore a GoTo meeting option that can be recorded for optimal attendance, and potential	Create a program that will be incorporated in robotic training curriculum for residents and staff: ICARS system evaluation tool, that will be sustainable Utilize previously approved HRO safety program for project Develop pre and post survey utilizing ICARS system Teach interactive HRO communication techniques utilizing "Safety Together" behaviors Schedule sessions for Residents on Friday morning between 8am-12N, and OR staff	Approval from VP of Perioperative Services/Chief GYN, and VP High Reliability Project time allotment approval 90% anticipated attendance of residents and staff HRO presentation formulated Compile attendance list of robotic staff and GYN residents Improved communication as evidenced by increased ICARS results between residents and robotic staff	Short- Term: GYN residents and robotic operating room staff will understand re-invigorated HRO communication techniques and their impact on safety culture Residents and staff will utilize communication techniques during every robotic case in gynecologic surgery Long-Term: HRO communication techniques will be implemented in the operating room during all robotic surgeries Operating room staff and residents will continue to utilize techniques in all surgeries after education	Robotic team communication will be improved compared to previous documented data Incorporating safety measures in post-operative debriefing Sustainability will be documented in program's yearly mandatory education, and will be customized and re-evaluated to maintain current evidence-based practice Organizational benchmark as cited by RWJ Barnabas Health (2020): S- Speak up for safety A-Accurately communicate

Evaluation Logic Model Guide, W.K. Kellogg Foundation, Page 54

Logic Model
Appendix D (cont)

Logic Model (continued)

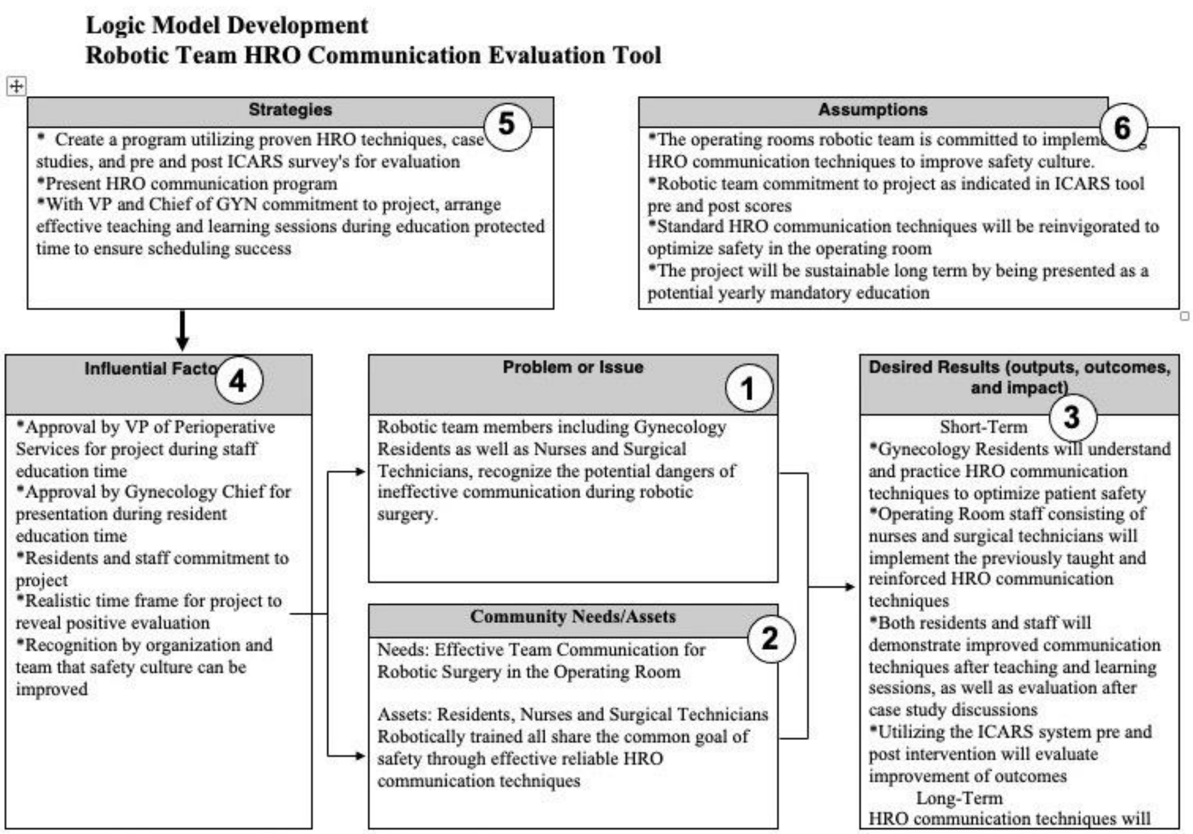
evaluation purposes Project participants will be GYN residents and operating room robotic staff Sites will be Medical School classroom already reserved for residents' education time. Robotic team education will take place in weekly reserved auditorium Construct program with the potential for future use as a mandatory yearly education program	education session between 7am-8:30 am on Wednesday morning Encourage and implement feedback from both disciplines At project completion collect post surveys After evaluation share results with both disciplines		Communication and Team skills will include: 1) Effective verbal communication while at console 2) Appropriate interaction with bedside assistant 3) Engages/initiates in confirmatory feedback with OR robotic staff (Raison et al., 2017) Project will be developed and approved as a mandatory program for robotic surgery curriculum, and reviewed quarterly	F-Focus on the task E-Exercise and accept a questioning attitude T-Thoughtfully interact Y-You and me together (Safety Together, 2020) National Benchmark-Patient Safety Indicators (AHRQ, 2015)

References
Agency for Healthcare Research and Quality. (2015). AHRQ Quality Indicators: Patient Safety Indicators. Retrieved: https://qualityindicators.ahrq.gov/Downloads/Modules/PSI/V50/PSI_Brochure.pdf
Raison, N., Wood, T., Brunckhorst, O., Abe, T., Ross, T., Challacombe, B., Khan, M. S., Novara, G., Buffi, N., Van Der Poel, H., McIlhenny, C., Dasgupta, P., & Ahmed, K. (2017). Development and validation of a tool for non-technical skills evaluation in robotic surgery—The ICARS system. *Surgical Endoscopy, 31*(12), 5403–5410. https://doi.org/10.1007/s00464-017-5622-x

Evaluation Logic Model Guide, W.K. Kellogg Foundation, page 54.

Appendix E

Conceptual Diagram



Evaluation Logic Model Guide, W.K. Kellogg Foundation, Page 57

Conceptual Diagram (continued)

CONSTRAINTS
*Short time frame of the QI project
*Restriction to Robotic Team service line (GYN residents, robotic nurses and surgical technicians, even though this is my population it is a pro and con)
*Resident and staff level of experience (novice-expert) with robotic knowledge as well as varying levels of HRO knowledge
*Individual history of teamwork effectiveness
*Utilizing only the "communication" portion of the ICARS tool for evaluation
*Unforeseen issues
ICARS Specific Constraints:
a) while ICARS has proven past reliability, continuing evaluation is required to test stability over time as well as determining appropriate benchmarks for training, b) use of simulated OR should be incorporated during live surgery and other surgeries (Raison et al., 2017)

be implemented in the operating room during all robotic surgeries
*Operating room staff and residents will continue to utilize techniques in all surgeries after education
Communication and Team skills will include:
1) Effective verbal communication while at console
2) Appropriate interaction with bedside assistant
3) Engages/initiates in confirmatory feedback with OR robotic staff (Raison et al., 2017)

*Project will be developed and approved as a mandatory program for robotic surgery curriculum, and reviewed quarterly

References
Raison, N., Wood, T., Brunckhorst, O., Abe, T., Ross, T., Challacombe, B., Khan, M. S., Novara, G., Buffi, N., Van Der Poel, H., McIlhenny, C., Dasgupta, P., & Ahmed, K. (2017). Development and validation of a tool for non-technical skills evaluation in robotic surgery—The ICARS system. *Surgical Endoscopy, 31*(12), 5403–5410. https://doi.org/10.1007/s00464-017-5622-x

Appendix F

Agency Letter of Intent and Agreement

DNP Project Letter of Intent

To: Claudia Pagani Assistant Vice President, Center for Professional Development, Innovation & Research
From: Joanne Mercurio MSN APN CRNFA

Subject: Robotic Team High Reliability Organization's Communication Evaluation Tool

Date: June 9, 2020

I am writing to obtain permission to conduct a quality improvement (QI) project in your facility with the purpose of improving robotic safety via this QI project. This project will be done to fullfill requirements for completion of the Doctor of Nursing Practice degree at Regis University, Denver, CO. The following information will review the study:

This project will employ a **Population-Intervention-Comparative-Outcome (PICO)** format for development of the study question to be investigated:

Population: Robotic team- Gynecology surgical residents, Registered Nurse First Assistants, Nurses, and Surgical Technicians

Intervention: Implementation of Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS)/High Reliability Organization (HRO) communication tool

Comparative: Review standard HRO communication techniques

Outcome: Improve robotic team's safety culture

Project Question: Will the utilization of previously taught HRO communication techniques improve the multidisciplinary robotic team's safety culture as evidenced by the Interpersonal and Cognitive Assessment for Robotic Surgery (ICARS) communication tool?

Project Significance: Importance to clinical practice:

1. Robotic surgery expansion/adaptation team interaction
2. Technical competency alone does not guarantee success

Type of Study: Quality Improvement

Participant Requirement: 30

Risks, Cost, and Benefits: Risks- mild discomfort related to training, anxiety. Benefits- increase in education and patient safety. Cost will include handouts and paper permission printing

Project Goals and Objectives:

The purpose of this QI initiative is to determine if utilizing a previously proven valid and reliable ICARS tool, while incorporating the organizations HRO communication program for education, can improve the intraoperative robotic program at a Level I Trauma Center thereby improving safety. The main goal of this project is to improve multidisciplinary robotic team communication

Project Goals/Objectives:

Goals: The multidisciplinary robotic team's safety culture will improve after learning HRO communication techniques. Objectives: Improved communication and safety as evidenced by ICARS scores. Robotic communication safety will be measured by ICARS scores

Permission is requested to conduct this quality improvement project at: North-East Academic Medical (AMC) Level 1 Trauma Center in New Jersey

I have included a template for the brief site approval letter that is required on letterhead from you.

Thank you for your assistance with completing my DNP Project.

Sincerely,

Joanne Mercurio MSN APN-BC CRNFA

References

Mathew, R., Markey, K., Murphy, J., & Brien, B. O. (2018). Integrative Literature Review Examining Factors Affecting Patient Safety With Robotic-Assisted and Laparoscopic Surgeries. *Journal of Nursing Scholarship*, *50*(6), 645–652. https://doi.org/10.1111/jnu.12437

Raison, N., Wood, T., Brunckhorst, O., Abe, T., Ross, T., Challacombe, B., Khan, M. S., Novara, G., Buffi, N., Van Der Poel, H., McIlhenny, C., Dasgupta, P., & Ahmed, K. (2017). Development and validation of a tool for non-technical skills evaluation in robotic surgery—The ICARS system. *Surgical Endoscopy*, *31*(12), 5403–5410. https://doi.org/10.1007/s00464-017-5622-x

Appendix G
Regis University IRB

REGIS UNIVERSITY

REGIS.EDU

Institutional Review Board

DATE:	August 9, 2022
TO:	Carol Wallman
FROM:	Regis University Human Subjects IRB
PROJECT TITLE:	[1875215-1] Robotic Team High Reliability Organization's Communication EvaluationTool
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF NOT RESEARCH
DECISION DATE:	August 9, 2022

Thank you for your submission of New Project materials for this project. The Regis University Human Subjects IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

The project may proceed as written.

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

If you have any questions, please contact the Institutional Review Board at irb@regis.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Regis University Human Subjects IRB's records.

Appendix H

CITI Training Certificate

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Joanne Mercurio (ID: 1776228)
- **Institution Affiliation:** Rutgers- The State University of New Jersey (All Campuses) (ID: 757)
- **Institution Email:** jomercurio@comcast.net
- **Institution Unit:** operating room
- **Phone:** (609)933-3727

- **Curriculum Group:** Human Research
- **Course Learner Group:** Social / Behavioral / Epidemiologic Research Investigators
- **Stage:** Stage 4 - Refresher Course

- **Record ID:** 36009567
- **Completion Date:** 19-Jun-2020
- **Expiration Date:** 19-Jun-2023
- **Minimum Passing:** 80
- **Reported Score*:** 91

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
SBE Refresher 1 - Instructions (ID: 943)	19-Jun-2020	No Quiz
SBE Refresher 1 – History and Ethical Principles (ID: 936)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Federal Regulations for Protecting Research Subjects (ID: 937)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Informed Consent (ID: 938)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Defining Research with Human Subjects (ID: 15029)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Privacy and Confidentiality (ID: 15035)	19-Jun-2020	4/4 (100%)
SBE Refresher 1 – Assessing Risk (ID: 15034)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Research with Prisoners (ID: 939)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Research with Children (ID: 15036)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Research in Educational Settings (ID: 940)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – International Research (ID: 15028)	19-Jun-2020	0/2 (0%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?kd324d5e3-fe87-4461-b63e-95f1a0189f48-36009567

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2

COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Joanne Mercurio (ID: 1776228)
- **Institution Affiliation:** Rutgers- The State University of New Jersey (All Campuses) (ID: 757)
- **Institution Email:** jomercurio@comcast.net
- **Institution Unit:** operating room
- **Phone:** (609)933-3727

- **Curriculum Group:** Human Research
- **Course Learner Group:** Social / Behavioral / Epidemiologic Research Investigators
- **Stage:** Stage 4 - Refresher Course

- **Record ID:** 36009567
- **Report Date:** 27-Jan-2022
- **Current Score**:** 93

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
SBE Refresher 1 - Instructions (ID: 943)	19-Jun-2020	No Quiz
SBE Refresher 1 – History and Ethical Principles (ID: 936)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Federal Regulations for Protecting Research Subjects (ID: 937)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Defining Research with Human Subjects (ID: 15029)	19-Jun-2020	2/2 (100%)
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SBE Refresher 1 – Research with Prisoners (ID: 939)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Research with Children (ID: 15036)	19-Jun-2020	2/2 (100%)
SBE Refresher 1 – Research in Educational Settings (ID: 940)	19-Jun-2020	2/2 (100%)
Research and HIPAA Privacy Protections (ID: 14)	18-Sep-2017	3/5 (60%)
SBE Refresher 1 – International Research (ID: 15028)	19-Jun-2020	2/2 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?kd324d5e3-fe87-4461-b83e-95f1a0189f48-36009567

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

Appendix I
Project Timeline

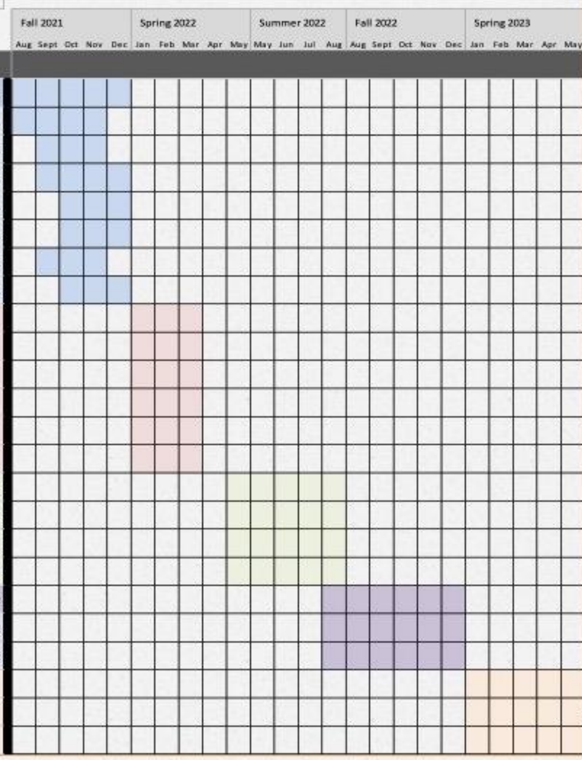
PROJECT TI Tool

Company Name Robert Wood Johnson University Hospital
Project Lead Joanne Mercurio MSN APN-BC CRNFA

Project Start: Mon, 8/23/2021
Display Week: 1

SIMPLE GANTT CHART b SIMPLE GANTT CHART by Vertex42.com
https://www.vertex42.com https://www.vertex42.com/ExcelTemplates/simple-gantt-chart.html

TASK	ASSIGNED TO	START	END
Phase 1	**Hospital Affiliation Agreement Begin NR706A (Fall)**	8/23/21	12/12/21
Task 1	Ongoing communication with Regis and hospital	8/23/21	11/23/21
Task 2	Weekly meeting with mentor Dr Lydia Weber	9/15/21	11/11/21
Task 3	Meeting with surgeon mentor weekly	9/1/21	12/12/21
Task 4	Met with Dr Buckley surgeon mentor to plan time to conduct presentation for project with residents during Friday educational	10/14/21	12/12/21
Task 5	Ongoing discussion with Dr Weber to fine tune PICO/schedule meeting with Barnabas system HRO VP	10/14/21	12/12/21
Task 6	Systematic review/reformulate PICO	9/20/21	11/29/21
Task 7	Ongoing Clinical Practice Hours	10/14/21	12/12/21
Phase 2	**NR 707- Clinical Practice Research for DNP (Spring)**	1/10/22	3/7/22
Task 1	Formulate project plan utilizing statistics	1/10/22	3/7/22
Task 2	Meet with Dr Weber regarding IRB	1/10/22	3/7/22
Task 3	Meet with Dr Buckley regarding setting education time	1/10/22	3/7/22
Task 4	Meet with OR Director/Robotic Coordinator to set time for education for nurses and scrub technicians	1/10/22	3/7/22
Task 5	Begin to gather data for IRB Proposal for NR 706B	1/10/22	3/7/22
Phase 3	**NR 706B DNP Project B/NR715B Application to Practice Clinical (Summer)**	5/2/22	8/21/22
Task 1	Create IRB project proposal	5/2/22	8/21/22
Task 2	Obtain IRB approval	5/2/22	8/21/22
Task 3	Ongoing meetings with Dr Weber	5/2/22	8/21/22
Phase 4	**NR 715C/NR 708 Application to Practice Clinical (Fall)**	8/22/22	12/11/22
Task 1	Conduct Project	8/22/22	12/11/22
Task 2	Gather Data for presention of project	8/21/22	12/11/22
Phase 5	**NR 706C/NR 702/NR715C/NR 799 Project, Clinical Hours, Capstone Defense (Spring)**	1/9/23	5/1/23
Task 1	Present Project	1/9/23	5/1/23
Task 2	Apply Statistical Analysis to Project/Final Defense	1/9/23	5/1/23



Appendix J
Project Budget

Resource Item	Provided by Site	Anticipated Cost for Project
Resident Protected Education Time	Medical School	Included in tuition
RNFA, Nurse, Surgical Technician Education Time	Project Site	Varied due to job title, education, years of experience, longevity & certification- (salaries not available)
Print Cost for pre/post assessments	Project Site	Provided by student and Project Site
HRO Program	Project Site	None- approved for use by VP HRO Projects Organizational System
Food & Set up (2 sessions)	DNP student	$126.18 total for 2 sessions
Total Cost		$126.18 Total

Appendix K
Demographic Data

DATE: ________ **PARTICIPANT ID:**____________________

Robotic Team High Reliability Organization's Communication Evaluation Tool

Directions:
Please complete the following questionnaire. Do not include your name. Only use your participant ID #.

All responses are voluntary and confidential and confirm consent. You may skip any questions you do not feel comfortable answering.

Upon completion, please submit your responses to the Co-Investigator- Joanne Mercurio MSN APN CRNFA

Gender	Male	Female	Identify as:	Prefer not to answer			
Age	18-24	25-34	35-44	45-54	55+		Prefer not to answer
Resident year in program	1	2	3	4	N/A		Prefer not to answer
Highest Degree or Level of Education	Surgical Technician	Associates	Bachelors	Masters	Other	N/A	Prefer not to answer
How many years have you worked in your position	0-5 years	6-10 years	11-15 years	16-24 years	25-34 years	35 years or more	Prefer not to answer
RN First Assistant years' experience	0-5 years	6-10 years	11-15 years	16-24 years	25+ years		Prefer not to answer
Number of Robotic Cases you have participated in	0-5 cases	6-20 cases	21 or more cases				Prefer not to answer

Appendix L
Multiple Choice Pre/Post Assessment

Date: ___________ Participant ID: _________

Robotic Team High Reliability Organization's Communication Evaluation Tool
Multiple Choice Assessment
Please Choose the Best Answer

1) Prior to a patient going to sleep, the WHO safety checklist should include the patients:
   a) Birthdate, allergies, and time of arrival to hospital
   b) Name, birthdate, and medical record number
   c) Name, birthdate, and the name of the person who is taking the patient home

2) After the resident checks for appropriate settings on the console, the resident will:
   a) Verbally communicate progression and selection of instruments with the bedside team
   b) Instruct the bedside team to insert robotic ports
   c) Begins procedure since console settings are correct

3) What is the recommended chain of events intraoperatively when the resident asks for a needle holder exchange in arm 3, the bedside team:
   a) Immediately removes the instrument from arm 3
   b) States they are removing the instrument from arm 3 and check with the anesthesia team prior to commencing
   c) States they are removing the previous instrument from arm 3, then state they are inserting the needle holder after previous instrument is removed

4) It is recognized during the surgery that pneumoperitoneum has decreased while performing the procedure. The resident's first action would be to communicate with the team:
   a) That the pneumoperitoneum is being lost, request immediate troubleshooting of inflow of CO_2
   b) Loudly notify the team that there is a problem that needs to be addressed
   c) Immediately undock the robot with instruments still in cannulas

5) The bedside team realizes one of the robotic instruments is on its last life prior to use, what would be the responsibility of the team:
   a) Notify the resident that they should not use the instrument because this is its last life
   b) Have another of the same instrument available in case
   c) There is no need to notify the resident because the instrument is still acceptable, and no backup is necessary

6) One of the robotic arms is not accepting the instrument on insertion, and is flashing yellow, the first step that the resident and bedside team must coordinate is:
   a) Read what the bedside monitor is identifying as the problem
   b) Ask for a different instrument immediately
   c) Undock the cannula while the instrument is still inserted

7) While the resident is at the console intraoperatively, the scissors they are using are not coagulating tissue. The first response from both the resident and team would be:
   a) Replace the scissor with a new one
   b) Remove and reinsert the same scissor
   c) Check the green cautery cord

8) Where is the sterile emergency release kit located?
   a) On the vision cart
   b) Hanging on the surgeon console
   c) In the sterile Robotic tray

9) The resident or OR staff is being asked to perform a complicated task they have not ever performed. What would be the best response?
   a) Identify that they have never performed task, and ask for assistance
   b) Perform the task anyway, and not necessarily tell anyone
   c) Verbalize that they are upset, and that they are new and should not be expected to know everything

10) The resident or an OR staff member identifies that they are having problems troubleshooting various technical skills. What would be the best resolution of this problem?
   a) Ask to not assist in robotic surgery because they are not competent
   b) Review the davincicommunity.com skills portion online
   c) They can learn as they go intraoperatively

11) The bedside team has a concern that during the surgery the resident may possibly be getting too close to the ureter, what is next course of action:
   a) Alert the resident immediately about the problem and concern to "stop the line"
   b) The resident knows the anatomy, and should be fine
   c) The bedside team should loudly state "STOP" to prevent the resident from causing any damage

12) In the middle of the surgical procedure, the resident is at the console, and sees that one of the robotic arms is not moving optimally due to the patient's leg being in the way. What would the resident do to resolve the problem?
   a) Delegate the task to the bedside team
   b) Scrub in to fix the problem and move the leg
   c) Ask anesthesia team to fix the leg

13) It is determined that during the robotic procedure there is minimal uncontrolled bleeding. What steps would provide the optimal results:
   a) Discuss what to do with the bedside team, OR team, and anesthesia team
   b) Team would use the STAR method-stop, think, act, review
   c) Resident would immediately shout out to the entire team that it was a stressful situation that he/she is going to open the patient right away

14) The HRO safety program uses "ARCC" to promote safety together. ARCC stands for:
   a) Ask a question, make a request, voice a concern, and if no success use the chain of command
   b) Ask a question, review, voice a concern, and if no success use the chain of command
   c) Ask a question, make a request, voice a concern, and control the situation

15) An example of the HRO Safety Together communication safety technique-Repeat back and Read back (3-way communication) during robotic surgery involves:
   a) Resident asks for a 2-0 vicryl, RNFA puts the needle through the cannula, and states the needle is available
   b) Resident asks for a 2-0 vicryl, RNFA states the 2-0 vicryl is "coming in" to the abdomen, resident states that they have "got the suture" in the needle holder
   c) Resident asks for a 2-0 vicryl, RNFA states the suture is coming in and they drop the needle in place

Answer Key

1) B
2) A
3) C
4) A
5) B
6) A
7) C
8) C
9) A
10) B
11) A
12) A
13) B
14) A
15) B

Appendix M
ICARS grading sheet/scenario specific

Jean Smith 61-year-old 9/28/61 presents for a Robotic Total Abdominal Hysterectomy BSO anticipated to take 2 hours. No allergies. No history of hypertension. Pre op Antibiotics-Ancef. Disposition-home post op
A resident is at the console, and a surgical technician and RNFA are at the bedside to assist you during the surgery, along with a circulating nurse, and anesthetist

WHO checklist-What would you discuss?

Correct patient using **2 identifiers-**	Name plus Birthdate and/or MR #	
Verified **Operative Procedure** on Consent		
Operative site marked by surgeon and documented if laterality	**N/A**	
Allergy assessed		
Difficult **airway**/aspiration risk		
Risk for **blood loss**-if applicable		
Availability of instruments		
Antibiotics, if applicable		
Fire Risk Assessment		

There are 9 identifiers
Likert scores

1= No identifiers, or 1 identifier (ie Name)
2= Names 2 identifiers
3= Names 3-4
4=Names 5-6
5=Names 7 or above

Category: Checklist & Console
Component:

-Completes WHO checklist

N/A	1	2	3	4	5

Please turn the robot on and ready. If you had an emergency, where is that button located?

Identify or locate the Clutch on the pedal, camera pedal, Cautery pedal and Focus bar.

Identify or locate the following buttons: Scope angle, Console height adjust, and Fault reset

-Appropriate robot settings and console adjustments set

N/A	1	2	3	4	5

Category: Communication and Team skills/Leadership

The pneumoperitoneum is being lost; how would you answer the following questions?

Demonstrate your interaction with the OR staff and anesthesia?

What is the first thing you would do?

What would you communicate to the staff and/or resident?

Component:

-Effective verbal communication whilst at the console

N/A	1	2	3	4	5

-Appropriate interaction with bedside assistant surgeon

N/A	1	2	3	4	5

-Appropriate interaction with anesthetist and (OR) theatre staff

N/A	1	2	3	4	5

-Engages /initiates in confirmatory feedback with theatre (OR) staff

N/A	1	2	3	4	5

Category: Leadership
Component:

-Instructs the team accordingly and politely

N/A	1	2	3	4	5

-Effective management of workload and resources

N/A	1	2	3	4	5

-Co-ordination of activities and team from console

N/A	1	2	3	4	5

-Co-ordination of activities and team whilst at patient bedside

N/A	1	2	3	4	5

-Comfortable delegating tasks to team members

N/A	1	2	3	4	5

-Maintenance of professional standards

N/A	1	2	3	4	5

Category: Decision making

With loss of pneumoperitoneum, how would you manage the equipment with continued loss of pneumoperitoneum?

Loss of pneumo continues:

How would you assess and manage the bedside?

What interventions are necessary to rectify the leak?

How would you assess outcome?

How would you determine if your interventions were successful?

Component:

-Appropriate decision in the event of equipment failure

N/A	1	2	3	4	5

-Appropriate decisions made at the bedside

N/A	1	2	3	4	5

-Prompt diagnosis of unforeseen/unexpected patient event

N/A	1	2	3	4	5

-Fast decision making in emergency situation

N/A	1	2	3	4	5

-Generation, selection and implementation of solution option(s)

N/A	1	2	3	4	5

-Outcome review of management decision

N/A	1	2	3	4	5

Category: Situational Awareness

After evaluation of loss of pneumoperitoneum, a leak is noted and fixed at the port site.

After the leak fixed, the robot reads "recoverable fault", what are your next steps? What is the indicated response?

When the console is reading "recoverable fault", what interactions are you anticipating from team members?

See Decision Making 2nd question for "ability to deal with patient at the bedside when necessary

Component:

-Awareness of patient status throughout the procedure

N/A	1	2	3	4	5

-Ability to deal with patient at the bedside when necessary

N/A	1	2	3	4	5

-Ability to adapt quickly if a problem arises

N/A	1	2	3	4	5

-Anticipation of potential problems/difficulties

N/A	1	2	3	4	5

-Role awareness of surrounding team members whilst at the console

N/A	1	2	3	4	5

Category: Stress and Distractors
Your team member has panicked and is unable to assist. What is your response?

What is the stressor?

Component:

-Understands personal limitations and asks for help if necessary

N/A	1	2	3	4	5

-Identification of stressor/distraction

N/A	1	2	3	4	5

-Maintenance of cognitive and interpersonal skills

N/A	1	2	3	4	5

-Maintenance of technical skills

N/A	1	2	3	4	5

Professional and appropriate choice of resolution

N/A	1	2	3	4	5