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Original Articles

Appropriateness of a pediatric-specific enhanced recovery protocol using a modified Delphi process and multidisciplinary expert panel $^{\bigstar, \bigstar \bigstar}$

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ABSTRACT

Purpose: Despite Enhanced Recovery After Surgery (ERAS) protocols demonstrating improved outcomes in a wide variety of adult surgical populations, these protocols are infrequently and inconsistently being used in pediatric surgery. Our purpose was to develop a pediatric-specific ERAS protocol for use in adolescents undergoing elective intestinal procedures.

Methods: A modified Delphi process including extensive literature review, iterative rounds of surveys, and expert panel discussions was used to establish ERAS elements that would be appropriate for children. The 16-member multidisciplinary expert panel included surgeons, gastroenterologists, anesthesiologists, nursing, and patient/family representatives.

Results: Building upon a national survey of surgeons in which 14 of 21 adult ERAS elements were considered acceptable for use in children, the 7 more contentious elements were investigated using the modified Delphi process. In final ranking, 5 of the 7 controversial elements were deemed appropriate for inclusion in a pediatric ERAS protocol. Routine use of insulin to treat hyperglycemia and avoidance of mechanical bowel preparation were not included in the final recommendations.

Conclusions: Using a modified Delphi process, we have defined an appropriate ERAS protocol comprised of 19 elements for use in adolescents undergoing elective intestinal surgery. Prospective validation studies of ERAS protocols in children are needed.

Level of evidence: Level V, Expert opinion.

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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 and have been shown to reduce length of stay (LOS), reduce postoperative morbidity, and decrease overall costs in a variety of adult surgical procedures [1–7]. 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 [8]. Evidence supporting the implementation of ERAS in pediatric surgical populations is far less robust than in the adult literature. Two

Abbreviations: ERAS, Enhanced Recovery After Surgery; LOS, length of stay; RCT, randomized, controlled trial; APSA, American Pediatric Surgical Association; MBP, mechanical bowel preparation; VTE, venous thromboembolism; NGT, nasogastric tube; NPO, nil per os; TAP, transversus abdominis.

recent reviews of the pediatric literature demonstrated that the use of ERAS protocols in children is limited, however both studies concluded that the use of these protocols in children may be beneficial [9,10]. Current ERAS protocols were designed specifically for use in adult surgical populations. 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 examining the use of comprehensive ERAS protocols in children, there is existing literature addressing the safety and efficacy of some individual elements [11–18]. Additionally, none of the adult ERAS elements are novel, and many are likely being implemented routinely by pediatric surgeons outside of an official ERAS protocol [19]. One approach to designing a pediatric-specific ERAS protocol would be to conduct multiple randomized, controlled trials (RCTs) comparing individual ERAS elements to traditional perioperative management techniques. However, this process would require extensive resources and years to complete and may delay potential benefits to patients by decades. An alternative approach is the adoption of specific elements for use in designated populations after consensus is reached through a process including review of





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the current evidence, repetitive questioning, and expert vetting. This method known as the modified Delphi process or the Rand/UCLA appropriateness method has been used in the surgical literature to develop guidelines for the management of several controversial topics [20–22]. The purpose of this study was to determine which individual ERAS elements are appropriate for inclusion in a pediatric-specific protocol for use in adolescents undergoing elective intestinal surgery for treatment of inflammatory bowel disease through a modified Delphi process.

1. Methods

Fig. 1 depicts a timeline of the methodology used for the development of our pediatric-specific ERAS protocol for use in adolescents undergoing intestinal surgery. This process took place between June 3, 2016 and December 31, 2016. This study was submitted and deemed exempt from review by the Children's Healthcare of Atlanta Institutional Review Board.

1.1. Round 1: national survey

A web-based survey of the American Pediatric Surgical Association (APSA) membership was conducted in June 2016. Respondents were asked to rate each of 21 adult colorectal ERAS elements on their willingness to incorporate them into their own practice when considering a 14-year-old female with a long-standing history of Crohn's disease scheduled to undergo an elective ileocecectomy. Willingness was measured using the following 5-point Likert scale: 1-"Unwilling", 2-"Uncertain", 3-"Somewhat willing", 4-"Definitely willing", and 5-"Already doing". Elements that were ranked as "Definitely willing" or "Already doing" (Likert score of 4 or 5) by more than 90% of respondents were considered appropriate for inclusion in a pediatric-specific ERAS protocol without any further discussion. Elements that were ranked as "Unwilling", "Uncertain", or "Somewhat willing" (Likert score of 3 or less) by more than 10% of respondents were considered controversial and required further review prior to being included in a pediatric-specific ERAS protocol [23].

1.2. Expert panel

In order to facilitate the Delphi process, an expert panel was assembled. Potential panelists were identified by the authors (HLS and MVR) and invited via email to voluntarily participate in the expert panel. The final panel consisted of 16 individuals representing leaders in pediatric care in multiple specialties related to pediatric abdominal/intestinal surgery as well as patient/family representatives. Panel participants represented 11 children's hospitals across the United States. The panel included 8 pediatric surgeons, 3 pediatric anesthesiologists, 2 pediatric gastroenterologists, 2 patient representatives, and 1 nurse practitioner.

1.3. Literature review

A compendium of the current literature surrounding ERAS protocol implementation in pediatric surgery, as well as use of individual ERAS elements, was compiled by the authors (HLS, NT, KP). This document along with an "Executive Summary" was sent to all expert panel members via email on October 10, 2016. The Executive Summary included a short introduction to ERAS, a summary of our institutional experience with ERAS in children, a short explanation of the Delphi process, and a summary of the current scientific evidence for the controversial ERAS elements identified in round 1 along with references (Executive Summary available upon request to the corresponding author). Panel members were instructed to read this document in its entirety in preparation for round 2 of the Delphi process.

1.4. Round 2: pre-meeting survey

After receiving the Executive Summary, expert panel members were sent a web-based survey. In round 2, panelists were asked to rate the appropriateness of inclusion of each of the controversial elements in a pediatric-specific ERAS protocol for use in adolescents undergoing elective intestinal surgery. Specifically, respondents were asked to answer each question as it pertained to a 14-year-old female with a longstanding history of Crohn's disease scheduled to undergo an elective ileocecectomy. Appropriateness was measured on a scale of 1 to 10 (1—"Extremely inappropriate", 10—"Extremely appropriate"). Panelists



Fig. 1. Timeline depicting rounds of modified Delphi process, which took place between June 2016 and December 2016.

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