I. INTRODUCTION

Patients, especially those admitted to the surgical critical care units, are at increased risk for deep vein thrombosis (DVT). Many of the classic risk factors of Virchow’s Triad (i.e. stasis, vascular injury, hypercoagulability) are present in this population.

DVT and pulmonary embolus (PE) constitute major health problems that result in significant morbidity and mortality. It is estimated that together they account for 300,000-600,000 hospitalizations per year and that 50,000 individuals die annually as a result of PE. Many cases of DVTs are not recognized clinically. The paucity of signs and symptoms coupled with the unreliability of physical examination underscores the importance of prophylaxis for DVT and PE. The prevalence, the challenge in diagnosis, the morbidity and mortality associated with untreated or unprevented DVTs, and the associated costs provide the rationale for prophylaxis.

II. PURPOSE

To minimize the incidence of DVT and PE in surgical critical care patients.

III. INTERVENTION

The clinical practice guidelines are summarized by the algorithm. The legend is as follows:

A. Risk factors:
   — age > 40 years
   — prolonged immobility
   — CVA
   — spinal cord injury (SCI)
   — traumatic brain injury (TBI) with coma
   — blood transfusion
   — post surgical procedure
   — trauma (especially fractures of the pelvis, hip, or leg)
   — obesity
   — varicose veins
   — pregnancy
   — estrogen therapy
--- history of DVT/PE
--- malignancy
--- hypercoaguable state (e.g. AT III deficiency)
--- extensive soft tissue trauma
--- cardiac dysfunction
--- central venous catheters
--- inflammatory bowel disease
--- nephrotic syndrome
--- sepsis / infection

B. *Relative contraindications to pharmacologic therapy:
--- Active or recent bleeding
--- Known bleeding disorder or coagulopathy
--- Platelet count < 50,000
--- History of heparin-induced thrombocytopenia or allergy to heparin (applies to Heparin only)
--- Creatinine clearance < 30 cc/min (applies to low molecular weight heparin (LMWH) only)
--- Weight > 150 kg (applies to LMWH only)
--- Pregnancy (ONLY for warfarin; NOT a contraindication for either UFH or LMWH)
--- Epidural hematoma

C. **Patients for whom prophylaxis is not recommended must have ALL of the following:
--- Age < 40
--- No recent major surgery (major surgery defined as operative procedure lasting ≥ 45 minutes)
--- No history of venous thromboembolism
--- No history of hypercoagulability
--- No history of cancer
--- No obesity (BMI < 30)
--- No ongoing estrogen or antiandrogen use
--- No history of varicose veins
--- Not bedbound
--- Absence of paraplegia, tetraplegia, or hemiplegia
--- Expected LOS < 3 days
D. Sequential compression devices (SCDs) are recommended preoperatively, intraoperatively, and postoperatively in conjunction with UFH or LMWH or alone if chemical prophylaxis is not indication or contraindicated.

E. Pharmacologic prophylaxis with Unfractionated Heparin (UFH) 5000 units subcutaneously (SQ) every 8 hours OR LMWH SQ daily, dosed postoperatively unless contraindicated* or not recommended**.

F. Special circumstances:
   1. Ear, Nose, and Throat surgery
      a. Pharmacologic prophylaxis with UFH 5000 units SQ every 8 hours OR LMWH SQ daily, dosed postoperatively unless contraindicated*.
      b. Use UFH 5000 units every 12 hours if on low dose Heparin infusion unless contraindicated*.
   2. Trauma Surgery
      a. Pharmacologic prophylaxis with LMWH SQ daily unless contraindicated*.
   3. Total Hip/Knee Replacement Surgery
      a. Pharmacologic prophylaxis with LMWH SQ daily postoperatively unless contraindicated* OR Warfarin dosed to INR 2-3, 1st dose on the night prior to or on the night of the operation unless contraindicated*.
   4. Urology
      a. Transurethral procedures do not require routine prophylaxis.
   5. Morbidly Obese Population (BMI > 35)
      a. Dose adjustment to UFH 7500u SC every 8 hours unless contraindicated*.
   6. Avoid LMWH when weight < 50 kg or > 150 kg.
   7. Consider reducing to bid dosing of UFH if weight < 50 kg.
   8. Consider low dose aspirin for general surgery patients who are not at high risk for bleeding in whom UFH and LMWH are contraindicated.
   9. Neurology
      a. Pharmacologic prophylaxis with LMWH SQ daily along with Aspirin for patients with acute ischemic stroke unless contraindicated*. Aspirin combined with UFH SC 5000 units every 8 hours or every 12 hours are reasonable alternatives.

G. Routine monitoring of platelet counts in patients on heparin or low-molecular-weight heparin is recommended.

H. Absolute contraindications to early initiation of UFH or LMWH are as follows:
   1. Central nervous system injury including TBI with intracranial hemorrhage
   2. Incomplete spinal cord injury with perispinal hematoma
3. On-going bleeding
4. Uncorrected coagulopathy
5. Presence of an epidural catheter***
6. Status post abdominal aortic aneurysm repair

I. The presence of a head injury, complete spinal cord injury, laceration or contusion of the lungs, liver, spleen, kidneys, or the presence of a retroperitoneal hematoma associated with pelvic fracture are relative contraindications to the early use of anticoagulation therapy. Re-evaluation with the primary surgical services and consulting services is indicated on a daily basis.

J. Surveillance ultrasounds have not demonstrated a reduction in the frequency of clinically important outcomes. Consider a screening ultrasound of the lower extremities only in high risk and very high risk trauma patients (refer to Trauma CMG: Deep Vein Thrombosis/Pulmonary Embolus Prophylaxis available online at http://uphsxnet.uphs.upenn.edu/surgery/trauma/assests/CMG/CMG_Deep_Vein_Thrombosis_Prophylaxis_drft1.2006.pdf) within 72 hours of admission and then weekly until 3 negative exams are obtained. An ultrasound should only be considered in those patients in which a positive finding would change the clinical management.

K. For patients with reliable enteral access, in whom risk factors are likely to persist after discharge from the hospital, conversion from UFH or LMWH to low-dose Warfarin should be considered prior to discharge. The optimal duration of prophylaxis is not known but a patient is considered to have ongoing risk if they will be immobile for > 2 weeks.

L. IVC filter insertion may be considered for patients with documented proximal DVT who have contraindications to full anticoagulation or who may require major surgery in the near future or who are trauma patients in the “very high risk” category (Refer to Trauma Surgery CPG: http://uphsxnet.uphs.upenn.edu/surgery/trauma/assests/CMG/CMG_Deep_Vein_Thrombosis_Prophylaxis_drft1.2006.pdf). IVC filters provide a short term risk reduction of symptomatic PE. In the setting of a retained filter, this benefit may be outweighed by the risk of long term complications such as DVT, filter thrombus or occlusion, and filter migration.

***LMWH
IV. BIBLIOGRAPHY

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<td>ADMINISTRATIVE</td>
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<td>Department of Surgery</td>
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X CLINICAL

Reference: Surgical Critical Care Policy Manual

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Last Review: September, 2012

Clinical Practice Guidelines (CPG) are meant to standardize and optimize care and decrease variability in practice. They are intended to be used as framework for the delivery of patient care in the surgical critical care units. CPG's are a combination of evidence-based medicine and accepted practices in critical care medicine. CPG's are intended to provide decision support for the management of the majority of patients, and are not proposed as directives, rules, or policies. They are not substitutes for clinical judgement. Deviations from the CPG's are expected when deemed medically necessary; all
exceptions should be documented in the medical record and require discussion between the Surgical Critical Care attending and the attending of the primary or consulting service.

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Date 12/5/13
Date 12/6/13
Algorithm

Risk Factors? No → No prophylaxis

Yes → Contraindications to pharmacologic prophylaxis?

Yes → SCD

No → Special Circumstance?

Yes → Refer to text for proper dosing of pharmacologic prophylaxis

No → UFH 5000u SC TID

Trauma Yes → LMWH SQ daily dosing

Refer to Trauma Surgery CPQ. May meet requirements for IVC filter.

High risk or very high risk trauma patient?

Yes → Contraindication to systemic anticoagulation

No → Screening duplex within 72h of admission. Then q 7d x 2.