Enhanced Recovery After Surgery (ERAS) for Minimally Invasive Mitral Valve Repair or Replacement Surgery Clinical Pathway

Site Applicability

Vancouver General Hospital

Overall ERAS Goals:

- ↓ stress response to surgery
- Improve patient experience
- ↓ complications and length of stay

Specific ERAS Goals:

1. Gum chewing x 15– 60 minutes while awake, several times/day
2. Advance DAT from POD 0
3. Discontinue CVC POD 2
4. Discontinue indwelling urinary catheter POD 1 by noon
5. Saline lock IV POD 1 or IV at TKVO when drinking greater than or equal to 600mL/12hr
6. Capillary Blood Glucose TID, HS and sliding scale insulin as ordered. If patient non-diabetic and all glucometer readings are less than 8.1mmol/L x 24 hrs, may discontinue glucometer
7. Ondansetron 4mg IV Q8H X 3 doses. First dose 8 hours after intra-op dose.
8. Mobility goals:

POD 0: Dangle on edge of bed (if extubated) and hemodynamically stable with RN &/or PT
POD 1: Walk to bathroom and sit up for meals as tolerated; Walk x 3 (minimum 5 meters/walk) a day
POD 2: Walk to bathroom and sit up for meals; Walk in hallway minimum 3 times per day

Pathway Patient Goals:

Patient will recover from surgery with an expected 4 – 6 day length of stay (LOS) and experience a safe discharge home.

1. Post-operative complications will be prevented by:
    - Extubation within 4 hours post-op
    - Transfer out of CSICU POD 1
    - Discharge home by POD 4
2. Patient will report pain below 3/10 or adequate for mobilizing and DB+C exercises
3. Effective discharge planning and teaching provided to patient and caregivers for a safe discharge

Inclusion Criteria

- All patients having **minimally invasive** mitral valve repair or replacement surgery

Exclusion Criteria

- Open mitral valve procedures, aortic valve, tricuspid, coronary artery bypass surgery, ascending aorta repair, descending aorta repair, TEVAR, robotic assisted procedures

Removal Criteria

- When significant deviations from expected outcomes are noted

Instructions

- Review pathway once per shift for patient care goals and expected outcomes
- A variance must be documented when expected outcomes have not been met or interventions not given. The variance is documented in the Electronic Health Record (Cerner) each shift until resolved.

Post- Operative Day 0 (CSICU)	
CARE CATEGORIES DAILY TASKS AND ACTIVITIES	**EXPECTED OUTCOMES**
Safety	• Beside safety check completed
Key Diagnostics & Other Assessments • Blood work, ABG's as per orders • Glucose monitoring as per orders • Portable CXR, ECG (unless A-V, or V paced) on admission to unit	• The results of the following are within acceptable range:CBC, electrolytes, urea, creatinine, glucose, coagulation status • CXR completed and reviewed by MD • ECG completed and reviewed by MD
Central Nervous System • Sedation and analgesic administered as per orders • Monitor the patient as per Pain Assessment and Documentation Standards • Delirium screening as per nursing standard	• Patient reports pain control as adequate or 3/10 • Complete pain assessment as per Pain Assessment and Documentation Standards • Nerve block assessment and safety check completed as per protocol • No evidence of delirium
Cardiovascular System • Nursing assessment frequency as per nursing standard • Maintain CI above 2.2 L/min/m^2 • Maintain SBP 90 to 120 mmHg (unless otherwise specified) • Maintain HR as per order • Temporary pacing as per nursing standards • Monitor CT drainage with vital signs	• Patient in stable cardiac rhythm • Normothermic within 2 hours post-op • Hemodynamically stable as per Critical Care goals ordered in Patient Care section in Cerner • CT drainage less than 150 mL/h for the first 4 hrs; then less than 50 mL/h
Respiratory System • Maintain PaO_2 above 80 mm Hg • Maintain SpO_2 above 92% as per respiratory standard • Assess weaning criteria respiratory standard • Extubate within 4 hours post-op	• Lung sounds within normal parameters for patient • Chlorhexidine mouthwash pre/post extubation • Extubate within 4 hours post-op or as assessed
Gastrointestinal System • NPO • Complete "Adult Swallowing Screen" post extubation as per dysphagia assessment protocol • Start diet as ordered if safe post extubation and dysphagia screen	• Nausea and vomiting absent or controlled with antiemetic • Nursing Bedside Swallow Screen completed • Tolerating clear fluids post extubation and dysphagia screening • Gum chewing (15 mins TID) when awake post extubation
Genitourinary System • Maintain urine output between 0.5 to 1 mL/kg/h • CAUTI precaution (no dependent loop, secured catheter, change collecting container daily and label)	• Urine output is between 0.5 to 1 mL/kg/h • Secure catheter and provide pericare/catheter care Q Shift
Skin • Complete skin assessment as per Braden Risk and Skin Assessment with first repositioning post-op • Dressings assessed as per nursing standard	• Skin integrity assessed as per Braden Risk Assessment • Keep dressings dry and intact. Do not change dressing until POD#3/as per order, unless

	saturated, otherwise outline drainage with a pen and reinforce as needed.
Mobility • Falls Risk Assessment prior to first mobilization • Dangle and stand if extubated and hemodynamically stable	• Fall prevention assessment completed and care plan in place if indicated • Dangle on edge of bed if able with RN or PT
Medications • Inotropes titrated to maintain hemodynamic parameters as per orders • Insulin sliding scale as ordered • Analgesics as ordered	• Inotropes weaned off • Blood glucose as per protocol • Achieve adequate (or 3/10) pain control with minimal opioids
Consult • As needed: POPS	• Consults performed as ordered
Patient/Family Teaching • Oriented to plan of care for the next 24 hours • Pain scale and use of analgesics • Deep breathing and coughing (ICOUGH protocol)	• Patient and family understand plan of care • Patient & family understand pain control management • Patient & family participate in deep breathing and coughing (ICOUGH protocol)

Post-Operative Day 1 (CSICU / WARD)	
CARE CATEGORIES DAILY TASKS AND ACTIVITIES	**EXPECTED OUTCOMES**
Safety	• Beside safety check completed
Key Diagnostics & Other Assessments • Blood work as per orders • Nursing assessment frequency as per unit standard: Q4H and PRN • In CSICU: vital signs Q1H • On ward: vital signs Q4H x 24 hours	• Blood work results are within acceptable range • Temp 36° to 37.5° C
Central Nervous System • Analgesic administered as ordered • Monitor the patient as per Pain Assessment and Documentation Standards • Delirium screening as per nursing standard	• Patient reports pain control as adequate or 3/10 • Complete pain assessment as per Pain Assessment and Documentation Standards • Nerve block assessment and safety check completed as per protocol • No evidence of delirium
Cardiovascular System • Remove PA lines, chest tube(s) and arterial line if hemodynamically stable, as per nursing standard and MD orders • Epicardial pacing and care of wires as per nursing standards and as MD orders • **Ward:** ECG strips Q12H or with a change in rhythm • CXR 2 hours following chest tube removal	• Patient in stable intrinsic cardiac rhythm • Hemodynamically stable as per Critical Care Goals ordered in Patient Care section in Cerner • Invasive monitoring lines removed • Chest tubes removed if less than 100ml for over 4 hours • Epicardial wires capped • Chest X-Ray 2 hours post CT removal and reviewed by MD
Respiratory • Wean from O_2 and maintain SpO_2 above 92% • Deep breathing & coughing Q1H (spirometer) • Mouth care: AM and HS + PRN (pneumonia prevention)	• No signs of respiratory complications • Patient reminded of mouth care: AM and HS + PRN
Gastrointestinal System • Complete "Adult Swallowing Screen" post extubation as per dysphagia assessment protocol if not completed on POD 0 • Regular Diet (+/- Diabetes no sugar added if diabetic)	• Nursing Bedside Swallow Screen completed • Tolerating prescribed regular diet as tolerated • Gum chewing (15 mins TID) when awake post extubation • No nausea & vomiting • Bowel protocol initiated • Saline lock IV once patient is drinking well (i.e. 600mL/ 12 hour)
Genitourinary System • Daily weight • Remove Foley catheter before 12:00pm unless contraindicated • In + out catheterization as per order	• Foley removed • Voiding without difficulty • Patient has an adequate fluid balance. Refer to intake and output documentation • Measure urine output Q4H until Foley catheter is removed

Skin • Dressing assessment and care daily	• Skin integrity assessed as per Braden Risk Assessment • No evidence of skin breakdown • Dressings dry and intact. Do not change dressing until POD#3/as per order, unless saturated
Mobility • Falls Risk Assessment as per protocol • Mobilize as per ERAS pathway • Up in chair for all meals as tolerated	• Fall prevention assessment completed and careplan in place if indicated • Walk x 3 (minimum 5 meters/walk) a day • Up in chair for meals as tolerated
Medications • Wean inotropes off • IV insulin infusion or siding scale insulin as ordered • Assess and initiate anticoagulation as ordered • Analgesics as ordered • Resume pre-op medications as appropriate	• Inotropes weaned off (document time) • Blood glucose as per protocol • Anticoagulation as per orders • Achieve adequate (or 3/10) pain control with minimal opioids
Consults • As needed: Psychiatry, Endocrine, Social Work	• Seen by consultants as ordered
Patient/Family Teaching • Oriented to plan of care for the next 24 hours • Patient and family reviewing ERAS booklet **Review:** • Pain scale and use of analgesics • ICOUGH protocol	• Patient and family understand plan of care • Patient & family participate in the ICOUGH protocol • **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family have this booklet at bedside or electronic version ○ Reviewed and reinforced pain management
Discharge Planning • Discuss length of stay • Discuss goals for the day (i.e.: exercises, pain management, rest) • Initiate teaching as applicable: anticoagulation, smoking cessation, endocarditis, HF	• Assess patient need for additional services • **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family have ERAS booklet at bedside or electronic version ○ Patient reviewed daily goals ○ Patient is aware of discharge criteria

Post-Operative Day 2 (Ward)	
CARE CATEGORIES DAILY TASKS AND ACTIVITIES	**EXPECTED OUTCOMES**
Safety	• Beside safety check completed
Key Diagnostics & Other Assessments • Blood work as ordered • MD/NP or Pharmacist to determine target INR and required anticoagulation • Nursing assessment Q8H and PRN	• MD/NP aware of abnormal results • Anticoagulation, INR discussed; target set • Temp 36° to 37.5° C
Central Nervous System • Delirium screening as per nursing standard • Monitor the patient as per Pain Assessment and Documentation Standards • Analgesic administered as ordered	• No evidence of delirium • Complete pain assessment as per Pain Assessment and Documentation Standards • Patient reports pain control as adequate or 3/10
Cardiovascular System • Vital signs Q6H (0200h assessment at RN discretion) • ECG strips Q12H or with a change in rhythm • Epicardial pacing and care of wires as per nursing standard and as per MD/NP orders	• Vital signs within normal limits for patient • Patient in stable intrinsic cardiac rhythm • Epicardial wires capped
Respiratory System • Wean from O_2 and maintain SpO_2 above 92%	• Mouth care of each meals • No signs of respiratory complications
Gastrointestinal System • Regular Diet (+/- Diabetes no sugar added if diabetic) • If no BM x 24 hrs, follow protocol	• Tolerating prescribed diet • Gum chewing (15 mins TID) when awake • No nausea & vomiting • Bowel movement daily • Discontinue CVC if in situ. Insert a peripheral IV
Genitourinary System • Daily weight	• Voiding without difficulty • Patient has an adequate fluid balance. Refer to intake and output documentation
Skin • Incision assessment and care daily	• No evidence of skin breakdown • Skin integrity assessed as per Braden Risk Assessment • Dressings dry and intact. Do not change dressing until POD#3/as per order, unless saturated
Mobility • Falls Risk Assessment as per protocol • Mobilize as per ERAS pathway • May shower (insulate epicardial wires)	• Fall prevention assessment completed and care plan in place if indicated • Walk in hallway minimum 3 times a day • Up in chair for meals or TID and to washroom PRN
Medications • Anticoagulation initiated as ordered • Glycemic control as per orders • Analgesics as ordered • Diuresis to target weight as per orders	• Anticoagulation initiated as per MRP orders • Blood glucose as protocol • Achieve adequate (or 3/10) pain control with minimal opioids

Consults • Reassess need for additional consults	• No additional consults required • New consults initiated as ordered
Patient/Family Teaching Review: • Incision care • Mood changes • Deep breathing and coughing • Pain management • Delirium	**ERAS Minimally Invasive Valve Surgery Booklet:** ○ Patient and family have reviewed this booklet with nurse and understand post-op care and management ○ Reviewed and reinforced pain management
Discharge Planning • Discuss length of stay • Goals of the day • Who is your support person when you are going to be home? • Continue teaching as applicable: anticoagulation, smoking cessation, endocarditis, HF	• Discussion on these topics took place • **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family have reviewed daily goals ○ Patient is aware of discharge criteria

Post-Operative Day 3	
CARE CATEGORIES **DAILY TASKS AND ACTIVITIES**	**EXPECTED OUTCOMES**
Safety	• Beside safety check completed
Key Diagnostics & Other Assessments • Blood work as per orders • MD/NP or pharmacist to determine target INR and required anticoagulation • Nursing assessment Q12H and PRN	• MD/NP aware of abnormal results • Temp 36° to 37.5° C • INR at target
Central Nervous System • Delirium screening as per nursing standard • Monitor the patient as per Pain Assessment and Documentation Standards • Analgesic administered as per orders	• No evidence of delirium • Complete Pain assessment as per Pain Assessment and Documentation Standards • Patient reports pain control as adequate or 3/10
Cardiovascular System • Vital signs Q8H • ECG strips Q12H and with a change in rhythm • Epicardial pacing and care of wires as per nursing standards and as MD/NP orders	• Vital signs within normal limits for patient • Patient in stable intrinsic cardiac rhythm • Epicardial pacing wires removed by MD/NP
Respiratory System • Maintain SpO_2 above 92% on room air	• Mouth care after each meals • No signs of respiratory complications
Gastrointestinal System • Regular Diet (+/- Diabetes no sugar added if diabetic) • If no BM x 48 hrs, follow protocol and notify MD/NP	• Tolerating diet • Gum chewing (15 mins TID) when awake • No nausea & vomiting • Bowel movement daily
Genitourinary System • Daily weight	• Voiding without difficulty • Patient has an adequate fluid balance. Refer to intake and output documentation
Skin • Incision assessment and care daily	• Skin integrity assessed as per Braden Risk Assessment • No evidence of skin breakdown • Mepilex removed incision cleaned, well approximated, dry + intact. Incision left exposed
Mobility • Falls Risk Assessment as per protocol • May shower (insulate epicardial wires) • Encourage independent mobilization	• Fall prevention assessment completed and care plan in place if indicated • Walk independently in hallway minimum 3 times per day • Up in chair for meals or TID and to washroom PRN
Medications • Anticoagulation as per orders • Glycemic control as per orders • Analgesics as ordered • Diuresis to target weight as per orders	• Achieve adequate (or 3/10) pain control with minimal opioids
Consults • As needed: Psychiatry, SW, Pastoral Care, Nephrology	• No additional consults required • New consults initiated as ordered

Patient/Family Teaching • Review previous topics and educate as needed **New topics:** • Heart Healthy diet • Resuming sex • Risk factor counseling • Returning to work • Driving • Sleep Hygiene • Activity after discharge	• **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** o Patient and family have reviewed this booklet with nurse and understand post-op care and management
Discharge Planning • Discuss transportation plans • Arrange PT/OT equipment PRN • Coordinate TST needs with CML	• Discussion on these topics took place • **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** o Patient and family have reviewed daily goals o Patient is aware of discharge criteria

Post-Operative Day 4	
CARE CATEGORIES DAILY TASKS AND ACTIVITIES	**EXPECTED OUTCOMES**
Safety	• Beside safety check completed
Key Diagnostics & Other Assessments • MD/NP or pharmacist to determine target INR and required anticoagulation • Nursing assessment Q12H and PRN • Vital signs Q12H **unless** otherwise indicated	• INR at target • Temp 36° to 37.5° C
Central Nervous System • Delirium screening as per nursing standard • Monitor the patient as per Pain Assessment and Documentation Standards • Analgesic administered as per orders	• No evidence of delirium • Complete pain assessment as per Pain Assessment and Documentation Standards • Patient reports pain control as adequate or 3/10
Cardiovascular System • ECG strips Q12H or with a change in rhythm • Epicardial pacing wires removed by MD/NP with nursing care as per standard (IV saline lock remains until discharge) • Discontinue telemetry if NSR x 24 hours	• Vital signs within normal limits for patient • Patient in stable intrinsic cardiac rhythm • Epicardial pacing wires removed
Respiratory • Maintain SpO_2 above 92% on room air	• Mouth care after each meals • No signs of respiratory complications
Gastrointestinal System • Diet as ordered • If no BM x 72 hrs, follow protocol and notify MD/NP	• Tolerating diet • No nausea & vomiting • Gum chewing (15 mins TID) when awake • Bowel movement daily
Genitourinary System • Daily weight	• Voiding without difficulty
Skin • Incision assessment and care daily • Discuss removal of surgical clips/staples with MD/NP • Remove chest tube sutures 3 days following chest tube removal if site is dry and well approximated or as otherwise directed by MD/NP. Apply steri-strips as needed	• Skin integrity assessed as per Braden Risk Assessment • No evidence of skin breakdown • Surgical incision well approximated, dry and intact • Chest tube sutures removed, incision well approximated, and sutures applied
Mobility • Falls Risk Assessment as per protocol • Encourage mobilization	• Fall prevention assessment completed and care plan in place if indicated • Walk independently in hallway minimum 3 times a day • Up in chair for meals or TID and to washroom PRN
Medications • Anticoagulation as per orders • Glycemic control as per pre-printed orders • Analgesics as ordered • Diuresis to target weight as per orders	• Achieve adequate (or 3/10) pain control with minimal opioids
Consults • Reassess need for additional consults	• No additional consults required • New consults initiated as ordered

Patient/Family Teaching • Review any topics patient and family have questions about and education as needed • **Review:** Medications • Cardiac Rehab program • When to call doctor or 911	• **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family have reviewed this booklet with nurse and understand post-op care and management
Discharge Planning • Discharge teaching • Provide: "My care Plan", and discharge prescription if applicable • Patient aware of follow up information	• Discharge teaching done • Documentation given • **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family reviewed daily goals ○ Patient is aware of discharge criteria

Post-Operative Additional Day	
CARE CATEGORIES **DAILY TASKS AND ACTIVITIES**	**EXPECTED OUTCOMES**
Safety	• Beside safety check completed
Key Diagnostics & Other Assessments • MD/NP or pharmacist to determine target INR and required anticoagulation	• INR at target
Central Nervous System • Delirium screening as per nursing standard • Monitor the patient as per Pain Assessment and Documentation Standards • Analgesic administered as per orders	• No evidence of delirium • Complete pain assessment as per Pain Assessment and Documentation Standards • Patient reports pain control as adequate or 3/10
Cardiovascular System • Nursing assessment Q12H and PRN • Vital signs Q12H • Epicardial pacing and care of wires as per nursing standards and as MD/NP orders	• Vital signs within normal limits for patient • Epicardial pacing wires removed by MD/NP • Patient in stable intrinsic cardiac rhythm
Respiratory	• Mouth care after each meals • No signs of respiratory complications
Gastrointestinal System	• Tolerating diet • No nausea & vomiting • Gum chewing (15 mins TID) when awake • Bowel movement daily
Genitourinary System • Daily weight	• Voiding without difficulty
Skin • Surgical incision exposed to air	• Skin integrity assessed as per Braden Risk Assessment • No evidence of skin breakdown • Incisions dry and intact
Mobility • Falls Risk Assessment as per protocol • Activity as tolerated • Independent personal care	• Fall prevention assessment completed and care plan in place if indicated • Patient independent with personal care and walking as tolerated
• **Medications** • Anticoagulation as per orders • Glycemic control as per orders • Analgesics as ordered • Diuresis to target weight as per orders	• Achieve adequate (or 3/10) pain control with minimal opioids
Consults • Reassess need for additional consults	• No additional consults required • New consults initiated as ordered
Patient/Family Teaching • Review any topics patient and family have questions about and educate as needed • Review: Medications • Cardiac Rehab program • When to call doctor or 911	• **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family have reviewed this booklet with nurse and understand post-op care and management

Discharge Planning • Discharge teaching • Provide: "My care Plan", and discharge prescription if applicable • Patient aware of follow up information	• Discharge teaching done • Documentation given • **ERAS Minimally Invasive Mitral Valve Surgery Booklet:** ○ Patient and family reviewed daily goals ○ Patient is aware of discharge criteria

Developed By

Effective Date:	
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Approved By:	VCH
	Endorsed By: • Gurdip Bhatti, Clinical Nurse Educator, Cardiac Surgery Intensive Care Unit, VGH • Tina Oye, Clinical Nurse Educator, Cardiac Ward, VGH **Final Sign Off:**
Owners:	VCH
	Cardiac Surgery **Developer Lead(s):** • Gurdip Bhatti, Clinical Nurse Educator, Cardiac Surgery Intensive Care Unit, VGH • Tina Oye, Clinical Nurse Educator, Cardiac Ward, VGH •