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## A survey of pediatric surgeons' practices with enhanced recovery after children's surgery<sup>☆,☆☆</sup>



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## ABSTRACT

**Purpose:** Enhanced Recovery After Surgery (ERAS) protocols have been shown to improve outcomes in adult abdominal surgical populations. Our purpose was to survey pediatric surgeons' opinions regarding applicability of individual ERAS elements to children's surgery.

**Methods:** A survey of the American Pediatric Surgical Association was conducted electronically. Using a 5-point Likert scale, respondents rated their willingness to implement 21 adult ERAS elements in an adolescent undergoing elective colorectal surgery.

**Results:** Of an estimated 1052 members, 257 completed the survey (24%). The majority of the respondents ( $n = 175$ , 68.4%) rated their familiarity with ERAS as "moderately", "very", or "extremely familiar". However only 19.2% ( $n = 49$ ) replied that they were "already implementing" an ERAS protocol in their practice. Most respondents replied that they were "already doing" or "definitely willing" to implement 14 of the 21 (67%) ERAS elements. For the remaining 7 elements, >10% of surgeons answered that they were only "somewhat willing" to, "uncertain" about or "unwilling" to implement these interventions.

**Conclusions:** Most respondents were willing to implement the majority of adult ERAS concepts in children undergoing abdominal surgery. However, we identified 7 elements that remain contentious. Further investigation regarding the safety and feasibility of these elements is warranted before applying them to children's surgery.

**Level of evidence:** Level V.

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Enhanced Recovery After Surgery (ERAS) protocols aim to optimize perioperative care in patients undergoing major surgical procedures by maintaining physiologic homeostasis and reducing surgical stress in order to improve recovery, reduce postoperative morbidity, and decrease overall costs [1,2]. General tenets of ERAS include perioperative patient education, shortened preoperative fasting durations, minimally invasive surgical techniques, opioid-sparing analgesia, early postoperative oral feeding and mobilization, and minimal use of surgical drains and catheters (Fig. 1) [3]. Procedure-specific ERAS protocols are being successfully implemented in a variety of adult surgical populations with documented decreases in postoperative length of stay (LOS), complications, and costs [4–8]. Evidence supporting the implementation of

ERAS in pediatric surgical populations is far less robust than in the adult literature. A literature review performed by Shinnick et al. identified only 5 pediatric studies that included at least 4 ERAS components, which are considerably less than adult protocols that typically include more than 20 components. Nevertheless, these studies preliminarily suggest that the application of ERAS in children would be safe and effective [9].

ERAS protocols, as they currently exist, were designed specifically for use in adult surgical populations. It is possible that not all the elements in the adult pathways are applicable or desirable in children. Accordingly, controversy exists regarding the adoption of these protocols for use in children in their current form. Some elements may require revision in order to meet the unique perioperative needs of children. Although there are no high-quality studies exploring the implementation of a comprehensive ERAS protocol in children, there is existing literature addressing the safety and efficacy of some individual elements in pediatric surgery [10–17]. Additionally, none of the elements included in adult protocols are novel, and many elements are likely being implemented routinely by pediatric surgeons outside of an official ERAS protocol [18].

**Abbreviations:** ERAS, Enhanced Recovery After Surgery; LOS, length of stay; APSA, American Pediatric Surgical Association; IBD, inflammatory bowel disease.

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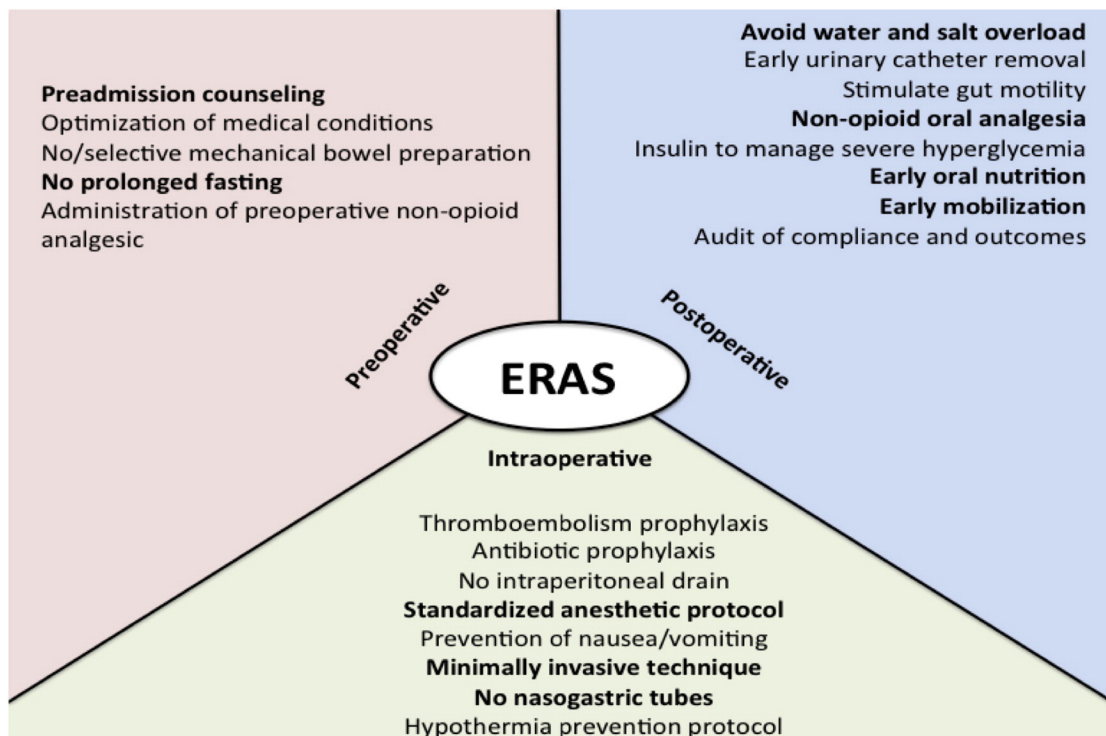


Fig. 1. Example of comprehensive adult ERAS protocol including 21 individual elements.

In order to reach a consensus on the applicability of ERAS in children and to determine which elements are appropriate for inclusion in a pediatric-specific protocol, we must first determine pediatric surgeons' current familiarity with and willingness to apply ERAS concepts in their individual practices. The purpose of this study is to assess pediatric surgeons' opinions regarding the applicability of ERAS in children through a survey of the American Pediatric Surgical Association (APSA) membership. We specifically aimed to gain a deeper understanding of individual surgeon's perceptions and attitudes towards specific ERAS elements and to identify potential barriers to implementation.

## 1. Methods

### 1.1. Study design

Adhering to the guidelines established by the APSA Outcomes and Evidence-Based Committee Subcommittee on Survey Development, a close-ended survey was created and administered through REDCap, a secure web-based application designed to support data capture for research studies [19,20]. Study data were collected and managed using REDCap electronic data capture tools hosted at Emory University and Children's Healthcare of Atlanta. The survey was designed to gauge the opinions of pediatric surgeons regarding the use of ERAS protocols in children and to determine willingness to implement individual elements. This study was submitted to the Children's Healthcare of Atlanta institutional review board and deemed to be exempt from review.

Demographic information was collected including individual surgeon's age group, gender, timing of fellowship completion, state and primary site of practice. To gauge surgeons' ERAS knowledge, respondents were asked to rate their level of familiarity and preparedness for large-scale implementation. Next, surgeons were asked to rate their willingness to implement 21 adult ERAS elements in a 14-year-old female with a long-standing history of Crohn's disease scheduled to undergo an elective ileocectomy. This patient was meant to represent the more general population of an adolescent undergoing an elective colorectal procedure for a diagnosis of inflammatory bowel disease (IBD). This specific clinical scenario was provided in order to most

closely align with adult populations for which ERAS protocols have become widely accepted. Details and explicit interventions that would satisfy each element (i.e. a postoperative pain regimen including acetaminophen, ibuprofen, and gabapentin to satisfy the "nonopioid oral analgesia" element) were included in each question. Ratings were based on a 5-point Likert scale with 1 representing "Unwilling" and 5 representing "Already Doing". The last section of the survey asked surgeons to identify factors that they felt would be barriers to and resources that would be essential for smooth protocol adoption at their institution. The survey concluded with an open-ended section that allowed for general comments and suggestions. A copy of the survey is included as [Appendix 1](#).

The survey was distributed to all APSA members who met the following criteria: attending pediatric surgeons actively practicing in the United States and Canada. After appropriate approval, an e-mail containing the survey link was sent to 1052 eligible participants from APSA headquarters on June 3, 2016. To maximize response rate, an APSA administrator delivered two reminders over a three-week period, and the survey closed on June 25, 2016. No personal identifying information was collected. All responses were voluntary and confidential.

Qualitative data were collected from the final open-ended response questions. These comments were collated and categorized based on similar concepts (i.e. skepticism, challenges) then supplemented with quotes to add detail to the point being made. Descriptive coding, unlike open coding to reach saturation through pattern identification, was used to gain general insight to inform future ERAS research activities. This process was completed through a manual review process completed by authors NT and KP.

### 1.2. Statistical analysis

Descriptive and inferential statistics were generated using IBM SPSS (Chicago, IL) software application. The answers to each survey question were summarized as frequency and percentage. Individual surgeon demographics were dichotomized or categorized into multiple groups where appropriate. Chi-square tests of independence were performed to identify possible associations between surgeon age and ERAS

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