Enhanced Recovery After Surgery (ERAS) for Hysterectomy - A Systematic Review

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Abstract

Purpose: Enhanced Recovery After Surgery (ERAS) is an evidence-based recovery programme that aids in the recovery time following major surgery to improve clinical outcomes while reducing demand on impatient beds. Previous studies from multiple specialities have demonstrated positive effects of ERAS, including colorectal, liver and pancreatic surgery with ERAS pathways becoming part of normal practice. The aim of this study was to systematically review the impact of ERAS in hysterectomy for benign conditions.

Methods: A comprehensive literature search was undertaken using CINAHL, EMBASE and PubMed using the search terms ‘Multi-modal’ or ‘fast track’ or ‘ERAS’ or ‘enhanced recovery’ or ‘same day discharge’ and ‘hysterectomy. In accordance with the PRISMA checklist, articles were selected for inclusion based on predetermined criteria, and a narrative synthesis was used to systematically review the selected articles.

Results: Eight articles describing the use of ERAS protocols in hysterectomy for benign conditions were identified. Three were cohort studies, three randomised controlled trials (RCTs) and two case-control studies. While there were no significant differences in postoperative pain, patient satisfaction, postoperative complications, or readmissions between groups, length of stay and cost were both decreased in the ERAS groups.

Conclusions: The use of ERAS protocols for hysterectomy resulted in reduced length of stay without increasing rates of complications or readmissions.

Background

A hysterectomy is a surgical procedure to remove the uterus, with over 75,000 performed in the UK each year to treat a variety of health problems affecting the female reproductive system [1]. Depending on the type of hysterectomy performed, women can expect to be in hospital for up to 5 days after surgery, with an expected recovery time of 6–8 weeks [3].

Enhanced recovery after surgery (ERAS), developed by Professor Henrik Kehlet in the 1990’s, was originally termed the ‘multi-model approach’ and is also referred to as ‘fast track surgery’. It is an evidence-based programme that aids in the recovery time following major surgery with the aim to improve patient experience and clinical outcomes while reducing the demand on inpatient beds [3]. Studies demonstrate positive effects of ERAS in multiple specialities, including colorectal [4], liver [5] and pancreatic surgery [6] with ERAS pathways becoming part of normal practice.

There appears to be limited systematic reviews for ERAS protocols used in gynaecological surgery. A literature review was undertaken by Scheib et al. to review the published literature on ERAS programmes in gynaecology, evaluate outcomes and look at key elements for a successful ERAS pathway. This review included any gynaecological surgery, with key findings highlighting the advantages of ERAS in

gynaecological surgery, and the study concluded that further reviews of ERAS for gynaecological surgery would benefit this speciality [7].

The aim of this study was to systematically review the literature on the impact of ERAS for hysterectomy for benign conditions.

Methods

This systematic review was conducted according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines [8]. A comprehensive literature search was undertaken using CINAHL, EMBASE and PubMed using the key terms 'multi-modal' *or* 'fast track' *or* 'ERAS' *or* 'enhanced recovery' *or* 'same day discharge' and hysterectomy. The search period included articles from 1990–2020. This literature search was conducted in December 2020 and performed independently by the two researchers.

Inclusion criteria included hysterectomy where an ERAS care bundle was used, hysterectomy performed for benign conditions, hysterectomy performed abdominally, vaginally or laparoscopically, including robotic assisted technique, with no restrictions on type of study design. Exclusion criteria included papers not written in English, non-full-text articles, surgery other than hysterectomy, hysterectomy for known malignancy or hysterectomy performed without the specified use of an ERAS bundle.

Results

8 studies of ERAS programmes used in hysterectomy for benign conditions met the inclusion/exclusion criteria and have been included in this systematic review of the literature: 3 cohort studies, 3 randomised controlled trials (RCTs) and 2 case-control studies. Cohort and case-control studies were assessed for quality using the STROBE checklist [9] and the RCTs using the CONSORT checklist [10]. A flow chart (figure 1) summarises the article selection process.

Patient selection in included studies

Nilsson et al. conducted a prospective, multicentre cohort study of 162 women that had previously participated in a RCT comparing fast-track abdominal hysterectomy under general anaesthesia with those under spinal anaesthesia [11].

The RCT performed by Kilpiö et al. used a computer-generated randomisation program to randomly allocate their patients to one of two groups: an ERAS group (n=60) and a conventional care (CC) group (n=60) [12]. Personnel that participated in the allocation did not generate the randomisation list or seal the envelopes, and allocation cards were sealed in opaque, sequentially numbered envelopes [12]. Akca and Yilmaz also used a sealed envelope technique to randomise 89 patients scheduled for an abdominal hysterectomy to an ERAS (n=44) or CC group (n=45) [13].

In their prospective RCT, Yilmaz et al. randomly assigned 30 women undergoing abdominal hysterectomy to an ERAS group and 32 to a CC group, with patients matched for age, BMI, and American Society of Anaesthesiologists (ASA) physical status [14]. The same patient matching was undertaken by both Yoong et al. [15] and Relph et al. [16] in their case-control studies of women undergoing vaginal hysterectomy with an ERAS pathway (n=50) (n=45) and comparing with women who underwent vaginal hysterectomy in the year prior to ERAS implementation (n=50) (n=45).

Keil et al. [17] reviewed data from the 165 women who had undergone laparoscopic hysterectomy with an ERAS pathway in the year following implementation of an ERAS pathway, and compared this with 90 historical controls that had undergone the same surgery for benign reasons in the 18 months prior to implementation of the ERAS pathway. Similarly, Miller et al. [18] included the 123 women who underwent abdominal hysterectomy for benign reasons one year following implementation of an ERAS pathway and compared with 100 patients who had undergone this surgery in the year prior to implementation. Patients who underwent emergency surgery or who had pre-existing chronic pain were excluded from both groups.

Length of stay (LOS)

LOS was documented in 7 of the included studies, and all 7 studies reported a reduced LOS in the ERAS group [12-18]. LOS in studies relating to abdominal hysterectomy was presented in days, and in vaginal and laparoscopic hysterectomy presented in hours.

Abdominal hysterectomy (Table 1).

Akca and Yilmaz found average postoperative LOS to be 2.6 days in the ERAS group compared with 3.1 days in the CC group [13]. Miller et al. and Yilmaz et al. found the ERAS group to have a median LOS of 2 days vs 3 days in the CC group [18,14].

Table 1: LOS abdominal hysterectomy - CC vs ERAS (hours)

Authors	LOS – CC group (days)	LOS – ERAS group (days)
Akca and Yilmaz	3.1	2.6
Miller et al.	3	2
Yilmaz et al.	3	2

Vaginal/laparoscopic hysterectomy (Table 2)

Kilpiö et al. found the median LOS in the ERAS group to be 19 hours vs 22 hours in the CC group [12]. 15% of women in the ERAS group were discharged on the day of surgery when performed in the afternoon compared with 3% in the CC group, and discharge within 24 postoperative hours occurred in 88% of the ERAS group compared with 55% of the CC group [12].

Keil et al. found that the average LOS decreased from 34 hours to 20 hours after implementation of an ERAS pathway, and of the 165 patients in the ERAS group, 56% were discharged on the same day of surgery [17]. Their study specifically looked at predictors for admission following laparoscopic hysterectomy with an ERAS pathway, and they found that increased ASA physical status, being African-American and increased length of procedure were significantly associated with an increased risk of admission, with odds ratios of 3.12, 2.47 and 1.23 respectively [17].

Yoong et al. found median LOS decreased from 45.5 hours to 22.0 hours in the ERAS group [15], like Relph et al. who documented a median LOS decreasing from 42.9 hours to 23.5 hours in their ERAS group [19].

Table 2: LOS vaginal/laparoscopic hysterectomy - CC vs ERAS (hours)

Authors	LOS – CC group (hours)	LOS – ERAS group (hours)
Kilpiö et al.	22	19
Keil et al.	34	20
Yoong et al.	45.5	22
Relph et al.	42.9	23.5

Postoperative pain and use of opioids

Postoperative pain and use of opioids were documented in 4 of the selected studies, and this did not significantly differ between groups [12,15,17,18].

Kilpiö et al. found that the median use of oxycodone used in the recovery room was the same between groups, but once back on the gynaecology ward this was 0mg in the ERAS group compared with 2.5mg in the CC group. 1-month post-surgery all women completed a questionnaire, which found the average duration of pain medication did not differ between groups [12]. Yoong et al. found no difference in the visual analogue scale (VAS) pain scores between the ERAS and CC groups in their study [15].

Neither Keil et al. nor Miller et al. assessed postoperative pain between groups, however, inadequate pain control was a documented reason for admission in 30% of women following laparoscopic hysterectomy and 17% following abdominal hysterectomy on an ERAS pathway [17,18].

Postoperative complications and readmission rates

Postoperative complications were not statistically different between groups in the 6 studies that recorded this data [11,12,14-17]. Nilsson et al. specifically looked at the risk factors for postoperative complications after abdominal hysterectomy with a fast-track programme. While data was not provided by way of a CC group, data was compared between 41 women with postoperative complications and 121

women without postoperative complications in a cohort of 162 women on an ERAS pathway. They found obesity, prior laparotomy, and an increase in weight gain during the first postoperative day increased the risk of postoperative complications, with odds ratios of 8.83, 2.92 and 1.52 respectively. Although the median difference in duration of hospital stay and time with catheter was 4 hours and 1 hour respectively, this was longer for the women who developed postoperative complications [11].

Readmission rates were documented in all 8 studies [11-18] (Table 3). Readmission rates (within 1-month of discharge) were not significantly different between the CC and ERAS groups in most of the studies, however, Yilmaz et al. found only 1 person in the ERAS group was readmitted compared with 9 in the CC group [14].

Table 3: Readmission rates - CC vs ERAS (%)

Authors	Readmissions CC group (%)	Readmissions ERAS group (%)
Nilsson et al.	n/a	2.5%
Kilpiö et al.	5%	6.6%
Akca and Yilmaz	31.1%	11.3%
Keil et al.	7%	4%
Yilmaz et al.	34.4%	3.3%
Miller et al.	13%	10%
Yoong et al.	0%	4%
Relph et al.	0%	6.7%

Costs

Costs were described in 3 papers [15,16,18]. Yoong et al. estimated median cost for vaginal hysterectomy before and after ERAS implementation to be £1148.63 and £1042.32 respectively. Despite additional expenses including a patient-orientated gynaecology school and employing a specialist ERAS nurse, a 55.1% reduction in LOS and minimal use of bladder catheterisation and vaginal packing resulted in a gross saving of 9.25% (£106.30) per patient [15]. Relph et al. found similar results to Yoong et al. and with the same additional expenses considered, found gross savings of 12.7% (£164.86) per patient [16].

While Miller et al. did not directly investigate cost savings as part of their research, they have documented that no increase in costs were incurred for additional funding, personnel or resources when implementing an ERAS pathway [18].

Patient satisfaction

Patient satisfaction was described in 3 papers and was not a significant finding in any of these studies [12,13,15]. Kilpiö et al. found that women were equally satisfied with their hospital stay and recovery period between groups, however, in the ERAS group the quality of information provided was rated better than the CC group (score 5 vs score 4 on Likert scale of 1-5, $p<0.007$) [12].

Akca and Yilmaz found an increase in mental health component scores (MCS) in the ERAS group compared with the CC group, but physical health component scores (PCS) and satisfaction rates were documented as not statistically different between groups [13] (Table 4).

Table 4: Physical health component score (PCS) mental health component score (MCS) and satisfaction rates of participants from Akca and Yilmaz (2019)

	ERAS (n=44)	CC (n=45)	P Value
PCS	45.9± 11.0	41.6± 11.4	0.06
MCS	53.6± 11.8	47.7± 13.9	0.008
Satisfaction rate (%)	72.7	53.3	0.07

Yoong et al. provided a programme satisfaction survey questionnaire for their ERAS group 4 weeks after surgery. While the median satisfaction score was 8/10, they found that 65% of these women scored >9/10 and 7% scored 1/10 and received feedback from 1 woman stating that “pressure was applied for early discharge” [15].

Discussion

The reduction in LOS without an increase in rates of postoperative complications or readmission rates when using an ERAS pathway for hysterectomy is consistent with the findings from previous studies of ERAS for colorectal [4], liver [5] and pancreatic surgery [6]. The concept of discharging a woman within 24-hours of a vaginal hysterectomy is not new. Penketh et al. found vaginal hysterectomy performed as a 24-hour day case procedure to be as safe as traditional inpatient management, with increased rates of early discharge and low readmission rates [19]. The case-control study by Yoong et al. supports this concept and found the introduction of an ERAS pathway halved their rates of LOS to an average of 22 hours [15].

Nilsson et al. specifically looked at risk factors for postoperative complications following hysterectomy with an ERAS pathway. Their findings showed that postoperative infection and complications due to wound healing were common, but major complications were rare [11]. Obesity and previous laparotomy were strong risk factors for postoperative complications, consistent with findings from previous studies of benign hysterectomy [20,21].

Keil et al. found that increased ASA physical status and increased surgery duration were significantly associated with admission following hysterectomy [17]. This is consistent with previous findings from

other specialities looking at predictors of admission following surgery [22,23].

Strengths and limitations of selected articles

In the cohort study by Nilsson et al. the data were collected prospectively, the trial was conducted in accordance with good clinical praxis, and an independent monitor regulated the trial. The researchers acknowledged the difficulty in comparing minor complications, due to different definitions of complications, but found their complications to be similar in type and frequency to those reported in papers relating to hysterectomy in non-fast-track settings. Methodological limitations included secondary analysis of data of a cohort that previously participated in the 'GASPI study', and sample size calculations were not performed for these secondary objectives [11].

The strengths of the study by Kilpiö et al. include the randomised nature of the trial, standardised protocols of the anaesthesia and surgical technique, documented pain scores of women, and documented use of postoperative medication in the 24-hours post-surgery. The monitoring of late complications and recovery was facilitated by following up these patients for 1-month post-surgery [12].

Although the methodology in the RCTs conducted by Kilpiö et al. Akca and Yilmaz and Yilmaz et al. avoided bias related to confounding factors and selection bias, interpretation bias may still exist due to the lack of blinded data; as the groups were not blinded, this may have affected discharge in the ERAS group [12-14]. It is also not possible to blind elements of care within the bundle, such as mobilisation and IV fluids. Akca and Yilmaz also acknowledge a lack of long-term follow-up data, not considering average SF-12 scores of the general population in Turkey and lack of cost-related data [13].

Keil et al. and Miller et al. acknowledged that not all readmissions, reoperations, urgent clinical visits, and attendances to emergency care may have been captured in their cohort study, as some patients may have accessed care at an alternative facility [17,18].

Yoong et al. and Relph et al. attempted to minimise selection bias in their studies by comparing groups undergoing similar procedures, performed by the same gynaecologists, and matched for age BMI and ASA score, so that the ERAS pathway was the main variable. However, their cost-calculations were locally derived, and the authors acknowledge caution in inferring these benefits can be replicated in other units [15,16]

A limitation from all 8 included studies is the relatively small sample sizes (62-255) [24]. As an ERAS pathway is multifaceted, the sample sizes do not enable evaluation of variables that affect early discharge. Also, data was not collected regarding the compliance of each individual component of the ERAS pathway in any of the studies, which should be taken into consideration when interpreting results.

Strengths and limitations of this review

The papers included in this review consisted of 3 RCTs, 3 cohort and 2 case-control studies. While RCTs are often recognised as the highest level of evidence in medical research, reviewing RCTs and

observational studies together, with their different study designs and methods, can provide a more comprehensive review of the intervention [25]. All papers were assessed for quality using the STROBE or CONSORT checklists, and this paper has been written according to the PRISMA guidance [8].

The methodology of this systematic review was clearly documented to enable replication. Assessment of bias within studies has been considered in the results section. Minimising bias in this systematic review included an unambiguous inclusion and exclusion criteria, a literature search undertaken by two people, randomised review of articles undertaken at each stage by another person to compare included/excluded studies, and a pre-specified, justified and systematically followed write-up. Although steps were taken to minimise potential bias, possible bias in this study include publication bias from not including unpublished studies: such as ongoing research, conference abstracts and theses, along with language bias; as all included studies were written in English as per the inclusion criteria [26].

Implications for further research

The findings from this systematic review have highlighted a need for further research into the impact of ERAS for women undergoing gynaecological surgery. Cost is one area that was discussed in 3 of the studies [15,16,18], and further research into the cost effectiveness of ERAS pathways would be beneficial.

Women who are obese, have had previous laparotomy, or have increased ASA scores may be at increased risk of wound complications following abdominal hysterectomy despite being on an ERAS pathway [11]. Further studies to determine optimal monitoring of these patients would aid in the development of ERAS protocols, specifically for these subgroups.

Postoperative pain is a major barrier in the early discharge of patients undergoing gynaecological surgery [13]. Further studies into the intraoperative and postoperative pain options in an ERAS protocol would be beneficial, as would further studies into ERAS compliance to determine if pain is due to incomplete preoperative multimodal analgesic therapy [16].

Very few studies have been undertaken to review patient satisfaction of ERAS programmes. additional studies focussing on patient’s experience, quality of life and long-term effects of ERAS would be greatly beneficial for developing ERAS pathways.

Conclusion

There have been many papers reporting on the effects of ERAS pathways. Systematic reviews from liver, colorectal and pancreatic surgeries have found ERAS pathways to decrease length of stay without compromising patient safety or increasing rates of readmission. ERAS pathways are becoming part of normal practice in these areas but, despite studies showing ERAS principles to be transferrable to other specialities, they have yet to be widely adopted in gynaecology.

The aim of this study was to systematically review the impact of ERAS protocols following hysterectomy for benign conditions. A total of 8 articles met the pre-specified inclusion and exclusion criteria and were

included for review. This study has found similar results to current published literature that ERAS pathways can reduce the length of stay for women undergoing hysterectomy, without increasing postoperative complication or readmission rates. It has also highlighted that further work is required to successfully implement an ERAS pathway, and to ensure patients are kept at the heart of their care.

Declarations

S O'Sullivan: Project development, Data collection, Data analysis, Manuscript writing

R Iranloye: Data collection, Manuscript editing

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Figures

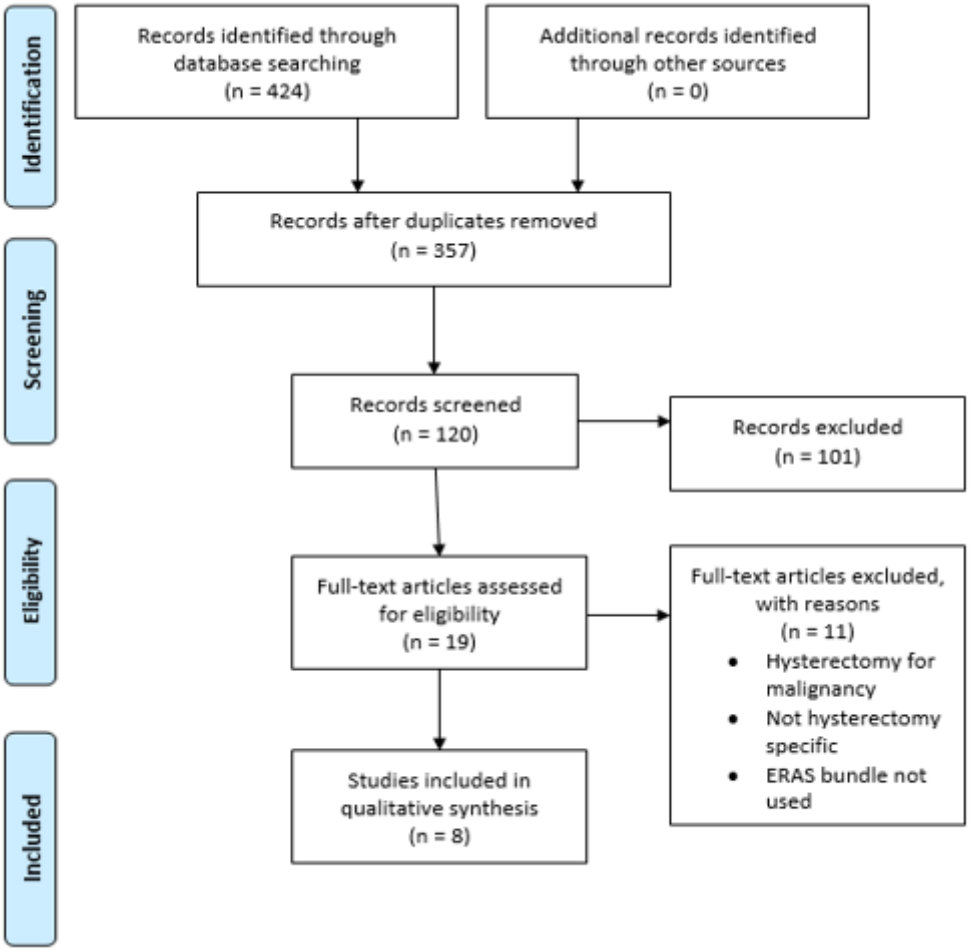

Figure 1

PRISMA flow diagram