Evidence check

13 July 2020

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Resuming elective surgery - Post-surgery innovations: enhanced recovery after surgery, early mobilisation and discharge

Evidence check question

1. What is the evidence for post-surgery innovations in hospital such as enhanced recovery, early mobilisation and early discharge in improving outcomes for patients who have undergone surgery?

In brief

Enhanced recovery after surgery (ERAS)

ERAS refers to evidence-based protocols that standardise care to improve outcomes and expedite recovery following elective procedures.(1)

- Overall, ERAS has been shown to reduce length of stay without compromising morbidity across numerous surgery types.
- There were many published systematic reviews showing ERAS:
  - reduced length of stay in pancreatic and breast surgery without compromising morbidity or mortality
  - reduced length of stay with no differences in 30-day readmission or complications in knee and hip surgery
  - provided faster recovery of bowel function, some studies reported reduced length of stay and postoperative complications for bladder surgery
  - decreased complications and length of stay for liver surgery
  - decreased length of stay and reduced or unchanged complication rates in gastroesophageal and colorectal surgery. Nonsteroidal anti-inflammatory drugs after colorectal surgery was associated with a higher risk of anastomotic leakage in some reviews.
- There was limited evidence on spine, orthopaedic, abdominal, bariatric, pelvic, lung, vascular, geriatric and emergency surgery and standard elective procedures. Outcomes were generally consistent in ERAS reducing length of stay, with decreased or no change in complications in these groups.
- Evidence was less clear for gynaecologic surgery, with some authors concluding advantages of ERAS do not extend to gynaecologic surgery, and lung cancer surgery, reduced length of stay

was shown in lower quality studies but not the one randomised controlled trial in the review.(2, 3)

- A systematic review found that the key facilitating factors to implementing ERAS were: adapting the program to fit local contexts, achieving and demonstrating early wins, gaining buy-in from both frontline clinicians and hospital leadership, having a strong enhanced recovery program team that met regularly, and leveraging supporters and full-time enhanced recovery pathway staff. The major barriers identified were: meeting with resistance to change from frontline clinicians, not having enough resources for implementation, and external factors, such as patient complexity or rural hospital location.(4)
- A review of patient experience saw that patients in enhanced recovery after surgery programs desired more consistency between pre- and postoperative information.(5) ERAS does not compromise patient satisfaction or quality of life after elective hip or knee surgery.(6)
- A review on staff experiences of ERAS reported that staff feel positive about the implementation of ERAS, but find the process complex and challenging.(7)

Early mobilisation, nutrition and discharge

- Early mobilisation seems to be important to prevent postoperative complications, improve functional capacity and reduce length of hospital stay in patients after cardiac surgery.
- Early versus delayed postoperative bathing or showering to prevent wound complications has limited evidence, in one study there was no statistically significant difference in the proportion of patients who developed surgical site infection.
- Early weight-bearing tends to accelerate return to work and daily activities compared to late weight-bearing after open reduction and internal fixation of ankle fractures.
- Early oral feeding following gastrectomy for gastric cancer found this was associated with a decreased length of hospital stay.
- Early discharge following endovascular aneurysm saw no difference in 30-day readmission, transcatheter aortic valve replacement showed no significant difference in 30-day mortality or discharge to 30-day new permanent pacemaker implantation and early discharge of percutaneous coronary intervention supports the safe use of early discharge in the treatment of a heterogeneous population of patients with coronary artery disease, however there was an increased risk of rehospitalisation.

Limitations

This study is limited to systematic reviews, and so some surgeries not yet evaluated in a review would not be included.

Background

ERAS, also known as fast-track surgery or enhanced recovery pathways, refers to evidence-based protocols that standardise care to improve outcomes and expedite recovery following elective procedures.(1) As elective surgery resumes in NSW, postoperative innovations both in and out of hospitals should be considered.

Methods (Appendix 1)

PubMed and google were searched on the 27 June 2020. Due to a large volume of literature, studies were limited to systematic reviews or meta-analysis. Enhanced recovery after surgery reviews were only included when evaluating clinical outcomes comparing ERAS with usual care.

Innovations included in this review were ERAS, early mobilisation and early discharge. Standard postoperative interventions such as nutritional supplements or exercise were not included unless they specifically referred to early mobilisation/exercise.

Results

Table 1 Post-surgery innovations in hospital

Innovation	Summary
Peer reviewed sources	
Enhanced recovery after surgery (ERAS)	A review on staff experiences of ERAS reported that staff feel positive about the implementation of ERAS, but find the process is complex and challenging.(7) A systematic review on barriers and facilitators to implementing enhanced recovery pathways found that the key facilitating factors were: adapting the program to fit local contexts, achieving and demonstrating early "wins," gaining buy-in from both frontline clinicians and hospital leadership, having a strong ERP team that met regularly, and leveraging supporters and full-time enhanced recovery pathway staff. The major barriers identified were: meeting with resistance to change from frontline clinicians, not having enough resources for implementation, and external factors, such as patient complexity or rural hospital location.(4) A review of patient experience saw that patients in enhanced recovery after surgery programmes desired more consistency between pre- and postoperative information. Important opportunities exist to improve symptom management and help patients feel more secure about recovery postoperatively.(5) Another describes a paucity of data in this area, however ERAS does not compromise patient satisfaction or QoL after elective hip or knee surgery.(6) ERAS protocols appear to be both clinically efficacious and cost effective across a variety of surgical specialties in the short term.(8) In a review of outcomes used to evaluate enhanced recovery, patient-reported outcomes, particularly post discharge functional status, were not commonly reported. All studies documented in-hospital outcomes, but only 17 reported post discharge outcomes other than complications or readmission.(9) Abdominal surgery • In laparoscopic abdominal surgery, the ERAS group was associated with shorter hospital stay and earlier time to first flatus. Meanwhile, lower overall postoperative complication rate and less hospital cost were

Innovation	Summary
Peer reviewed sources	
	observed in ERAS group. Similar readmission rate and perioperative mortality were found between the two groups.(10) • In non-colorectal abdominal surgery, ERAS protocols decreased length of stay and cost by not increasing complications or readmission rates.(11) Bariatric surgery • This meta-analysis saw a significant reduction in the length of stay, and no significant variations in overall morbidity, specific complications and Clavien-Dindo classification among the study groups. An ERAS protocol in bariatric surgery leads to the reduction of length of hospital stay, while maintaining no or low influence on morbidity.(12) Bladder surgery • In patients undergoing radical cystectomy, pooled data showed that compared to standard care, ERAS protocols were associated with significantly faster recovery of bowel function, faster return to regular diet and shorter hospital stay with no increase in 30-day and 90-day major complication, mortality or readmission rates. There was however a non-negligible inter-study variability between ERAS protocols.(13) • A meta-analysis demonstrated that ERAS was associated with a shorter time to first flatus passage, return of bowel function, lower rate of postoperative complications and the length of hospital stay than standard care in patients undergoing radical cystectomy.(14) • Pooled data showed a lower overall complication rate, a shorter length of, and a faster return of bowel function in the ERAS group. No difference was noted for the overall readmission rates, although a stratified analysis showed a lower 30-d readmission rate in the ERAS group compared to standard care.(15) • The European Association of Urology robotic urology section scientific working group recommended key principles or ERAS, based on a systematic review which includes preoperative patient education, optimisation of nutrition, robot-assisted radical cystectomy approach, standardised anaesthetic, analgesic, and antiemetic regimens, and early mobilisation.(16) • In patients undergoing radical cystectomy and urinary diversion, the use of alvimopan administered as part of an enhanced recovery pathway for a limited duration (up to 15 doses for up to seven days) probably

Innovation	Summary
Peer reviewed sources	
	reduces the time to tolerance of solid food, time to hospital discharge and rates of major adverse events. Readmission rates, rates of cardiovascular events and narcotic pain requirements are probably similar and the need for reinsertion of nasogastric tubes is reduced.(17) Breast surgery • For patients with breast cancer, compared with a conventional program, ERAS was associated with significantly decreased length of stay, morphine administration, and pain scores. The other variables did not differ significantly.(18) • Following autologous and alloplastic breast reconstruction, most frequently reported significant outcomes in the included studies were reduced length of stay and opioid use with ERAS implementation. No significant change in major complication or readmission rate was demonstrated.(19) • Length of stay was significantly shorter for patients on an ERAS pathway. Enhanced recovery was not associated with changes in 30-day postoperative morbidity.(20) • ERAS pathways significantly reduce opioid use and length of hospital stay following autologous breast reconstruction without increasing complication rates.(21) • Key recommendations from the ERAS Society, based on a systematic review, support use of opioid-sparing perioperative medications, minimal preoperative fasting and early feeding, use of anesthetic techniques that decrease postoperative nausea and vomiting and pain, use of measures to prevent intraoperative hypothermia, and support of early mobilization after surgery.(22) Colorectal surgery • An enhanced recovery program was feasible in the elderly although postoperative morbidity was higher compared to younger patients. Compared to traditional management, an enhanced recovery program was effective in decreasing the overall rate of complications and duration of hospital stay.(23) • Protocol compliance is the most frequently reported predictive factor for outcomes of ERAS programs following laparoscopic colorectal resection.(24) • For laparoscopically operated patients with or without ERAS, no differences in morbidity were found and postoperative hospital stay favoured ERAS.(25)

Innovation	Summary
Peer reviewed sources	
	• ERAS can be safely applied to elderly patients to reduce complications and shorten length of hospital stay.(26) • A Cochrane review concluded the quantity and especially quality of data are low in colorectal cancer for ERAS. Analysis shows a reduction in overall complications, but major complications were not reduced. Length of stay was reduced significantly.(27) • Nonsteroidal anti-inflammatory drugs after colorectal surgery may be associated with a higher risk of anastomotic leakage, therefore it is important to balance between the benefits of faster post-operative recovery and potential adverse effects.(28) A further two reviews saw use of a nonsteroidal anti-inflammatory drug postoperatively was associated with an overall increased risk of anastomotic leakage.(29, 30) One review concluded that the risk-benefit balance is acceptable.(31) In another review, patients receiving the active drug had faster return of flatus, stool, and oral tolerance. The drugs were not associated adverse events, but one was temporarily suspended for safety.(32) • Recovery of gastrointestinal motility after colorectal surgery was accelerated when one of the following forms of treatment was administered: probiotics, early feeding in combination with multimodal regimens, pentoxifylline, flurbiprofen, valdecoxib, ketorolac, clonidine, ropivacaine, lidocaine or spinal analgesia. Gum chewing, preoperative carbohydrate loading, bisacodyl and Doppler-guided fluid management have an uncertain effect on bowel motility.(33) • There is a paucity of data assessing the benefits of postoperative analgesic regimes following laparoscopic colorectal surgery and none of the protocols were shown to be clearly superior.(34) Gastroesophageal surgery • ERAS or fast track surgery for laparoscopy-assisted gastrectomy found that fast track surgery is associated with shorter postoperative hospital stay, rapid postoperative recovery, and decreased cost, without increasing complications or readmission rate compared with conventional care.(35) • For gastric surgery, length of stay was significantly shorter after enhanced recovery programs when compared with control, but with significant heterogeneity between studies. Enhanced recovery programs was also associated with reduced serum inflammatory response, less weight loss, and lower cost, as well as a trend toward shorter duration of intravenous infusion. However, it was not associated with increased postoperative morbidity or hospital readmission.(36)

Innovation	Summary
Peer reviewed sources	
	• Several core enhanced recovery pathway components and principles, including immediate extubation, astrograffin swallow ≤5 days, mobilisation on postoperative day ≤1, removal of urinary catheter ≤2 days, oral intake with at least sips of fluid ≤1 day, enteral diet with feeding jejunostomy or gastrostomy ≤1 day and epidural removal ≤4 days appear to be associated with reduced length of stay.(37) • Use of enhanced recovery pathways following oesophagectomy was associated with a reduction in the incidence of anastomotic leak, pulmonary complications and length of hospital stay, and with no significant change in postoperative mortality or readmission rate.(38) • Mortality rates following fast track surgery were 0.8% for oesophageal resection and 0% for gastric resection. The reported morbidity rate was 16.5% following gastric resection and 38.6% following oesophageal resection. Length of stay was reduced in both groups compared with conventional recovery groups in comparative studies.(39) • In major upper gastrointestinal, liver and pancreatic surgery, based on low quality evidence, enhanced recovery protocols may reduce length of hospital stay and costs, primarily because of reduction in hospital stay.(40) Geriatric and emergency surgery • Elderly patients had fewer postoperative complications and a reduced hospitalization with ERAS, while emergency surgical patients had fewer postoperative complications with ERAS compared to conventional care.(41) Gynaecologic surgery • Authors conclude that the advantages of ERAS do extend to gynaecologic surgery. Overall, there was a reduction in length of stay for open gynaecologic cancer surgery. There was no significant differences in complication rates for open, minimally invasive, and vaginal surgery, readmission rates or reoperation.(2) • Gynaecologic surgery with and without bowel surgery. ERAS pathways decreased length of stay and/or increased the proportion of same-day discharge surgeries, improved patient satisfaction, and reduced hospital costs while maintaining low postoperative complication and readmission rates. Limited data from one study suggests that ERAS in minimally invasive gynaecologic surgery with bowel surgery leads to shortened hospital stay, stable postoperative morbidity, and less readmissions.(42)

Innovation	Summary
Peer reviewed sources	
	• Early feeding appeared to be safe and was associated with significantly faster recovery of bowel function after ovarian cancer surgery.(43) • Enhanced recovery pathways reduced primary and total length of hospital stay in abdominal gynaecologic surgery compared with traditional perioperative care, without an increase in complications, mortality or readmission rates.(44) • A Cochrane review identified no studies meeting their criteria concluding that there is currently no evidence from high-quality studies to support or refute the use of perioperative enhanced recovery programs for gynaecological cancer patients.(45) Knee and hip surgery • In elderly people undergoing total hip arthroplasty, compared with traditional management, ERAS decreased the average length of stay without increasing complications, re-admissions and mortality rates.(46) • Compared with conventional care, ERAS was associated with a significant decrease in mortality rate, transfusion rate, complication rate and length of stay. However, no significant difference was found in range of motion and 30-day readmission rate. There was no significant difference in complications of total knee arthroplasty and transfusion rate in randomised controlled trials.(47) • This meta-analysis showed that length of stay was significantly lower in the ERAS group than in the control group (non-ERAS group) ($p<0.01$), and there were fewer incidences of complications in the ERAS group than in the control group ($p=0.03$). However, no significant difference was found in the 30-day readmission rate ($p=0.18$).(48) Liver surgery • For patients undergoing liver surgery, length of stay was reduced by 2.22 days in ERAS group compared to the standard care group, and fewer patients in ERAS group experienced complications.(49) • In liver surgery, an ERAS program is associated with an overall decrease in complications by 30 to 60%, but without improvement in the rates of hospital readmission and postoperative mortality.(50)

Innovation	Summary
Peer reviewed sources	
	• Immediate postoperative tracheal extubation can achieve an enhanced recovery for adult patients underwent liver transplantation without additional re-intubation, morbidity, and mortality risks compared with conventional tracheal extubation.(51) • In patients undergoing hepatectomy, postoperative length of stay was significantly lower in the ERAS group, whereas readmission and mortality rate were similar. The ERAS group had also significant lower complication rate in two of four studies, while the complication rate in the two other studies was similar.(52) • After liver surgery, length of stay and time to first flatus were both reduced in the ERAS group. There were also fewer complications in the ERAS group.(53) • Significantly reduced overall complication rates following ERAS care were demonstrated by a meta-analysis of the data reported in the two randomised controlled trials. The median length of stay reported by the studies was 5.0 days in ERAS patients, and 7.5 days in non-ERAS patients. Recovery milestones, when reported, were improved following ERAS care.(54) • ERAS protocols can be successfully implemented in liver cancer. Median length of stay ranged from 4 days in an ERAS group to 11 days in a control group. Morbidity, mortality and readmission rates did not differ significantly between the groups.(55) Lung surgery • Non-randomised studies reported shorter length of stay in the intervention group, but the one included randomised study reported no differences. There were no differences between groups in readmissions, overall complications, and mortality rates.(3) Orthopaedic surgery • Patients undergoing ERAS following orthopaedic surgery had reduced incidence of postoperative complications, 30-day mortality rate, and Oswestry Disability Index after orthopaedic surgery, but not of 30-day readmission rate.(56) Pancreatic surgery • For patients who have undergone pancreaticoduodenectomy, meta-analysis showed a decrease in pancreatic fistula, infection, especially incision infection, and pulmonary infection. Length of stay and cost

Innovation	Summary
Peer reviewed sources	
	were also significantly reduced. There was no significant increase in mortality, readmission, reoperation, or delayed gastric emptying.(57) • Implementation of an ERAS protocol significantly reduced postoperative length of hospital stay, delayed gastric emptying, overall morbidity, and in-hospital costs compared to conventional perioperative care. There were no statistically significant differences in other postoperative outcomes.(58) • In pancreatic surgery, no articles reported an adverse effect of an ERAS protocol for pancreatic surgery on perioperative morbidity or mortality. Length of stay was decreased and readmission rates were found to be unchanged in six of seven studies that compared these outcomes.(59) • This systematic review suggests that using an ERAS protocol in pancreatic resections may help to shorten hospital length of stay without compromising morbidity and mortality. This seemed to apply to distal pancreatectomy, total pancreatectomy, and pancreaticoduodenectomies.(60) • Nutrition management after abdominal pancreatic surgery saw no significant differences between the groups in mortality or re-hospitalisation rates. A significant decrease was detected in mean hospital stay in the ERAS group in all the studies. Several studies reported a statistically significant decrease in the incidence of delayed gastric emptying in patients in the group using the ERAS protocol.(61) Pelvic surgery • Among all included trials, ERAS or fast track surgery was associated with a significant reduction in postoperative lung infection, urinary tract infection and surgical site infection compared with conventional controls.(62) Spine surgery • In patients undergoing spine surgery, reduction in length of stay was reported in 7 of 19 studies using the ERAS protocol. Comparative studies between ERAS and non-ERAS show improved pain scores and reduced opioid consumption postoperatively, but no differences in complications or readmissions between groups. Complication rates under ERAS protocols ranged from 2.0% to 31.7%. Significant pain reduction in visual analogue scale scores was observed with three ERAS protocols. Direct, indirect, and total cost decreases were also observed with implementation of ERAS protocols.(63)

Innovation	Summary
Peer reviewed sources	
	Standard elective surgery • Meta-analyses showed that enhanced recovery programs reduced the primary length of stay and reduced the risk of all complications within 30 days. There was no evidence of a reduction in mortality, major complications or readmission rates. The impact of enhanced recovery programs was similar across specialties and there was no consistent evidence that elements included within ERPs affected patient outcomes.(64) • In an enhanced recovery program after elective surgery, preoperative carbohydrate treatment was associated with a small reduction in length of hospital stay when compared with placebo or fasting in adult patients.(65) Vascular surgery • Based on systematic review, the use of ERAS pathways in vascular surgery is limited, and existing evidence of their feasibility and effectiveness is low quality. Included studies did consistently demonstrate clinically and statistically significant outcomes, with patients tolerating regular diets within a median of three days of surgery, decreased length of stay to as few as three days, and no increase in postoperative complications and 30-day mortality.(66)
Early mobilisation	• A review on early mobilisation after dysvascular major lower limb amputations revealed a lack of evidence, however ambulation from the first postoperative day with temporary prosthesis is possible among the heterogeneous population of dysvascular lower limb-amputated patients if the necessary interdisciplinary team is dedicated to the task.(67) • Trials revealed diversity in techniques used for mobilisation, as well as periods considered early for the start of the intervention. Early mobilisation seems to be important to prevent postoperative complications, improve functional capacity and reduce length of hospital stay in patients after cardiac surgery.(68) • In one included study on early versus delayed postoperative bathing or showering to prevent wound complications, there was no statistically significant difference in the proportion of patients who developed surgical site infection between the two groups.(69) A Cochrane review found that there is currently no

Innovation	Summary
Peer reviewed sources	
	conclusive evidence available from randomised trials regarding the benefits or harms of early versus delayed postoperative showering or bathing for the prevention of wound complications.(70) • Early weight-bearing tends to accelerate return to work and daily activities compared to late weight-bearing after open reduction and internal fixation of ankle fractures.(71)
Early nutrition	• Early oral feeding following gastrectomy for gastric cancer found this was associated with a decreased length of hospital stay ranging from -1.3 to -2.5 days when compared to conventional care, a faster time to first flatus was recorded in all four studies in the early oral feeding group and it does not increase postoperative complication risk when compared to conventional care.(72)
Early discharge	• Reducing length of stay following endovascular aneurysm repair saw 75% of patient successfully discharged, complications most often occurred within three hours of surgery and major complications within six hours, no difference in 30 day readmission rates and a significant cost saving.(73) • Early discharge following transcatheter aortic valve replacement showed no significant difference in 30-day mortality or discharge to 30-day new permanent pacemaker implantation compared with a standard discharge pathway. Early discharge patients were less likely to be readmitted compared with standard discharge patients.(74) • Early discharge after percutaneous coronary intervention, the pooled effect supports the safe use of early discharge in the treatment of a heterogeneous population of patients with coronary artery disease. There was an increased risk of rehospitalisation for all subpopulations, except patients with stable angina.(75)

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Appendix

PubMed search terms

("Enhanced Recovery" OR ERAS OR "early mobilisa*" OR “Resistance Training” OR "early discharge" OR ((virtual OR "tele*") AND (rehabilitation OR "follow up" OR "follow-up"))) AND ((((((surgery[MeSH Subheading]) OR (surgical procedures, operative[MeSH Terms])) OR (general surgery[MeSH Terms])) OR (surgi*[Title/Abstract])) OR (surge*[Title/Abstract])))

=238 hits on 27 June 2020

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