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Enhanced Recovery After Surgery (ERAS) Protocols is Extremely Beneficial in Liver Surgeries - A Meta-Analysis

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Abstract BACKGROUND: Enhanced recovery after surgery (ERAS) programs aim to improve postoperative outcomes. This meta-analysis aims to evaluate the impact of ERAS programmes on outcomes following liver surgeries. METHODS: EMBASE, MEDLINE, PubMed and the Cochrane Database were searched for studies comparing outcomes in patients undergoing liver surgery utilizing ERAS principles with those patients receiving conventional care. The primary outcome was the occurrence of 30-day morbidity and mortality. Secondary outcomes included length of stay, functional recovery, readmission rates, time to pass flatus, blood loss and hospital costs. RESULTS: Ten articles were included in the meta-analysis. 30 days morbidity and mortality were significantly less in the ERAS group. Hospital stay, time to pass flatus, time to complete recovery and hospital costs were also significantly reduced due to ERAS protocols. Blood loss and readmission rates were also significantly less in the ERAS group. CONCLUSIONS: The adoption of ERAS protocols significantly reduced morbidity, mortality hospital stay, readmission rates, time to recovery, hospital costs, time to pass flatus, blood loss and readmission rates.

Keywords: *enhanced recovery after surgery, liver surgery, HPB surgery, morbidity, mortality, liver resection, fast track surgery*

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1. Introduction

Early recovery after surgery (ERAS) protocol is becoming the gold standard in perioperative care with excellent results in colorectal, gastric and HPB surgeries. [1].

ERAS is an evidence peri-operative protocol which has shown significant improvements in perioperative outcomes. [2]. Despite these overwhelming evidence implementation of these protocols has been very slow and lack widespread implementation. [3] ERAS has initially developed for colorectal surgeries. However, its implementation is being tested in all other fields [4] and it has now spread over other specialities. ERAS protocols have been applied to liver surgeries also and found to be beneficial. [5]

Primary Aim of this meta-analysis was to study the effect of ERAS protocols on 30 days morbidity and mortality. The secondary aim was to study the effect of ERAS protocols on hospital stay, readmission rates, time to recovery, time to pass flatus, and Hospital costs.

2. Material and Methods

In this systemic review and meta-analysis, we searched EMBASE, MEDLINE, PubMed and the Cochrane Database with keywords like "liver surgery", "Enhanced recovery after surgery", "ERAS protocols", "ERAS vs conventional liver surgery", " morbidity and mortality following liver surgery", 'liver resections". Two independent authors extracted the data (B.V and H.P). Systemic review and Metaanalysis was done according to MOOSE and PRISMA guidelines [6,7].

2.1. Statistical Analysis

The meta-analysis was conducted using Open meta-analysis software. Heterogeneity was measured using Q tests and I^2, and $p < 0.10$ was determined as significant [8]. If there was no or low heterogeneity ($I^2 < 25$ %), then the fixed-effects model was used. Otherwise, the random-effects model was used. The risk ratio (RR) was calculated for dichotomous data, and weighted mean differences (WMD) were used for continuous variables.

Both differences were presented with 95 % CI. For continuous variables, if data were presented with medians and ranges, then we calculated the means and SDs according to Hozo et al. [9]. If the study presented the median and inter-quartile range, the median was treated as the mean, and the interquartile ranges were calculated using 1.35 SDs, as described in the Cochrane handbook.

2.2. Inclusion Criteria

1. Studies that compared ERAS protocols with that of a conventional protocol
2. Minimum 25 numbers of patients
3. Means and standard deviations or medians and range mentioned.
4. Full texts available
5. Prospective, retrospectives studies or randomised control trials included.
6. ERAS program should include most of the 17 items included according to ERAS group recommendation. [10].

2.3. Exclusion Criteria

1. Studies whose full texts can not be obtained.
2. Studies with no comparable groups [ERAS vs conventional]
3. Duplicate studies.

2.4. Assessment of Bias

Characteristics of the studies are described in Table 1. Identified studies were broadly grouped into 1 of 2 types, either randomized trials or cohort studies. Cohort studies were assessed for bias using the Newcastle-Ottawa Scale [10]. Randomized trials were assessed based on the Cochrane Handbook. [11] (Table 2 and Table 3)

Table 1. Charecteristics of studies

Study	Type of study	Number of patients in ERAS group	Number of patients in control group
bobbyv2015	COHORT	91	93
vandam2008	COHORT	61	100
koea2009	COHORT	50	50
lin2011	COHORT	56	61
jones2013	RCT	46	45
ni2013	RCT	80	80
sanchez2012	COHORT	26	17
HeF2015	RCT	48	38
lu2014	RCT	80	80
liang 2016	RCT	80	107

Table 2. Risk of bias summary of RCT. + denotes low risk of bias, - denotes high risk of bias

	Random Sequence generation	Allocation Concealment	Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Other
jones2013	+	+	-	+	+	+	?
ni2013	+	+	-	-	+	+	+
HeF2015	+	+	-	+	+	+	+
lu2014	?	?	-	+	+	+	?
liang2016	?	?	-	-	+	+	-

Table 3. Assessment of bias in cohort studies. + Denotes low risk of bias, - denotes high risk of bias

	Representative of exposed cohort	Selection of non exposed cohort	Ascertainment of Exposure	Demonstration that outcome was not present at start of study	Comparability of cohorts	Assessment of outcomes	Adequate time for follow up	Complete Follow up of cohort	Total score
bobbyv2015	+	+	+	+	+	-	+	+	7
vandam2008	+	+	+	+	-	-	+	+	6
koea2009	+	-	-	+	-	-	+	+	4
lin2011	+	+	+	+	+	-	+	+	7
sanchez2012	+	+	+	+	-	-	+	+	6

3. Results

3.1. Search Results

Total of 190 studies identified from the initial literature search, 157 studies were evaluated after duplicates removed. Only 57 studies included ERAS protocols, 34 studies full text obtained. 13 studies had comparable groups for conventional protocols. Out of its 10 studies included in the final analysis as other studies did not include adequate ERAS protocols. [Figure 1]. [13-22]

Total of 1289 patients' outcomes were studied from these 10 studies. 618 in the ERAS group and 618 in the conventional group.

3.2. Metaanalysis

3.2.1. Primary Outcome Measures

30 days mortality:

3 patients died in ERAS out of 458 and 5 patient died in conventional approach out of 511. Mortality was significantly less (p =0.029).

30 days morbidity:

30 days morbidity rates were significantly less. P<0.001.114/593 patients developed complications in ERAS group vs 171/673 in conventional group.

3.2.2. Secondary Outcomes

We also evaluated hospital stay, time to functional recovery, readmission rates, time to pass flatus, hospital costs and blood loss in ERAS protocols in liver surgery.

As shown in Figure 3 hospital stay (p<0.001 WMD -2.191 and time to functional recovery (p<0.001, WMD -2.462) were significantly less in the ERAS group. Readmission rates were also significantly less in the ERAS group.

There was significantly less blood loss in the ERAS group. (p<0.001) (Figure 4). Time to pass flatus and hospital costs were significantly lesser in the ERAS group. (p= 0.035 and p <0.001 respectively with WMD of -0.996 days and - 1803.536 $ respectively).

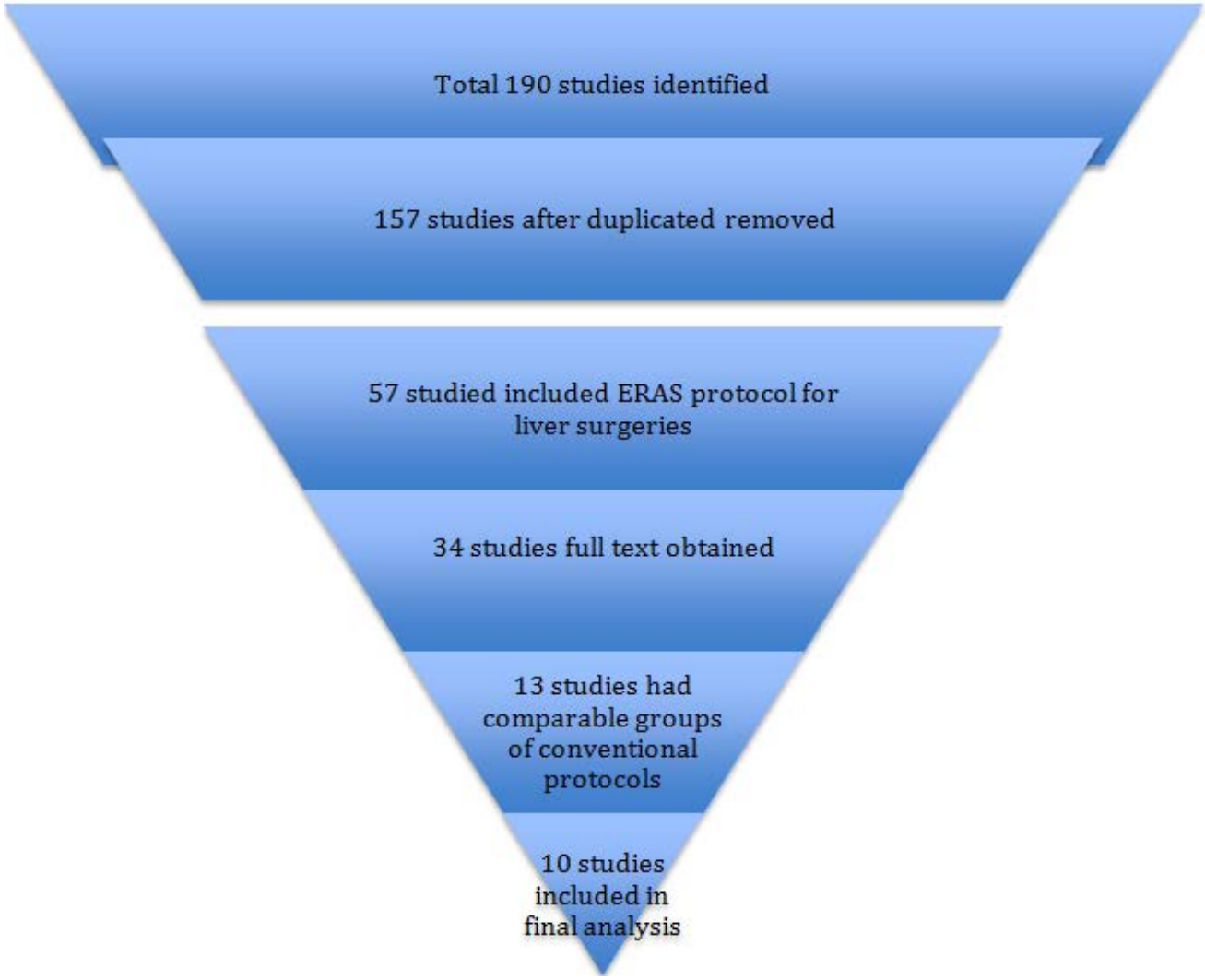
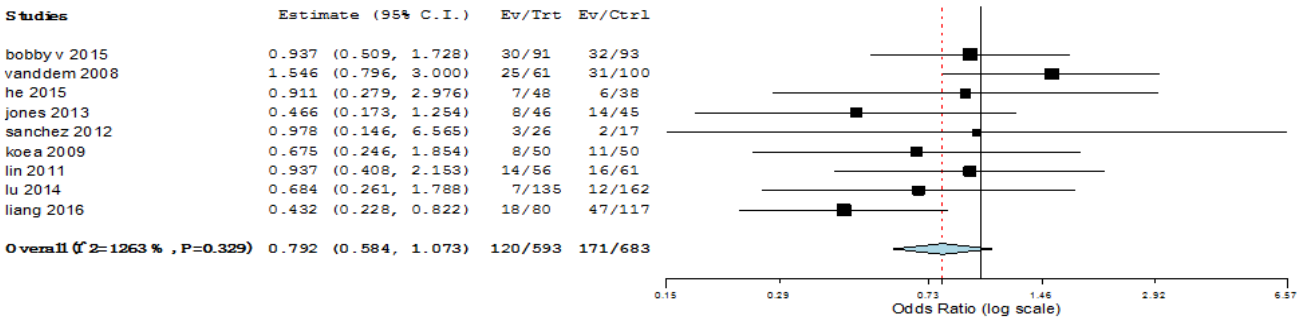
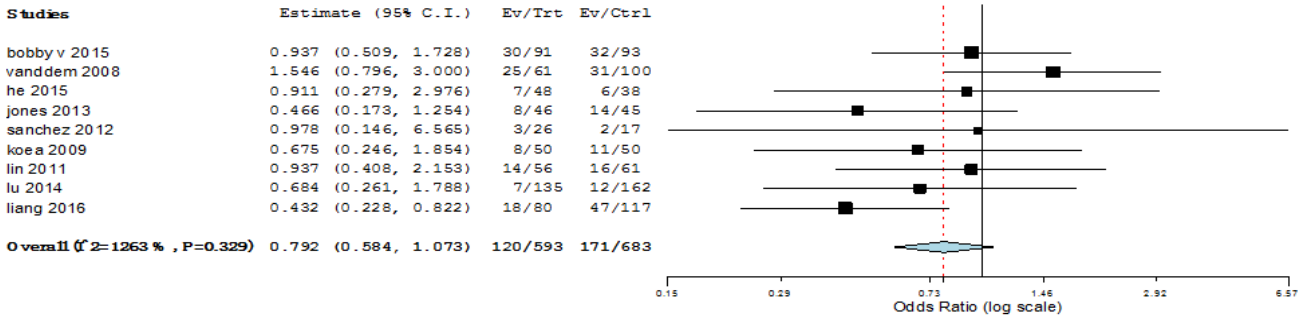


Figure 1. Search strategy according to PRISMA guidelines

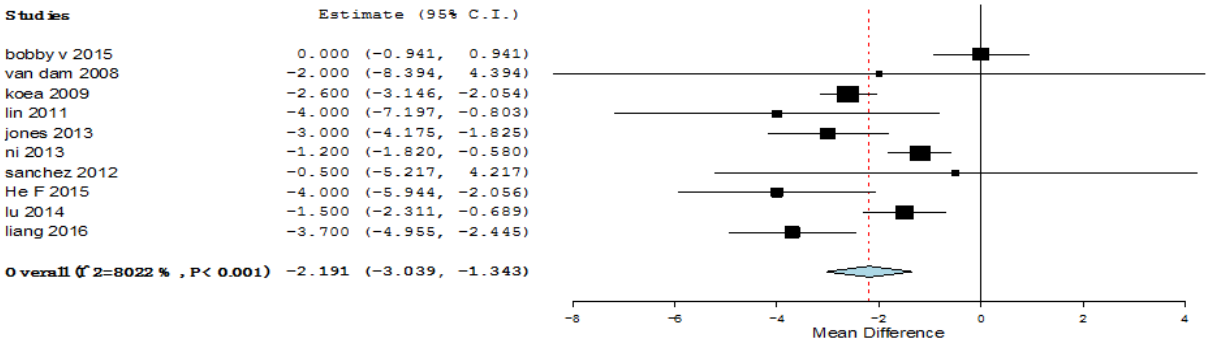


Metaanalysis of 30 days mortality. Mortality rates were significantly low in ERAS group

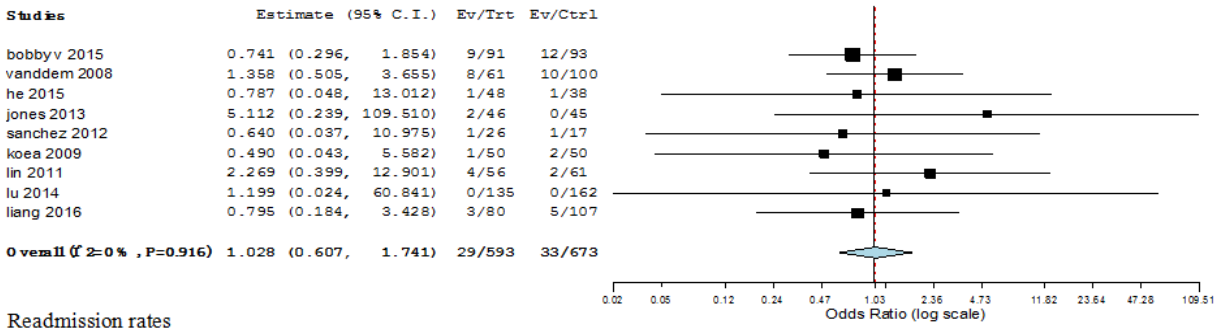


30 days Morbidity and mortality rates were significantly lesser in ERAS group

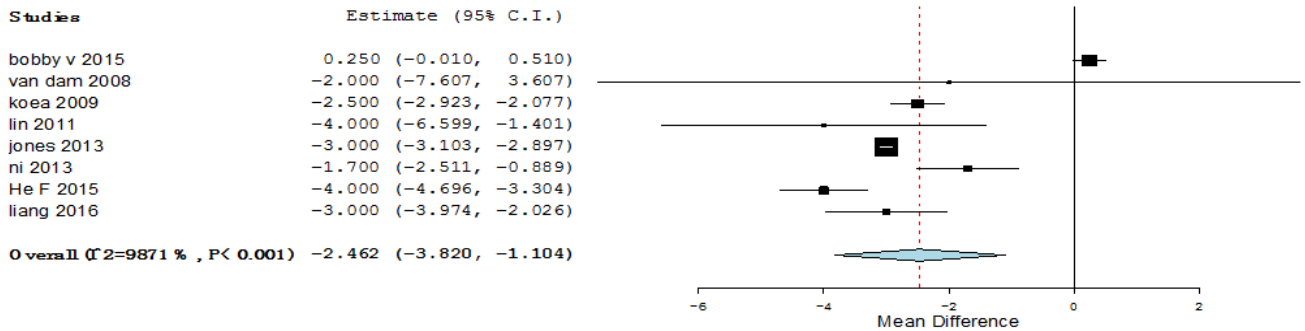
Figure 2. Metaanalysis of 30 days mortality and morbidity rates between ERAS vs conventional approach



Forest plot for hospital stay. weighted mean difference -2.191 (95% confidence interval -3.039- -1.343)



Readmission rates



Times to functional recovery was also significantly lesser in ERAS group. weighted mean difference -2.462 (-3.826,-1.104)

Figure 3. Metaanalysis of hospital stay, readmission rates and time to functional recovery

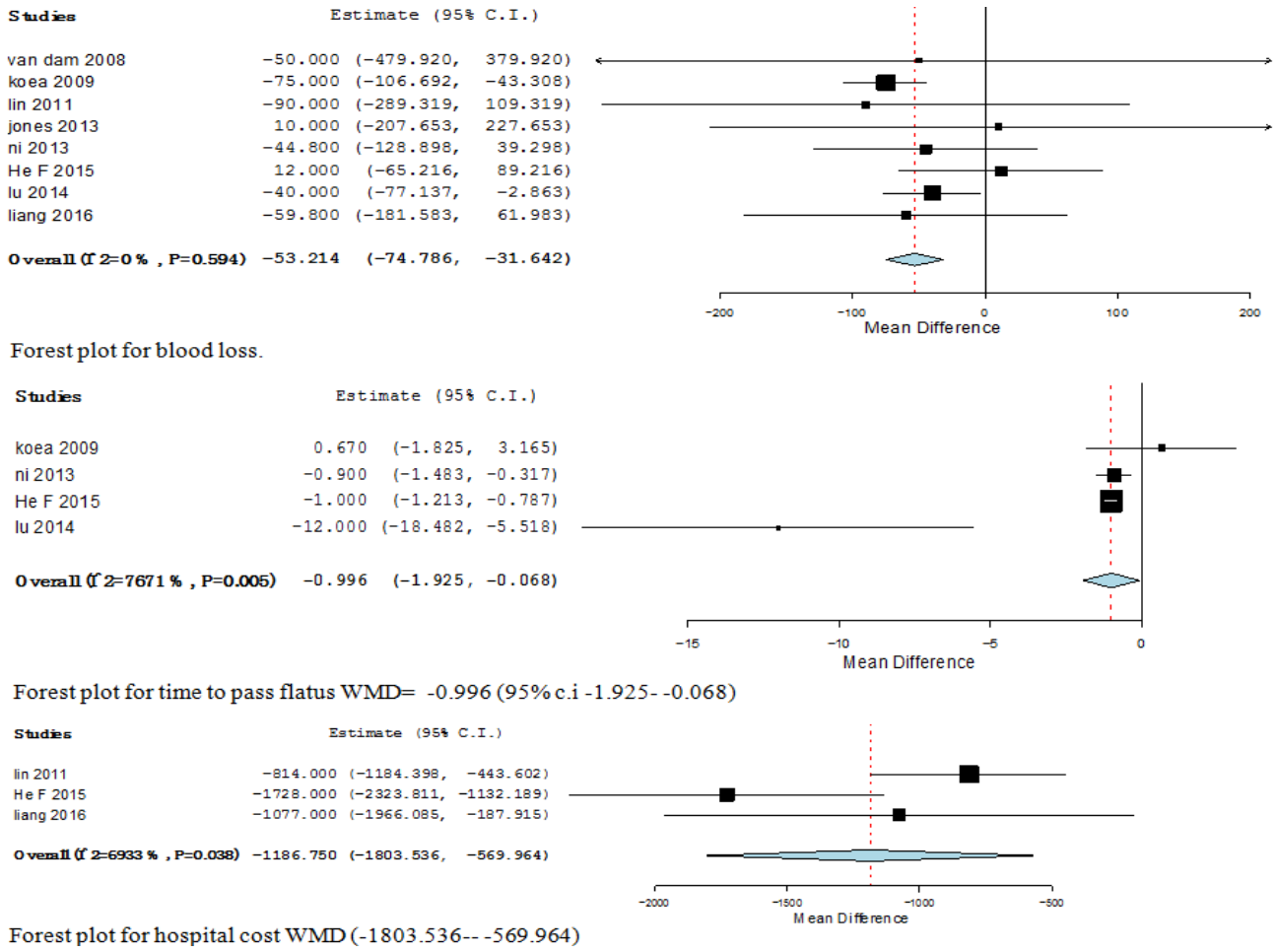


Figure 4. Metaanalysis for blood loss, time to pass flatus and hospital cost

4. Discussion

Enhanced recovery after surgery though initially described for colorectal surgery is now becoming standard protocol for all surgeries and it has significantly reduced hospital stay and cost without affecting morbidity and mortality. [1-5]

Started from colorectal surgeries ERAS protocols have now moved to other branches of surgeries. Many authors have tried to study applications of ERAS protocols on liver surgeries. [13-22] and showed ERAS protocol has a significant benefit over standard protocols however large number of studies and quality meta-analysis are still missing. Purpose of this meta-analysis to compare outcomes between ERAS and conventional group.

After the literature review, we evaluated 10 studies in this metaanalysis 4 were Randomised control trials [11-14] and 6 were prospective or retrospective cohort studies. [15-20].

We evaluated 30 days mortality and morbidity as primary outcomes and hospital stay, time to complete recovery (time to complete physical independence), readmission rates, time to pass flatus, blood loss and hospital costs as secondary outcomes.

There were significantly less mortality and morbidity in the ERAS group. (Figure 2). Hospital stay, time to functional recovery and time to pass flatus (4 studies) were also significantly different in both the groups. (WMD-2.191, Odds ratio 0.016, and WMD-2.462 respectively).

Blood loss and readmission rate were significantly less in the ERAS group. Only 3 studies out of 10 evaluated hospital cost which was significantly lesser in the ERAS group. (WMD -1803.536$).

There are some limitations of this meta-analysis as the heterogeneity of studies was significantly random effect models were used. Except hospital stay at least one study did not evaluate other factors.

In conclusion ERAS programs in liver surgeries reduce morbidity, mortality hospital stay, readmission rates, time to recovery, time to pass flatus, hospital cost and blood loss and it is extremely beneficial in liver surgeries.

Abbreviations

Enhanced Recovery After Surgery (ERAS), Weighted Mean Difference (WMD), Confidence Intervals. (C.I)

References

[1] Pędziwiatr M, Mavrikis J, Witowski J, et al. Current status of enhanced recovery after surgery (ERAS) protocol in gastrointestinal surgery. Med Oncol. 2018 May 9; 95.

[2] Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review. JAMA Surg. 2017 Mar 1; 292-298.

[3] Melnyk M, Casey RG, Black P, et al. Enhanced recovery after surgery (ERAS) protocols: Time to change practice? Can UrolAssoc J. 2011 Oct; 342-8.

[4] Ljungqvist O. ERAS--enhanced recovery after surgery: moving evidence-based perioperative care to practice. JPEN. Jul; 38(5): 559-66.

[5] Bobby V. M. Dasari, RashaRahman, Shakeeb Khan et al. Safety and feasibility of an enhanced recovery pathway after a liver resection: prospective cohort study. HPB 2015, 700-706.

[6] Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA. 2000 Apr 19; 2008-12.

[7] Liberati A, Altman DG, Tetzlaff J et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. J ClinEpidemiol. 2009 Oct; e1-34.

[8] Higgins JP, Thompson SG (2002). Quantifying heterogeneity in a meta-analysis. Stat Med.1539-1558.

[9] HozoSP, Djulbegovic B, Hozo I (2005) Estimating the mean and variance from the median, range, and the size of a sample. BMC Med Res Methodol 5: 13.

[10] Wells G, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. September 1, 2016.

[11] Higgins JP, Altman DG, Gøtzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ. 2011; 343: d5928.

[12] Lassen K, Soop M, Nygren J, et al. Consensus review of optimal perioperative care in colorectal surgery. Arch Surg: 961-969.

[13] He F, Lin X, Xie F, et al. The effect of enhanced recovery pro-gram for patients undergoing partial laparoscopic hepatectomy of liver cancer. ClinTranslOncol. 2015.

[14] Jones C, Kelliher L, Dickinson M, et al Randomized clinical trial on enhanced recovery versus standard care following open liver resection. Br J Surg:1015-1024.

[15] Lu H, Fan Y, Zhang F, et al. Fast-track surgery improves postoperative outcomes after hepatectomy. Hepatogastroenterology 61: 168-172.

[16] Ni CY, Yang Y, Chang YQ, et al. Fast-track surgery improves postoperative recovery in patients undergo-ing partial hepatectomy for primary liver cancer: a prospective rand-omized controlled trial. Eur J SurgOncol 39:542-547.

[17] sánchez-Pérez B, Aranda-NarváezJM, Suárez-Muñoz MA, et al. Fast-track program in laparoscopic liver surgery: theory or fact? World J Gastrointest Surg 2012; 4; 246-250.

[18] R. M. van Dam, P. O. Hendry, M. M. E. Coolsen, et al. Initial experience with a multimodal enhanced recovery programme in patients undergoing liver resection. *British Journal of Surgery* 2008; 95: 969-975.

[19] Bobby V. M. Dasari, RashaRahman, et al. Safety and feasibility of an enhanced recovery pathway after a liver resection: prospective cohort study. HPB 2015, 17, 700-706.

[20] Jonathan B. Koea, Yatin Young, et al. Fast Track Liver Resection: The Effect of a Comprehensive Care Package and Analgesia with Single Dose Intrathecal Morphine with Gabapentin or Continuous Epidural Analgesia. HPB Surgery 2009.

[21] Xiao Liang, Hanning Ying, MM, Hongwei Wang et al. Hongxia Xu, BN, Hong Yu, MD, Liuxin Cai, MD et al. Enhanced Recovery Program Versus Traditional Care in Laparoscopic Hepatectomy. Medicine; 2016; 95.

[22] De-Xin Lin, Xuan Li ،Qi-Wen Yet al.Implementation of a Fast-Track Clinical Pathway Decreases Postoperative Length of Stay and Hospital Charges for Liver Resection. Cell BiochemBiophys 2011; 61; 413-419.