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VIEWPOINT

Order Sets for Enhanced Recovery After Surgery Protocol

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Enhanced Recovery After Surgery (ERAS) protocols are designed to facilitate recovery from surgical procedures. They have been shown to reduce surgical morbidity and length of stay in hospital[1,2] and may be associated with better cancer-specific survival.[3] Until recently, there was no specific ERAS protocol for breast reconstruction. A newly developed and internationally relevant protocol, based on a systematic review and consensus recommendations, can now guide the optimal perioperative management of this patient population.[4] Based on this protocol, we have developed detailed order sets, with specific drug names and doses. Such information may be useful for centers intending to implement an ERAS protocol for breast reconstruction.

PREOPERATIVE ORDER SETS

Preoperative ERAS guidelines call for limited fasting and carbohydrate loading, medications to reduce postoperative pain, nausea and vomiting, and risk of venous thromboembolism, and management of fluids.[4] Our institution's orders (Table 1) include a light snack up to 8 hours before surgery, clear fluids up to 3 hours before surgery, and consumption of a carbohydrate-rich juice the evening before and morning of surgery. We have included cefazolin, aprepitant, celecoxib, acetaminophen, dalteparin, hydromorphone, and gabapentin; doses are provided in Table 1. Our orders also include lactated ringers infusion by peripheral line at 125 mL/h continuous.

POSTOPERATIVE DAY SURGERY ORDER SETS (IMPLANT RECONSTRUCTION)

Intra- and postoperative ERAS guidelines for day surgery patients are relatively straight forward.[4] Our postoperative day surgery order set (Table 2) includes lactated ringers infusion by peripheral line at 30 mL/h continuous and saline lock once the patient is drinking well. Postoperative medications may include acetaminophen and gabapentin, as well as the following, as needed: codeine, ketorolac, hydromorphone or morphine, ondansetron, dimenhydrinate, and metoclopramide; doses are provided in Table 2. Discharge instructions include wound observation, drain care, and dressing care.

POSTOPERATIVE INPATIENT ORDER SETS (FLAP RECONSTRUCTION)

The order sets for patients undergoing abdominal flap reconstruction are more extensive (Table 2) and include early activity, early refeeding, nutritional supplementation, drain care teaching, regular surgical flap checks, and fluid management. Postoperative analgesic medications may include acetaminophen and gabapentin, as well as the following, as needed: oxycodone, codeine, and hydromorphone or morphine; doses are provided in Table 2. Postoperative antinauseants may include, as needed, ondansetron, dimenhydrinate, and metoclopramide. Laxatives may be used as needed. Measures for thromboembolism prophylaxis include dalteparin and a sequential compression device. Our order set also includes referral for physiotherapy assessment and treatment, including teaching around mobility and precaution with certain activities and patient education around wound care, drain care, and VTE prophylaxis. We have collected and analyzed data on outcomes associated with this order set in patients undergoing flap reconstruction, and a paper is pending.

Our order sets operationalize ERAS recommendations that can be implemented into the health system. They add depth to the existing ERAS recommendations by providing a specific set of medications and interventions that institutions considering ERAS breast reconstruction protocols can adopt. Depending on the context, some custom tailoring of the order sets may be required. Our hope is that as other institutions adopt ERAS for breast reconstruction, we will see a growing body of comparably treated patients to allow for robust evaluation of quality, safety, and cost of care.

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Plast Reconstr Surg Glob Open 2017;5:e1323; doi:10.1097/GOX.0000000000001323; Published online 25 May 2017.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the University of Calgary Library.

Table 1. Preoperative Order Sets for Patients Electing to Follow ERAS for Breast Reconstruction

Item	Clinical Communication	Comments
Fasting guidelines	☐ May have a light snack	Up to 8 h before surgery
	☐ May drink clear fluids	Up to 3 h before surgery
	☐ Confirm that patient drank carbohydrate-rich juice	Evening prior and morning of surgery
Intravenous fluids	☐ Lactated ringers by peripheral intravenous line, 125 mL/h	Continuous infusion
Medications	☐ Cefazolin, 2 g	Intravenous, preoperatively
	☐ Aprepitant capsule, 80 mg	Oral, preoperatively, with a sip of water
	☐ Celecoxib capsule, 400 mg	Oral, preoperatively
	☐ Acetaminophen tablet, 1,000 mg	Oral, preoperatively
	☐ Dalteparin, 5,000 units	Subcutaneous injection, only for abdominal flap reconstruction, preoperatively
	☐ Hydromorphone, 4 mg tablet	Oral, preoperatively, with a sip of water once the surgeon has marked the patient in the holding area
	☐ Gabapentin capsule, 300 mg	Oral, preoperatively, with a sip of water once the surgeon has marked the patient in the holding area

Table 2. Postoperative Order Sets for Day Surgery Patients Electing to Follow ERAS for Breast Reconstruction

Item	Clinical Communication	Comments
Day surgery (implant reconstruction)		
Patient care	☐ Vital sign protocol	Once, postoperatively (temperature, pulse, respirations, blood pressure, oxygen saturation, pain score, sedation)
Intravenous fluids	☐ Lactated ringers by peripheral intravenous line 30 mL/h	Continuous infusion
	☐ Saline lock	Remove when patient is drinking well
Medications		
Analgesics	☐ Acetaminophen tablet, 1,000 mg	Oral, every 6 h, postoperatively
	☐ Gabapentin capsule, 200 mg	Oral, once, postoperatively
	☐ Codeine tablet, 15–30 mg	Oral, every 6 h, postoperatively
	☐ Hydromorphone, 0.5–1 mg	Intravenous, every 3 h, postoperatively
	☐ Ketorolac, 30 mg	Intravenous, once, postoperatively
	☐ Morphine, 5–10 mg	Intravenous, every 3 hours, postoperatively
Antinausea medications	☐ Ondansetron, 4–8 mg	Oral or intravenous, every 6 h, postoperatively
	☐ Dimenhydrinate, 25–50 mg	Oral or intravenous, every 4 h, postoperatively
	☐ Metoclopramide tablet, 10 mg	Oral or intravenous, every 4 h, postoperatively
Discharge	☐ Call surgeon's office if wound concerns	Spreading redness, increasing pain, purulent discharge, fever, or other concerns
	☐ Nurses to provide instruction regarding drain care	Nurses to provide teaching regarding recording of volume of drain bulb and routine drain care
	☐ Patient instructions regarding dressing care	Patient to remove dressings at 48 h, leaving steristrips in place; may shower at 48 h and pat steristrips dry; may wear supportive bra without underwire
Inpatient (flap reconstruction)		
Anticipated discharge	☐ Less than 5 d (1–5 d)	
Notifications	☐ Systolic blood pressure	Notify plastic surgery resident on call if < 90 mm Hg
	☐ Urine output	Notify plastic surgery resident on call if < 0.5 cc/kg/h
	☐ Flap check	Notify plastic surgery resident on call if flap problems; if no answer within 15 minutes notify attending physician
Activity	☐ Transfers	Provide total assistance, transfer to chair
	☐ Ambulate	Ambulate at least once a day with 1 person assist until fully ambulated
	☐ Abduct, upper extremity	Right, left, bilateral
	☐ Hip flexion	
Nutrition	☐ Clear fluids diet on day of surgery	Nonformulary: Ensure Plus 90 mL orally 5 times a day
	☐ Regular diet	Order regular diet starting on postoperative day 1
	☐ Clinical communication	Patient not to consume caffeine and not to smoke
Patient care	☐ Vital signs	Postoperative vital signs protocol once postoperatively, then once every hour for 24 h, once every 2 h from 24 to 48 h, once a shift until discharge
	☐ O2 therapy	Titrate to saturation; maintain SpO2 92%
	☐ Intake/output, bowel monitoring	Monitor bowel and intake/output hourly for 24 h, then intake/output once per shift from 24 to 48 h
	☐ Foley catheter	Remove postoperative day 1 by 1,600 h
	☐ Patient weight	Weigh patient daily to avoid over-hydration
Drain care	☐ Jackson Pratt drain	Drain postoperatively once per shift and reprime once
	☐ Drain teaching	Teach drain care and recording of drain output
Surgical flap checks	☐ Check flaps	Check hourly starting immediately through postoperative day 1, then every 2 h through postoperative day 2, then every 4 h until discharge

(*Continued*)

Table 2. (*Continued*).

Item	Clinical Communication	Comments
Leeching	☐ Leech(es), if needed	Apply every 2 h
	☐ Ceftriaxone injection, 1 g	Intravenous, once every 24 h, while leeching
Remove flap sutures	☐ Remove sutures from flap paddle	Remove flap monitoring sutures on postoperative day 4
TFI	☐ 40 mL/h + body weight (kg)	Starting postoperatively, all intravenous fluids, enteral feeds, and flushes to the total calculated maximum TFI
Fluids	☐ Lactated ringers, 1,000 mL	Continuous infusion by intravenous peripheral line
	☐ Saline lock	Remove when patient is drinking well
	☐ Sodium chloride 0.9% flush/lock	2–5 mL flush injection every 12 h
Medications	☐ Cefazolin injection, 1 g	Intravenous, once every 8 h for 24 h
Antibiotics	☐ Clindamycin injection, 600 mg	Intravenous, once every 8 h for 24 h, if cefazolin allergy
Analgesics	☐ Acetaminophen, 1,000 mg tablet	Oral, once every 6 h, up to 12 doses
	☐ Celecoxib, 200 mg capsule	Oral, once every 12 h, up to 3 doses
	☐ Gabapentin, 200 mg capsule	Oral, once every 8 h, up to 4 doses (as needed)
	☐ Oxycodone, 5–10 mg tablet	Oral, once every 3 h for pain starting postoperative day 1 (as needed)
	☐ Codeine, 15–30 mg tablet	Oral, once every 6 h for pain (as needed)
	☐ Hydromorphone, 4 mg tablet	Oral, once every 4 h for pain (as needed)
	☐ Morphine injection, 5–10 mg	Intravenous, once every 3 h for pain (as needed)
	☐ Hydromorphone, 0.5–1 mg	Intravenous, once every 3 h for pain (as needed)
Antinauseants (as needed)	☐ Ondansetron, 4–8 mg	Oral or intravenous, once every 6 h
	☐ Dimenhydrinate, 25–50 mg	Oral or intravenous, once every 4 h
	☐ Metoclopramide, 10 mg	Oral or intravenous, once every 4 h for nausea and vomiting
Laxatives (as needed)	☐ Docusate sodium, 100 mg capsule	Oral, twice per day
	☐ Senokot, 1–2 tablets	Oral, twice per day
	☐ Lactulose 15–30 mL	Three times per day
	☐ Glycerin adult suppository	Rectally daily
Deep vein thrombosis prophylaxis	☐ Dalteparin, 5,000 units	Subcutaneous injection, once every 24 h
	☐ Sequential compression device	Continuous; stop when ambulating
	☐ Teaching	Teaching about wound care, drain care, self-injection with dalteparin (through day 7)
Referral	☐ Physiotherapy assessment and treatment	Postoperative day 1, routine for postoperative flap mobility and precaution with certain activities
Clinical instruction	☐ Communication	Confirm that checklist is in front of the chart and Education Workbook is provided to patient

TFI, total fluid intake.

REFERENCES

1. Greco M, Capretti G, Beretta L, et al. Enhanced recovery program in colorectal surgery: a meta-analysis of randomized controlled trials. *World J Surg*. 2014;38:1531–1541.
2. Gustafsson UO, Hausel J, Thorell A, et al.; Enhanced Recovery After Surgery Study Group. Adherence to the enhanced recovery after surgery protocol and outcomes after colorectal cancer surgery. *Arch Surg*. 2011;146:571–577.
3. Gustafsson UO, Oppelstrup H, Thorell A, et al. Adherence to the ERAS protocol is associated with 5-year survival after colorectal cancer surgery: a retrospective cohort study. *World J Surg*. 2016;40:1741–1747.
4. Temple-Oberle C, Shea-Budgell M, Tan M, et al. Consensus review of optimal perioperative care in breast reconstruction enhanced recovery after surgery ERAS® society recommendations. *Plas Reconstr Surg*. 2017;139:1056e–1071e.