What is the role of enhanced recovery after surgery in children? A scoping review

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Acknowledgements

NJH is supported by the Southampton NIHR Biomedical Research Centre in Nutrition

Abstract

Purpose: Enhanced Recovery after Surgery (ERAS) pathways are standard practice in adult specialties resulting in improved outcomes. It is unclear whether ERAS principles are applicable to Paediatric Surgery. We performed a scoping review to identify the extent to which ERAS has been used in Paediatric Surgery, the nature of interventions and outcomes. Methods: Pubmed, Cochrane library, Google Scholar and Embase were searched using the terms enhanced recovery, post-operative protocol/pathway and paediatric surgery. Studies were excluded if they did not include abdominal/thoracic/urological procedures in children. Results: Nine studies were identified (2003-2014; total 1269 patients): Three case control studies, one retrospective review and five prospective implementations, no RCTs. Interventional elements identified were post-operative feeding, mobilisation protocols, morphine-sparing analgesia, reduced use of nasogastric tubes and urinary catheters. Outcomes reported included post-operative length of stay (LOS), time to oral feeding and stooling, complications and parent satisfaction. Fast-track programmes significantly reduced LOS in 6/7 studies, time to oral feeding in 3/3 studies and time to stooling in 2/3 studies. Conclusion: The use of ERAS pathways in Paediatric surgery appears very limited but such pathways may have benefits in children. Prospective studies should evaluate interventions used in adult ERAS on outcomes in the paediatric setting.

Introduction

Enhanced Recovery after Surgery (ERAS) pathways are well established in many adult surgical specialties following the work of Henrik Kehlet [1,2]. Enhanced recovery concepts include enhanced preoperative information, minimising pre-operative starvation, the use of minimally invasive techniques, avoidance of opiate analgesia, eliminating the use of drains, tubes and catheters, immediate postoperative feeding and early mobilisation [3]. A multitude of evidence shows that they result in improved clinical outcomes with less morbidity, reduced cost and higher patient satisfaction [4-9]. The ERAS Society guidelines detail the pathway elements across the spectrum of specialties [10-14].

It is unclear to what extent these ERAS principles are applicable to Paediatric Surgery and whether similar benefits could be realised in children.

To address this question and assess the existing literature we have undertaken a scoping review. This methodology allows a broader interrogation than a systematic review since it is not confined by narrow confines of a predetermined research question. It consequently does not attempt to assess the quality of the included studies. Our aim in conducting this scoping review is to establish the breadth of the existing literature relating to ERAS in Paediatric Surgery including the interventions used, outcomes assessed and efficacy. Further we aimed to identify gaps in the existing literature in this field with a view to guiding future work and research direction.

Methods

We conducted a scoping review using recommended methodologies described by Arksey and O’Malley from the University of York [15]. There are five key phases to the process as shown in Figure 1

Figure 1 (adapted from original description[15]).

Identifying the research question

The research questions for this scoping review were defined as:

1. To what extent has ERAS has been used in the field of Paediatric Surgery
2. Which ERAS type interventions have been used?
3. Which outcomes have been reported?
4. Is there any evidence to suggest ERAS is effective in children?

Identifying the relevant studies

We searched a wide range of electronic databases to ensure a comprehensive mapping of the research field. Pubmed (from 1946), Embase (from 1949), Cochrane library and Google Scholar to December 2015 were searched using the terms “enhanced recovery”, “protocolised care”, “post-operative protocol”, “post-operative pathway”, “fast track surgery” and “paediatric surgery”. We used English and American variations of spellings. Only full original articles written in English were included. We focused on published and peer reviewed literature. The references of selected studies were also checked using the same limits as the initial review.

Study selection

Studies were included if they reported the use of any intervention falling under the ERAS umbrella in children undergoing abdominal, thoracic or urological surgical procedures.

Studies were excluded if the only intervention they reported using was related to post-operative pain management with no other enhanced feature of peri-operative care.

Charting the data

The data were charted as per Armstrong’s recommendations[16] in Microsoft Excel 2013 with the following titles: author, year of publication, study location, intervention type, study population, aims of study, overview of methods, outcome measures and results.

Collating, summarising and reporting the results

Descriptive statistics were used to present the data.

# Results

We identified nine studies that met the criteria for inclusion. They originated from centres in the UK, USA, Europe and Asia. They were published over the time period 2003 to 2014 and included a total of 1269 patients. Characteristics of the studies included are shown in Table 1.

Table 1: Characteristics of included studies

There were no randomised control trials. Three studies were case matched control studies (two of which were retrospective [17,18], and one compared a prospective intervention group with historical controls [19]), one was a retrospective review [20] and five reported prospective implementations of a new fast-track protocol [21-25]. All studies originated from a single institution and four were from the same research group [21-24].

Case matched studies compared patients on a ‘fast track programme’ with those that had traditional treatment. The prospective studies investigated the feasibility or successful application of fast track elements and compared length of stay (LOS) with national data.

Fast track protocol elements

There was a range of interventions used across studies, and fast track programmes contained different elements in individual studies as summarised in Table 2. Despite this variation, there were some key elements identified. See Figure 2.

Table 2: Elements of individual fast track programmes

Figure 2: Most common fast track protocol elements

Figure 3: Outcomes used to assess efficacy

Outcomes

Outcomes used to assess efficacy of the ERAS intervention varied across studies (Figure 3). Of the seven studies that compared outcomes for children receiving an ERAS intervention, 6 [19,21-23,17,18] reported at least one improved outcome for patients receiving an ERAS intervention. Two studies made no comparison to controls[20,25]. Just one study showed no reduction in LOS compared to a national data control group [24].

The outcomes that were improved in patients on a fast track programme were reduced LOS in 6/7 studies [19,21-23,17,18], significantly reduced time to oral intake in 3/3 studies [18,19,17], significantly reduced time to stooling in 2/3 studies [19,18] and significantly reduced time to mobilisation in 1/1 study [17]. Parent satisfaction with fast track programme was high in all 4 studies that measured it [21-24]. Detailed individual outcomes are summarise in Table 3

Table 3: Outcomes and results of included studies

# Discussion

To what extent has ERAS has been used in the field of Paediatric Surgery?

This scoping review has identified just nine studies that have primarily investigated the application of an element of care that may be considered to fall under the ERAS umbrella in children. As such there is a paucity of comprehensive, multimodal enhanced recovery programmes described in the paediatric surgical literature. It is interesting to consider possible reasons for this lack of detailed investigation. One possibility may be a perceived lesser demand for improving outcomes in children following surgery. On the whole children do not have prolonged periods of recovery and rehabilitation after even major surgery, likely due to minimal comorbidities and better physiology. It may be considered that ERAS pathways are therefore unnecessary in children. However we do not believe this dismissal of ERAS in children is valid. Pushing the boundaries and seeking even marginal gains in all aspects of healthcare is important in our quest to improve clinical outcomes and quality, and reduce cost, whilst simultaneously maintaining safety.

Which ERAS type interventions have been used?

We found a number of interventions had been used in different combinations, these ranged in number from two [19] to eleven [17] but none had as many as standard adult ERAS protocols which typically have around 22 elements [3].The most common elements used were early diet, enhanced preoperative information and avoidance of drains (Figure 2). Studies also ranged from implementing just two elements (early feeding and NG removal) in a single population group (colostomy closure in anorectal malformation) [19] to multi-element whole fast track programmes across all patients in three broad specialties (abdominal, thoracic and urological) [21-24]. These multi-faceted fast track programmes did include many of the elements detailed in the well-established adult ERAS programmes, the notable exception being pre-operative carbohydrate loading.

Which outcomes have been reported?

Wide variety was also identified in the outcomes measured between studies. The most common outcomes used to assess efficacy were complications (including morbidity, readmission and reoperation) and postoperative length of stay (Figure 3). In four studies the only outcome used to compare to controls was length of stay and just three studies provided comparative data between interventional and control groups for more than one outcome. Two studies looked a cost implications [19,24] and both concluded that there was no increase (or decrease) in cost to the hospital using the new fast track protocols. There was some evidence of qualitative outcomes being measured in that parent satisfaction was reported in four studies, although all were from the same research group. Patient satisfaction and experience are increasingly important outcomes measured in adult ERAS programmes alongside a standardised Post Operative Morbidity Score (POMS)[26]

To ensure that important and relevant outcomes are measured in future studies, a core outcome set developed specifically for this purpose would be highly desirable. Such a core outcome set would also help limit heterogeneity in outcome reporting. Although there is a lack of core outcome sets within paediatric surgery [27,28] there is work ongoing to develop them [29,30] which we would like to see extended to cover studies of ERAS.

Is there any evidence to suggest ERAS is effective in children?

The existing literature demonstrates there are likely some advantages to enhanced recovery or fast track programmes although the evidence should be interpreted with caution due to the study methodology used. Overall six studies reported improvement in at least one outcomes for children undergoing surgery and treated on an enhanced recovery programme. There was evidence of significant reduction in length of stay, time to oral intake, time to stooling and time to mobilisation. Of note, these benefits were not seen consistently across all studies. Of the seven studies that recorded length of stay, six documented a reduction with an enhanced recovery protocol. The one study that didn’t was a non-university teaching hospital implementing a fast track programme and comparing implemented in the local university hospital did show a reduction in length of stay compared to the national data. Two of the three studies that measured time to stooling demonstrated a decrease with an enhanced recovery protocol. The one study that did not [17], still showed a reduction in total postoperative length of stay so clearly this did not delay discharge significantly. The three studies that recorded time to stooling also demonstrated a reduced time to oral intake. Only one study compared time to mobilisation and found a significant reduction in those on an enhanced recovery programme.

Limitations

There are a number of limitations to this study which preclude drawing firm conclusions regarding the efficacy of ERAS pathways in children compared to standard care. Of note, however, it was never the aim of our review to determine the efficacy of ERAS pathways by assimilating the available evidence. Moreover, we aimed to identify the current status of ERAS pathways within the specialty, to identify the extent to which interventions used in standard adults ERAS pathways have been incorporated into paediatric surgical care, and to identify areas that should form the basis for future research and/or quality improvement in this field. With this in mind the principle limitation of our study is that we may have failed to identify and include relevant work where it exists. We used wide search criteria across multiple databases when identifying potentially relevant studies in order to be as inclusive as possible. However we cannot exclude the possibility that institutions have introduced ERAS pathways into paediatric surgical care without publishing their results.

In addition to the articles included in this review, we have identified a recent systematic review by Shinnick et al [31] which included just five studies [22-24,18,25] that we have also included. Shinnick et al concluded that enhanced recovery pathways appear promising in children and merit further investigation. Based on a wider review of the literature we would concur that there may indeed be a role for ERAS within paediatric surgical practice. We propose a need for robustly designed comparative studies, preferably of a randomised nature in order to identify the true extent to which ERAS pathways may benefit children. Further there is a need to consider a wider range of ERAS type interventions than have been investigated to date in children and outcomes that are appropriate for children and their families so that the most relevant aspects for this population can be identified and utilised.

Conclusions

The use of ERAS pathways in Paediatric surgery appears very limited according to the current literature. Although the benefits are likely less in children compared to adults, this literature does suggest that such pathways do have benefits in children. The concept and role of ERAS pathways in children should be investigated further. Prospective studies should be of robust methodology and should evaluate a wide range of interventions used in adult ERAS on outcomes appropriate to the paediatric setting, ideally facilitated by a core outcome set.

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