

**VANDERBILT UNIVERSITY MEDICAL CENTER  
MULTIDISCIPLINARY SURGICAL CRITICAL CARE**

**Venous Thromboembolism Prophylaxis Guidelines**

**Purpose:** To provide guidance on preventing venous thromboembolism (VTE) in the surgical intensive care unit (SICU) at Vanderbilt University Medical Center (VUMC).

Risk Stratification <sup>1</sup>	Procedures	Patient Specific Factors
<b>Low</b>	<ul style="list-style-type: none"> <li>• Laparoscopic cholecystectomy</li> <li>• Appendectomy</li> <li>• Transurethral prostatectomy</li> <li>• Inguinal herniorrhaphy</li> <li>• Unilateral/bilateral mastectomy</li> </ul>	<ul style="list-style-type: none"> <li>• Ambulating/mobilization</li> <li>• Age &lt; 40 years with no additional risk</li> </ul>
<b>Moderate</b>	<ul style="list-style-type: none"> <li>• Gynecologic (non-malignancy) surgery</li> <li>• Cardiac surgery</li> <li>• Thoracic surgery</li> <li>• Spinal surgery for malignancy</li> <li>• Bariatric surgery</li> </ul>	<ul style="list-style-type: none"> <li>• BMI &gt; 25 kg/m<sup>2</sup></li> <li>• Age 40-60 years with no additional risk</li> <li>• Estrogen therapy</li> </ul>
<b>High</b>	<ul style="list-style-type: none"> <li>• Open-abdominal</li> <li>• Open-pelvic</li> <li>• Orthopedic</li> </ul>	<ul style="list-style-type: none"> <li>• Age &gt; 60 years</li> <li>• Prior VTE</li> <li>• Malignancy</li> <li>• Anesthesia ≥ 2 hours</li> <li>• Bed rest ≥ 4 days</li> <li>• Postpartum</li> <li>• Hospital stay &gt; 2 days</li> <li>• Long bone fractures</li> <li>• Multi-trauma</li> </ul>

**Contraindications to Pharmacologic VTE Prophylaxis:**

- Heparin
  - Active bleeding
  - Heparin induced thrombocytopenia (HIT)
- Enoxaparin
  - Active bleeding
  - HIT
  - Epidural catheter
  - Intra-cranial Pressure (ICP) Monitor
  - External Ventricular Drain (EVD)

## Initiation for Pharmacologic VTE Prophylaxis:

All patients admitted to the SICU should be started on VTE prophylaxis on admission to the unit unless they have a contraindication or one of the following:

- Intra-cranial hemorrhage – start 72h after injury
- Craniotomy – start 72h after procedure
- Significant spinal injury/surgery – start 24h after injury or surgery

## Special Population: Obese Patients [10-14, 19-20]

- Enoxaparin

Obese patients with a BMI > 40 may benefit from higher doses of enoxaparin for VTE prophylaxis and monitoring of low molecular weight heparin assays (anti-Xa levels).

- Dosing
  - BMI > 40 = enoxaparin 40 mg subQ q12h (normal renal function)
- Monitoring
  - Low molecular weight heparin assay (Anti-Xa levels) should be obtained 4 hours after the 3<sup>rd</sup> or 4<sup>th</sup> dose
  - Goal level = 0.2-0.5 IU/mL

- Heparin

If enoxaparin is contraindicated and the patient does not have an epidural, higher doses of low dose unfractionated heparin may be used.

- Dosing:
  - Heparin 7,500 units subQ q8h

## VTE Prophylaxis with an Epidural:

- Epidural Placement

- Heparin:
  - Hold dose for 6 hours prior to epidural placement
- Enoxaparin:
  - 1 mg/kg subQ q12h or 1.5 mg/kg subQ q24h: Hold VTE prophylaxis for 24 hours prior to epidural placement
  - 40 mg subQ q24h or 30 mg subQ q12h: Hold VTE prophylaxis for 12 hours prior to epidural placement

- Epidural Removal

- Heparin
  - Hold dose for 4 hours prior to epidural removal
- Enoxaparin
  - Should not be used while epidural is in place

- Resuming after epidural is removed

- May initiate subcutaneous heparin or enoxaparin 2-4 hours after epidural removal

## Sequential Compression Devices (SCDs):

- It is the SICU practice to have SCDs ordered on every patient on admission to the unit.

### Treatment Overview:

	<b>Epidural</b>	<b>CrCl <math>\geq</math> 30 mL/min</b>	<b>CrCl 20-29 mL/min</b>	<b>CrCl &lt; 20 mL/min</b>
<b>High Risk</b> • Ortho • Malignancy	Heparin SubQ 5,000 units q8h	Enoxaparin 40mg SubQ q24h	Enoxaparin 30mg SubQ q24h	Heparin SubQ 5,000 units q8h
<b>Moderate Risk</b> • Age > 60 • Prolonged OR • Immobility • Prior VTE • Postpartum	Heparin SubQ 5,000 units q8h	Enoxaparin 40mg SubQ q24h	Enoxaparin 30mg SubQ q24h	Heparin SubQ 5,000 units q8h
<b>Low Risk</b> • Ambulating • No additional risk factors	Early Ambulation & SCD's			
<b>Trauma</b>	Heparin SubQ 5,000 units q8h	Follow trauma protocol ( <a href="https://www.vumc.org/trauma-and-scc/trauma-and-surgical-critical-care-practice-management-guidelines">https://www.vumc.org/trauma-and-scc/trauma-and-surgical-critical-care-practice-management-guidelines</a> )		
<b>Obese</b> (BMI > 40)	Heparin SubQ 5,000 units q8h	Enoxaparin 40mg SubQ q12h - OR - Heparin SubQ 7,500 units q8h	Enoxaparin 30mg SubQ q24h - OR - Heparin SubQ 5,000 units q8h	Heparin SubQ 5,000 units q8h

### Authors:

Kelli Rumbaugh, PharmD, BCPS  
Lauren Schmidt, PharmD

**Date Last Updated:** October 2018

## References

1. Agnelli G: **Prevention of venous thromboembolism in surgical patients.** *Circulation* 2004, **110**(24 Suppl 1):IV4-12.
2. Geerts WH, Heit JA, Clagett GP, Pineo GF, Colwell CW, Anderson FA, Jr., Wheeler HB: **Prevention of venous thromboembolism.** *Chest* 2001, **119**(1 Suppl):132S-175S.
3. Mismetti P, Laporte S, Darmon JY, Buchmuller A, Decousus H: **Meta-analysis of low molecular weight heparin in the prevention of venous thromboembolism in general surgery.** *The British journal of surgery* 2001, **88**(7):913-930.
4. Clagett GP, Reisch JS: **Prevention of venous thromboembolism in general surgical patients. Results of meta-analysis.** *Annals of surgery* 1988, **208**(2):227-240.
5. Collins R, Scrimgeour A, Yusuf S, Peto R: **Reduction in fatal pulmonary embolism and venous thrombosis by perioperative administration of subcutaneous heparin. Overview of results of randomized trials in general, orthopedic, and urologic surgery.** *The New England journal of medicine* 1988, **318**(18):1162-1173.
6. Gould MK, Garcia DA, Wren SM, Karanicolas PJ, Arcelus JI, Heit JA, Samama CM, American College of Chest P: **Prevention of VTE in nonorthopedic surgical patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines.** *Chest* 2012, **141**(2 Suppl):e227S-277S.
7. Planes A, Vochelle N, Mazas F, Mansat C, Zucman J, Landais A, Pascariello JC, Weill D, Butel J: **Prevention of postoperative venous thrombosis: a randomized trial comparing unfractionated heparin with low molecular weight heparin in patients undergoing total hip replacement.** *Thrombosis and haemostasis* 1988, **60**(3):407-410.
8. Colwell CW, Jr., Spiro TE, Trowbridge AA, Morris BA, Kwaan HC, Blaha JD, Comerota AJ, Skoutakis VA: **Use of enoxaparin, a low-molecular-weight heparin, and unfractionated heparin for the prevention of deep venous thrombosis after elective hip replacement. A clinical trial comparing efficacy and safety. Enoxaparin Clinical Trial Group.** *The Journal of bone and joint surgery American volume* 1994, **76**(1):3-14.
9. Geerts WH, Jay RM, Code KI, Chen E, Szalai JP, Saibil EA, Hamilton PA: **A comparison of low-dose heparin with low-molecular-weight heparin as prophylaxis against venous thromboembolism after major trauma.** *The New England journal of medicine* 1996, **335**(10):701-707.
10. Borkgren-Okonek MJ, Hart RW, Pantano JE, Rantis PC, Jr., Guske PJ, Kane JM, Jr., Gordon N, Sambol NC: **Enoxaparin thromboprophylaxis in gastric bypass patients: extended duration, dose stratification, and antifactor Xa activity.** *Surgery for obesity and related diseases : official journal of the American Society for Bariatric Surgery* 2008, **4**(5):625-631.
11. Freeman A, Horner T, Pendleton RC, Rondina MT: **Prospective comparison of three enoxaparin dosing regimens to achieve target anti-factor Xa levels in hospitalized, medically ill patients with extreme obesity.** *American journal of hematology* 2012, **87**(7):740-743.
12. Scholten DJ, Hoedema RM, Scholten SE: **A comparison of two different prophylactic dose regimens of low molecular weight heparin in bariatric surgery.** *Obesity surgery* 2002, **12**(1):19-24.
13. Wang TF, Milligan PE, Wong CA, Deal EN, Thoenke MS, Gage BF: **Efficacy and safety of high-dose thromboprophylaxis in morbidly obese inpatients.** *Thrombosis and haemostasis* 2014, **111**(1):88-93.
14. Miller MT, Rovito PR: **An approach to venous thromboembolism prophylaxis in laparoscopic Roux-en-Y gastric bypass surgery.** *Obesity Surgery* 2004, **14**(6):731-7.
15. Cheng SS, Nordenholz K, Matero D, Pearlman N, McCarter M, Gajdos C, Hamiel C, Baer A, Luzier E, Tran ZV, Olsen T, Queensland K, Lutz R, Wischmeyer P: **Standard subcutaneous dosing of unfractionated heparin for venous thromboembolism prophylaxis in surgical ICU patients leads to subtherapeutic factor Xa inhibition.** *Intensive care medicine* 2012, **38** (4): 642-8.
16. Testroote M, Stigter WAH, Janssen L, Janzing HMJ. **Low molecular weight heparin for prevention of venous thromboembolism in patients with lower-leg immobilization.** *Cochrane review* 2014, **4**: 1-38.

17. Imberti D, Baldini E, Pierfranceschi MG, Nicolini A, Cartelli C, DePaoli M, Boni M, Filippucci E, Cariani S, Bottani G. **Prophylaxis of venous thromboembolism with low molecular weight heparin in bariatric surgery.** *Obesity surgery* 2014; **24** (2): 284-91.
18. Wang H, Sun Z, Jiang W, Zhang Y, Li X, Wu Y. **Postoperative prophylaxis of venous thromboembolism in patients undergoing high ligation and stripping of the great saphenous vein.** *Vascular medicine* 2015, **20**(2):117-121.
19. Tahaineh L, Edaily SM, Gharaibeh SF. **Anti-factor Xa levels in obese patients receiving enoxaparin for treatment and prophylaxis indications.** *Clin Pharmacol* 2018, **10**: 63-70.
20. Wei MY, Ward SM. **The anti-factor Xa range for low molecular weight heparin thromboprophylaxis.** *Hematol Rep* 2015, **7**(4): 5844.