

ERAS Protocol for Total Joint Arthroplasty Patients: A Quality Improvement Initiative

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Abstract

As the surgical volume of total joint arthroplasty (TJA) continues to rise, healthcare systems must respond to increasing demand with efficiency. Enhanced Recovery After Surgery (ERAS) protocols are effective tools frequently used in surgical centers to standardize evidence-based practice for a patient population. A quality improvement (QI) initiative set about to develop a multidisciplinary protocol through the condensation of current practices in alignment with ERAS principles for a large multi-center academic hospital (AH). An email survey was sent to all members of the multidisciplinary team to assess current practice standards and a baseline understanding of ERAS guidelines before garnishing feedback on the proposed protocol. A Likert scale and free-text feedback was utilized for data collection. This QI project met its goal of over 60% buy-in from the team as evidenced by an interest in ERAS implementation (69%), agreeing the protocol clarified goals of care (89%), and perceiving a protocol would improve quality, safety, efficiency, and satisfaction among TJA patients (80%). The ERAS protocol developed from this QI initiative has the potential to ignite positive change at the AH. As ERAS ingrains in the culture of care for the TJA population, there is potential for spread to other orthopedic and surgical specialties.

Keywords: total joint arthroplasty, TJA, total knee arthroplasty, TKA, total hip arthroplasty, THA, enhanced recovery after surgery, ERAS, quality improvement, QI, protocol

ERAS Protocol for Total Joint Arthroplasty Patients: A Quality Improvement Initiative

Total knee arthroplasty (TKA) and total hip arthroplasty (THA) are common surgical procedures performed in the United States (Singh *et al.*, 2019). As the surgical volume of total joint arthroplasty (TJA) continues to rise, healthcare systems must respond to increasing demand with efficiency. Care pathways are effective tools frequently used in surgical centers to standardize evidence-based practice for a patient population. Nomenclature surrounding these pathways are “Enhanced Recovery After Surgery” (ERAS) protocols, “fast track,” or “same day surgery.” A historical control study by Featherall *et al.* (2019), estimated a cost-savings of \$2360 per patient and projected an annual cost-reduction nationally of \$1.6 billion with protocol implementation. Since the majority of TJA reimbursement is through Medicare, the value-based payment model incentivizes increasing throughput to enhance profitability. Recent limitations in hospital capacity delayed many elective joint surgeries due to COVID-19 safety protocols. This challenge motivated elective joint procedures to move from inpatient settings to outpatient day surgery settings. Continued efforts to implement evidence-based practice supporting pre-operative optimization, local anesthesia, opioid-sparing analgesia, transfusion strategies, and encouraging early mobility have transformed total joint arthroplasty from multi-day hospitalizations to same-day surgeries (Wainwright *et al.*, 2020). Additionally, patients report greater satisfaction at shortened recovery time and early discharge home (Frassanito *et al.*, 2020). Improvement in efficiency requires a multidisciplinary team (MDT) approach to maintain quality care.

The Pre-operative Medicine Clinic (PMC), Outpatient Care Unit (OCU) and Operating Room (OR) at a metropolitan, academic hospital cares for a large volume of TJA patients. Currently, a lack of consistent and coordinated efforts to optimize the care of TJA patients has

impeded prompt recovery and delayed discharge. This QI project aimed to describe the current state of caring for TJA patients at the academic hospital and propose an ERAS protocol for future utilization.

Available Knowledge

In the 1990s, the Danish surgeon Henrik Kehlet first described the idea behind ERAS to minimize the physiological and psychological stress of colorectal surgical patients (Kaye et al., 2019). By optimizing patients for surgery and reducing the overall burden of recovery, he reduced their hospital length of stay. Orthopedic surgery is a prime field for ERAS implementation, because of the relatively low risk procedures coupled with a high-volume demand. The American Academy of Orthopedic Surgeons (AAOS) and Acta Orthopaedica provided evidence-based clinical practice guidelines for perioperative use in TJA patients (Wainwright *et al.*, 2020; Weber, Jevsevar, & McGrory, 2016). The success of ERAS programs; however, relies on the standardization of a process that bundles several evidence-based items suitable to an institution and type of surgery (Frassanito *et al.*, 2020). Ljungqvist *et al.*, (2021), recommends little improvisation within the pathway. Adherence greater than 60% is associated with a decrease length of stay and a decrease in postoperative complications at the 30-day follow-up (Rippollés-Melchor *et al.*, 2020). Therefore, a standardized multidisciplinary approach is fundamental to successful implementation of an ERAS protocol.

Rationale

This QI project utilized the Model for Improvement (MFI) by the Institute of Healthcare Improvement (IHI) as the framework for change. The MFI methodology aided organizations in restructuring QI projects, resulting in advancements in clinical outcomes, reduction in costs, and superior efficiency (Crowl et al., 2015; Picarillo, 2018).

The AH lacked a standardized multidisciplinary ERAS protocol for TJA patients. The completed literature review revealed adherence to an ERAS protocol as essential for improving patient outcomes more than any element in isolation. High quality interventions from the evidence along with the current standards at the AH were combined into an ERAS protocol and implemented through a “Plan-Do-Study-Act” (PDSA) cycle allowing for feedback to assess willingness to adopt practice change with the goal of achieving a high level of buy-in from each sector of the multidisciplinary team (Langley et al., 2009). The ERAS protocol created language around this unique orthopedic population and serves as a reference tool to consistently provide evidence-based care to TJA patients. Its strength lies in multidisciplinary team communication and collaboration, as well as periodic review for updating evidence and responding to feedback from multiple PDSA cycles during the implementation process to promote sustained improvement.

Specific Aims

The objective of this QI project was to improve communication and role clarification among the multidisciplinary team on a TJA ERAS protocol through a buy-in percentage of 60%, consistent with the evidence to support positive patient outcomes (Rippollés-Melchor *et al.*, 2020). Surveying of the team garnered feedback to support the long-term goal of implementing the care pathway for TJA patients through further PDSA cycles.

Methods

Context

The AH was a metropolitan, multi-site campus connected by aerial tram between the inpatient hospital and the outpatient clinics and surgery center. While the outpatient campus functioned independently of the main hospital campus, the surgeons, residents, and physical

therapists moved between both locations. Providers at the Pre-operative Medicine Clinic (PMC) screened, educated, and optimized patients for surgery. The Outpatient Care Unit (OCU) received post-operative patients from a wide variety of surgical specialties, providing around-the-clock staffing by nurses and at least one provider. The orthopedic advanced practice provider (APP) managed TJA patients four days a week giving consistent provider coverage week to week. The surgical team comprised three orthopedic joint surgeons, general anesthesiologists, and a monthly rotation of orthopedic residents who covered when the orthopedic APP was not present. Physical therapists worked between both campuses and evaluated every TJA patient before discharge. An onsite pharmacy reviews perioperative medications for surgery and dispenses discharge prescriptions. The multidisciplinary team (MDT) is comprised of PMC providers, orthopedic providers, anesthesiologists, pharmacists, physical therapists (PT), perioperative nurses (OR RN) and inpatient nurses (IP RN).

Limited capacity for inpatient beds from the COVID-19 surge in hospitalizations within the last three years motivated the AH to look for opportunities to meet acute needs, while providing care for elective procedures. The clinical stability of TJA patients paired with advanced surgical technique and optimized perioperative care, made it possible to decrease hospital length of stay to same day discharge for TJA patients. Despite these efforts, unclear expectations and turnover among the interdisciplinary team demonstrated the need for an evidence-based protocol to improve communication and consistency for enhanced TJA patient recovery. Additionally, the DNV, an independent hospital accreditation board, requires an ERAS protocol for advanced hip and knee replacement certification (see Appendix A). The AH utilized ERAS protocols in specialties such as OB/GYN day surgeries, but there was not a published

ERAS protocol for orthopedics. These contextual elements provided reason to revitalize and prioritize this improvement work.

Intervention

The primary intervention for this project was to assess the need and multidisciplinary support of an ERAS protocol in TJA patients by surveying the team over one month. After collaborating with the orthopedic surgeons and the orthopedic APP, a synthesized ERAS protocol was created with evidence-based elements suitable to the TJA patients at the AH environment (see Appendix B). The original impetus of the protocol was promoting same day discharge, which was later generalized to include all TJA patients with the addition of high-risk patient modifiers. This preliminary protocol was presented to key representatives from the MDT at the quarterly Orthopedic Workgroup to gauge initial perceptions. Challenges arose in consensus on elements of the protocol where there was not strong evidence. A pre- and post-survey was emailed to the MDT through Qualtrics, a secure platform (see Appendix C). This platform was owned by the AH; therefore, the intervention was at no cost to the institution. The survey included the team member role and pre-survey assessment of perceived need for an ERAS protocol for TJA patients. Participants reviewed the proposed ERAS protocol and completed a similar post-assessment with the option for feedback. The survey utilized a Likert scale, which is a simple and effective means of quantifying qualitative data (Jebb, Ng, & Tay, 2021). Questions included the following elements: care for TJA patients, multidisciplinary communication, clinical support, overall care quality, and interest in a multidisciplinary ERAS protocol.

Study of the Intervention

The study of this intervention included collecting survey data for comparison of pre-test to post-test responses. An increase in the Likert scale from pre-test to post-test assumed buy-in from the team, while a decrease in the scale assumed resistance to the protocol. Additional feedback provided clarity on protocol refinement and inform the next steps for implementation of the ERAS protocol.

Measures

Process measures, outcome measures, and balancing measures were considered throughout the course of the improvement project to ensure accountability of variables. The process measure included the number of emails sent and the percent of survey responses for each role on the MDT. A two-week follow-up reminder to complete the survey was sent to improve response rate. The outcome measures were the percent of staff sampled supporting the protocol and the perceived benefits and barriers of protocol use. The balancing measure was email survey burden. The opportunity to provide feedback supported the value of team collaboration and ownership of the ERAS protocol.

Analysis

Analysis of the qualitative data outcomes collected from the MDT included a pre-post comparison of survey feedback. Scores rating self-perceived agreement (agree, neutral, disagree) were entered for each complete survey according to each staff role along with a cumulative team response for each question. The percent change in agreement scores were calculated before and after the protocol presentation. Grouped bar charts were created for visual representation. Free-text responses were utilized to refine elements of the ERAS protocol.

Ethical Considerations

Free-text responses from the MDT were weighed against evidence to ensure safe and effective care delivery before changing the protocol. This ERAS protocol was meant to fit the context of TJA patients at this AH. It may not be conducive in other settings.

Institutional review board (IRB) approval was obtained before initiating the intervention and safe handling of data and anonymity of respondents was maintained during the duration of the project. The author reported no conflict of interest involved in the undertaking of this QI project.

Results

The intention of the survey was to assess multidisciplinary communication, clinical support, overall care quality, and perception of an ERAS protocol. A low response rate was expected, given the balancing measure of email survey burden. A response total of 72 surveys from the multidisciplinary team with the largest response rate coming from the pre-operative and post-anesthesia nurses (OR RN) (36%) (see Appendix D). Multidisciplinary communication was assessed by evaluating clarity among the multidisciplinary team, consistency in care, and education provided to the patients. The PTs perceived patient education lacking (22%), while PMC providers attributed the breakdown to team communication (44%) (see Appendix E). After review of the protocol, there was an overall improvement from 45% to 78% in perceived communication (see Appendix F). Despite the need for improved communication, only 3% of participants cannot identify a clinical support person if they have questions regarding TJA patients.

At baseline, there was a high perception of care quality, safety, and patient satisfaction. Team members reported a 94% confidence in their role expectations and a 75% understanding of

other team roles. A decrease of 13% in individual role clarity occurred after review of the protocol among the PT and PMC participants, whereas team role clarity increased by 14%.

Half of the participants reported a good understanding of ERAS guidelines for TJA patients (51%); after reviewing the proposed ERAS protocol 83% agreed that the protocol clarified the goals of care for TJA patients and believed an ERAS protocol would improve quality, safety, efficiency, and satisfaction among TJA patients. Interest in an ERAS protocol for TJA patients (73%) surpassed those opposed (11%) (see Appendix G).

Challenges in dissemination to the anesthesia team resulted in missing data from a significant portion of the MDT. An overall low response from the MDT was considered regarding skewed results. When surveying the therapy team, a distinction was made from occupational therapy (OT). While involvement of OT in the MDT was not a standard in the literature of TJA ERAS recommendations, they were included in the survey since they were utilized in posterior hip arthroplasty cases. Results from the OT team were separated from the rest of the MDT, since they were not accounted for in the ERAS protocol at this stage.

Discussion

Summary

This QI initiative aimed to consolidate the principles of ERAS into an accessible format for improve expectations, care quality, and teamwork among the clinicians as a foundation for further implementation efforts. Despite the barriers to obtaining robust data, participants expressed a 32% post-survey increase in understanding of ERAS principles, a 73% interest in ERAS, and over 80% agreement that the protocol improves the care provided to TJA patients, which exceeded the aim of a 60% buy-in goal. MDT communication increased from 45% to 78%

through the proposed protocol, despite a decrease of 13% in individual role clarity. Utilization of survey feedback refined the protocol and aided implementation considerations.

Interpretation

The QI project demonstrated initial interest in a multidisciplinary ERAS protocol to improve for preoperative patient optimization, decreased perioperative stress, and accelerated recovery time. Meta-analysis emphasizes the importance of MDT collaboration, communication, and thorough staff education for ERAS program implementation (Smith Jr. *et al.*, 2020). Feedback on the ERAS protocol from an orthopedic resident expressed the ease in coordinating care for both straightforward and complex patients, saying “I wish I had this chart at the beginning of my rotation.” The sustainable implementation of the ERAS protocol has the potential for creating consistency in a dynamic AH.

The knowledge gap on ERAS principles (32%) revealed through the survey will need to be addressed through educational trainings and utilization of a clinical champion to clarify questions in the early stages and to audit its success with rollout. Further, the decrease in expressed clinical support from 82% to 67% after viewing the protocol reflects a significant shift in practice change that warrants a clinical champion. Major limitations to the success of ERAS are compliance to each element throughout all phases of patient care (Kaye *et al.* 2019).

While the barriers for protocol failure are multifactorial, survey feedback expressed inconsistencies in patient education around *Non per os* (NPO) status, potential for inadequate pain management, barriers to early mobility, ensuring thorough pre-operative screening, and identifying patients as ERAS in scheduling. Adjustments to the protocol were weighed against the evidence. The ERAS principle of euvolemia encourages patients to receive fluids up to two hours before surgery without risk of aspiration (Smith *et al.*, 2020). Clarification is needed in the

protocol on home medication administration and distinguishing NPO solids from clears.

Multimodal narcotic-sparing pain management decreases the side effects of nausea and vomiting and has evidence of decreasing narcotic usage by 71% in oral morphine equivalents through the implementation of an ERAS protocol (Smith *et al.*, 2020). Managing pain with fewer opioids allows for less impedance to mobility and delayed discharge. Education on multi-modal pain management strategies should be discussed with staff. Many physical therapists voiced concerns about the time constraints of assessing a patient within two hours of arrival to the inpatient unit that can be incumbered by issues of staffing, late surgeries, or patients becoming symptomatic. Nurse-driven activity through the safe mobility tool can alleviate the actual barrier of delayed patient mobility. The PMC providers suggested adopting a system for flagging patients as ERAS in the referral as a means of ensuring the protocol is followed. This was a practice done by obstetrics/gynecology to distinguish their ERAS patients. Additionally, including “barriers to discharge” screening by PMC will avoid unexpected post-operative delays and needed home safety. Continued involvement of the MDT in creative problem solving will be key to building a robust ERAS culture for TJA patients among the AH that has the potential to reduce length of stay, efficiency in care coordination, and improve patient satisfaction.

Limitations

Data collected for this quality improvement project was qualitative and limited to the TJA population at an academic institution. The principles of ERAS were upheld throughout the proposed protocol, but widespread utilization of the work can result in bias and generalizability.

The email survey was a cost-effective and time-efficient tool that allowed members to anonymously respond without the interference of in-person related barriers or scheduling. Offering free-text response allowed for critique and clarification on disagreements. A low

response rate from specialties limited internal validity, despite a reminder email was sent with some improvement. Engagement of staff through multiple avenues of protocol awareness, ERAS education, and designation of a clinical champion is important for subsequent PDSA cycles.

Conclusion

The ERAS protocol developed from this quality improvement initiative has the potential to ignite positive change among the AH. Further refinements to the protocol will ensure its suitable implementation and sustainable change. As ERAS ingrains in the culture of care for the TJA population, there is potential for spread to other orthopedic and surgical specialties.

Based on the data gathered, barriers exist to implementation that an ERAS protocol alone cannot address. Creating further education to clinicians will build the foundation of to guide the clinical practice framework. Utilization of a clinical champion in all specialties to provide assessment, education, and in-time feedback will be key for continuing efforts to solidify an ERAS culture.

References

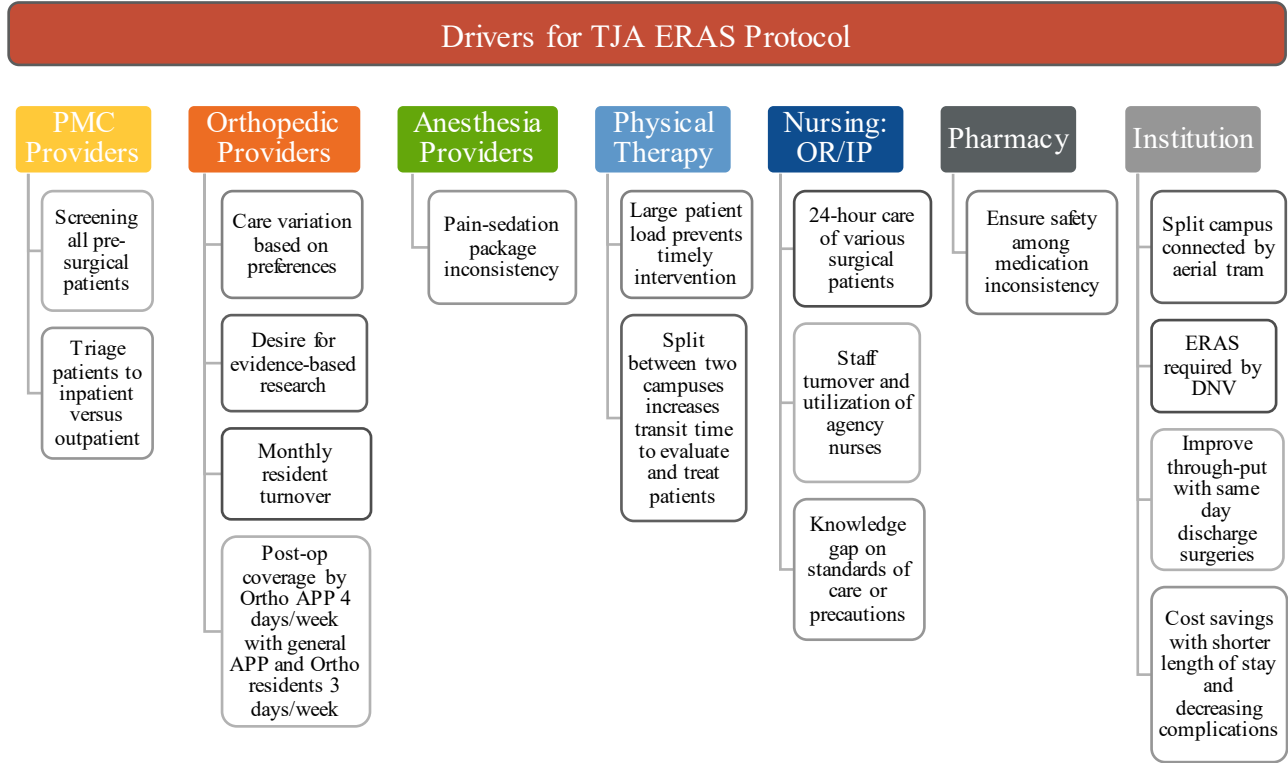
- Crowl, A., Sharma, A., Sorge, L., & Sorensen, T. (2015). Accelerating quality improvement within your organization: Applying the Model for Improvement. *Journal of the American Pharmacists Association: JAPhA*, 55(4), e364–e376.
<https://doi.org/10.1331/JAPhA.2015.15533>
- Featherall, J., Brigati, D. P., Arney, A. N., Faour, M., Bokar, D. V., Murray, T. G., Molloy, R. M., & Higuera Rueda, C. A. (2019). Effects of a Total Knee Arthroplasty Care Pathway on Cost, Quality, and Patient Experience: Toward Measuring the Triple Aim. *The Journal of Arthroplasty*, 34(11), 2561–2568. <https://doi.org/10.1016/j.arth.2019.06.011>
- Frassanito, L., Vergari, A., Nestorini, R., Cerulli, G., Placella, G., Pace, V., & Rossi, M. (2020). Enhanced recovery after surgery (ERAS) in hip and knee replacement surgery: description of a multidisciplinary program to improve management of the patients undergoing major orthopedic surgery. *Musculoskeletal Surgery*, 104(1), 87–92.
<https://doi.org/10.1007/s12306-019-00603-4>
- Jebb, A. T., Ng, V., & Tay, L. (2021). A review of key likert scale development advances: 1995-2019. *Frontiers in Psychology*, 12, 637547. <https://doi.org/10.3389/fpsyg.2021.637547>
- Kaye, A. D., Urman, R. D., Cornett, E. M., Hart, B. M., Chami, A., Gayle, J. A., & Fox, C. J. (2019). Enhanced recovery pathways in orthopedic surgery. *Journal of Anaesthesiology, Clinical Pharmacology*, 35(Suppl 1), S35–S39.
https://doi.org/10.4103/joacp.JOACP_35_18
- Langley, G.J., Moen, R., Nolan, K.M., Nolan, T.W., Norman, C.L. and Provost, L.P. (2009), *The improvement guide: A practical approach to enhancing organizational performance*, 2nd ed., Jossey-Bass, Chichester.

- Ljungqvist, O., de Boer, H. D., Balfour, A., Fawcett, W. J., Lobo, D. N., Nelson, G., Scott, M. J., Wainwright, T. W., & Demartines, N. (2021). Opportunities and challenges for the next phase of enhanced recovery after surgery: A Review. *JAMA Surgery*, *156*(8), 775–784. <https://doi.org/10.1001/jamasurg.2021.0586>
- Picarillo A. P. (2018). Introduction to quality improvement tools for the clinician. *Journal of Perinatology: Official Journal of the California Perinatal Association*, *38*(7), 929–935. <https://doi.org/10.1038/s41372-018-0100-4>
- Ripollés-Melchor, J., Ramírez-Rodríguez, J. M., Casans-Francés, R., Aldecoa, C., Abad-Motos, A., Logroño-Egea, M., García-Erce, J. A., Camps-Cervantes, Á., Ferrando-Ortolá, C., Suarez de la Rica, A., Cuellar-Martínez, A., Marmaña-Mezquita, S., Abad-Gurumeta, A., Calvo-Vecino, J. M., & POWER Study Investigators Group for the Spanish Perioperative Audit and Research Network (REDGERM) (2019). Association between use of enhanced recovery after surgery protocol and postoperative complications in colorectal surgery: The postoperative outcomes within enhanced recovery after surgery protocol (POWER) study. *JAMA Surgery*, *154*(8), 725–736. <https://doi.org/10.1001/jamasurg.2019.0995>
- Singh, J. A., Yu, S., Chen, L., & Cleveland, J. D. (2019). Rates of total joint replacement in the United States: Future projections to 2020-2040 using the national inpatient sample. *The Journal of rheumatology*, *46*(9), 1134–1140. <https://doi.org/10.3899/jrheum.170990>
- Wainwright, T. W., Gill, M., McDonald, D. A., Middleton, R. G., Reed, M., Sahota, O., Yates, P., & Ljungqvist, O. (2020). Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. *Acta Orthopaedica*, *91*(1), 3–19. <https://doi.org/10.1080/17453674.2019.1683790>

Weber, K. L., Jevsevar, D. S., & McGrory, B. J. (2016). AAOS clinical practice guideline: Surgical management of osteoarthritis of the knee: Evidence-based guideline. *The Journal of the American Academy of Orthopaedic Surgeons*, 24(8), e94–e96.
<https://doi.org/10.5435/JAAOS-D-16-00160>

Appendices

Appendix A: Drivers for Multidisciplinary TJA ERAS Protocol Diagram



Appendix B: Total Joint Arthroplasty ERAS Protocol



Guiding Principles of ERAS®:

- Maintain euolemia and normothermia.
- If possible, manage pain without opiates and IV medications.
- Aggressively manage potential for and symptomatic nausea and vomiting.
- Proactive advancement of diet and early mobility.

Definition of "High Risk" Patient:

- BMI>35
- Non-Aspirin anticoagulation or risk factors requiring post op therapeutic anticoagulation
- Complex or revision arthroplasty
- Systemic immunosuppression
- Malnutrition
- History of Hep. C with cirrhosis
- Stasis dermatitis or chronic lymphedema
- Poorly controlled DM with HbA1c>7
- Old scars with threatened soft tissue envelope

PRE-OP and INTRA-OP			
ORTHOPEDIC PROVIDER	ANESTHESIA	NURSING	PATIENT EDUCATION
<p>Screening:</p> <ul style="list-style-type: none"> - Identify "High Risk" patient (see definition). - Screen for PONV (female, non-smoker, hx of PONV, and <75yo). - MSSA/MRSA nasal swab. If positive, PMC to provide mupirocin nasal ointment BID 5 days prior to surgery. - COVID testing per venue. - Pre-op anemia consult for Hgb <12. - D/c barriers (stairs in house and to bathroom, ride, caregiver first 24 hrs). <p>Pre-Op Orders:</p> <ul style="list-style-type: none"> - Acetaminophen 1000mg PO. - Celecoxib 400mg PO *Hold in CKD or Hx GIB from NSAIDs. - Pregabalin 150mg PO. - Scopolamine patch *At-risk for PONV. - Tranexamic acid 1950mg PO. - Diet: 6hr solids fast and 2 hours clears fast. - LR at 100ml/hr. <p>Intra-Op Orders:</p> <ul style="list-style-type: none"> - Antibiotic prophylaxis: Cefazolin 2mg IV before first incision. If MRSA+ and/or allergy to beta lactams, use vancomycin IV 1500mg. - Periarticular Injection: ropivacaine 180mcg, ketorolac 30mg, epinephrine 0.5mg, and clonidine 80mcg in normal saline 100ml. 	<ul style="list-style-type: none"> - Anticipate NPO status. <p>Spinal:</p> <ul style="list-style-type: none"> - Mepivacaine 60mg (4mL of 1.5% or 3mL 2%). - For revisions: 0.5 % bupivacaine 15mg in 3 mL. - For cases >2.5hrs: Consider additional operative epidural or general. - Placement in 15min: 10min resident/CRNA attempts, with 5min fellow/attending attempts, then transition to general anesthesia. <p>TKA:</p> <ul style="list-style-type: none"> - AC block single injection with bupivacaine 0.5% +/- perineural dexmedetomidine 0.5-1 mcg/kg. - Optional: ambulatory AC catheter with ropivacaine 0.2%. 	<p>Patient Prep:</p> <ul style="list-style-type: none"> - Place IV as soon as possible. - Verify patient had CHG wipes at home and give 2nd CHG wipe. - NPO orders. - Pre-surgical clipping of surgical site. - Keep patient warm. - Voids prior to OR. - Place TED hose and SCD. o TKA/posterior THA: only placed on contralateral extremity with spares placed on chart to go with patient to OR. <p>Medications:</p> <ul style="list-style-type: none"> - Start LR at 100ml/hr ASAP. - Acetaminophen, celecoxib, pregabalin, tranexamic acid, and cefazolin or vancomycin. <p>Intra-Op:</p> <ul style="list-style-type: none"> - Bladder scan and straight catheter for volumes >500mL. 	<p>One month prior:</p> <ul style="list-style-type: none"> - Stay active (daily walk) - Smoking cessation 4 weeks pre-op. - Alcohol cessation. - Understand post-op exercises and precautions, if any. - Review home pump instructions. - Complete Advance Directive form. <p>Two weeks prior:</p> <ul style="list-style-type: none"> - Stop taking herbals and vitamin E supplements, except melatonin. <p>One week prior:</p> <ul style="list-style-type: none"> - Stop taking NSAIDs. Use Tylenol if you need a general pain medication. <p>24hrs before surgery:</p> <ul style="list-style-type: none"> - Home CHG bath. Do NOT shave the surgical area. - Solids fast 6 hours before surgery. - Clears fast 2 hours before surgery. - At night, take ALL your evening medications. - Take AM home meds by 5am, such as Lexapro and aspirin. Do NOT take hydrochlorothiazide, laxatives, or vitamins/minerals/supplements. - Bring Sleep Apnea treatments (CPAP/BiPAP or mouth guard). - Bring a copy of your Advance Directive.

PACU and POST-OP				
ORTHOPEDIC PROVIDER	ANESTHESIA	NURSING	PHYSICAL THERAPY	PATIENT EDUCATION
<p>Post-Op Orders:</p> <ul style="list-style-type: none"> - TKA: AP and Lateral X-rays. - THA: AP Pelvis in PACU. - Posterior THA: Hip precautions. Consider OT referral. - Restart home meds. - Hold BP meds, except Beta Blockers. OK to restart POD#1 after ambulation and SBP>160. - Hold oral DM meds and use Moderate SSI. For insulin drip, leave on and order IP glycemic referral. <p>Pain:</p> <ul style="list-style-type: none"> - Acetaminophen 1000mg q6h (from pre-op dose). - Oxycodone 5-10mg PO q4h PRN or 2.5-5mg if >75yo (hold for MAP <65). If unable to tolerate, hydromorphone 2-4mg PO q3h PRN or 1-2mg PO q3h if >75yo. - 15mg ketorolac IV PRN x2 (total post-op doses). - Consider: cyclobenzaprine or NSAIDs, if no contraindications. <p>Antiemetics:</p> <ul style="list-style-type: none"> - Ondansetron PO/IV 4mg q8h (1st line). - Prochlorperazine 5-10mg PO/IV q6h (2nd line). <p>Other Meds:</p> <ul style="list-style-type: none"> - Dexamethasone IV 10mg once (hold if DM). - Aspirin 81mg BID x6wks unless on warfarin/DOAC, then continue POD#1. If ASA allergy or hx of DVT/PE, use rivaroxaban 10mg daily or apixaban 2.5mg BID x3wks. <p>Prescribed Opioid for D/C Rx:</p> <ul style="list-style-type: none"> - Qty: 30 tablets and/or 7-day supply. <p>Dressing:</p> <ul style="list-style-type: none"> - Ag-bordered Mepilex for 1-2 wks. - ACE wrap for TKA. Take down POD#1. <p>For High-Risk Patients (BMI>35 +1 risk factor):</p> <ul style="list-style-type: none"> - Incisional wound vac therapy in place until battery dies or POD#7 (Prevena) or POD#14 (Arthroform). <p>Positive MRSA Nasal Swab:</p> <ul style="list-style-type: none"> - IV cefazolin 2g IV x2 or IV vancomycin for 24hrs. - Transition to cephalixin 1g PO TID or doxycycline 100mg PO BID. 	<ul style="list-style-type: none"> - Multimodal antiemetic and pain medication orders for PACU. - For iflow, keep in place for 72hrs. - 15mg ketorolac IV if >12hr from pre-op Celebrex. 	<p>In addition to standard care, antcipate orders for:</p> <ul style="list-style-type: none"> - Ice to incision but keep patient warm. - Acetaminophen q6h from pre-op dose. - Aggressively manage nausea with multimodal antiemetics for patients at risk or symptomatic. - Proactively manage pain without opiates or IV meds whenever possible. - Proactively advance diet and encourage PO intake. - Encourage Gatorade/caffeine for voiding or dizziness. - Assess block regression with SLR q30min with goal to EOB and OOB within 2 hours using safe mobility tool. - Pre-medicate for pain/nausea and call PT if patient is in OCU. - Encourage IS for pneumonia prevention. - TKA: leg elevated and stretched to full extension in bed. - Provider will remove ACE wraps for TKA. OK to shower with silver dressing. TED hose bilaterally. <p>Posterior Hip Precautions:</p> <ul style="list-style-type: none"> -No bending over at hip. -No crossing legs. -No pigeon toes. 	<ul style="list-style-type: none"> - See promptly on arrival to OCU. - Assess DME needs and barriers to d/c. 	<ul style="list-style-type: none"> - Encourage food and fluids. - Encourage regular non-opiate pain management, such as NSAIDs. - Expect activity as soon as possible. - Use IS to prevent pneumonia. - TKA: Keep leg elevated and stretched to full extension in bed. - OK to shower with dressing (and wound vac) in place. - Remove wound vac after battery dies or POD#7 (Prevena) or POD#14 (Arthroform).

Appendix C: Multidisciplinary Team Survey in Qualtrics

[Answer options: Disagree → Neutral → Agree]

Clinical Role:

What is your clinical role with orthopedic patients?

- a. PMC Provider
- b. Orthopedic Provider (attending, fellow, resident, or APP)
- c. Anesthesia Provider (attending, fellow, resident, or CRNA)
- d. Pharmacist
- e. Pre-Op/PACU Nurse
- f. Inpatient Nurse
- g. Physical Therapist
- h. Occupational Therapist

Pre-Pathway Survey

Please provide a response regarding your **understanding** of Total Joint Arthroplasty (TJA) patients.

1. I have a good understanding of the expectations for my role in caring for TJA patients.
2. I have a good understanding of the multi-disciplinary team roles in caring for TJA patients.
3. I have a good understanding of Enhanced Recovery After Surgery (ERAS) guidelines.

Please provide a response regarding **communication** for Total Joint Arthroplasty (TJA) patients.

4. There is clear communication between the multidisciplinary team that cares for TJA patients.
5. There is consistency in the care of TJA patients.
6. Patients are educated on what to expect during their stay and for home.

Please provide a response regarding **clinical support** for Total Joint Arthroplasty (TJA) patients

7. If I have questions about the care of TJA patients, I know who to ask.
8. My questions are sufficiently answered when I need clarity about caring for TJA patients.

Please provide a response regarding the **overall care** for TJA patients.

9. Our team provides high-quality and safe care to TJA patients.
10. Our team provides efficient and cost-effective care to TJA patients.
11. TJA patients are satisfied with the care they receive.
12. I am interested in having a **multi-disciplinary care pathway** for TJA-SDD patients.

[Insert ERAS Protocol]

Post-Pathway Survey

Please provide a response regarding your **understanding** of ERAS Guidelines for Total Joint Arthroplasty (TJA) patients.

1. The ERAS Guideline clarifies expectations for my role in caring for TJA patients.
2. The ERAS Guideline clarifies the multi-disciplinary team roles in caring for TJA patients.
3. The ERAS Guideline clarifies the goals of care for TJA patients.

Please provide a response regarding **communication** of ERAS Guidelines for Total Joint Arthroplasty (TJA) patients.

4. The ERAS Guideline clarifies communication between the multidisciplinary team.
5. The ERAS Guideline will provide consistency in the care of TJA patients.
6. The ERAS Guideline clarifies patient education on what to expect during their stay and for home.

Please provide a response regarding **clinical support** for Total Joint Arthroplasty (TJA) patients.

7. If I have questions about the ERAS Guideline for TJA patients, I know who to ask.

Please provide a response regarding the **overall care** for TJA patients under ERAS Guidelines

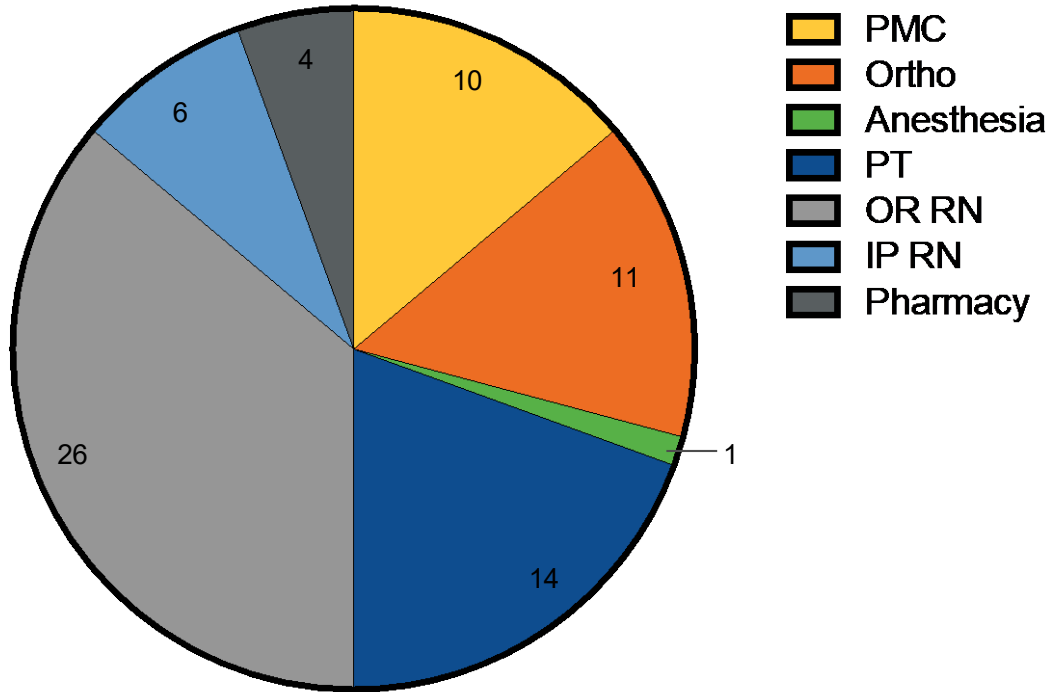
8. The ERAS Guideline will improve the quality and safety of care for TJA patients.
9. The ERAS Guideline will improve efficiency and cost-effectiveness of the care provided to TJA patients.
10. The ERAS Guideline will improve TJA patient satisfaction.

We welcome any feedback, questions, or concerns regarding the ERAS Guideline for TJA patients.

[Free text response]

Appendix D: Survey Responses by Multidisciplinary Role

Responses per Role

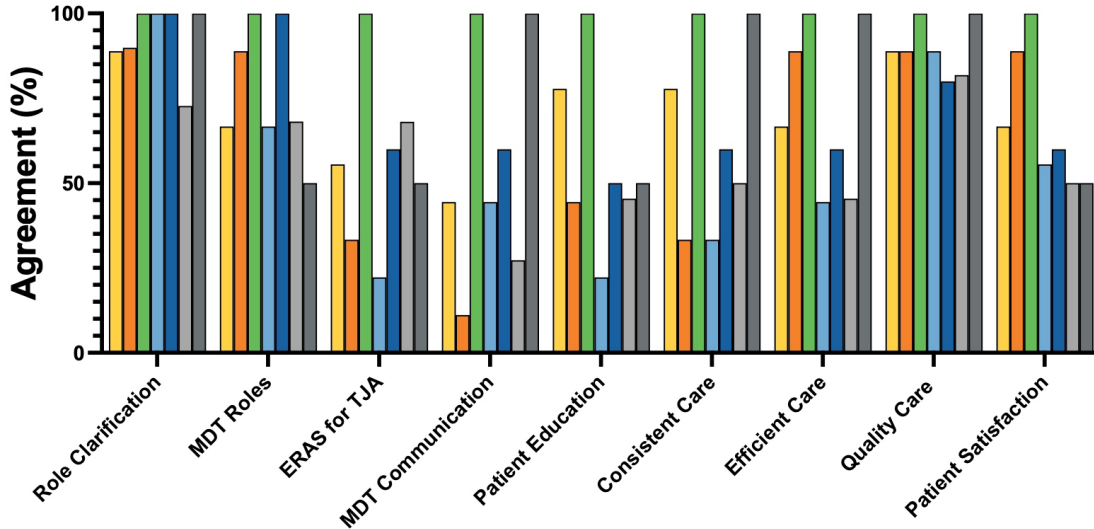


Total=72

Note: PMC (Preoperative Medical Clinic provider), Ortho (orthopedic provider), PT (physical therapist), OR RN (pre-op/post-op nurse), IP RN (inpatient nurse)

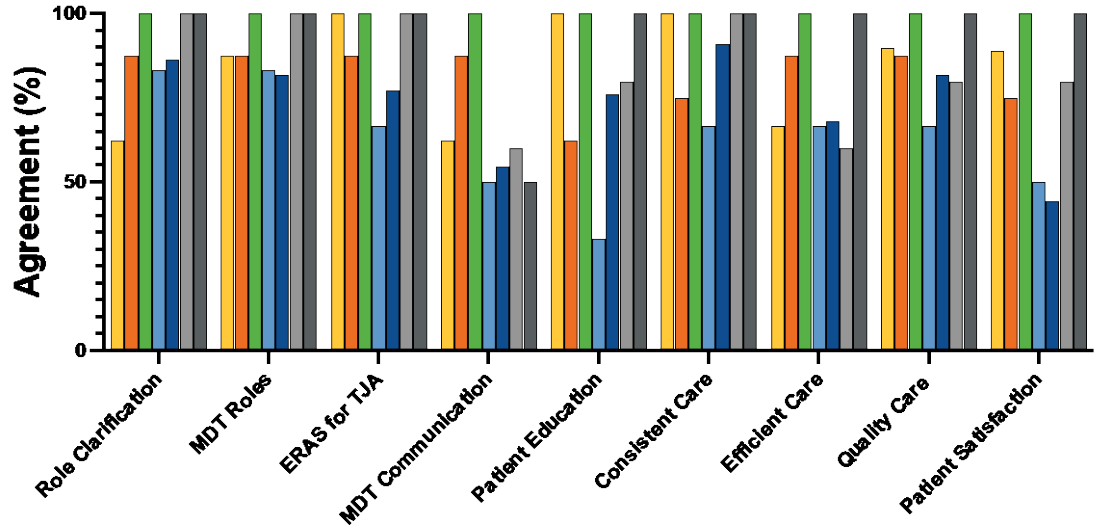
Appendix E: Average Pre and Post Survey Response by Role

Average Pre-Survey Response By Role



Care of TJA Patients

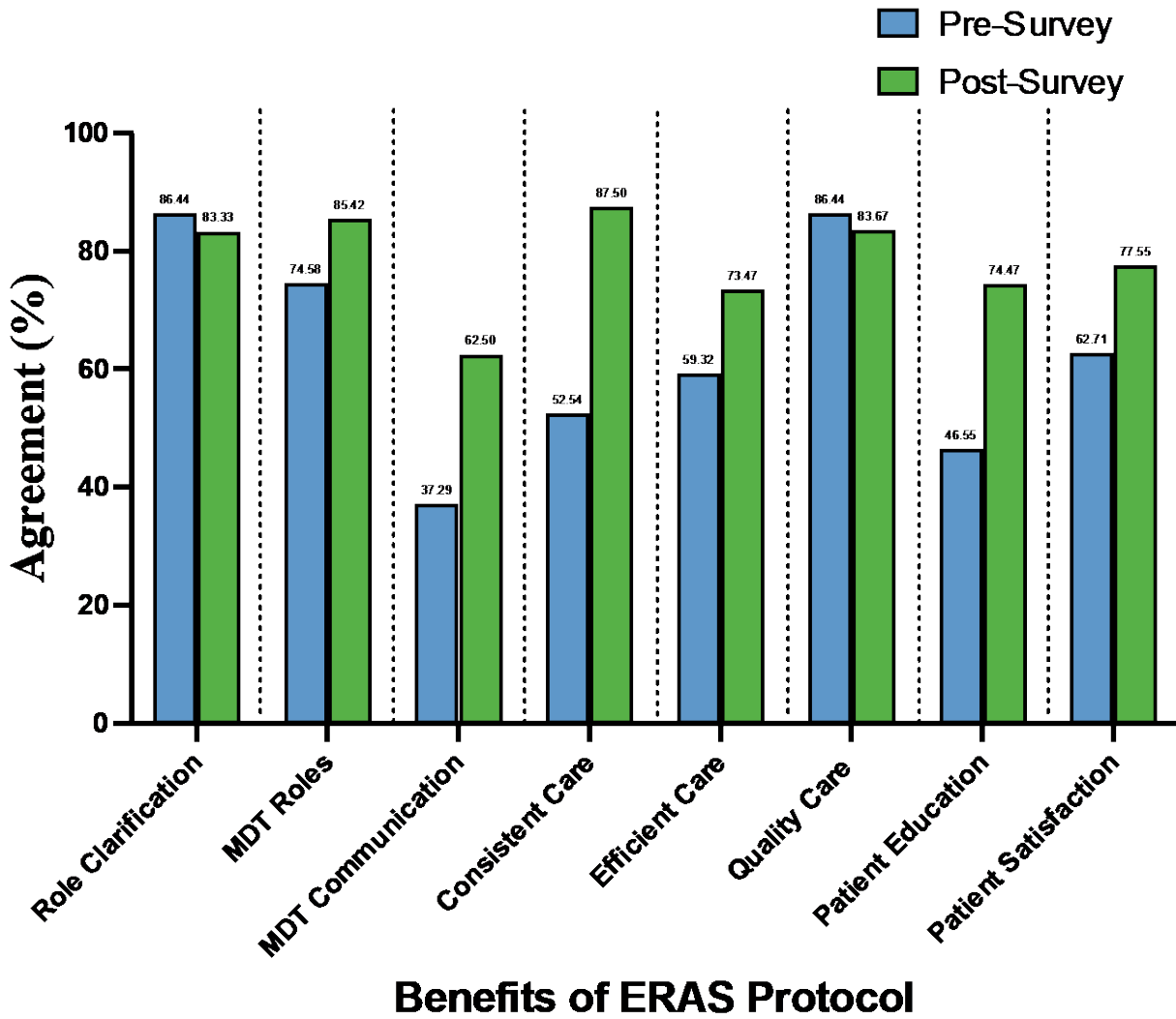
Average Post-Survey Response By Role



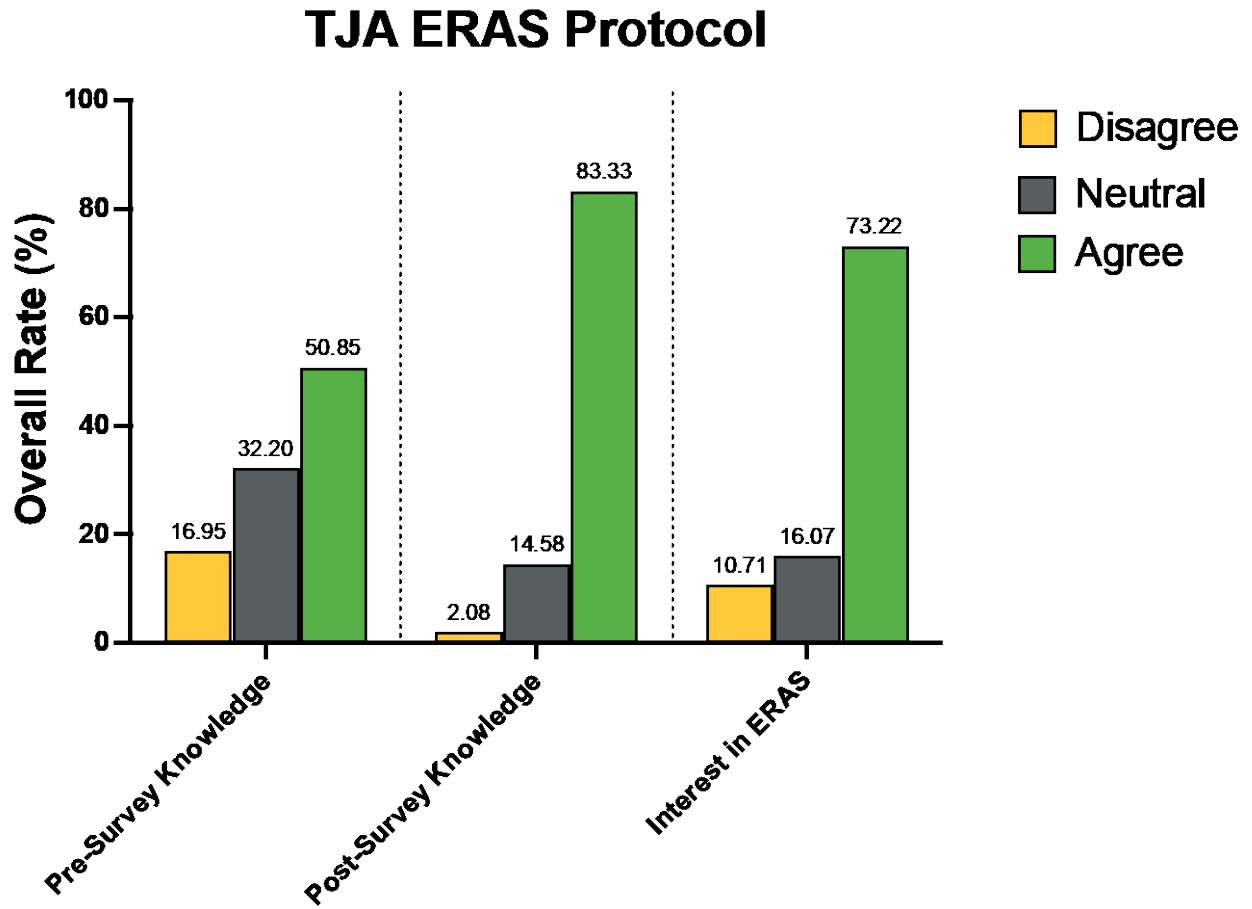
Care of TJA Patients

- PMC
- Ortho
- Anesthesia
- PT
- OR RN
- IP RN
- Pharmacy

Appendix F: Average Pre and Post Survey Team Response



Appendix G: Overall Response to ERAS Protocol



Knowledge and Interest in ERAS Protocol