Feasibility of Enhanced Recovery Protocols in Children

CE 1.5 Contact Hours

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Introduction: Enhanced recovery after surgery (ERAS) programs have been utilized among various adult populations, and successful outcomes are well described in the literature. However, similar programs are not well established for children. The aims of this article were to explore the existing literature for current knowledge of the feasibility of enhanced recovery protocols in children, to explore patient and provider experiences with enhanced recovery programs, and to discuss implications for nursing.

Methods: Two basic searches were conducted using PubMed/Medline, CINAHL, and EMBASE to identify pediatric ERAS studies and studies discussing patient and nurse experiences with ERAS programs. Keywords included "pediatrics or children," "enhanced recovery after surgery," "enhanced recovery," "fast-track surgery," "ERAS," "perioperative," and "experiences/perceptions/attitudes/views/opinions/feelings."

Results: The search for pediatric ERAS studies yielded nine studies: five prospective implementations, one retrospective case-match, one retrospective review, one systematic review, one scoping review, and no randomized control studies. There were different combinations of ERAS principles among the studies, ranging from 5 to 12. Outcomes included a decreased hospital length of stay and reduced time to oral nutrition, return of bowel function, and mobilization. The search for experiences with ERAS yielded three qualitative studies and one systematic review: two patient experience and two healthcare provider experience studies.

Discussion: The literature suggests that ERAS protocols in pediatric surgery can be safely integrated into practice and are an effective method for standardizing care. However, additional high-quality experimental and quasi-experimental studies are needed to analyze the impact of ERAS on pediatric patients.

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Enhanced recovery after surgery (ERAS) was first introduced in 2001 by the ERAS Study Group, a collaboration of academic surgeons in Europe, whose primary focus was to improve the overall quality of postoperative recovery and reduce complications among patients undergoing major abdominal surgery (Ljungqvist, Scott, & Fearon, 2017; Reismann, Arar, Hofmann, Schukfeh, & Ure, 2012; Reismann et al., 2007, 2009; Schukfeh et al., 2014; Smart et al., 2012; Wilmore & Kehlet, 2001). On the basis of published evidence, the ERAS Study Group developed standardized protocols for the entire operative spectrum, including care management in the preadmission, preoperative, intraoperative, postoperative, and follow-up phases. The first evidence-based protocol was published in 2005 for adult patients undergoing colorectal surgery (ERAS Society, 2016). Currently, there are over 20 adult colorectal ERAS principles (Table 1) with the core including perioperative counseling and education, limited fasting, early nutrition and mobilization, minimal use of narcotics, and nonroutine use of surgical drains and tubes (Gustafsson et al., 2012; Shinnick et al., 2016). Together, these principles aim to maintain physiologic homeostasis and reduce surgical stress, therefore facilitating a quicker postoperative recovery and discharge to home (Shinnick et al., 2016). ERAS is a multimodal approach, and a single element alone has not been associated with improved surgical outcomes (Ljungqvist et al., 2017).

Colorectal surgery is common in children and is associated with a high rate of postoperative morbidity. Colorectal procedures are responsible for a disproportionate burden of surgical site infection relative to other surgical procedures in children (Feng, Sidhwa, Cameron, Glass, & Rangel, 2016). Presently, there is high variability in the perioperative management and surgical outcomes of pediatric colorectal patients (Leeds et al., 2016; Mattioli et al., 2009; Pearson

Table 1: ERAS Guidelines for Perioperative Care in Colorectal Surgery

ERAS Society Recommendations (Gustafsson et al., 2012)		Johns Hopkins Children's Center Pilot ERAS for Patients ≥ 12 Years Old (Leeds et al., 2016)
Item	**Guideline**	**Modified Guidelines**
Preoperative information, education, and counseling	Routine for all patients	Included
Preoperative medical optimization	Cessation of smoking and alcohol consumption at least 4 weeks before surgery	Omitted
Preoperative standardized bowel preparation	Routine mechanical prep not recommended	Antibiotic and mechanical
Preoperative fasting and fluid Carbohydrate treatment	Before anesthesia: Solids allowed up to 6 hours prior. Clears allowed up to 4 hours prior. Routine carbohydrate treatment, including diabetic.	Gatorade/Pedialyte up to 2 hours before anesthesia
Preanesthesia medication	Avoid routine sedatives before anesthesia.	Included
Thromboembolism prophylaxis	Compression stockings, intermittent pneumatic compression device, and low-molecular-weight heparin	For patients > 14 years old
Antibiotic prophylaxis and skin preparation	Intravenous (IV) antibiotics 30–60 minutes before surgery and subsequent doses for prolonged operations.	Included chlorhexidine baths night before and morning of surgery
Perioperative fluid management	Administration of crystalloids and colloids, guided by clinical measurements to optimize cardiac output. IV fluids should be transitioned to enteral as soon as possible.	Internal anesthesia/surgical consensus
Perioperative nutrition	Early nutrition screening and support Minimal perioperative fasting Early postoperative enteral nutrition	Included
Standardized anesthesia protocol	Short-acting anesthetics Midthoracic epidural analgesia	Internal anesthesia consensus group
Laparoscopic approach	Recommended	Omitted
Intraoperative normothermia	Maintain core body temperature > 36 °C using warming devices and warmed IV fluids.	Included
Nasogastric tube	Early removal	Included
Drains	Discouraged	Excluded
Urinary catheter	Early removal; epidural analgesia is not an indication for maintaining a Foley catheter.	Included
Postoperative glucose control	Prevent hyperglycemia without causing hypoglycemia	Omitted
Postoperative nausea and vomiting	Multimodal approach to prevention	Included
Postoperative ileus prevention	Midthoracic epidural analgesia and laparoscopic approach recommended. Avoid fluid overload and nasogastric decompression. Chewing gum may be recommended.	Omitted
Postoperative analgesia	Nonopioid	Included
Early mobilization	Routine for all patients	Included
Outcomes and compliance monitoring	Standardized routine audits	Included

Note. ERAS = enhanced recovery after surgery.

& Hall, 2017; Reismann et al., 2007, 2009, 2012; Schukfeh et al., 2014; Shinnick et al., 2016; Vrecenak & Mattei, 2014; West et al., 2013). In the last two decades, standardization in perioperative care has become increasingly popular due to associated improvements in clinical outcomes and reduced healthcare costs (Huang, 2016). ERAS programs, also referred to as fast-track surgery, are clinical pathways designed to standardize perioperative care and improve surgical outcomes by reducing institutional and provider level variation in care.

ERAS programs have been utilized among various adult populations, and successful outcomes are well described in the literature. However, similar programs are not well established for children, perhaps because of the physiological, psychosocial, and developmental factors unique to the pediatric population. The aims of this article were to explore the existing literature for current knowledge of the feasibility of enhanced recovery protocols in children, to explore patient and provider experiences with enhanced recovery programs, and to discuss implications for nursing.

METHODS

Two basic searches were conducted using PubMed/Medline, CINAHL, and EMBASE. Filters for both searches were set to include full-text articles with an abstract, available in English, and published in an academic journal between 2007 and 2017. The first search was conducted to identify pediatric ERAS studies. The key search terms included "pediatrics" or "children," "enhanced recovery after surgery," "enhanced recovery," "fast-track surgery," "ERAS," and "perioperative." Titles were reviewed for pediatric ERAS studies, and pediatric was defined as less than 18 years old. Abstracts and articles were then reviewed for the inclusion of multimodal ERAS programs for the perioperative management of colorectal and abdominal surgical patients. Articles that were adult-only, were not research oriented, and/or studied a population not inclusive of colorectal or abdominal surgical patients were excluded.

The second search was conducted to identify articles discussing nurse and patient experiences with ERAS. The key search terms included "enhanced recovery after surgery," "enhanced recovery," "fast-track surgery," "ERAS," and "experiences" or "perceptions" or "attitudes" or "views" or "opinions" or "feelings." The search was not limited to pediatrics or colorectal or abdominal surgical patients, and there were no additional exclusions. Titles and abstracts were reviewed for relevant qualitative studies.

RESULTS

Pediatric ERAS Studies

The search for pediatric ERAS yielded nine studies (Table 2) that originated from Germany (n = 4), Italy (n = 1), the United Kingdom (n = 2), and the United States (n = 2). There were no randomized control studies. Four studies were prospective implementations of ERAS programs, using data from the German diagnosis-related groups as the comparison group (Reismann et al., 2007, 2009, 2012; Schukfeh et al., 2014). Three of these prospective studies investigated the feasibility of ERAS in pediatric surgery (Reismann et al., 2007, 2009; Schukfeh et al., 2014), and the fourth investigated the impact of individual elements of an ERAS protocol on outcomes (Reismann et al., 2012). Of note, these four studies were conducted by the same research group but at different periods and with different samples. There was a fifth prospective study that described the experience with ERAS protocol implementation and outcomes; however, this study did not have a control or comparison group (Mattioli et al., 2009). A retrospective case-match study compared outcomes among a pediatric cohort, managed by traditional perioperative methods, with the outcomes of an adult cohort (18–25 years old) that was managed by an established ERAS program; patients were matched by diagnosis and surgical procedure (West et al., 2013). There was one retrospective review that investigated ERAS outcomes in pediatrics (Vrecenak & Mattei, 2014). One systematic review synthesized evidence from five pediatric ERAS studies, all of which are also included in this review (Shinnick et al., 2016). One scoping review discussed nine studies, seven of which are also included in this review (Pearson & Hall, 2017); the two studies excluded focused exclusively on nutrition or surgical technique.

Sample sizes among the prospective and retrospective studies were small, ranging from 46 to 203 participants. Males accounted for greater than 50% of the sample in six of seven studies (Reismann et al., 2007, 2009, 2012; Schukfeh et al., 2014; Vrecenak & Mattei, 2014; West et al., 2013), ranging from 53% to 78%. Gender was not included in the seventh study (Mattioli et al., 2009). The mean ages are described in Table 2. In three studies, the surgeries were colorectal procedures only (Mattioli et al., 2009; Vrecenak & Mattei, 2014; West et al., 2013). One study included abdominal and urological procedures (Reismann et al., 2007), and three studies included abdominal, urological, and thoracic procedures (Reismann et al., 2009, 2012; Schukfeh et al., 2014). There were different combinations of ERAS principles among the studies, ranging from 5 to 12. Principles utilized in all six pediatric ERAS studies were perioperative counseling and education, early nutrition, early mobilization, limited use of opioids, nonroutine use of surgical drains, and limited use/early removal of nasogastric (NG) tube and Foley (Figure 1).

Table 2: Characteristics of Included Pediatric ERAS Studies

Reference, Journal, and Location	Aim of the Study	Study Type and Dates	Number of Participants	Mean Age (Years)	Surgical Procedures	Outcomes	Conclusions
Reismann et al. (2007), *Journal of Pediatric Surgery*, Germany	To assess feasibility of FT concepts for pediatric surgical procedures.	Prospective cohort, June 2004–June 2005	113, 65% male	5.8 ± 5.3	Abdominal and urological procedures.	Reduced LOS Patients "highly" satisfied Three readmissions: two required additional surgery	Implementation of all elements of FT protocols is required to achieve optimal results.
Mattioli et al. (2009), *Journal of Laparoendoscopic and Advanced Surgical Techniques*, Italy	To present FT experience.	Prospective cohort without a comparison group, 2000–2007	46	Colon innervation = 7.9 months IBD = 8 months	Laparoscopic colon resection surgery for anomalies of colon innervation and IBD.	Oral nutrition and first bowel movement achieved within 1 day Discharge by Day 5 in 96% Two readmissions, both required additional surgery	FT principles should always be implemented unless there is early detection of postoperative complications.
Reismann et al. (2009), *Langenbeck's Archives of Surgery*, Germany	To investigate FT concepts in routine pediatric surgery.	Prospective cohort, June 2006–June 2007	155, 65% male	7.3 ± 6.4	Elective abdominal, thoracic, or urological surgery with required hospitalization.	Reduced LOS 90% achieved oral nutrition by the end of POD 1 Patients "generally" satisfied Three readmissions	In this population, FT principles can be applied safely and be effective in reducing hospital length of stay.
Reismann et al. (2012), *European Journal of Pediatric Surgery*, Germany	To investigate the applicability of single FT elements and their impact on the quality of patient care.	Prospective cohort, April 2009–April 2010	203, 66.5% male	8.3 ± 6.7	Elective abdominal, thoracic, or urological surgery with required hospitalization.	Reduced LOS 95% of patients were "very satisfied" Four readmissions: one required additional surgery	FT elements in pediatric surgery have the potential to improve outcomes irrespective of the applicability of a whole FT protocol.
West et al. (2013), *Journal of Pediatric Surgery*, United Kingdom	To compare a cohort of pediatric patients managed with traditional perioperative methods with a matched cohort of adult patients (< 25 years old) managed with an established ERAS protocol.	Retrospective review, January 2005–January 2011	Pediatrics = 34, 53% male Adults = 34, 53% male	Pediatrics = 15 Adults = 22	Elective colorectal surgery for IBD.	The adult cohort experienced reduced LOS and reduced time to oral nutrition and mobilization. No difference between pediatric and adult cohorts in time to return of bowel function, morbidities, or readmissions. One readmission in ERAS cohort and required additional surgery Three readmissions in pediatric cohort: one required additional surgery.	Application of ERAS in pediatric surgery could accelerate recovery and reduce length of postoperative stay, improving the overall quality and efficiency of care.

(continues)

Table 2: Characteristics of Included Pediatric ERAS Studies, Continued

Reference, Journal, and Location	Aim of the Study	Study Type and Dates	Number of Participants	Mean Age (Years)	Surgical Procedures	Outcomes	Conclusions
Schukfeh et al. (2014), *European Journal of Pediatric Surgery*, Germany	To assess the applicability of established FT concepts in a nonacademic department of pediatric surgery.	Prospective cohort, February 2011–January 2012	143, 78% male	7.9 ± 5.0	Abdominal, thoracic, and urological procedures	No reduction in hospital LOS Mean patient satisfaction = 8.6/10 Six readmissions	FT concepts can be safely and effectively applied to pediatrics in a nonacademic hospital without previous FT experience.
Vrecenak & Mattei (2014), *Journal of Pediatric Surgery*, United States	To assess FT outcomes	Retrospective review, December 2000–December 2010	71, 60% male	14.6	Laparoscopic ileocecectomy for Crohn's disease.	Reduced LOS Reduced time to oral nutrition and return of bowel function Two readmissions Increase in SBO in ERAS cohort ($p = .15$)	FT principles are safe and effective in reducing hospital length of stay and return of bowel function.
Shinnick et al. (2016), *Journal of Surgical Research*, United States	To explore the existing evidence of multimodal ERAS programs that integrate guidelines from the ERAS Society.	Systematic review, 2000–2012	–	–	–	–	ERAS in pediatrics appears promising; however, there is a need for additional prospective studies to define and validate adult ERAS principles adapted to pediatrics.
Pearson & Hall (2017), *Pediatric Surgery International*, United Kingdom	To identify gaps in the existing literature on pediatric ERAS to offer guidance for future clinical work and research.	Scoping review	–	–	–	–	ERAS in pediatrics has benefits. However, the literature is limited, and additional prospective studies are needed.

Note. ERAS = enhanced recovery after surgery; FT = fast-track; IBD = inflammatory bowel disease; POD = postoperative day; SBO = small bowel obstruction.

Five of seven studies reported a decreased hospital length of stay among ERAS cohorts (Reismann et al., 2007, 2009, 2012; West et al., 2013; Vrecenak & Mattei, 2014). Mattioli et al. (2009) reported that 96% of patients were discharged by postoperative day (POD) 5. West et al. (2013) reported a reduced time to oral nutrition and return of bowel function. Vrecenak and Mattei (2014) also reported these outcomes, plus reduced time to mobilization. Mattioli et al. reported that oral nutrition and first bowel movement were achieved by 100% of patients by the end of POD 1. Vrecenak and Mattei reported that 90% of patients achieved oral nutrition by the end of POD 1. All studies reported readmissions, and four studies reported readmissions for surgical management of a complication (Mattioli et al., 2009; Reismann et al., 2007, 2012; West et al., 2013). Three studies reported that complications were not associated with the ERAS interventions (Reismann et al., 2007, 2012; Schukfeh et al., 2014). Four studies reported patient satisfaction outcomes, which range from "generally satisfied" to "very satisfied" (Reismann et al., 2007, 2009, 2012; Schukfeh et al., 2014).

All seven pediatric ERAS studies concluded that implementation of ERAS is feasible and safe for pediatric surgical patients. Schukfeh et al. (2014) suggest that pediatric ERAS may be implemented in nonacademic hospital settings. Reismann et al. (2007) concluded that implementation of all elements of ERAS programs is required to achieve optimal results; however, Reismann et al. (2012) suggest that individual elements of ERAS in pediatric surgery have the potential to improve outcomes "irrespective of the applicability of a whole [ERAS] protocol" (p. 44). Although outcomes and conclusions were positive, all studies implied that the literature is limited and additional research is needed. Shinnick et al. (2016) and Pearson and Hall (2017) discussed the need for future prospective cohort studies with strong controls, large samples, and models that implement multifaceted ERAS.

ERAS Experience Studies

The search for experiences with ERAS yielded three qualitative studies (Bernard & Foss, 2014; Gotlib Conn et al., 2015; Jeff & Taylor, 2014) and one systematic review (Sibbern et al., 2017). Two studies discussed patient experiences (Table 3; Bernard & Foss, 2014; Sibbern et al., 2017), and two studies discussed provider experiences (Table 4). Of the provider experiences, one Gotlib Conn et al., 2015) and one study discussed experiences of ward nurses with varying years of nursing experience (Jeff & Taylor, 2014). Sample sizes for the three qualitative studies were small. Two studies enrolled less than 10 participants (Bernard & Foss, 2014; Jeff & Taylor, 2014). Gotlib Conn et al. (2015) enrolled 48 participants, including nurses, anesthesiologists, and surgeons from each of 15 participating ERAS centers. Sibbern et al. (2017) synthesized findings from 11 qualitative studies, one of which is also included in this review (Bernard & Foss, 2014). The qualitative studies utilized semistructured interviews, and all four studies utilized thematic analysis, which produced four final themes. These are described in Table 4.

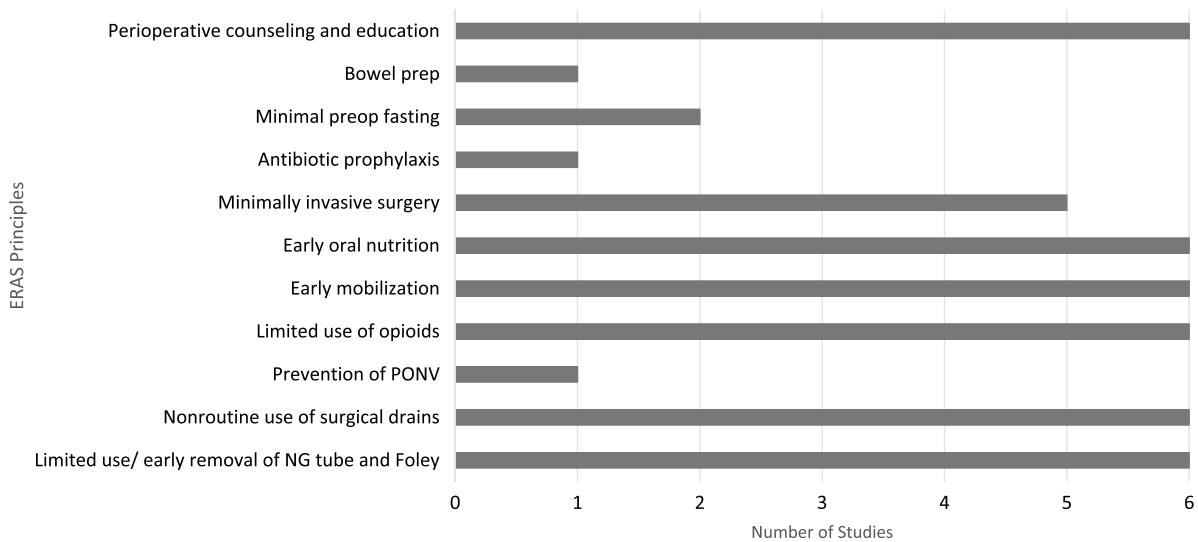

FIGURE 1. ERAS principles utilized in the pediatric studies.

Table 3: Patient Experiences With ERAS Protocols

Reference, Journal, and Location	Aim of the Study	Study Characteristics	*N*	Findings	Conclusions
Bernard & Foss (2014), *British Journal of Nursing*, England	To explore experiences of patients who received care within an ERAS program by understanding how patients view, cope with, and experience surgery.	Qualitative Grounded theory Semistructured interviews Thematic analysis Constant comparative analysis	6	Theme 1: information provision. Variation in the amount and quality of perioperative information and education. Theme 2: inpatient experiences Expectations for recovery and discharge were clear and a decreased hospital LOS was preferred. Theme 3: home recovery experiences. Home recovery was preferred, although complicated by physical challenges/limitations and confusion regarding outpatient resources and follow-up. Theme 4: psychological/emotional experiences Increased anxiety and isolation, especially during home recovery, attributed to an increased emphasis on patient self-care and a decreased hospital LOS.	Home recovery elicited high levels of anxiety among ERAS patients, which was exacerbated by a lack of information and poor communication with their ERAS team. Consistent, high-quality information for patients is needed to support and achieve successful home recovery. ERAS is expanding among specialties, and nursing will be expected to be knowledgeable of the ERAS process. Community nurses need additional resources to support patients during home recovery.
Sibbern et al. (2017), *Journal of Clinical Nursing*	To further knowledge on patients' perioperative experiences under ERAS program management.	Systematic review of qualitative studies	11	Theme 1: information transfer Preoperative information was helpful, but some patients preferred additional time to ask questions and consider the information before surgery. Inconsistent information was troublesome. Theme 2: balancing burdensome symptoms and expectations for rapid recovery Patients were motivated to participate in their care planning. Patients found it challenging to meet the providers' expectations for recovery when they were in pain or physically limited. Positive reinforcement from the treatment team motvated patients. Theme 3: individualized treatment vs. standardized regimen Patients experienced variable responses to ERAS protocols. Patients expressed the need to be supported as individuals. Theme 4: sense of security at discharge Patients were motivated by the possibility of early discharge. Level of comfort at discharge correlated with the amount and quality of information given.	Patients are motivated to participate in their care plan. Understanding of program expectations eases patient anxiety. Therefore, sufficient patient education and counseling are essential.

Note. ERAS = enhanced recovery after surgery; LOS = length of stay.

Table 4: Nurse/Healthcare Professional Experiences

Reference, Journal, and Location	Aim of the Study	Study Characteristics	*N*	Findings	Conclusions
Gotlib Conn, McKenzie, Pearsall, & McLeod (2015); *Implementation Science*; Canada	To understand the champions' perceptions of process enablers and barriers that influenced the success of ERAS implementation and sustainability.	Qualitative Semi-structured interviews Thematic analysis The Normalization Process Theory One nurse, one surgeon, and one anesthesiologist champion from each of the 15 participating ERAS centers.	58	Theme 1: coherence Champion cohesion was important for problem solving and to address emerging problems. Theme 2: cognitive participation Team building, ongoing collaboration, and constant communication among champions were imperative for program integration and sustainability of provider interest. Theme 3: collective action Departmental leadership was needed to establish provider confidence with program interventions. Integration into the electronic ordering and documentation systems was a challenge. Theme 4: reflexive monitoring Quantitative data were the primary evaluation method because they offered concrete evidence to the providers and supported ongoing program funding. Monitoring and reporting of quality indicators was needed to sustain momentum.	Champions must be committed and engaged in the integration and ongoing monitoring of ERAS programs. "Successful ERAS implementation is achieved by a complex series of cognitive and social processes" (p. 10).
Jeff & Taylor (2014), *Gastrointestinal Nursing*	To explore and describe ward nurses' experiences with ERAS programs during the postoperative phase.	Qualitative Grounded theory Semistructured interviews Memos and reflective journal Thematic analysis Constant comparative analysis Four "experienced" nurses: experience with traditional perioperative care and ERAS Four new nurses: experience with ERAS only All nurses had at least 1 year of experience with ERAS.	8	Theme 1: believing in the program Nurses wanted to feel confident in the care they provide. Nurses were skeptical and hesitant because ERAS was different from what they know and are comfortable with. Nurses were indecisive about when to advance the patient and subsequently scrutinized by the medical team. Theme 2: identifying the ward nurse role in the program Nurses perceived their role to include encouraging patients to achieve goals, educating, and coordinating all aspects of postoperative ERAS. Theme 3: the working program Perceived negativity among some nurses was influential on program development and overall nurse attitudes. Inconsistent implementation among services and teams. Nurses suggest that treatment goals can be set but a degree of flexibility is needed to address specific patient needs. Theme 4: adapting to the road to recovery Compliance with ERAS was dependent on the medical team, nurse, and patient. Experienced conflict when trying to balance protocol and clinical intuition. When not meeting goals, adapted protocol, in agreement with the patient, and had positive results.	Different levels of nurse experience led to different perceptions and comfort levels with the ERAS program. Nurses felt conflict about the care they were meant to provide through the ERAS program and the care they were actually providing. Nurses must have the autonomy to adapt protocols to individualized care based on patient recovery trajectory.

Note. ERAS = enhanced recovery after surgery.

PATIENT EXPERIENCES

Patients are motivated to participate in their own care planning (Sibbern et al., 2017). At the same time, patients experience high levels of anxiety when discussing early discharge and home recovery. This anxiety is exacerbated by inadequate or inconsistent information provided by the healthcare team and unclear expectations of the patient during the postoperative recovery phase. Therefore, consistent and high-quality information for patients and individualized supportive measures are essential for easing patient anxiety and promoting successful outcomes (Bernard & Foss, 2014; Mitchell, 2011; Sibbern et al., 2017).

PROVIDER EXPERIENCES

According to Gotlib Conn et al. (2015), "successful ERAS implementation is achieved by a complex series of cognitive and social processes" (p. 10). The multidisciplinary team "championing" an ERAS program must be committed and engaged, as they are responsible for the program implementation; the ongoing monitoring of quality, compliance, and outcomes; and the problem-solving and team-building activities necessary to achieve sustainability. For bedside nurses, Jeff and Taylor (2014) found that level of experience was influential on nurse perceptions of ERAS. Experienced nurses reported negative feelings toward ERAS and deviated from the protocol if certain elements conflicted with the care they provided in the past. Newer nurses felt that they were more positive than the experienced nurses in regard to program implementation and, as a result, adjusted to ERAS programs with more ease. Both experienced and newer nurses wanted to feel confident in the care they provide. However, nurses felt confused about their role in the ERAS protocol, when to advance a patient's recovery, and when to deviate from the ERAS protocol if a patient is not meeting treatment goals. Nurses felt that they needed more clarity and guidance. Jeff and Taylor concluded that nurses must have the "autonomy to adapt standardized protocols to individualize patient care" (p. 31) based on patient recovery trajectory.

DISCUSSION

Feasibility of ERAS Programs in Children

There is a notable gap in the literature regarding pediatric-specific enhanced recovery protocols. This review identified only six studies that exclusively investigated multimodal pediatric ERAS programs. Although each of the six studies concluded that implementation of ERAS is feasible and safe for pediatric surgical patients, additional research is needed. The comparability between studies and the generalizability beyond studies are impaired by multiple factors. Most of these studies were small populations housed within a single institution. It is difficult to evaluate if these early adopters may have also been disproportionately suited to benefit from such a pathway compared with other care environments. In addition, different combinations of ERAS principles were utilized within each study leading to limited hypothesizing of which of the many time-consuming and often resource-intensive ERAS interventions are critical and drive the observed benefits. We also worry that the lack of rigorous criteria for selecting included ERAS components suggests that improvements may not have been directly linked to an ERAS implementation at all. Of note, not one study included all elements of an adult ERAS program as defined by the ERAS Society (Table 1; Gustafsson et al., 2012).

Furthermore, there are important considerations when transposing adult ERAS principles to children, and many of the best practices in the latter patient population are yet to be determined. It cannot be concluded whether all adult principles are meaningful and applicable to the pediatric population. Furthermore, it cannot be concluded that all principles deemed appropriate for pediatric ERAS programs are actually clinically relevant to all children aged 0–18 years. Age-related implications are not well described, making it difficult to ascertain whether, for example, neonates experienced the same benefits from a colorectal ERAS program compared with school agers and adolescents. No current society recommendations exist for how to modify ERAS principles for a pediatric population. Recognizing the potential need for further age stratification, Leeds et al. (2016) have initiated a pilot study to investigate the outcomes of a modified ERAS program among pediatric colorectal patients greater than 12 years old. Modifications were based on age-related physiologic and psychosocial factors. This modified ERAS program is compared with the ERAS Society adult principles in Table 1.

Implications for Nurses

As ERAS programs are growing in popularity among pediatric surgical specialties, it is imperative for nurses to have a fundamental understanding of what an ERAS program is, why the program is important, and the expectations for nurses in practice. As active and integral members of the ERAS team, nurses facilitate the patients' transitions through the perioperative process, beginning with the preoperative counseling and assessments, patient and caregiver education, hospital and procedure coordination, and overall expectation setting for the

duration of the ERAS protocol. In the outpatient setting, a small group of nurses may be responsible for the ERAS patients. However, once admitted to the hospital, patients may encounter a number of nurses, from preoperative to the inpatient unit. A reliable method for identifying ERAS patients should be established as well as a consistent and reliable method for communicating the patient's protocol and clinical progress.

Although standardization is the fundamental intent of ERAS programs, it is important for nurses to understand that not every patient will be a "perfect fit." Elements of the protocol may need to be individualized to meet the patients' needs. We suspect that individualization will be needed more for the pediatric population as compared with adults because of the unique developmental and psychosocial factors associated with children. In such cases, communication of individualized protocols will be crucial to ensure consistent care and to prevent frustration among the ERAS team, patient, and caregiver(s).

Resistance to ERAS programs may arise when the nursing interventions outlined in a protocol conflict with traditional nursing cares. For instance, Jeff and Taylor (2014) found that experienced nurses tended to deviate from the protocol when it differed from their prior experiences. Because the success of an ERAS program relies heavily on protocol compliance, it is imperative for nursing leadership to identify ways to engage the nursing staff while fostering an environment that supports change and the advancement of evidence-based practice. It is important for ERAS teams and clinical nursing units to establish an organized ongoing process for identifying and monitoring issues related to compliance and educational needs. The Comprehensive Unit-Based Safety Program could be a viable option for this task.

CONCLUSION

The literature suggests that ERAS protocols in pediatric surgery can be safely integrated into practice and are an effective method for standardizing care. However, additional high-quality experimental and quasi-experimental studies are needed to analyze the impact of ERAS on pediatric patients. Researchers may consider investigating which ERAS interventions are most effective in ensuring optimal pediatric outcomes. This specificity would be beneficial when designing education for the multidisciplinary healthcare team, patients, and caregivers. Further observation and management of the bedside caregiver experience is also an important area for further research. Nurses play an integral role in successful ERAS programs; thus, it is imperative for nurses to have a fundamental understanding of what an ERAS program is, why the program is important, and the expectations for nurses in practice.

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