Provincial Clinical Knowledge Topic
Anesthesia – Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy, Adult – Inpatient
Version 1.1

Revision History

Version	Date of Revision	Description of Revision	Revised By
V 1.0	January 2019	Clinical Knowledge Topic Complete	See Acknowledgements
V1.1	June 2021	Table 9; Name, epidural, deep plexus/deep peripheral block note	Donal Finegan / Candice Healey

Alberta Health Services

Contents

Important Information Before you Begin

The recommendations contained in this knowledge topic have been provincially adjudicated and are based on best practice and available evidence. Clinicians applying these recommendations should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care. This knowledge topic will be reviewed periodically and updated as best practice evidence and practice change.

The information in this topic strives to adhere to Institute for Safe Medication Practices (ISMP) safety standards and align with Quality and Safety initiatives and accreditation requirements such as the Required Organizational Practices. Some examples of these initiatives or groups are: Health Quality Council Alberta (HQCA), Choosing Wisely campaign, Safer Healthcare Now campaign etc.

ASRA guidelines offer advice regarding multiple regional procedures including peripheral block, paravertebral blocks and neuraxial blocks. However, interventional spine and pain procedures cover a broader spectrum than for regional anesthesia as well as including different goals and targets. In addition, spinal cord stimulation (SCS) requires larger needle and thus is also considered a higher risk procedure. Thus, separate guidelines (Narouze S et al.) with focus on procedure and patient-specific factors were established in 2015. These are consensus statements primarily based on case reports, clinical series, pharmacology, hematology, and risk factors. Variances from recommendations may be acceptable based on “the judgment of the responsible anesthesiologist/perioperative physician”. Clinicians should also consider the indication for ASA when instituting perioperative management (e.g. stroke, stent, primary or secondary prevention etc.).

Guidelines

This topic is based on the following guidelines:

American Society of Regional Anesthesia and Pain Medicine Anticoagulation Guidelines 4th Edition

Gogarten W, Vandermeulen E, Van Aken H, et al. Regional anaesthesia and antithrombotic agents: recommendations of the European Society of Anaesthesiology. *Eur J Anaesthesiol* 2010; 27:999. doi: 10.1097/EJA.0b013e32833f6f6f

Horolocker TT. Regional aneaesthesia in the patient receiving antithrombotic and antiplatelet therapy. *BJA*: 2011:107(S1):i96-i106. doi:10.1093/bja/aer381

Horlocker TT et al. Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy. American Society of Regional Anesthesia and Pain Medicine Evidence-based Guidelines (Forth Edition) *Regional Anesthesia and Pain Medicine* 2018;43:263-309 doi: 10.1097/AAP.0000000000000763

Leitch JA et al. Perioperative management of direct oral anticoagulants (DOACs): A systemic review. *Can J Anaesth*: 2017: 64(5). 656-672.

Narouze S et al. Interventional spine and pain procedures in patients on antiplatelet and anticoagulant medications: guidelines from the American Society of Regional Anesthesia and Pain Medicine, the European Society of Regional Anaesthesia and Pain Therapy, the American Academy of Pain Medicine, the International Neuromodulation Society, the North American

Neuromodulation Society, and the World Institute of Pain. *Reg Anesth Pain Med*:2015:40(3):182-212. doi: 10.1097/AAP.0000000000000223

Additionally, the American Society of Regional Anesthesia and Pain Medicine (ASRA) has created a smartphone app for both iPhone and Android users offering updated recommendations.

Keywords

- Analgesia
- Anticoagulation
- Antiplatelet
- Antithrombotic
- Bleeding
- Deep Vein Thrombosis
- DVT
- Epidural
- Fibrinolytic
- Fondaparinux
- Herbal
- Hirudin Derivatives
- LMWH
- Low Molecular Weight Heparin
- Neuraxial
- Neurologic
- Obstetric
- Oral Anticoagulants
- Peripheral blocks
- Platelet
- Plexus
- Spinal
- Thrombolytic
- Thrombosis
- UFC
- Unfractionated Heparin
- VTE
- Warfarin

Rationale

This clinical knowledge topic aims to provide information to assist clinicians in the assessment of risk and benefit of neuraxial and regional anesthesia in the context of anticoagulant treatment and thromboembolism risk. This topic also serves to alert health care professionals to the need for vigilance in the detection and management of neurological complications following regional and neuraxial anesthesia.Additionally, there is a need for prompt diagnosis of complications and to provide intervention thus minimizing neurological complications.

Although the feasibility of regional or neuraxial anesthesia can be narrowly defined by the patient's comorbidities and preferences, together with the surgical procedure and post-operative pain management plan, the clinicians must also consider thrombo-embolic risk and whether prophylactic or therapeutic measures against thromboembolism are indicated. A shared set of information concerning the risks and benefits may aid in achieving consensus among clinicians from different specialties and perspectives:

- All patients undergoing surgery are at risk of Deep vein Thrombosis (DVT) and pulmonary thromboembolism (PE); however, patients undergoing hip and knee arthroplasties, hip fracture, or spinal cord surgeries are at particularly high risk for thromboembolic events; perioperative thromboprophylaxis is standard treatment to prevent or minimize perioperative thromboembolism.
- Patients requiring surgical and/or anesthetic treatment who are also receiving anticoagulation therapy are at increased risk of bleeding complications.

- Regional anesthetic techniques are being incorporated into post-operative pain management plans with increasing frequency with the goal being to reduce postoperative morbidity.
- Providing regional anesthetic techniques or nerve block for pain control for patients receiving anticoagulation therapy may increase the patient's risk of side effects including bleeding and other associated complications such as nerve damage or paraplegia.
- According to American Society of Regional Anesthesia and Pain Medicine (ASRA), although the incidence of neurologic dysfunction from a bleeding complication is low (spinal hematoma after epidural anesthesia, 1:150 000, spinal anesthesia 1:220 000 for patients receiving spinal anesthetic; prompt diagnosis of these rate complications is key to a favorable outcome.
- Patients receiving intravenous heparin during vascular or diagnostic procedures have an increased risk of spinal hematoma after neuraxial techniques.
- Other risk factors for spinal hematoma include:
    - Patients who have existing or acquired coagulopathy;
    - Patients who have HELLP syndrome;
    - Patients who experience a traumatic neuraxial procedure including difficulty placing the epidural or receiving a puncture of the dural space during insertion; (traumatic puncture increases risk by 10x);
    - Advanced age
    - Female > Male gender

Goals of Management

The information within the Regional Anesthesia Techniques for Patients receiving Anticoagulation Therapy Clinical Knowledge Topic offers guidance for clinicians in an effort to:

- Ensure safe and quality anesthetic care or patients with comorbidities that require anticoagulation therapy.
- Reduce practice variation through provision of evidence based information.
- Decrease the potential for complications from regional anesthetic including neuraxial anesthesia techniques as well as nerve blocks for patients receiving anticoagulation therapy.
- To help clinicians balance the risks of anticoagulant therapy interruption and thromboembolic complications against the risks of regional anesthetic related bleeding complications.
- Provide guidance in the evaluation of risks and benefits of regional anesthetic techniques for patients receiving anticoagulation therapy
    - Risks may include:
        - Bleeding
        - Nerve damage
    - Benefits may include:
        - Improved pain control
        - More rapid mobilization
        - Decrease in perioperative morbidity and mortality.

Clinical Decision Support

Assist:
Link within order set to decision making table: Management of Common Anticoagulants for Neuraxial Anesthetic and/or Nerve Blocks

Alert for Pre-Operative Regional Anesthesia Order Set
If a patient has existing anticoagulation therapy orders, the alert should read: This patient may receive neuraxial (spinal/epidural) anesthesia. Carefully consider timing of start of hold for anticoagulation/antiplatelet medication. This patient currently on anticoagulation/antiplatelet therapy potentially requiring interdisciplinary management perioperatively.

Decision Making

Testing Requirements for Direct Oral Anticoagulant Agents (DOAC)

- Patient monitoring is not required routinely
- Normal INR/PTT levels do not exclude significant residual anticoagulant effects
- Thromboelastography (TEG®) and rotational thromboelastometry (ROTEM®) are not validated in context of DOAC.

Dabigatran

- A PTT value 2 times greater than normal may be associated with increased risk of bleeding
- A normal thrombin time value can be used to exclude significant residual anticoagulant effect
- Idarucizumab (Praxbind®) provides reversal of dabigatran. Administer 2.5 to 5 grams intravenous to obtain normal hemostasis.

- Consideration should be given to current AHS formulary restrictions. Limit use to severe life-threatening or uncontrollable bleeding in patients.
  Refer to AHS Insite Page: **AHS Provincial Drug Formulary on AHS insite** to view formulary restricitions. (Please see *AHS Provincial Drug Formulary* on the AHS internal website).

Xa Inhibitors (e.g. rivaroxaban, apixaban, edoxaban)

- A heparin calibrated anti-Xa level with a value less than 0.1 units/mL excludes any significant residual effect.
- Reversal of factor Xa inhibitors still depends on the use of prohemostatic agents such as PCC and recombinant factor VIIa.
- Currently, no specific reversal therapy is available.
  - Antidote under development (Andexanet alpha, PER977).
  - Recommended management per provincial guidelines
  - Depending on a number of factors, bypassing agents may not be required and conservative measures may be most appropriate. The provincial guideline outlines all these options and is the best source of reference.

The following table is an overview of commonly used anticoagulants and their management in the context of neuraxial blocks/nerve blocks

Management of Common Anticoagulants for Epidurals / Deep Plexus / Deep Peripheral Block

*Quick reference table only – please consider patient specific factors and refer to relevant guidelines (ASRA 4th edition, Narouze, European Society of Aneshesia and Thrombosis Canada) for full details/clinical decision making.

**Areas not addressed in this table include interventional pain procedures.

Table 1: Common Anticoagulants for Epidurals / Deep Plexus / Deep Peripheral Block**

Generic (Trade) **Name**	**Time Before Puncture/Catheter Manipulation**	**Use of Anticoagulant in Patients with Indwelling Neuraxial Catheter**	**Time after Puncture/Catheter Manipulation or Removal to next dose – If NOT traumatic** (Longer if traumatic)
Warfarin Coumadin©	Stop 5 days prior and check INR (<1.5)*	Contraindicated	Immediately after catheter removal
Heparin (UFH) IV	Stop heparin infusion 4 to 6 hours and verify normal coagulation status prior to neuraxial blockade. If UFH given more than 4 days, check platelet count	Contraindicated	1 hour
Subcutaneous Unfractionated Heparin			
Low Dose 5000 Units TID	Wait 4-6 hours OR verify normal aPTT	Acceptable	May give Immediately (ASRA)– but also reasonable to wait 1 hour (ESA guidelines)
Higher Dose 7500-10,000 Units BID (<=20,000Units/day)	Wait 12hours and verify normal aPTT	Safety Not established – Individualize risks/benefits – increase monitoring suggested	Wait 1 hour
Low Molecular Weight Heparin (Tinzaparin, Enoxaparin, Dalteparin)			
Prophylatic Doses	≥12 hours	Single daily dosing – Catheter Acceptable (Remove catheter 12 hours prior to next dose of LMWH, and subsequent dose should be >4 hours after removal) Twice daily dosing – Do not maintain catheter.	First postoperative dose ≥12 hours after neuraxial procedure; subsequent dose ≥24 hours after the first dose
Therapeutic Doses	≥24 hours	Contraindicated	≥4 hours after catheter removal
Direct Thrombin and Xa Inhibitors (DTI)			
Dabigatran Pradaxa©	3 days (CrCl > 80) 4 days (CrCl 50-80) 5 days (CrCl 30-50) CrCl <30: contraind.	Contraindicated If accidental admin. wait 36 hrs before cath. removal	Minimum 6 hrs after needle placement/puncture

	may be less with prophylactic dose		
Rivaroxaban Xarelto©	3 days (CrCl > 30) may be less (26 hrs) with prophylactic dose	Contraindicated If accidental admin. wait 26 hrs before cath. removal	6 hours
Apixaban Eliquis©	3 days (CrCl > 15) may be less (30 hrs) with prophylactic dose	Contraindicated If accidental admin. wait 30 hrs before cath. removal	6 hours
Fondaparinux (Anti Factor Xa inhibitor)	Not addressed by ASRA ESA -no safe time defined with therapeutic dosing- avoid neuraxial. For prophylactic dose 36-42 hrs Consider holding dose longer if GFR <30	Safety Not established. Limited clinical experience. Not recommended.	6-12 hours after catheter removal (note: rapid onset). Also ensure 36-42 hours after last pre operative prophylactic dose.
Oral Antiplatelet Agents			
ASA/NSAIDs	May be given, no time restrictions. Risk higher in combination with other concomitant anticoagulation		
Clopidogrel Plavix©	7 days	Contraindicated	prophylactic immediately but 6 hrs for loading dose
Ticlopidine Ticlid©	10 days	Contraindicated	prophylactic immediately but 6 hrs for loading dose
Prasugrel Effient©	7-10 days	Contraindicated	prophylactic immediately but 6 hrs for loading dose
Ticagrelor Brilinta©	5-7 days	Contraindicated	prophylactic immediately but 6 hrs for loading dose
GP IIB/IIIA Inhibitors			
Abciximab ReoPro©	24-48 hours	Contraindicated	contraindicated within 4 weeks of surgery, emergency admin: close neuro-monitoring
Eptifibatide Integrilin©	4-8 hours	Contraindicated	
Tirofiban Aggrastat©	4-8 hours	Contraindicated	
Thrombolytic Agents			
Alteplase/Tenectaplase Activase rt-PA® (TPA)	In general not recommended (at least 48 hrs and detailed normal clotting studies)	Contraindicated If accidental admin. cath. removal after normalization of all clotting factors	According to clinical judgement (emergencies)/neuro-monitoring <2 hrs

*Enhanced response to warfarin includes a number of factors:

- Age over 65 years,
- Female,
- Weight less 50 kg,
- Comorbidities,
- Ethnicity,
- Genetic Variations

** **Note:** In the case of superficial peripheral block, management should be based on site compressibility, vascularity, and consequences of bleeding.

Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Pre-Op, Adult – Inpatient Order Set

Restrictions for use of this set of orders: This order set is for patients receiving anticoagulation therapy who will undergo procedures requiring epidural/regional and/or neuraxial anesthesia.
Order Set Requirements: Review all analgesic, antiemetic, antipruritic and sedation orders with ordering service prior to ordering Continuous Regional Anesthesia. Discontinue existing orders as appropriate.
Warnings and Cautions:
This patient may receive neuraxial (spinal/epidural) anesthesia. Carefully consider timing of start of hold for anticoagulation/antiplatelet medication.
This patient currently on anticoagulation/antiplatelet therapy potentially requiring interdisciplinary management perioperatively.

Patient Care
Carefully consider timing of start of hold for anticoagulation/antiplatelet medication if patient receiving neuraxial (spinal/epidural) anesthesia.

- ☑ This patient is currently on anticoagulation/antiplatelet therapy potentially requiring interdisciplinary management perioperatively.
- ☐ Patient instructed to hold _____ medication _____ days prior to anticipated procedure. Last dose to be _____ (date:time).
- ☐ If neuraxial anesthesia performed, recommend medication restart: _____ medication _____ dose can be restarted post-operative _____ (day/hours) after removal of _____ if surgical team agreeable.
- ☐ If neuraxial anesthesia performed, recommend delay as per Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Clinical Knowledge Topic (CKT) to restarting anticoagulation medication.
- ☐ Contact surgeon office regarding surgical preference for anticoagulation/antiplatelet management perioperatively.

Laboratory Investigations, Before Day of Surgery:
Routine Pre-Operative Laboratory Investigations

- ☐ Complete Blood Count (CBC) with differential
- ☐ PTT/INR
- ☐ Fibrinogen
- ☐ Creatinine

If patient receiving Xa inhibitors or heparins:

- ☐ Anti Xa

If patient receiving dabigatran

- ☐ Thrombin time
- ☐ Type and screen

Laboratory Investigations, Day of Surgery:

On Admission/day of surgery Pre-Procedure STAT

- ☐ Complete Blood Count (CBC) with differential
- ☐ PTT/INR
- ☐ Fibrinogen

- ☐ Creatinine

If patient receiving Xa inhibitors or heparins:

- ☐ Anti Xa

If patient receiving dabigatran:

- ☐ Thrombin time

- ☐ Type and screen

Consults / Referrals

- ☐ Consult Anesthesia
- ☐ Consult Cardiology
- ☐ Consult Internal Medicine
- ☐ Consult _____

Regional Anesthesia Techniques (EPIDURAL/Neuraxial/Regional Anesthesia) for Patients Receiving Anticoagulation Therapy Post-Op, Adult – Inpatient Order Set

Restrictions for use of this set of orders: This order set is for the care and monitoring post regional/neuraxial anesthesia. It does not address regional anesthetic medications, epidural infusions or adjuvant analgesia medications. Please see other relevant order sets for this information.
Post-Operative Anesthesia orders restricted to Anesthesia/Acute Pain Service. Do not discontinue anesthesia orders without consultation.
Order Set Requirements: Review all analgesic, antiemetic, antipruritic and sedation orders with ordering service prior to ordering Continuous Regional Anesthesia. Discontinue existing orders as appropriate.
Warnings and Cautions: Invasive Anesthetic Technique Performed

Patient Care

- ☐ This patient has a continuous nerve block catheter in place.
- ☐ If neuraxial anesthesia performed, recommend medication restart: _____ medication _____ dose can be restarted post-operative _____ (day/hours) after removal of _____ if surgical team agreeable.
- ☐ Epidural/Spinal Medication: _____ administered at (hh:mm): _____ (as documented in the Anesthetic Record). The block can be expected to last _____ hours.
- ☑ Notify Attending Anesthetist/Pain Consultant/Acute Pain Service for all problems and orders related to pain, sedation, nausea and vomiting, and pruritus for first _____ hours, including ineffective nerve block plus oral analgesia.
- ☑ Notify Attending Anesthetist/Pain Consultant/Acute Pain Service prior to starting any anticoagulation, thrombolytic or antiplatelet treatment.
- ☑ Notify Attending Anesthetist/Pain Consultant/Acute Pain Service if dyspnea develops post upper limb nerve blocks.
- ☑ Notify Attending Anesthetist/ Pain Consultant/Acute Pain Service if sensations such as tingling, numbness or motor deficit in the blocked limb persists beyond 24 hours after single dose injection.

Monitoring
Regional Block Anesthesia – Single Shot Regional Anesthesia

- ☐ Vital Signs Protocol for Peripheral Nerve Block – Monitor as follows: every one hour for 4 hours, **and then** every four hours for 20 hours. Continue assessment until block has been resolved.
- ☐ Sensory Level Monitoring: Monitor every four hours until block resolves.
- ☐ Bromage Scale Assessment: Monitor every four hours until block resolves.
- ☐ Color, Sensation and Movement: Monitor color, warmth, sensation and movement on affected limb(s) every four hours and as needed.
- ☐ Range of Motion: Reposition affected limb(s). Protect the blocked limb as the patient will have limited sensation; motor power and proprioception every two hours until block resolves.

Regional Block Anesthesia – Continuous Infusion Regional Anesthesia

- ☐ Vital Signs Protocol for Peripheral Nerve Block – Monitor as follows: every one hour for 4 hours, **and then** every four hours for duration of infusion. Continue assessment post infusion every four hours until block resolves.
- ☐ Vital Signs Protocol Post Clinician Bolus – Monitor as follows: vital signs, motor power and sensory level monitoring every 5 minutes x 4, **and then** every 15 minutes x 2 after administering any clinician bolus
- ☐ Sensory Level Monitoring: Monitor every one hour for 4 hours, **and then** every 4 hours for duration of infusion. Continue post infusion every 4 hours until block resolves.
- ☐ Bromage Scale Assessment: Monitor every one hour for 4 hours, **and then** every 4 hours for duration of infusion. Continue post infusion every 4 hours until block resolves.
- ☐ Color, Sensation and Movement: Monitor color, warmth, sensation and movement on affected limb(s) every four hours and as needed.
- ☐ Range of Motion: Reposition affected limb(s). protect the blocked limb as the patient will have limited sensation; motor power and proprioception every two hours until block resolves

Single Dose Spinal/Epidural Opioid – Post Procedure

- ☐ Vital Signs Protocol for Higher Risk Patients – Monitor as follows: every one hour for 8 hours, **and then** every two hours for 16 hours. Increase frequency of monitoring as needed or as indicated by physician.
- ☐ Vital Signs Protocol for Lower Risk Patients – Monitor as follows: blood pressure, pulse and pain score every one hour for 8 hours, **then** every four hours for 16 hours. Respirations, oxygen saturation and sedation level every one hour for 8 hours then every 2 hours for 16 hours.
- ☐ Bromage Scale Assessment – Monitor every one hour for 4 hours, **and then** every 4 hours for duration of infusion. Continue post infusion every 4 hours until block resolves. Also assess prior to ambulation. Continue assessment until block has resolved.
- ☐ Sensory Level Monitoring – Monitor every one hour for 4 hours, **and then** every 4 hours for duration of infusion. Continue post infusion every 4 hours until block resolves.

Patient Controlled EPIDURAL Analgesia

- ☐ Vital Signs Protocol Post All Clinical Boluses – Monitor as follows: every 5 minutes x 4, **and then** every 15 minutes x 2 after administering any clinician bolus.
- ☐ Vital Signs Protocol: Monitor every 1 hour for 4 hours, **and then** every 4 hours for duration of infusion**.**
- ☐ Sensory Level Monitoring: Monitor every one hour for 4 hours, **and then** every 4 hours for duration of infusion.
- ☐ Bromage Scale Assessment: Monitor every one hour for 4 hours, **and then** every 4 hours for duration of infusion. Continue post infusion every 4 hours until block resolves. Check prior to ambulation and after administration of any clinician bolus.

Intravenous Therapy

- ☐ Intravenous Cannula – Maintain for duration of therapy

Consults / Referrals

- ☐ Consult _____

Treatment of Side Effects

Patient Care

- ☐ Intermittent catheter PRN for urinary retention

Respiratory Care - PRN

- ☑ Oxygen Therapy: Titrate to Saturation SpO2 equal to or greater than 92%, continuous, PRN
- ☐ Oxygen Therapy: Titrate to Saturation SpO2 equal to or greater than _____%, continuous, PRN

Medications

Antipruritics – PRN

For diphenhydramine, recommended standard dosing is 10 to 50 mg. Maximum daily dose 400 mg.

- ☐ diphenhydrAMINE _____mg IV every 4 hours PRN for pruritus.

Nalbuphine may cause sedation and/or respiratory depression in the elderly (over the age of 60). Consider limiting the dose to 2.5 mg every 3 hours or use IV naloxone instead.

- ☐ nalbuphine 2.5 mg IV every 3 hours PRN for severe pruritus.

For naloxone, recommended standard dosing is 0.02 to 0.04 mg.

- ☐ naloxone _____ mg IV every two hours PRN for pruritus.

- ☐ naltrexone liquid 5 mg PO every 12 hours PRN for pruritus.

Antiemetics – PRN

For dimenhydrinate, recommended standard dosing is 12.5 to 50 mg.

- ☐ dimenhyDRINATE _____ mg IV every 4 hours PRN for nausea & vomiting.

- ☐ metoclopramide 10 mg IV every 4 hours PRN for nausea & vomiting.
- ☐ ondansetron 4 mg IV/PO every 8 hours PRN for nausea & vomiting.

Naloxone Protocol

Patient Care

- ☑ Notify Attending Service when Respiratory rate less than 8 per minute and Sedation Level 3.
- ☑ Vital Signs: When respirations less than 8 per minute and Sedation Level 3 as per local Naloxone Protocol monitor pulse, respirations, oxygen saturation, pain score, sedation level, blood pressure every 5 minutes for 30 minutes and then every 15 minutes for one hour and then when required.

Medication

- ☑ naloxone 0.1 mg Direct IV every 3 minutes PRN for respiratory rate less than 8 per minute and sedation level 3. Maximum 4 doses. Give first dose STAT.
- ☑ naloxone 0.2 mg SUBCUTANEOUSLY / IM every 10 minutes PRN for respiratory rate less than 8 per minute, sedation level 3 **AND** no IV access. Maximum 4 doses. Give first dose STAT.

Disposition Planning

1. Considerations for Admission
   Preoperative planning for anticoagulation therapy interruption should involve multiple specialties as appropriate.
   - General practitioner;
   - Anesthesiologist;
   - Surgeon;
   - Internal medication Specialist and / or;
   - Cardiologist
2. Resumption of therapy in consideration for Discharge / Transfer and Outpatient Follow Up
   Ensure appropriate plan for resumption of anticoagulation therapy and antiplatelet medication is in place as indicated post operatively when considered safe as per the guidelines outlined within this Clinical Knowledge Topic.
   - Indications to return to hospital should be reviewed prior to patient discharge as prompt diagnosis and treatment is required if the patient is suspected of having complications following the surgical procedure.

Rural Considerations

Indications to Return to Hospital:

- Neurologic outcome after spinal hematoma depends on interval between onset of paraplegia and the patient's need for rescue surgery.
- Expediting a diagnosis and transfer to a facility with the capability of treating patients suspected of requiring rescue surgery is essential for all patients including those recovering in a rural setting.

Analytics

Outcome Measure # 1

Name of Measure	Bleeding Risk Stratification
Definition	To track patient factors (diabetes, renal dysfunction, advanced age), medication related factors (medication type and medication combinations) and procedure factors (superficial block versus neuraxial anesthesia versus interventional pain procedures) which are thought to contribute to bleeding risks.
Rationale	To prevent or reduce neurological complications perioperatively due to bleeding for patients receiving anticoagulation therapy by risk stratifying these patients preoperatively. The goal will be to develop a system to facilitate individualized treatment for patients receiving anticoagulation / antiplatelet therapy. This system will help guide perioperative management and the benefit/risk balance for each patient.
Notes for Interpretation	
Cited References	*Regional Anesthesia and Pain Medicine*:2010:35(1):64-101. *Reg Anesth Pain Med*:2015:40(3):182-212.

Outcome Measure # 2

Name of Measure	Neurologic Dysfunction after neuraxial/regional anesthesia
Definition	This analytic is used to report neurological dysfunctions that occur post regional/neuraxial anesthetic techniques.

Rationale	Reporting of neurological dysfunction incidence occurring post regional/neuraxial anesthetic techniques facilitates a comprehensive understanding of the true frequency of the occurance.
Notes for Interpretation	Currently, a system to report and measure the frequency of neurological complications post regional/neuraxial anesthesia administration for patients who receive anticoagulation/antiplatelet therapy is not available for clinicians. Our vision is to create an incident reporting system that can provide further education for clinicians.
Cited References	*Regional Anesthesia and Pain Medicine*:2010:35(1):64-101. *Reg Anesth Pain Med*:2015:40(3):182-212.

Outcome Measure # 3

Name of Measure	Number of times Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Pre-Op, Adult – Inpatient Order Set is used.
Definition	To determine frequency of Order Set Usage.
Notes for Interpretation	Health record to have coding for Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Pre-Op, Adult – Inpatient Order Set.

Outcome Measure # 4

Name of Measure	Adherence to clinical standards in Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Post-Op, Adult – Inpatinet Order Set
Definition	To determine compliance to clinical standards within the order set
Rationale	What percentage of the time are the orders within the Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Post-Op, Adult – Inpatient Order Set followed for patients in which the Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Post-Op, Adult – Inpatient Order Set is ordered?
Notes for Interpretation	Health record to have coding for Regional Anesthesia Techniques for Patients Receiving Anticoagulation Therapy Post-Op, Adult – Inpatient Order Set.

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Thank you to all provincial stakeholders who participated in the review process for this topic. Your time spent reviewing the knowledge topics and providing valuable feedback is appreciated.

For questions or feedback please contact ClinicalKnowledgeTopics@ahs.ca

Appendix A – Potential Risk for Serious Bleed

Table 2: Pain Procedure Classifcation According to the Potential Risk for Serious Bleed

High-Risk Procedures	Intermediate-Risk Procedures*	Low-Risk Procedures*
SCS trial and implant. Intrathecal catheter and pump implant. Vertebral augmentation (vertebroplasty and kyphoplasty). Epiduroscopy and epidural decompression.	Interlaminar ESIs (C, T, L, S). Transforaminal ESIs (C, T, L, S). Facet MBNB and RFA (C, T, L). Paravertebral block (C, T, L). Intradiscal procedures (C, T, L). Sympathetic blocks (stellate, thoracic, splanchnic, celiac, lumbar, hypogastric). Peripheral nerve stimulation trial and implant. Pocket revision and IPG/ITP replacement.	Peripheral nerve blocks. Peripheral joints and musculoskeletal injections. Trigger point injections including piriformis injection. Sacroiliac joint injection and savral lateral branch blocks.

*Patients with high risk for bleeding undergoing low- or intermediate-risk procedures should be treated as intermediate or high risk, respectively. Patients with high risk for bleeding may include old age, history of bleeding tendency, concurrent uses of other anticoagulants/antiplatelets, liver cirrhosis or advanced liver disease, and advanced renal disease.

SCS = spinal cord stimulator, ESI = epidural steroid injection, C = cervical, L = lumbar, MBNB = medial branch nerve block,RFA = radiofrequency ablation, S = sacral,T = thoracic, IPG = internal pulse generator.

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