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Identification of Perioperative Barriers to Enhanced Recovery After Surgery in Colorectal Surgical Populations

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Identification of Perioperative Barriers to Enhanced Recovery After Surgery in Colorectal
Surgical Populations

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Identification of Perioperative Barriers to Enhanced Recovery After Surgery in Colorectal Surgical Populations

Enhanced recovery after surgery (ERAS) has evolved over the past 30 years through evidence-based interventions. Enhanced recovery after surgery uses a multidisciplinary and multimodal evidence-based approach to maximize patient recovery. Perianesthesia nurses are critical to its success and have an obligation to understand and participate in the process to optimize patient outcomes. Despite proving to decrease complications and duration of stay in colorectal surgery patients without following colorectal surgery, the implementation of ERAS in colorectal pathways have been met with barriers (Alawadi et al., 2015). Subramaniam & Horgan (2016) describe ERAS pathways as evidence-based interventions that eliminate dated practices based in tradition that hinder patient recovery.

This project is designed to address the identification of barriers in the implementation of ERAS in colorectal populations at specific perioperative identified levels for provider and patient crucial to quality and improvement practices.

The Clinical Nurse Leader (CNL) is optimally suited for identification of perioperative barriers for the implementation of ERAS as a clinician while focusing on complex nature of ERAS in the increasingly complex and diverse patient populations in multiple environments. Functioning in the role of systems analyst/risk anticipator, the CNL is able to review systems in place to improve quality of client care delivery while focusing on individual patient care to

evaluate and anticipate risks to safety with the goal of prevention of medical error (AACN, 2007).

Statement of the Problem

Integrated care delivery is an emerging model with growing adoption. The CNL utilizes evidence based practice in an organized manner to focus attention at the microsystem level to optimize multidisciplinary engagement of quality practices. Using a systematic approach, research and practice guidelines, the CNL will assist in identification of perioperative barriers for providers and patients in the implementation of ERAS in colorectal populations. Improvement programs should aspire to eliminate all preventable harm, increase value, and optimize patient experience concurrently using an interdependent, holistic, and integrated platform (Wick et al., 2015). The goal of modern perioperative care is not primarily to minimize the length of stay (LOS) but rather to improve the quality and outcomes of recovery following colorectal surgery. Enhanced recovery pathways in the colorectal surgical experience has both clinical and financial benefits. Widespread implementation has the potential for dramatic impact on healthcare costs, patient outcomes, and patient satisfaction. Through evidence based research, ERAS-care pathways have been proven to reduce surgical stress, maintain postoperative physiological function, and enhance mobilization after surgery. Effectiveness of these aforementioned interventions should be measured using clinically accepted auditing tools such as the ERAS Interactive Audit System (EIAS) and/or the Enhance Recovery Partnership Programme (ERPP).

Project Overview

Thoughtful identification of perioperative barriers specifically designated between medical staff (surgeons, anesthesiologists, and nursing staff) and patients will be addressed while proposing solutions to identified barriers. Provider identified barriers include time restraints, opposing colleagues (opposition to change) and logistics. Comprehensive guidelines with multi-institutional collaboration, increased education of the multidisciplinary team, and the sharing among sites and exchanges of successful and less than successful interventions through story have shown to resolve barriers. The success of ERAS depends on all members of the health care team working together and communicating any deviations from the protocol.

From a patient perspective, opposing personality (lack of understanding), comorbidities, and language barriers were commonly found. Resolution of opposing personality (lack of understanding) may be resolved through improved information and discussion with patient and family while empowering patient through perioperative process. Language barriers and health literacy assessment should be individually adapted in preadmission counseling to prepare patients to assume active role in their healthcare journey (Martin et al. 2017). Promotion of self-advocacy with learning tools to promote effective decision making through the delivery of patient specific levels of health literacy provide patients with effective decision making skills and feelings of empowerment for their future healthcare needs. An individualized pain management regimen optimizing multimodal pain management in conjunction with the patient's routine pain medications will be necessary during the hospitalization for a successful ERAS

experience. Inclusion of patient perspectives is critical to identify challenges and facilitators in the implementation of ERAS.

Medical management should optimize the effects of comorbidities such as diabetes, coronary artery disease and hypertension with patient medication adherence in the prehospital care of an ERAS patient. Smoking and alcohol cessation are important considerations to optimize recovery through multimodal and multidisciplinary approaches to care. Adequate nutritional status decreases the risk of infection, wound healing and length of stay (Crosson, 2018).

Semi-structured interviews using predefined questions were administered to colorectal surgeons (4) , anesthesiologists (6), and nursing administrators (4) including departments directly involved in the implementation of ERAS; surgery director and managers of OR, pre-op/PACU, and post-surgical unit. Additionally, staff RN's (4) from each individual specialty were involved in the interview process to gain insight of those involved in the optimization of patient care through ERAS pathways. Initiation of a dedicated ERAS team consisting of surgeons, anesthesiologists and nursing staff with continuous education to sustain adherence will be assembled to spearhead the changes in practice within the perioperative setting.

A systematic audit is essential to determine clinical outcome and measure compliance to establish successful implementation of the care protocols. The system should also report patient experience and functional recovery. Two such auditing tools accepted by the ERAS society include the ERAS audit system and the Enhanced Recovery Partnership Programme (ERPP) that

include a toolkit to measure compliance in ERAS. The EIAS is a web based, online, interactive software tool to monitor and control compliance with ERAS Protocols. ERAS protocols are proven through evidence based medicine (EBM) to support implementation, decision support and quality control in healthcare provider setting. Auditing tools should include data collection and a systematic process of audits to facilitate implementation. EIAS allows practitioners continuous follow up, analysis, adjustments and improvements, the perioperative team and its management can not only ensure improved patient outcome but also increase the understanding of the perioperative care process and thus the motivation of the staff involved. The ERAS database includes collection of data on patient demographics, treatment and outcomes and recording of compliance shown to influence outcomes. The ERAS audit system provides relevant feedback on clinical outcomes important for the improvement of care practices for providers, patients and key stakeholders.

Literature Review

The articles included in this literature review identify barriers of implementation of ERAS in colorectal surgical populations. Using mixed methodology, qualitative and quantitative research articles, and evaluations of programs with successful practices, identification of peri-operative barriers in the implementation of ERAS in colorectal surgical populations will be addressed. Using key words *colorectal*, *enhanced recovery after surgery*, *perioperative* and *barriers*, articles were identified through the Cumulative Index of Nursing and Allied Health Literature (CINHAL) database within the past five years and considered applicable for review.

Gramlich et al., (2017) used the Theoretic Domains Framework (TDF) in application of the Quality Enhancement Research Initiative (QUERI) model to analyze implementation of ERAS in colorectal surgery across six total sites within a single health system. In this program evaluation, the ERAS Interactive Audit System (EIAS) was used to monitor compliance with guidelines, length of stay, readmissions, and complications. Participant numbers included 352 pre-and 2235 post-ERAS implementation over an eight-month period in six Alberta hospitals. Researchers determined compliance at baseline at 40%, however improvement to 65% occurred with the implementation of best practice. Researchers determined the change in care practices resulted in a positive impact on patient and health system outcomes. Of note, cost savings ranged between \$2806 and \$5898 per patient (Gramlich et al, 2017).

Barriers were identified for improvement at each site and unit level for further development within Alberta Health Services. Patient-level barriers identified support as a positive indicator to successful care. Desiring to be involved and engaged through their surgical journey, patients stated concern over care following discharge. Additionally, patients did not feel able to self-advocate but desired learning tools to enable effective decision making (Gramlich et al, 2017). Educational strategies were identified as not updated, conflicting and confusing.

Provider-level barriers related to the culture of environment and acceptance. Resistance in the form of late adopters were identified, desire to witness failure, and loss of initial excitement were behaviors identified as barriers by staff. Practice changes to remove or reduce

barriers at each site were identified to future successful implementation (Gramlich et al, 2017). Finally, organizational-level barriers included difficulty in adapting to change, lack of departmental coordination, limited resources, rotation of residents, and the ability to meet the needs of unique populations.

Through semi-structured interviews using exploratory, mixed-method research design, Alawadi et al., (2015) effectively identified patient and provider barriers to change by all stakeholders prior to the adoption of ERAS pathways in colorectal surgery in a safety-net hospital at the University of Texas Health Science Center at Houston. Targeting general surgeons (5), anesthesiologists (8), nurses (6), and patients (18), three trained interviewers conducted an interview lasting 30 minutes using predefined questions specific to their stakeholder group. Using inductive coding methods, researchers ensured transferability, credibility, dependability, and confirmability (Guba, 1981) to analyze results. Theoretical saturation and consistency were achieved with numbers less than indicated by initial target sample.

Provider-level barriers by surgeons were identified as resistance to “cook-book” approach to practice, impaired adaptation to change, need for flexibility, and assumed resistance from anesthesiologists regarding preoperative fasting and carbohydrate loading (Alawadi et al, 2015). Surgical staff noted barriers in interdependent issues within demographics of this population: medical characteristics (high comorbidity, obesity, and presentation of advanced disease), health literacy (lower educational levels), and language barriers (large Spanish speaking population).

Patient-identified factors included general recovery (lack of quiet and privacy), social support, pain management, and patient education. Finally, Alawadi et al., 2015 summarize organizational-identified factors including lack of coordination across different departments, rotating residents (disruptive and inconsistent), and limited resources (equipment, nursing staff, and space).

A 2015 study of 92 patients at Jagiellonian University in Krakow, Poland identified three study groups (30 initial introduction of ERAS protocol, 30 following second cycle of training, and 32 following next audit) and the average compliance for ERAS within each group. Researchers summarized the effectiveness of change in perioperative care is to establish new protocols, assemble multidisciplinary team responsible for implementation, and appoint one individual responsible for continuous monitoring of effectiveness (Pedziwiatr et al, 2015). In this study, traditional training habits, lack of skill and fear of new and unproven workflows were identified as initial barriers to successful implementation. Doctor-patient cooperation, continuity of care and preoperative education were included in patient described barriers to care. Authors provided strong evidence for the need for a process of gradual change to allow managers of medical units and adoption of comprehensive guidelines by staff members. The dissolution of barriers in indoctrinated traditional practices and dogmas were identified as the “greatest difficulty” by authors.

Rationale

This project aims to identify barriers in the implementation of ERAS at specific perioperative microsystem level to identify factors proven to promote quality and improvement practices. The Plan-Do-Study-Act (PDSA) (Appendix A) will be offered to reinforce practice change and tailored interventions (Gramlich *et al*, 2017) using the Transtheoretical Model of Change (Appendix B) within the initial period of early adaptation. Using a systematic approach, research and practice guidelines will identify peri-operative barriers to implementation of ERAS in colorectal populations. Enhanced recovery pathways in the colorectal surgical experience has both clinical and financial benefits.

The quality improvement theme of the project is based on the IHI's quadruple aim (Appendix C); improving the patient experience of care, reducing the per capita cost of health care, improving the patient care experience, and the experience of the provider. Widespread implementation has the potential for dramatic impact on healthcare costs, patient outcomes, and patient satisfaction. In order to adopt change in daily clinical practice, identification of barriers and dissemination of multidimensional information throughout the healthcare team is necessary (Martin *et al.*, 2017).

The CNL is optimally suited for identification of perioperative barriers for the implementation of ERAS as a clinician. Functioning in the role of systems analyst/risk anticipator, the CNL is able to review systems in place to improve quality of client care delivery while focusing on individual patient care. With focus on the complex nature of ERAS in the

increasingly complex and diverse patient populations in multiple environments, the CNL evaluates and anticipates risks to safety with the goal of prevention of medical error.

Methodology

The Transtheoretical Model of Change (Appendix B), an integrative model, has been used for developing effective interventions to promote health change behavior. Focusing on the decision making of the individual, the Transtheoretical Model is a model of intentional change (Frochaska, Fava, Norman & Redding, 1998). Unlike alternative theories of change, Transtheoretical Model views change as a process transitioning through a series of five stages; precontemplation, contemplation, preparation, action, and maintenance.

As healthcare systems navigate through new approaches to care models, the CNL is strategically positioned to assist in this journey. With the evolution of healthcare from a curative model to a preventative focus, nurses are provided the opportunity to influence care using complexity science approaches to influence clinical outcomes from a patient-centered approach (Davidson, Ray & Turkel, 2011).

Challenging nurses to explore learning styles and theories outside of the existing, traditional, reductionism approach to healthcare comes with speculation and resistance. As standardized nursing and clinical care using reductionism models infiltrated healthcare, marked by high volume production and low costs, structured regimens came to define nursing work (Davidson, et. al, 2011). In order to break this cycle of strict adherence, we must contextualize care, we as nurses, holistically deliver to patients, families, and communities.

Using the Transtheoretical Model of Change to deliver this innovative and necessary care delivery system, a systematic, proven approach to change ensues. The *precontemplation* phase does not actively involve participants (nursing staff). The precontemplation phase is an ideal opportunity for leaders, physicians, informaticians, pharmacists, dieticians and key nursing members, to employ story theory communication. Through use of active listening, members are able to share their concerns and engage meaningful collaboration. Story theory can be used as an assessment tool to challenges team members face (Davidson, et. al, 2011). Those involved in the development and institutional change are positioned to identify communication practices that have failed in the past as the recipients are either uninformed or under-informed.

During the *contemplation* phase, thoughtful delivery to staff nurses occur. Use of story theory may bring forth essential individual elements that bring for interrelated factors that in turn transform the whole. This is an important time as staff nurses are acutely aware of the pros and cons of the change proposed. Contemplation and procrastination are frequently found in this stage.

Implementation of a well-rounded, patient specific colorectal bundle plan for perioperative care of colorectal surgical patients is initially introduced to staff through email, reader boards, and interactive training modules prior to delivery to patients. As nurses and physicians begin to buy-in to the proposed changes, the *preparation* stage sees participants intending to take an action-oriented approach to the proposed task. Communication through

multiple options of delivery allows for knowledge deficits by staff to be addressed prior to full implementation and further adjustments to the proposed ERAS system.

Full engagement of participants is found in the *action* stage. Attainable levels of criteria must be met in order for the action stage to be considered sufficient. Criteria set forth as key indicators for improvement by physicians (dressings, activity, hygiene, diet, and meds), provides nursing staff opportunity to holistically provide specific instructions to bridge the gaps previously identified to increase the occurrence of readmission, infection rates, and overall patient satisfaction. Vigilance against relapse is critical within the action stage (Velicer et. al, 1998). Each member of the team must remain engaged in optimizing patient specific care.

Finally, within the *maintenance* stage, prevention of relapse is necessary. However, new found confidence ranks higher than the temptation to relapse within this stage. Through use of distributed control, all parties engage in self-regulated behavior to achieve that goal, adapting and creating solutions to ensure balance (Davidson et.al, 2011). Providing IT support and addressing ongoing system concerns observed by team members will keep team members educated and engaged. Use of an adaptable system has elements that change in a dynamic manner.

Awareness and exposure to theories of change models such as Transtheoretical Model of Change by leaders within healthcare systems today allow for forward movement and active engagement of those who facilitate change.

Timeline

The application of this information is individualized for the healthcare system initiating change (Appendix H). Early identification of barriers allows for successful change practices to occur.

Expected Result

This project is designed to address the identification of barriers in the implementation of ERAS in colorectal populations at the perioperative microsystem level to identify factors crucial to quality and improvement practices. The key elements of an ERAS protocol include preoperative counseling, optimization of nutrition, standardized analgesic and anesthetic regimens, and early mobilization.

Financial Impact

The impact of ERAS on health economics at this time is limited due to inconsistency and few studies comparing ERAS to traditional open or laparoscopic colon resection methods. ERAS was associated with reducing the primary LOS at the two lead sites by 2.3 days equating to 1603 hospital days capacity. Readmissions were reduced by 7.9 % equating to 55 prevented readmissions and 660 hospital days. For those patients that were readmitted, ERAS was associated with reducing the LOS by 4.5 days equating to 293 hospital days. The total estimated gross cost savings were \$2,420,276 to \$4,575,496. The total cumulative intervention cost of ERAS during the analysis period was \$464,518. The net cost savings of ERAS were therefore

\$1,955,758 to \$4,110,977 or \$2806 to \$5898 per patient. Comparably, results of the sensitivity analysis showed the net cost savings per patient were \$2668 to \$5643 (Gramlich, 2017). More important than financial implication is the reduction of complications and postoperative hospital length of stay. These significant improvements to patient outcomes have major implications on the health system in terms of health system efficiency and potential cost savings. A preliminary economic analysis indicated that after accounting for intervention costs, the reductions in LOS, complications and readmissions generated a net cost savings ranging between \$1,955,758 to \$4,110,977 or \$2806 to \$5898 per patient.

Nursing Relevance

Pre-admission counseling begins important education for the patient and caregiver while allowing for identification of medical conditions before surgery. Consumption of carbohydrate drinks up to 2 hours before surgery and the elimination of traditional bowel prep have been proven to improve sense of well-being, decrease anxiety, decreased postoperative nausea and vomiting (PONV) and decreased postoperative insulin resistance. Intraoperatively, the RN should advocate for the use of regional anesthesia, minimally invasive incision, thermoregulation through forced-air warming, judicious IV fluids and minimizing external tubes (NG and foley catheter) and drains (JP). Postoperative nursing care includes the prevention of nausea and vomiting, multimodal pain management, early mobilization, early PO intake and early catheter removal. A structured implementation program, including a regular biweekly team audit of data on compliance and outcomes allows team members ongoing monitoring of effectiveness of

interventions. Real-time data checks helped teams improve and maintain high compliance to the protocol as well as maintain high-quality data. Data should be collected by well-trained nurse clinicians with in-depth knowledge of clinical aspects of colorectal surgery and outcomes measured in this study using EIAS or ERPP auditing tools in compliance with the colorectal society recommendation.

Ethical considerations including privacy and autonomy were maintained throughout the compilation of data for this project. ERAS is a widely accepted practice therefore does not require a formal ethics review. There are no potential conflicts of interest to report in the identification of barriers in the implementation of ERAS in colorectal surgical populations.

Implementation

Direct implementation of ERAS currently lacks resources and direct physician buy-in. Despite proving to positively impact patient experience and decrease overall costs, barriers remain in place to indicate movement toward change. Rather than attempting to overhaul perioperative procedures system wide, change practices could be implemented at individual centers guided by progressive physician influence.

Evaluation

Proposed changes to ERAS should be evaluated under the guidelines of EIAS while individually assessing patient understanding and compliance throughout the surgical and recovery experiences. For instance, under designated timeframes, wound healing, infection rates, readmission rates, return to independent living, and quality of life should be considered for

analysis. Patient centered outcomes and patient reported outcomes using qualitative narrative methods and quantitative experimental design, or mixed methodology provide researchers with information to guide promotion of ERAS implementation.

Conclusion

The implementation of evidence-based ERAS care into practice is challenging and requires commitment and change in clinical practice for all members of the healthcare team. With the expectation to reduce complications and LOS while improving patients' satisfaction and financial impact, ERAS pathways offer promising change for colorectal surgical populations.

The CNL is optimally suited in the adoption of ERAS in perioperative microsystems. Acting in the role of clinician, the CNL is positioned to identify barriers in the perioperative microsystem that hinder efforts to adopt ERAS pathways in colorectal surgical populations. The CNL is able to review systems in place to improve quality of client care delivery while focusing on individual patient care to evaluate and anticipate risks to safety with the goal of prevention of medical error as a systems analyst/risk anticipator.

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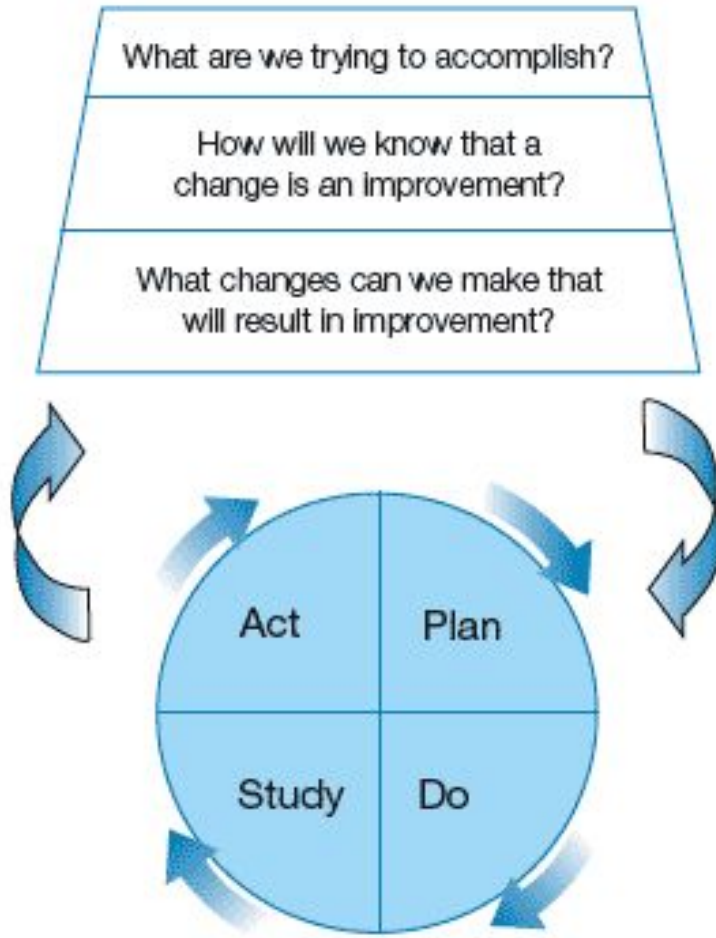
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Appendix A

Figure A1: Plan, Do, Study, Act (PDSA) Cycle

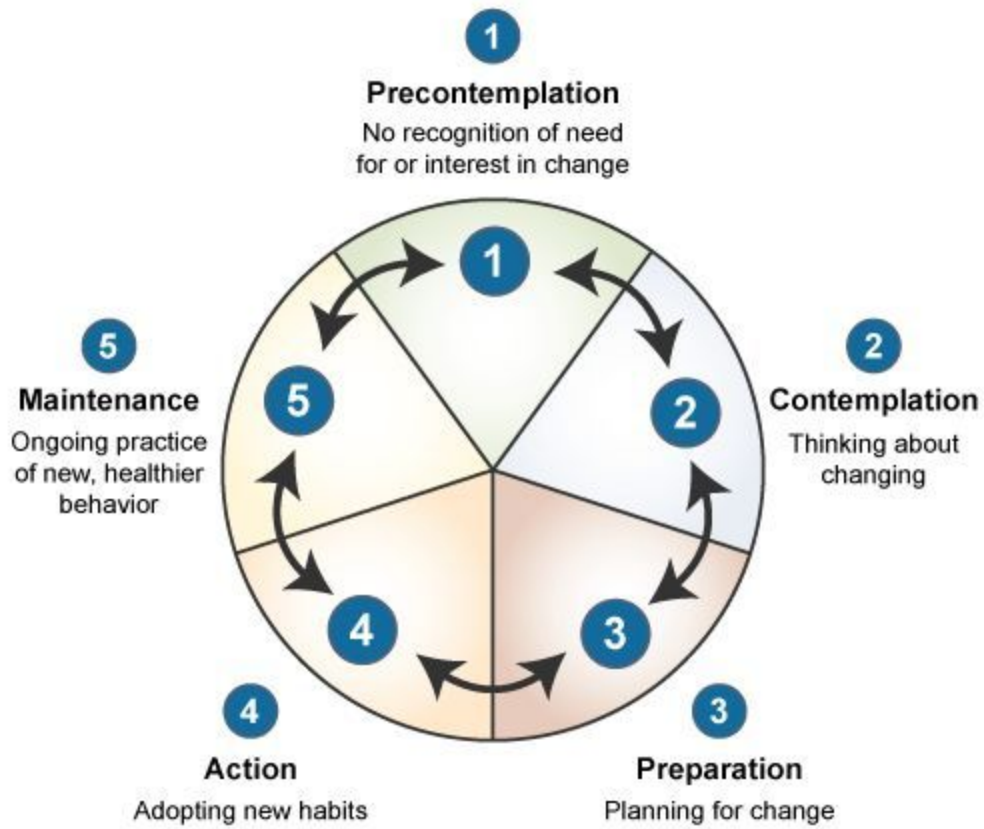


PDSA cycles and focuses the work around three simple questions:

- What are we trying to accomplish? Identification of barriers to ERAS in colorectal surgical populations
- How will we know that a change is an improvement? Decreased LOS and readmission rates, increased patient satisfaction and savings
- What change can we make that will result in improvement? Implementation of ERAS in colorectal surgical populations

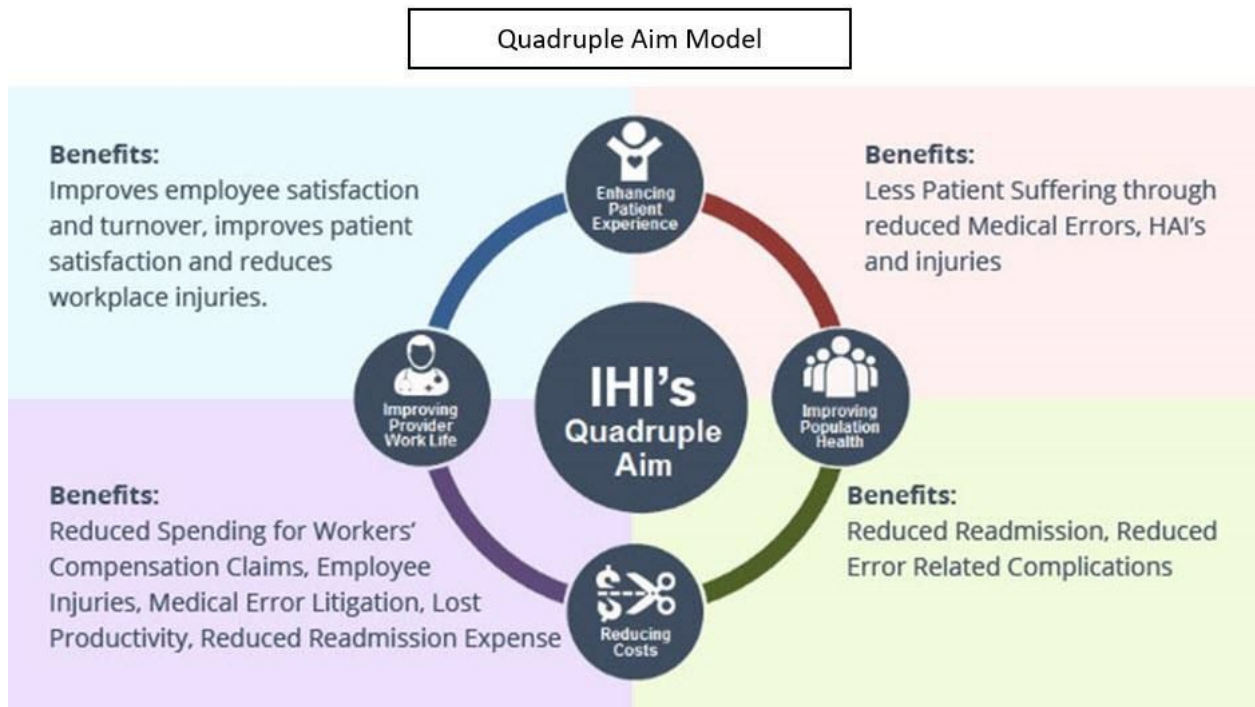
Appendix B

Figure B1: Transtheoretical Model of Change



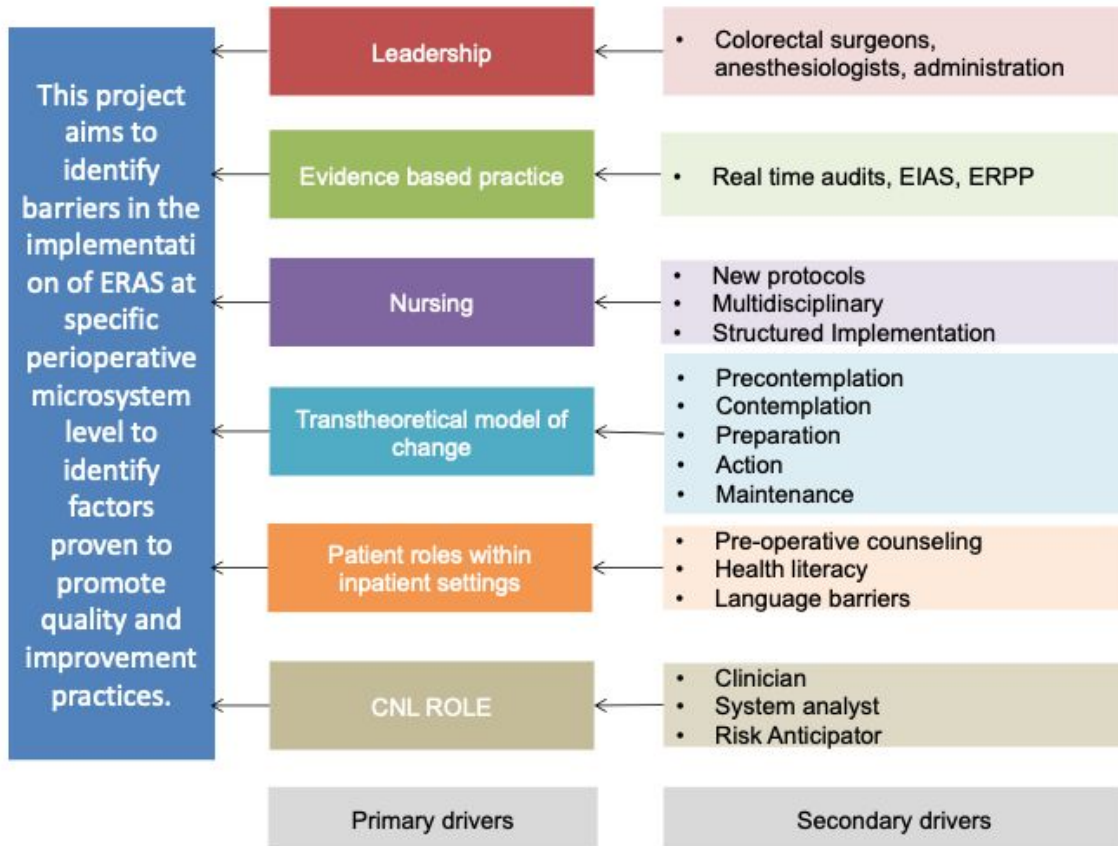
Appendix C

Figure C1: IHI Quadruple Aim Model



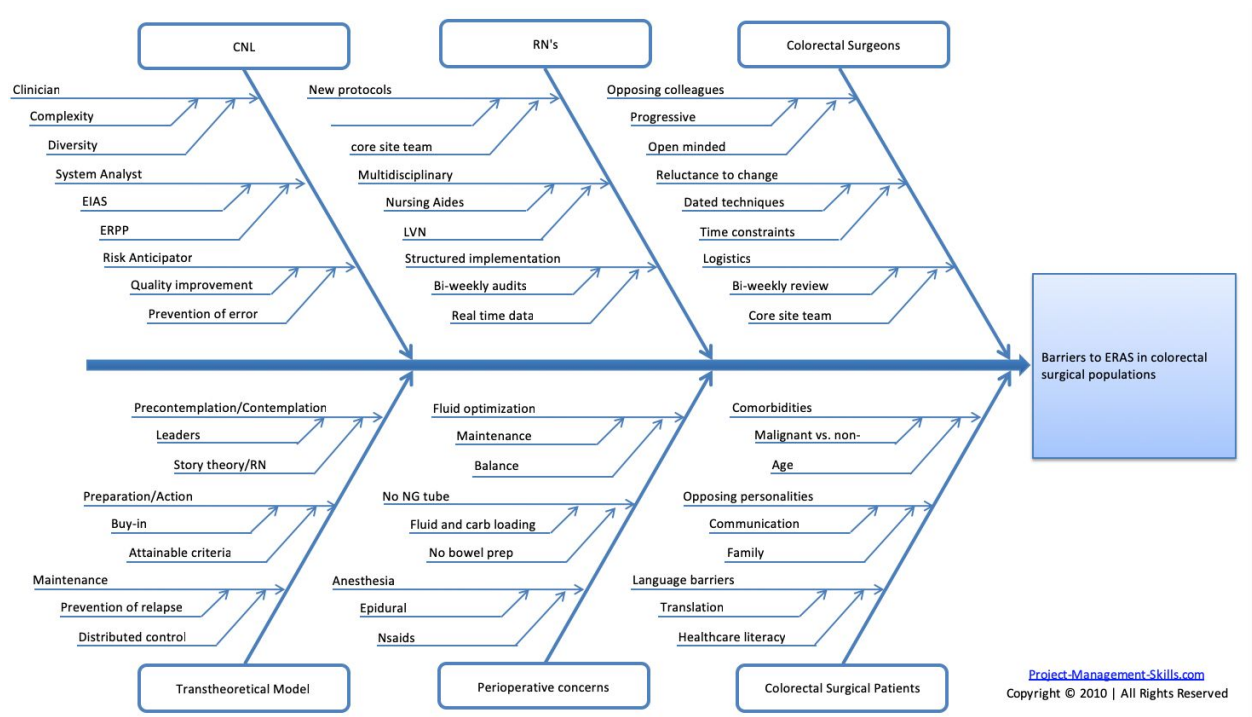
Appendix D

Figure D1: Driver Diagram



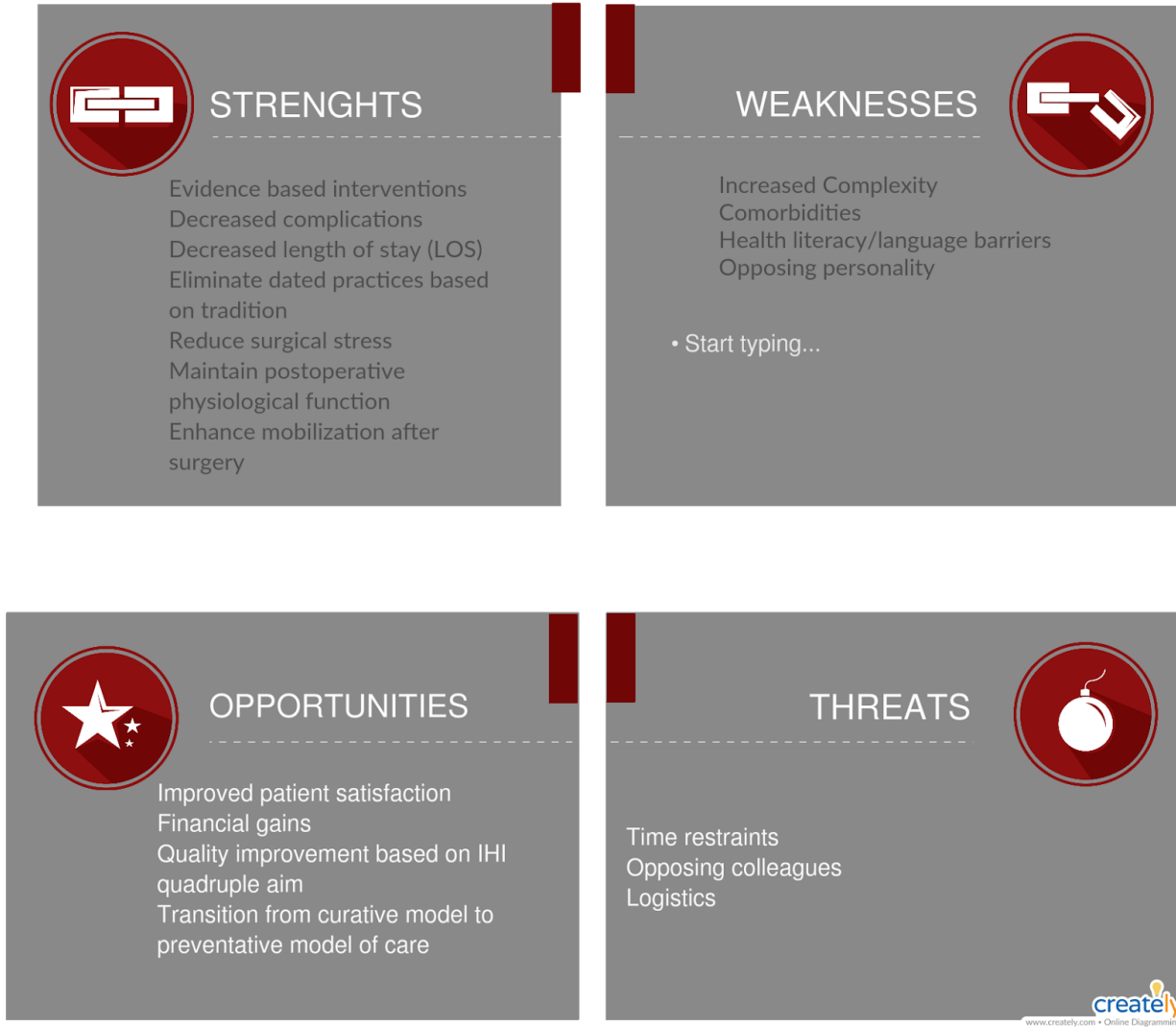
Appendix E

Figure E1: Fishbone Diagram: Cause and Effect



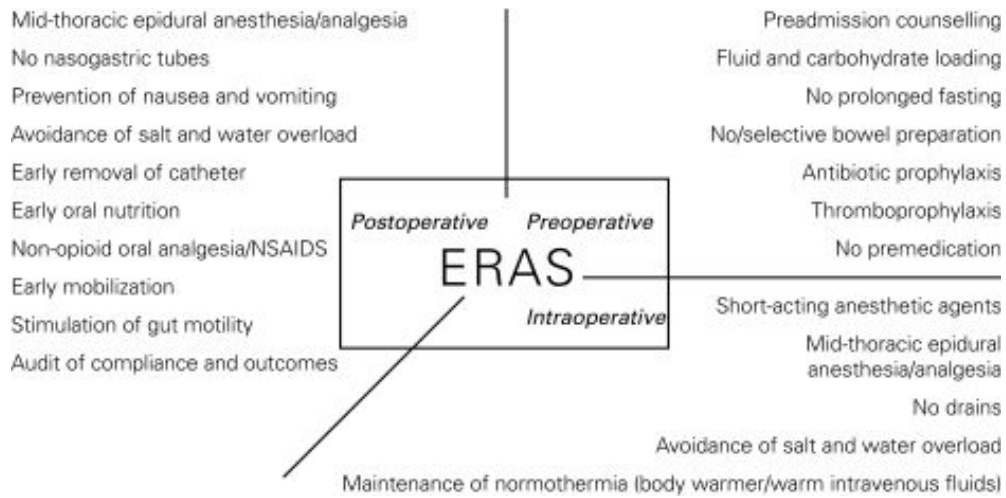
Appendix F

Figure F1: Strength, Weaknesses, Opportunities, and Threats (SWOT) Analysis



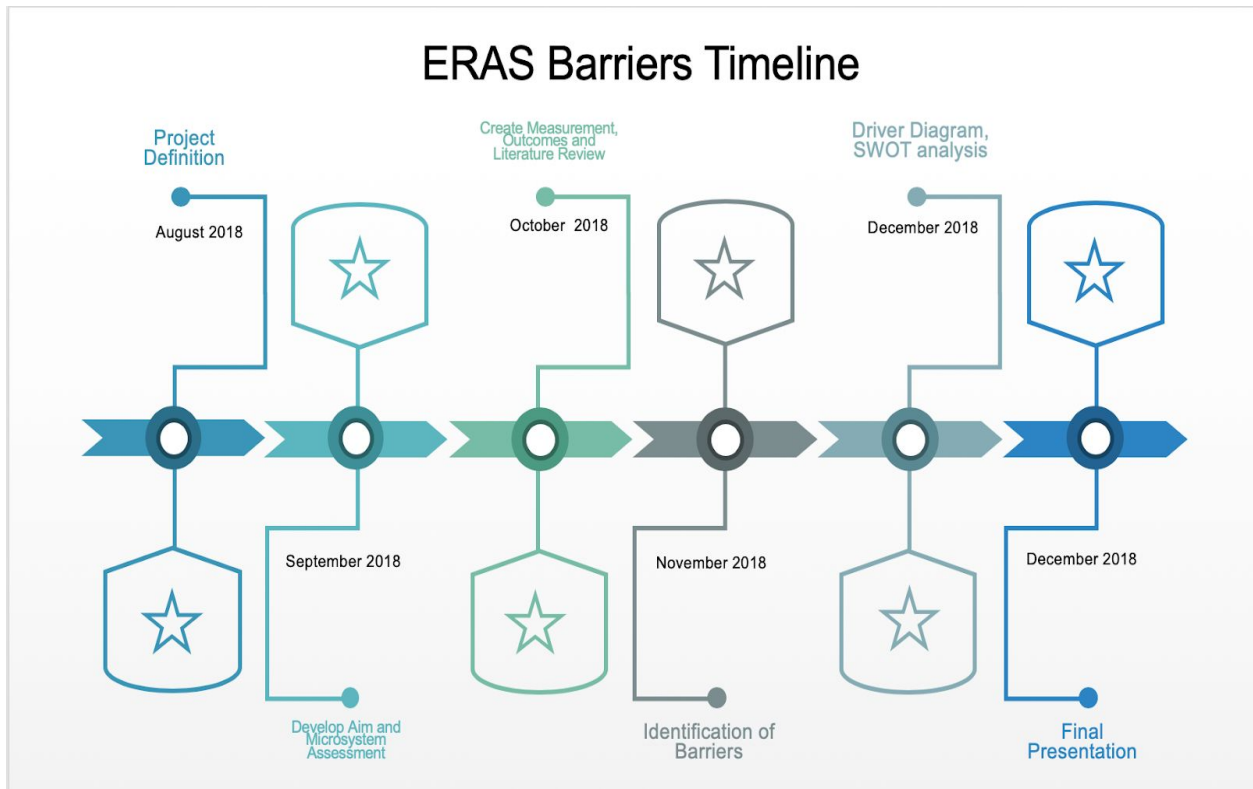
Appendix G

Figure G1: Key aspects of ERAS protocols



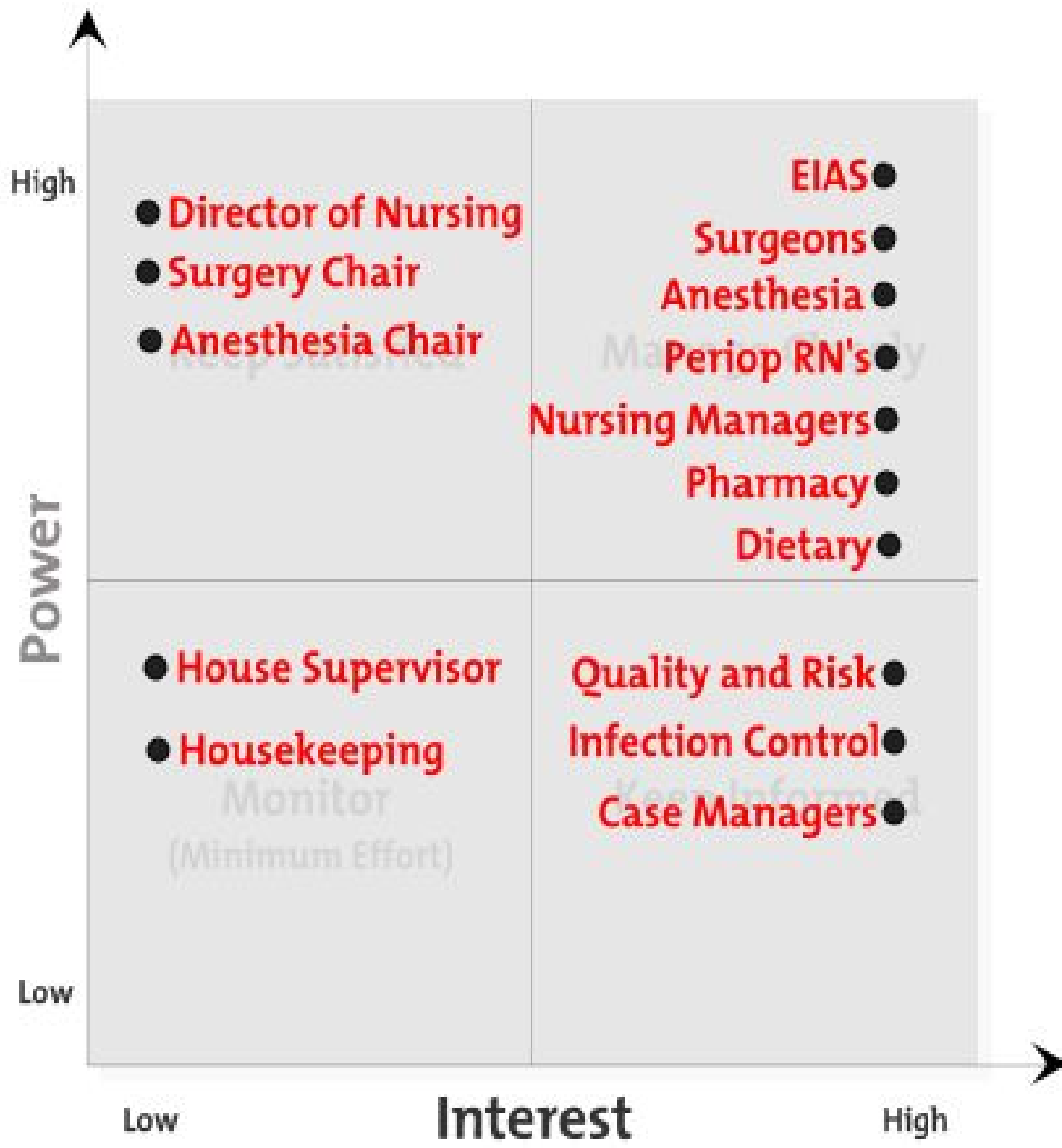
Appendix H

Figure H1: Timeline



Appendix I

Figure I1: Stakeholder Analysis



Johns Hopkins Nursing Evidence-Based Practice Appendix F: Non-Research Evidence Appraisal Tool

Evidence Level & Quality: _____

Article Title: Number:

Author(s): Publication Date:

Journal:

Does this evidence address the EBP question? Yes No

Do not proceed with appraisal of this evidence

Clinical Practice Guidelines: Systematically developed recommendations from nationally recognized experts based on research evidence or expert consensus panel. **LEVEL IV**

Consensus or Position Statement: Systematically developed recommendations based on research

and nationally recognized expert opinion that guides members of a professional organization in decision-making for an issue of concern. **LEVEL IV**

Are the types of evidence included identified? Were appropriate stakeholders involved in the development of recommendations? Are groups to which recommendations apply and do not apply clearly stated? Have potential biases been eliminated? Were recommendations valid (reproducible search, expert consensus, independent review, current, and level of supporting evidence identified for each recommendation)? Were the recommendations supported by evidence? Are recommendations clear?

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- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- Yes
- No
- No
- No
- No
- No

No

No

Literature Review: Summary of published literature without systematic appraisal of evidence quality or strength. **LEVEL V**

Is subject matter to be reviewed clearly stated? Is relevant, up-to-date literature included in the review (most sources within

last 5 years or classic)? Is there a meaningful analysis of the conclusions in the literature?

Are gaps in the literature identified? Are recommendations made for future practice or study?

Yes

Yes

Yes

Yes

Yes

No

No

No

No

No

Expert Opinion: Opinion of one or more individuals based on clinical expertise. **LEVEL V**

Has the individual published or presented on the topic? Is author's opinion based on scientific

evidence? Is the author's opinion clearly stated? Are potential biases acknowledged?

Yes

Yes

Yes

Yes

No

No

No

No

Johns Hopkins Nursing Evidence-Based Practice Appendix F: Non-Research Evidence Appraisal Tool

Organizational Experience:

Quality Improvement: Cyclical method to examine organization-specific processes at the local level.

LEVEL V

Financial Evaluation: Economic evaluation that applies analytic techniques to identify, measure, and compare the cost and outcomes of two or more alternative programs or interventions. **LEVEL V**

Program Evaluation: Systematic assessment of the processes and/or outcomes of a program and can involve both quantitative and qualitative methods. **LEVEL V**

Setting: Sample (composition/size): Was the aim of the project clearly stated? Was the method adequately described? Were process or outcome measures identified? Were results adequately described? Was interpretation clear and appropriate? Are components of cost/benefit analysis described?

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Yes

Yes

Yes

Yes

Yes

Yes

No

No

No

No

No

No N/A

Case Report: In-depth look at a person, group, or other social unit. **LEVEL V**

Is the purpose of the case report clearly stated? Is the case report clearly presented? Are the findings of the case report supported by relevant theory or research? Are the recommendations clearly stated and linked to the findings?

Yes

Yes

Yes

Yes

No

No

No

No

Community Standard, Clinician Experience, or Consumer Preference

Community Standard: Current practice for comparable settings in the community **LEVEL V**

Clinician Experience: Knowledge gained through practice experience **LEVEL V**

Consumer Preference: Knowledge gained through life experience **LEVEL V**

Information Source(s): Number of Sources:

Source of information has credible experience. Opinions are clearly stated. Identified practices are consistent.

Yes

Yes

Yes

No

No N/A

No N/A **Findings that help you answer the EBP question:**

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Non-Research Evidence Appraisal Tool

QUALITY RATING FOR CLINICAL PRACTICE GUIDELINES, CONSENSUS OR

POSITION STATEMENTS (LEVEL IV) A High quality: Material officially sponsored by a professional, public, private organization, or

government agency; documentation of a systematic literature search strategy; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies and definitive conclusions; national expertise is clearly evident; developed or revised within the last 5 years.

B Good quality: Material officially sponsored by a professional, public, private organization, or

government agency; reasonably thorough and appropriate systematic literature search strategy; reasonably consistent results, sufficient numbers of well-designed studies; evaluation of strengths and limitations of included studies with fairly definitive conclusions; national expertise is clearly evident; developed or revised within the last 5 years.

C Low quality or major flaws: Material not sponsored by an official organization or agency; undefined, poorly defined, or limited literature search strategy; no evaluation of strengths and limitations of

included studies, insufficient evidence with inconsistent results, conclusions cannot be drawn; not revised within the last 5 years.

QUALITY RATING FOR ORGANIZATIONAL EXPERIENCE (LEVEL V)

A High quality: Clear aims and objectives; consistent results across multiple settings; formal quality improvement or financial evaluation methods used; definitive conclusions; consistent recommendations with thorough reference to scientific evidence

B Good quality: Clear aims and objectives; formal quality improvement or financial evaluation methods used; consistent results in a single setting; reasonably consistent recommendations with some reference to scientific evidence

C Low quality or major flaws: Unclear or missing aims and objectives; inconsistent results; poorly defined quality improvement/financial analysis method; recommendations cannot be made

QUALITY RATING FOR LITERATURE REVIEW, EXPERT OPINION, COMMUNITY STANDARD, CLINICIAN EXPERIENCE, CONSUMER PREFERENCE (LEVEL V)

A High quality: Expertise is clearly evident; draws definitive conclusions; provides scientific rationale; thought leader in the field

B Good quality: Expertise appears to be credible; draws fairly definitive conclusions; provides logical argument for opinions

C Low quality or major flaws: Expertise is not discernable or is dubious; conclusions cannot be drawn

Appendix K

Table K:Literature Evaluation

PICO: This project is designed to address the identification of barriers in the implementation of ERAS in colorectal populations at the perioperative microsystem level to identify factors crucial to quality and improvement practices.

Citation	Design/ Method	Sample/ Setting	Variable Studied	Measurement	Data Analysis	Findings
Aliawaldi et al., 2016	Semi-structured interview	Safety-net hospital setting	Assessment of perceived variables and facilitators to ERAS implementation	Stratified purposive sampling	Audiotaped, transcribed and analysed using content analysis	Facilitators and barriers identified by medical professionals and patient perspectives
Gramlich et al., 2017	QUERI model and TDF	Six sites within a single health system	The ERAS Interactive Audit System (EIAS) was used to assess compliance with the guidelines, length of stay, readmissions, and	surveys, focus groups, interviews, and other qualitative data sources such as minutes and status updates	189 documents with 2188 quotes meeting the inclusion criteria. Data sources were analyzed for barriers or enablers,	26% of barriers and enablers to ERAS implementation occurred at the site and unit levels, with a provider focus 26% of the time, a patient focus 26%

			complications.		organized into a framework that included individual to organization impact, and areas of focus for guideline implementation.	of the time, and a system focus 22% of the time
Pędziwiatr et al., 2015	prospective cohort study	92 patients with colorectal cancer	3 subgroups (30 patients) depending on the time from ERAS protocol implementation.	Analyzed compliance with ERAS protocol and its influence on length of hospital stay, postoperative complications and readmission rate in different subgroups.	Aim of the study was to analyse the course of implementation of the ERAS protocol into daily practice on the basis of adherence to the protocol	The introduction of the ERAS protocol is a gradual process, and its compliance at the level of 80% or more requires at least 30 patients and the period of about 6 months
Chand et al., 2016	prospective data	300 patients	Discharge before and after 72 hr	to evaluate the early outcomes of patients		BMI, duration of operation and

			after surgery	undergoing ERAS protocols to determine peri-operative factors that may predict appropriateness		post-operative complications were determined to predict a longer length of stay
Geltzeiler et al., 2016	Prospective study	community hospital setting	Decreased LOS and cost savings	Assessment of patient outcomes and practice standards		Increased use of laparoscopy, decreased use of narcotics, no increase in readmissions
Jakobsson et al., 2014	Longitudinal 6 month study		Day of discharge, one month and six months	Patient reported perspective	Postoperative recovery profile used to assess continuation of recovery needs after discharge	Differentiation of needs in prolonged support

Appendix L

Table L1: Return on investment

Description	Pre-ERAS	Post-ERAS	LOS	Hospital Days
Compliance	39%	60%	n/a	n/a
Median LOS	6 days	4.5 days	↓2.3 days	↓1603
Readmissions	n/a	n/a	↓7.9%	↓660
Patients who were readmitted	n/a	n/a	↓4.5 days	↓293
Gross cost savings	n/a	\$2,420,276- \$4,575,496	n/a	n/a
Net cost savings	n/a	\$1,955,758- \$4,110,977	n/a	n/a
Patient cost savings	n/a	\$2,806- \$5,898	n/a	n/a
Sensitivity sampling	n/a	\$2,668- \$5,643	n/a	n/a