Enhanced Recovery Pathway v2.0: **Table of Contents**

Stop and **Review**

Inclusion Criteria

- Patients for whom an enhanced recovery bundle exists
  - All patients at the Bellevue Surgery Center
  - Any surgical service in Seattle that has implemented an enhanced recovery bundle

Exclusion Criteria

- Cardiac surgery

Enhanced Recovery Care

Appendix

Last Updated: November 2023
Next Expected Review: November 2026

For questions concerning this pathway, contact:
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Enhanced Recovery Pathway v2.0: **Pre-Op**

Stop and **Review**

Inclusion Criteria

- Patients for whom an enhanced recovery bundle exists
  - All patients at the Bellevue Surgery Center
  - Any surgical service in Seattle that has implemented an enhanced recovery bundle

Exclusion Criteria

- Cardiac surgery

Surgery Clinic or Inpatient

- **Counseling:** inform patient/family about protocol and expectant preoperative pain management
- **Bowel prep**
  - Continue regular bowel program
  - Avoid routine laxative, suppositories, or other mechanical bowel prep, use only when indicated
  - Antibiotic bowel prep, use as indicated
- **NPO times per** Perioperative Services NPO Standards, 10855 (*for SCH only*)
  - Some patients are instructed to start a clear liquid diet the day before surgery
- **Carbohydrate load**
  - Not for patients with type 1 or 2 diabetes, morbid obesity (BMI>40 or >35 with metabolic effects), short gut syndrome, ketogenic diet, gastrointestinal dysmotility (i.e. gastroparesis)
  - Drink clear carbohydrate liquid completed up to 2 hours prior to procedure
    - Use these: apple juice, white grape juice, Gatorade, Powerade, Pedialyte, ClearFast
    - Drinks to avoid
      - No sugar-free or low sugar drinks (no “G2”)
      - No red-colored drinks
      - No drinks or juice with pulp (such as orange juice)
      - No smoothies or shakes
  - How much
    - 9 years old or younger: 2 to 8 ounces
    - 10 years old or older: 8 to 16 ounces
- **Optimize chronic conditions:** Diabetes (mellitus and insipidus) first case of day, standardize PASS clinic referrals, identify malnutrition or morbid obesity
- **Prevent surgical site infection**: See Surgical Site Infection (SSI) Prevention Pathway
- **VTE Prophylaxis**:
  - Use mechanical prophylaxis per Non-Pharmacologic Venous Thromboembolism Prophylaxis in the Perioperative Setting, 12766 (*for SCH only*)
  - For patients with additional risk factors, consider pharmacologic prophylaxis (enoxaparin preferred). Consult hematology if needed. If pain management plan includes an epidural, pharmacological prophylaxis may be contraindicated or limited; huddle with pharmacy and anesthesia to coordinate pain management and VTE prevention plan
- **Surgery:** Use minimally invasive techniques when indicated or feasible

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Enhanced Recovery Pathway v2.0: **Peri-Op**

Stop and **Review**

Inclusion Criteria

- Patients for whom an enhanced recovery bundle exists
  - All patients at the Bellevue Surgery Center
  - Any surgical service in Seattle that has implemented an enhanced recovery bundle

Exclusion Criteria

- Cardiac surgery

Operating Room

Antibiotic Prophylaxis
- Per P&P Surgical Antimicrobial Prophylaxis, 10999 (*for SCH only*)

Postoperative Nausea/Vomiting (PONV) Prophylaxis
Suggest minimum 2, at provider discretion
- Dexamethasone IV
- Ondansetron IV
- Propofol IV infusion
- Diphenhydramine IV
- Propofol or promethazine as an alternative in PACU

Venous Thromboembolism Prophylaxis
- Place Sequential Compression Devices (SCDs) prior to induction, if indicated Non-Pharmacologic Venous Thromboembolism (VTE) Prophylaxis in the Perioperative Setting, 12766 (*for SCH only*)

Normothermia (core body temperature 36°C to 38°C)
- Per GOC Perioperative Warming, 12121 (*for SCH only*)

Anesthesia and Analgesia
- Regional anesthesia
- Minimize opioids (max 0.3 mg/kg morphine equivalents)
- Consider multimodal adjuvants
  - Acetaminophen IV early in the case
  - Ketorolac IV at completion of case
  - Dexmedetomidine IV bolus early in case
  - (+/-) Ketamine IV by infusion or intermittent bolus
  - (+/-) If no regional, lidocaine IV at induction followed by infusion

Fluids
- Target euvolemia

Tubes and Drains
- No routine NG tubes. If orogastric tube required, remove by end of surgery if not sooner
- Avoid surgical drains unless necessary. Foley catheters only if clinically necessary, evaluate for removal at the end of the case
- Label all catheters clearly before leaving OR

PACU

- PONV medications PRN
- Continue regional catheters if appropriate. If regional catheters, pain team to manage medications.

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Enhanced Recovery Pathway v2.0: **Post-op**

Stop and **Review**

Inclusion Criteria

- Patients for whom an enhanced recovery bundle exists
  - All patients at the Bellevue Surgery Center
  - Any surgical service in Seattle that has implemented an enhanced recovery bundle

Exclusion Criteria

- Cardiac surgery

Therapy

- **Analgesia:**
  - Scheduled acetaminophen and/or NSAID therapy for 24 hours
  - Minimize opioid medications. Target <0.15 mg/kg/day morphine equivalents. Order opioids only as a PRN breakthrough pain (not scheduled)
- **PONV prophylaxis:**
  - Ondansetron IV
  - Diphenhydramine IV
  - Consider escalation to pain service for administration of other options (dexamethasone, propofol, promethazine)
- **Diet:**
  - If the patient is on a clinical pathway that includes special diet enhancements (e.g. Gastroschisis), follow those instructions
  - Regular diet POD #1 (only clinically indicated restrictions unless patient has trouble swallowing)
  - Age 4 and older and no concern for aspiration: chew gum or suck on hard candy to help restart the gut. Assure child is sitting up so they don't choke
- **Activity:** Out of bed POD #1 (at least to chair)
- **Fluids**: Discontinue maintenance fluids by POD #2 for patients tolerating PO intake
- **Tubes and drains**
  - Discontinue JP drains by postoperative day #4
  - Urinary Foley catheter should be removed as soon as clinically appropriate

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Evidence Summary

We identified the most recently published systematic reviews of bundled enhanced recovery programs in adults. Neurosurgery, cardiac surgery, and solid organ transplant surgeries were excluded. Thirteen systematic reviews were included, which used randomized-controlled trials or cohort studies to evaluate patient outcomes. Overall, patients who received enhanced recovery bundles had similar or improved outcomes compared to usual care.

Improved outcomes with enhanced recovery

- Reduce length of stay in colorectal, cystectomy, esophageal, gastric, liver, lung, ortho-arthroplasty, pancreatic, pancreaticoduodenectomy, laproscopic GI/prostate/solid organ by 1.2 to 4.4 days *(Greer 2018, Wessels 2020, Triantafyllou 2020, Lee 2020, Noba 2020, Deng 2018, Ji 2018, Cao 2019, Li 2018)*. Reduction in LOS of 2 days was not statistically significant in lung surgery *(+2 low certainty; Li 2017).*
  - Reduce time to first oral intake in gastric surgery by 2 days *(+2 low certainty; Lee 2020).*
  - Reduce time to first flatus in esophageal and gastric surgery by 0.5 to 5 days *(+2 low certainty; Triantafyllou 2020, Lee 2020).*
  - Reduce time to defecation in cystectomy, esophageal, and gastric surgery by 1 to 1.4 days *(+2 low to +3 moderate certainty; Wessels 2020, Triantafyllou 2020, Lee 2020).*
- Reduce overall complications by 11% to 35% in cystectomy, liver, ortho-arthroplasty, pancreatic, colorecta, esophageal, lung, and laparoscopic surgeries *(+2 low to +4 high certainty; Noba 2020, Deng 2018, Ji 2018, Greer 2018, Triantafyllou 2020, Li 2017, Li 2018).* Reduction of 11% was not statistically significant in gastric *(+1 very low certainty, Wessels 2020).*
  - Reduce pulmonary complications in esophageal, gastric, and lung surgery by 50% to 63% *(+2 low to +3 moderate certainty; Triantafyllou 2020, Lee 2020, Li 2017).*
  - Reduce anastomotic leak in esophageal surgery by 37% (95% CI: 0% to 60%; *+3 moderate certainty; Triantafyllou 2020)* but no difference in gastric or pancreaticoduodenectomy *(+1 very low to +3 moderate certainty; Lee 2020, Cao 2019).*
  - Reduce surgical site infection in pancreatic and pancreaticoduodenectomy by 27% to 33% *(+2 low certainty; Ji 2018, Cao 2019)* but no difference in colorectal or gastric surgery *(+2 low to +3 moderate certainty; Greer 2018, Lee 2020).*

No difference

- No difference in mortality in colorectal, esophageal, liver, lung, ortho-arthroplasty, pancreatic, pancreaticoduodenectomy *(+1 very low to +4 high certainty; Greer 2018, Triantafyllou 2020, Noba 2020, Li 2017, Deng 2018, Ji 2018, Cao 2019).*
- No difference in readmission rate in 8 of 9 surgeries including colorectal, cystectomy, esophageal, liver, ortho-arthroplasty, pancreatic, pancreaticoduodenectomy, laparoscopic *(+1 very low to +4 high certainty; Greer 2018, Wessels 2020, Triantafyllou 2020, Noba 2020, Deng 2018, Ji 2018, Cao 2019, Li 2018)* Readmission rate was 2.4 times higher in gastric surgery, with an excess of 2.4 readmissions per 100 patients *(+3 moderate certainty; Lee 2020).*
- No difference in cardiac complications for esophageal and lung surgery *(+3 moderate to +4 high certainty; Triantafyllou 2020, Li 2017).*

Summary of Version Changes

- **Version 1.0 (11/2/2021):** Go live. Enhanced Recovery (ERP, ERAS) is a bundle of interventions designed to minimize opioids, accelerate return of bowel function, and reduce the risk of hospital acquired conditions. The interventions span the entire patient journey: beginning preoperatively, then on the day of surgery, and into the postoperative period.
- **Version 2.0 (11/9/2023)**: Adjusted Inclusion and Exclusion Criteria to include ERP expansion to all General Surgery and Neurosurgery. Added reference to the SSI Prevention Pathway in Pre-op phase. Added link to GOC Perioperative Warming in Peri-op phase.

Approval & Citation

Approved by the CSW ERP Pathway team for November 2, 2021, go-live

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Retrieval Website: https://www.seattlechildrens.org/pdf/enhanced-recovery-pathway.pdf

Please cite as:
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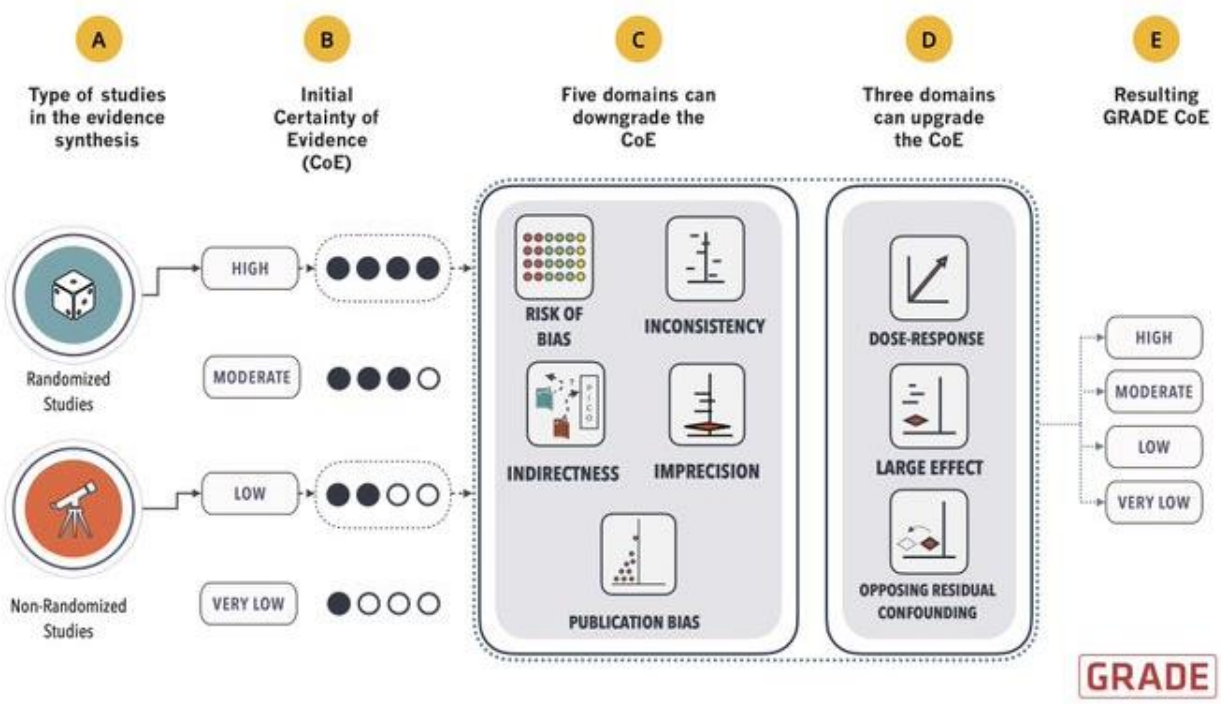
Evidence Ratings

This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children's. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94, Hultcrantz M et al. J Clin Epidemiol. 2017;87:4-13.):



Source: Carlos Cuello

Certainty of Evidence

✪✪✪✪ High: The authors have a lot of confidence that the true effect is similar to the estimated effect
✪✪✪○ Moderate: The authors believe that the true effect is probably close to the estimated effect
✪✪○○ Low: The true effect might be markedly different from the estimated effect
✪○○○ Very low: The true effect is probably markedly different from the estimated effect
Guideline: Recommendation is from a published guideline that used methodology deemed acceptable by the team
Expert Opinion: Based on available evidence that does not meet GRADE criteria (for example, case-control studies)

Bibliography

Literature Search Methods

A literature search was conducted in March 2020 to target synthesized literature on enhanced recovery programs from 2010 to current and limited to English. The search was executed in Ovid Medline, Embase, Cochrane Database of Systematic Reviews (CDSR) and Turning Research into Practice (TRIP) databases.

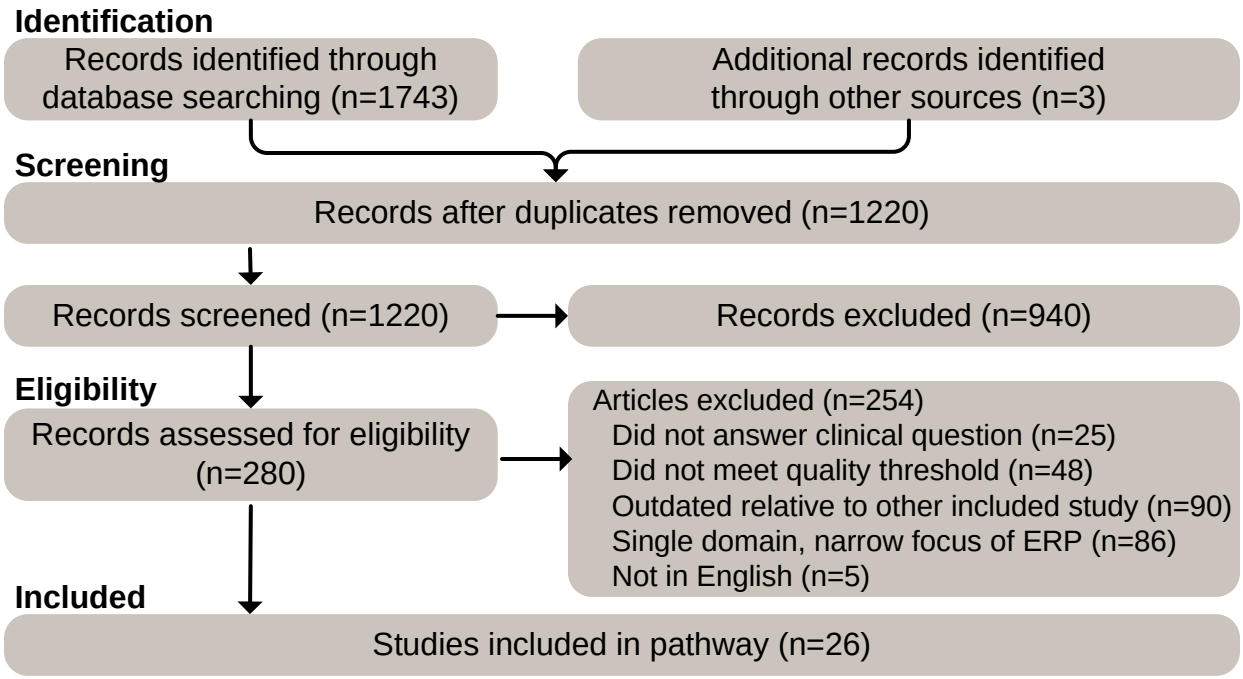
Screening and data extraction were completed using DistillerSR (Evidence Partners, Ottawa, Canada). Two reviewers independently screened abstracts and included guidelines and systematic reviews that addressed enhanced recovery after surgery programs. One reviewer screened full text and extracted data and a second reviewer quality checked the results. Differences were resolved by consensus.

Literature Search Results

The searches of the 4 databases retrieved 1743 records. Our searches of other resources including the bibliographies of included articles identified 3 additional records that appeared to meet the inclusion criteria.

Once duplicates had been removed, we had a total of 1220 records. We excluded 940 records based on titles and abstracts. We obtained the full text of the remaining 280 records and excluded 254.

We have included a total of 26 studies. The flow diagram summarizes the study selection process. In addition, 5 primary pediatric studies obtained outside the structured search parameters (added from the bibliography of an included systematic review), are listed under Additional References.



Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535

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Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor Seattle Children's Healthcare System nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.

Readers should confirm the information contained herein with other sources and are encouraged to consult with their health care provider before making any health care decision.