Venous Thromboembolism Prophylaxis – Adult – Inpatient/Ambulatory

Consensus Care Guideline

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Introduction:

Hospital admission for surgical interventions or acute medical illness accounts for nearly 50% of all venous thromboembolism (VTE) events.[1,2] Hospital acquired VTE has been considered the most common cause of preventable death. Both patient specific risk factors and procedural risk factors should be considered to determine who is at high risk for VTE.[2,3]

There have been many risk factors identified in both the medical and surgical patient populations that can increase the risk of developing VTE. This guideline provides recommendations on the use of risk assessment models (RAM), validated in their respective patient populations, with the intent to identify patients who are at high risk for VTE and to provide recommendations for appropriate VTE prophylaxis modalities.

Definitions

1. Obesity Class 3 – patients with a BMI $\geq$ 40 (kg/M^2) [4,5]

2. Renal failure – patients with a CrCl< 30 mL/min or evidence of stage 4 [eGFR 15-29 mL/min/1.73M2] or 5 [eGFR < 15 mL/min/M2] renal dysfunction

3. Mechanical prophylaxis – methods may include graduated compression stockings (GCS), intermittent pneumatic compression devices (IPC), and venous foot pumps (VFP)[3]

Recommendations:

1. Considerations for Hospitalized Patients[3,6]
   - 1.1. All hospitalized patients should be evaluated for both bleeding and VTE risk within 24 hours of admission, upon transferring level of care, and periodically during the hospital stay. *(UW Health GRADE Moderate quality evidence, strong recommendation)*
   - 1.2 Documentation of initial bleeding and VTE risk should occur in the medical record within 24 hours of hospital admission or postsurgical procedure. *(UW Health GRADE Very low quality evidence, strong recommendation)*
   - 1.3 Reassessment of bleeding and VTE risk should occur in the medical record when there is a change in medical condition or level or care. *(UW Health GRADE Very low quality evidence, strong recommendation)*

2. Evaluation of Bleeding Risk
   There is no universally validated model to assess the potential for bleeding from receiving prophylactic anticoagulation in surgical patients.[3] The IMPROVE investigators did create an externally validated RAM for bleeding in medical patients.[7,8] This is described in Table 1. Additional general considerations for both surgical and medical patients are listed in Table 2.

Table 1. IMPROVE bleeding RAM for medical patients[7,8]

Renal dysfunction (GFR 30-59 mL/min)	1
Male	1
Age 40-84 years old	1.5
Current cancer	2
Rheumatic disease	2
Central venous catheter	2
ICU/Critical care unit during admission	2.5
Renal failure (GFR < 30 mL/min)	2.5
Hepatic failure (INR > 1.5)	2.5
Age >84 years old	3.5
Platelet count < 50 x10^9/L	4
Bleeding in the 3 months prior to admission	4
Active gastroduodenal ulcer	4

- A score of < 7: 0.4%-1.5% risk for bleeding
- A score of ≥ 7: 4.1%-7.9% risk for bleeding

Table 2. Bleeding risk factor consideration for medical and surgical patients[2,3]

Medical Patients*	Surgical Patients
Platelet count < 50 x10^9/L	Active bleeding or previous major bleeding
Bleeding in the 3 months prior to admission	Renal failure (CrCl < 30 mL/min)
Active gastroduodenal ulcer	Hepatic failure (INR > 1.5 without anticoagulants)
	Thrombocytopenia
	Acute stroke
	Uncontrolled systemic hypertension
	Concomitant use of anticoagulants, antiplatelets or thrombolytics

- *Risk factors listed under medical patients are considered *absolute* contraindications to anticoagulation while risk factors listed under surgical patients are *relative* contraindications

3. Evaluating VTE risk in medical patients
   3.1 UW Health endorses the use of the Padua RAM and modified this to incorporate additional VTE risk factors. This RAM was selected based on support in the literature and ease of use for medical patients.[1,3,9] *(UW Health GRADE Moderate quality evidence, strong recommendation)* See Table 3.

Table 3: Modified Padua Risk Assessment Model[1,3,10,11]

Risk Factor	Points
Critically Ill	4
Inflammatory Bowel Disease	4
Admission for trauma (injured patient with fracture)	4
Active COVID-19 infection	4
Active Cancer	3
Previous VTE	3
Reduced Mobility	3
Thrombophilic Condition	3
Recent (< 1month) Trauma/Surgery	2
Age ≥ 70 years	1
Heart or Respiratory Failure	1
Acute Myocardial Infarction or Ischemic Stroke	1
Acute Infection or Rheumatologic Disorder	1
BMI ≥ 30	1

Ongoing Hormonal Treatment	1
	Total Points
Low VTE Risk – no prophylaxis needed	< 4
High VTE Risk – prophylaxis recommended	≥ 4

- Critically ill is defined as a patient being followed by a critical care service, admitted under an ICU status, or has been admitted for stroke
- Inflammatory bowel disease is limited to Crohn's disease and ulcerative colitis.
- Active cancer is defined as local or distant metastases and with chemotherapy or radiation in the previous 6 months
- Reduced mobility is defined as anticipated bed rest with bathroom privileges for at least 3 days, if immobile at baseline, or admitted from an outside facility where they were immobile ≥ 72 hours
- Thrombophilic condition is defined as defects of antithrombin, protein C or S, factor V Leiden, G20210A prothrombin mutation, active heparin induced thrombocytopenia or antiphospholipid syndrome
- Heart or respiratory failure implies an admission for heart failure exacerbation, asthma or COPD exacerbation, cystic fibrosis exacerbation or admitted for continuous BiPAP.
- Rheumatologic disorder examples: rheumatoid arthritis, Lupus, Sjögren's Syndrome
- Ongoing hormonal treatment includes: oral contraceptives, estrogen replacement or testosterone injections

3.2 Medical patients identified as high VTE risk should receive the corresponding prophylaxis based on individual considerations. See recommendations in Table 4. *(UW Health GRADE Low quality evidence, strong recommendation)*

3.2.1 Enoxaparin is the preferred pharmacologic prophylaxis agent for medical patients.[3] *(UW Health GRADE Moderate quality evidence, strong recommendation)*

3.2.2 If UFH is heparin is used, every 12 hours dosing regimen is preferred.[12,13] *(UW Health GRADE Moderate quality evidence, strong recommendation)*

3.2.3 When utilizing mechanical prophylaxis IPC devices are preferred[14-16] *(UW Health GRADE Moderate quality evidence, strong recommendation)*

Table 4: VTE Prophylaxis Regimens for High VTE Risk Medical Patients[3,12,13,17-21]

Patient Population	**VTE Prophylaxis Regimens**	
	Preferred Option	Alternative Option
High VTE Risk	Enoxaparin 40 mg SQ every 24 hrs[a]	Heparin 5000 units SQ every 8-12 hrs[a]
Trauma/Injury with fracture	Enoxaparin 30 mg SQ every 12 hrs[a]	Enoxaparin 0.5 mg/kg every 12 hrs Heparin 5000 units SQ every 8-12 hrs[c]
Renal failure (CrCl < 30 mL/min)* *Not on renal replacement therapy	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 30 mg SQ every 24 hrs[b]
Obesity Class 3 (BMI > 40 kg/M^2)	Enoxaparin 40 mg SQ every 12 hrs[b]	Heparin 5000 units SQ every 8 hrs[b]
Low body weight (weight < 50 kg)	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 30 mg SQ every 24 hrs[c]
High Bleeding Risk	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]

a: *UW Health GRADE Moderate quality evidence, strong recommendation*

b: *UW Health GRADE Low quality evidence, strong recommendation*

c: *UW Health GRADE Low quality evidence, weak/conditional recommendation*

3.3 Refusal of parenteral prophylaxis during hospital admission[22-25]
Oral anti-Xa inhibitors have been studied for extended VTE prevention versus enoxaparin. While similar outcomes in VTE prevention were seen when compared to enoxaparin, higher major bleeding was also seen with these agents.

3.3.1 Oral anticoagulants may be considered in high VTE risk medical patients who refuse parenteral VTE prophylaxis.[22-25] *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*

3.3.2 Apixaban 2.5 mg by mouth twice daily[22] *(UW Health GRADE Moderate quality evidence, weak/conditional recommendation)*

3.3.3 Rivaroxaban 10 mg by mouth daily[23,25] *(UW Health GRADE Moderate quality evidence, weak/conditional recommendation)*

3.3.4 Avoid use in patients with CrCl < 30 mL/min

4. Evaluating VTE risk in surgical patients

4.1 UW Health endorses the use of the Caprini RAM. This RAM was selected based on support in the literature for general surgery patients. It should be used to assess VTE risk in general and abdominal-pelvic surgery patients.[6,26] See Table 5. *(UW Health GRADE Moderate quality evidence, strong recommendation)*

Table 5: Caprini Risk Assessment Model[2,26] *(UW Health GRADE Moderate quality evidence, strong recommendation)*

1 Point	2 Points	3 Points	5 Points
Age 41-60	Age 61-74	Age ≥ 75	Acute spinal cord injury (< 1 mo)
Acute MI (<1 mo)	Central venous access	Established thrombophilia	Elective lower extremity arthroplasty
BMI > 25	Immobile ≥ 72 hrs	HIT	Hip, pelvis, or leg fracture (< 1 mo)
CHF exacerbation (<1 mo)	Leg plaster cast or brace	Hx of VTE	Stroke (< 1 mo)
Hx of Inflammatory Bowel Disease	Malignancy	Family hx VTE *(1 degree relative)*	
Procedure with local anesthesia	Surgery- arthroscopic		
Swollen legs or Varicose veins	Surgery > 45 mins		
Sepsis (< 1 mo)			
Serious lung dx *ex. Pneumonia* (<1 mo)			

1 point **(For Women Only)**
Oral contraceptives or HRT
Pregnancy or postpartum (< 1 month)
Hx of unexplained stillborn infant, spontaneous abortion (≥3), premature birth with toxemia or growth restricted infant

Points	Risk	Recommendation
0	Very Low VTE Risk	Early and frequent ambulation
1-2	Low VTE Risk	Mechanical Prophylaxis
3-4	Moderate VTE Risk and Low Bleed Risk	Pharmacologic Prophylaxis

≥ 5	High VTE Risk and Low Bleed Risk	Mechanical AND Pharmacologic Prophylaxis
> 2	High **Bleed** Risk	Mechanical Prophylaxis

- Established thrombophilia is defined as factor V Leiden, G20210A prothrombin mutation, antiphospholipid syndrome, and lupus anticoagulant.[2,26] *(UW Health GRADE Moderate quality evidence, strong recommendation)*
- Inflammatory bowel disease is limited to Crohn's disease and ulcerative colitis.
- Malignancy is defined as local or distant metastases and with chemotherapy or radiation in the previous 6 months

4.3 Surgical patients not included in the Caprini RAM who classify as high VTE risk should receive the corresponding prophylaxis based on individual considerations. See recommendations in Table 6. *(UW Health GRADE Low quality evidence, strong recommendation)*

Table 6: VTE Prophylaxis Regimens for High VTE Risk General Surgery Patients[2,12,13,15,16,20,27-34]

Patient Population	**VTE Prophylaxis Regimens**	
	Preferred Option	Alternative Option
High VTE Risk	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 40 mg SQ every 24 hrs[a]
Renal impairment (CrCl < 30 mL/min)* *Not on hemodialysis	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 30 mg SQ every 24 hrs[b]
Bariatric Surgery	Enoxaparin 40 mg SQ every 12 hrs[a]	Heparin 5000 units SQ every 8-12 hrs[c]
Major Trauma	Enoxaparin 30 mg SQ every 12 hrs[a]	Enoxaparin 0.5 mg/kg every 12 hrs Heparin 5000 units SQ every 8-12 hrs[c]
Abdominal/Pelvic Surgery for Cancer	Enoxaparin 40 mg SQ every 24 hrs[b]	Heparin 5000 units SQ every 8-12 hrs[c]
High Bleed Risk	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]
Cardiac Surgery	Heparin 5000 units SQ every 8-12 hrs	Enoxaparin 40 mg SQ every 24 hrs
Craniotomy	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]
Spinal Surgery	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]
Thoracic Surgery	Heparin 5000 units SQ every 8-12 hrs	Enoxaparin 40 mg SQ every 24 hrs
Trauma Surgery	Enoxaparin 30 mg every 12 hrs[a]	Enoxaparin 0.5 mg/kg every 12 hrs Heparin 5000 units SQ every 8-12 hrs[c]

a: *UW Health GRADE Moderate quality evidence, strong recommendation*

b: *UW Health GRADE Low quality evidence, strong recommendation*

c: *UW Health GRADE Low quality evidence, weak/conditional recommendation*

4.4 Orthopedic Surgery[35-43]

There is no validated VTE RAM for orthopedic patients. Generally, patients undergoing orthopedic surgery are considered at risk for VTE. Determining if a surgical orthopedic patient is at a standard or elevated VTE risk is based on the additional risk factors present. While most patients will receive pharmacologic prophylaxis for VTE, it is the

level of VTE risk balanced with the bleed risk that dictates the selected regimen.[35-43] Table 7 outlines considerations for elevated VTE risk based on specific risk factors. Recommendations for VTE prevention strategies for patients undergoing elective hip or knee arthroplasty or hip fracture surgery based on VTE and bleeding risks are listed in Table 8. Selections are listed alphabetically.

Table 7. VTE Risk Categories for Orthopedic Surgery Population [35-43] *(UW Health GRADE moderate quality of evidence, weak/conditional recommendation)*

Elevated Risk (if any are present)	Elevated Risk (if 2 or more are present)
Hip fracture surgery	Age > 70 years
Surgical revision or protective weight bearing	New onset ischemic stroke
Personal history of DVT or PE	Morbid obesity (BMI > 40 or >120 kg)
History of active malignancy	Venous stasis (varicose veins)
History of known thrombophilia	Active heart failure (NYHA Class III or IV)
	Acute myocardial infarction
	Acute respiratory disease (COPD or asthma exacerbation or pneumonia)
	1st degree family history of DVT or PE
	Active (treated) inflammatory disease (IBD, rheumatic disease
	Immobility (bedridden > 72 hrs, immobilizing lower extremity cast, paralysis)

- Active malignancy is defined as local or distant metastases and/or in whom chemotherapy or radiotherapy had been performed in the last 6 months
- Known thrombophilia is defined as factor V Leiden, prothrombin gene mutation, antiphospholipid antibody syndrome, lupus anticoagulant, anticardiolipin antibodies, antithrombin deficiency, protein C deficiency, protein S deficiency, sickle cell anemia, myeloproliferative disorder, JAK-2 mutation

Table 8. VTE prophylaxis regimens for orthopedic surgeries[35-43]

	Standard VTE Risk	Elevated VTE Risk	High Bleed Risk
Total Hip, Total Knee, or Shoulder Arthroplasty	Apixaban 2.5 mg PO BID[a] ASA 81 mg BID [b] ASA 325 mg QD - BID [b] Enoxaparin 40 mg SQ daily[a] Enoxaparin 30 mg SQ every 12 hrs[a] *Fondaparinux 2.5 mg daily [b] Rivaroxaban 10 mg PO daily[a] Warfarin (target INR 1.8-2.2) [b]	Apixaban 2.5 mg PO BID[a] Enoxaparin 30 mg SQ every 12 hrs[a] Enoxaparin 40 mg SQ daily[a] *Fondaparinux 2.5 mg daily [b] Rivaroxaban 10 mg PO daily[a] Warfarin (target INR 1.8-2.2) [b]	Mechanical prophylaxis
Hip Fracture Surgery	<u>All patients considered at elevated VTE risk:</u> Apixaban 2.5 mg BID Enoxaparin 30 mg SQ every 12 hrs[a] Enoxaparin 40 mg Sq every 24 hrs[a] *Fondaparinux 2.5 mg daily [b] Rivaroxaban 10 mg PO daily[a] Warfarin (target INR 1.8-2.2) [b]		Mechanical prophylaxis

* May be considered for patients with heparin allergy

a: *UW Health GRADE Moderate quality evidence, strong recommendation*

b: *UW Health GRADE Very Low quality evidence, strong recommendation*

4.4.1 Patients receiving therapeutic anticoagulation prior to procedure should resume therapeutic anticoagulation therapy post procedure. *(UW Health GRADE Moderate quality evidence, strong recommendation)*

5. VTE Prophylaxis for Special Populations

5.1 Acute kidney injury (AKI) or chronic kidney disease (CKD)
- 5.1.1 UFH is the preferred agent for patients who are on renal replacement therapy[44] *(UW Health GRADE Low quality evidence, strong recommendation)*
- 5.1.2 Enoxaparin 30 mg every 24 hours may be considered[18,19,21,44] *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*
  - 5.1.2.1 Consider monitoring anti-Xa level after 7-10 doses to evaluate for accumulation *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*
  - 5.1.2.2 Goal anti-Xa 0.2-0.4 units/mL

5.2 Obesity[17,19,21,44-47]
- 5.2.1 Optimal thromboprophylaxis has not been established *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*
- 5.2.2 Enoxaparin 40 mg every 12 hours is the preferred agent for VTE prevention in obese patients *(UW Health GRADE Moderate quality evidence, strong recommendation)*
  - 5.2.2.1 Routine anti-Xa monitoring is not recommended *(UW Health GRADE Very low quality evidence, weak/conditional recommendation)*
- 5.2.3 Prophylactic UFH has not been adequately studied in morbidly obese patients *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*
  - 5.2.3.1 May consider heparin 5000 - 7,500 units every 8 hours[45-47] *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*

5.3 History of Heparin Induced Thrombocytopenia
- 5.3.1 Unfractionated and low molecular weight heparins are not recommended.[48] *(UW Health GRADE High quality evidence, strong recommendation)*
- 5.3.2 Fondaparinux 2.5 mg SQ every 24 hours[42] *(UW Health GRADE Low quality evidence, strong recommendation)*
- 5.3.3 Apixaban 2.5 mg BID for 30 days or rivaroxaban 10 mg daily *(UW Health GRADE Low quality evidence, weak/conditional recommendation)* 18-21

6. Extended duration VTE prophylaxis upon hospital discharge.

6.1 Bariatric surgery[15,49]
- 6.1.1 Recommended for patients with high VTE risk, low bleed risk and BMI $\geq$ 55 kg/m^2 *(UW Health GRADE Moderate quality evidence, strong recommendation)*
- 6.1.2 Enoxaparin 40 mg SQ every 12 hours for 10 days *(UW Health GRADE Moderate quality evidence, strong recommendation)*

6.2 Abdominal or pelvic surgery for cancer[49,50]
- 6.2.1 Recommended for patients with a cancer diagnosis who received a traditional laparotomy or vulvectomy and is either $\geq$ 60 years or < 60 years old with a history of VTE *(UW Health GRADE Low quality evidence, strong recommendation)*
- 6.2.2 Enoxaparin 40 mg SQ every 24 hours for 28 days *(UW Health GRADE Moderate quality evidence, strong recommendation)*

6.2.3 If patient refuses 28 days of prophylactic therapy then enoxaparin or UFH may be considered for 14 days *(UW Health GRADE Low quality evidence, strong recommendation)*

6.3 Orthopedic surgery[43,51]

6.3.2 Total hip or knee arthroplasty: 10-14 days *(UW Health GRADE Moderate quality evidence, strong recommendation)*

6.3.3 Hip fracture surgery: 4 – 6 weeks *(UW Health GRADE Moderate quality evidence, strong recommendation)*

6.3.4 For major orthopedic surgery extended prophylaxis up to 35 days may be considered. *(UW Health GRADE Low quality evidence, strong recommendation)*

6.4 Medical patients:[22-25]

The oral Xa inhibitors have been compared to enoxaparin for prevention of VTE after hospital discharge. In these extended VTE prophylaxis studies the oral Xa inhibitors did not provide additional benefit in preventing VTE 30-45 days post discharge but were associated with an increased risk in major bleeding. Extended VTE prophylaxis for medical patients is not a standard of care for most patients. Identifying the highest risk patients who may benefit from extended prophylaxis has yet to be determined.

6.4.1 Apixaban 2.5 mg BID for 30 days or rivaroxaban 10 mg daily for 45 days may be considered for high risk medical patients to prevent VTE post discharge. *(UW Health GRADE Low quality evidence, weak/conditional recommendation)*

6.5 COVID-19 Hospitalization[52-54]

6.5.1 Extended VTE prophylaxis is not necessary for all patients with COVID-19 who are being discharged after acute hospital admission. *(UW Health GRADE Low quality evidence, weak/conditional recommendation*

6.5.2 Extended VTE prophylaxis may be considered for patients with an IMPROVED-D VTE score of 4 or more (see Table 9). The primary team should determine ongoing VTE risk factors and if the patient may benefit from extended post-hospital VTE prophylaxis. *(UW Health GRADE Low quality evidence, weak/conditional recommendation*

6.5.3 If extended VTE prophylaxis is deemed reasonable, recommend use of adequately studied and/or approved agent and suggest limiting the total duration as used in the clinic trials (i.e., enoxaparin 40 mg daily for 6-14 days; rivaroxaban 10 mg daily for 31-39 days) adjusted as needed based on weight, renal/liver function and drug-drug interactions. *(UW Health GRADE Low quality evidence, strong recommendation*

Table 9. IMPROVED-D VTE RAM for Extended VTE Prophylaxis

Risk Factor	Score
History of VTE	3
Thrombophilia	2
Paralysis of lower extremity during hospitalization	2
Current malignancy	2
D-dimer ≥ 2x ULN	2
Immobilization for at least 7 days	1
ICU or CCU during hospitalization	1
Age ≥ 60 years	1

7. Anticoagulant Monitoring[44]
   - 7.1 Platelets (PLT)
     - 7.1.1 Baseline PLT should be obtained within 48 hours of starting heparin or enoxaparin *(UW Health GRADE very low quality evidence, strong recommendation)*
     - 7.1.2 Recheck PLT 24 hours after initiating heparin or enoxaparin therapy and every other day thereafter for up to 14 days or until therapy is discontinued *(UW Health GRADE very low quality evidence, strong recommendation)*
     - 7.1.3 If PLT count decreases > 50% from baseline or if PLT count falls below 100 x 10^9/L; See Heparin Induced Thrombocytopenia – Adult- CPG *(UW Health GRADE very low quality evidence, strong recommendation)*

   - 7.2 Hemoglobin/Hematocrit (Hgb/HCT)
     - 7.2.1 Obtain a baseline Hgb or HCT prior to initiating anticoagulant therapy *(UW Health GRADE very low quality evidence, strong recommendation)*
     - 7.2.2 Recheck Hgb/HCT a minimum of every 3 days thereafter *(UW Health GRADE very low quality evidence, strong recommendation)*

   - 7.3 After hospital discharge PLT and CBC should be monitored only as clinically indicated *(UW Health GRADE very low quality evidence, strong recommendation)*

Disclaimer
Consensus care models assist clinicians by providing a framework for the evaluation and treatment of patients. This guideline outlines the preferred approach for most patients. It is not intended to replace a clinician's judgment or to establish a protocol for all patients. It is understood that some patients will not fit the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.

Conflicts of Interest

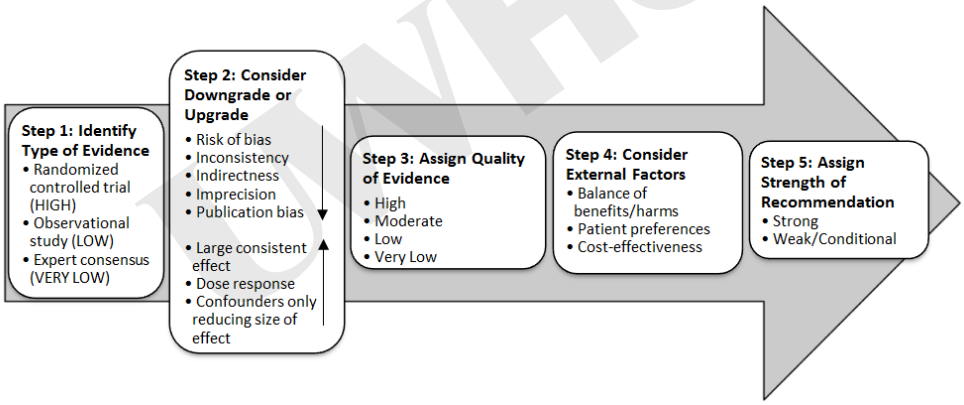
All guideline workgroup members are expected to follow institutional policies and procedures around conflicts of interest. Actions in which a guideline member discloses a conflict of interest relevant to the guideline topic may include, but is not limited to, abstaining from voting, dismissal during comment and voting period, or recusal from requesting and/or participation in the decision-making process.

Methodology

Development Process

Each guideline is reviewed and updated approximately every 3 years, in consideration of the primary literature and relevant practice changes. All guidelines are developed using the guiding principles, standard processes, and styling outlined in the UW Health Clinical Practice Guideline Resource Guide. This includes expectations for workgroup composition and recruitment strategies, disclosure and management of conflict of interest for participating workgroup members, literature review techniques, evidence grading resources, required approval bodies, and suggestions for communication and implementation.

GRADE Methodology adapted by UW Health



Rating Scheme for the Strength of the Evidence/Recommendations:

Table 1. GRADE Ranking of Evidence

High	We are confident that the effect in the study reflects the actual effect.
Moderate	We are quite confident that the effect in the study is close to the true effect, but it is also possible it is substantially different.
Low	The true effect may differ significantly from the estimate.
Very Low	The true effect is likely to be substantially different from the estimated effect.

Table 2. GRADE Ratings for Recommendations for or Against Practice

Strong (S)	Generally, should be performed (i.e., the net benefit of the treatment is clear, patient values and circumstances are unlikely to affect the decision.)
Conditional (C)	May be reasonable to perform (i.e., may be conditional upon patient values and preferences, the resources available, or the setting in which the intervention will be implemented.)

Revise guideline as necessary, based on workgroup feedback and continued evidence

Collateral Tools & Resources:

The following collateral tools and resources support staff execution and performance of the evidence-based guideline recommendations in everyday clinical practice.

Metrics
1. Performance Measure VTE CMS 108: VTE prophylaxis received within 24 hours of admission or documented reason why none received
2. Performance Measure VTE CMS 190: VTE prophylaxis received within 24 hours of admission or documented reason why none received for ICU patients
3. Patient Safety Indicator 12: Post-operative VTE events
4. Hospital acquired VTE events

Best Practice Alerts (BPA)
1. VTE risk assessment BPA for pharmacists

Order Sets & Smart Sets
Included in all admission, transfer, and postoperative order sets

Patient Resources
1. Health Facts For You #7522 – Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE) Treatment and Prevention
2. Health Facts For You #6915 – Heparin (Unfractionated and Low Molecular Weight Heparin)
3. Health Facts For You #6900 – Warfarin (Coumadin®, Jantoven®)

Appendix A. VTE Prophylaxis in Medical Patients

Modified Padua Risk Assessment Model[1,3,10,11]

Risk Factor	Points
Critically Ill	4
Inflammatory Bowel Disease	4
Admission for trauma (injured patient with fracture)	4
Active COVID-19 infection	4
Active Cancer	3
Previous VTE	3
Reduced Mobility	3
Thrombophilic Condition	3
Recent (< 1month) Trauma/Surgery	2
Age ≥ 70 years	1
Heart or Respiratory Failure	1
Acute Myocardial Infarction or Ischemic Stroke	1
Acute Infection or Rheumatologic Disorder	1
BMI ≥ 30	1
Ongoing Hormonal Treatment	1
	Total Points
Low VTE Risk – no prophylaxis needed	< 4
High VTE Risk – prophylaxis recommended	≥ 4

VTE Prophylaxis Regimens for High VTE Risk Medical Patients[3,12,13,17-21]

Patient Population	VTE Prophylaxis Regimens	
	Preferred Option	Alternative Option
High VTE Risk	Enoxaparin 40 mg SQ every 24 hrs[a]	Heparin 5000 units SQ every 8-12 hrs[a]
Trauma/Injury with fracture	Enoxaparin 30 mg SQ every 12 hrs[a]	Enoxaparin 0.5 mg/kg every 12 hrs Heparin 5000 units SQ every 8-12 hrs[c]
Renal failure (CrCl < 30 mL/min)* *Not on renal replacement therapy	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 30 mg SQ every 24 hrs[b]
Obesity Class 3 (BMI > 40 kg/M^2)	Enoxaparin 40 mg SQ every 12 hrs[b]	Heparin 5000 units SQ every 8 hrs[b]
Low body weight (weight < 50 kg)	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 30 mg SQ every 24 hrs[c]
High Bleeding Risk	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]

a: *UW Health GRADE Moderate quality evidence, strong recommendation*

b: *UW Health GRADE Low quality evidence, strong recommendation*

c: *UW Health GRADE Low quality evidence, weak/conditional recommendation*

Appendix B. VTE Prophylaxis in Surgical Patients

Caprini Risk Assessment Model[2,26]

1 Point	2 Points	3 Points	5 Points
Age 41-60	Age 61-74	Age ≥ 75	Acute spinal cord injury (< 1 mo)
Acute MI (<1 mo)	Central venous access	Established thrombophilia	Elective lower extremity arthroplasty
BMI > 25	Immobile ≥ 72 hrs	HIT	Hip, pelvis, or leg fracture (< 1 mo)
CHF exacerbation (<1 mo)	Leg plaster cast or brace	Hx of VTE	Stroke (< 1 mo)
Hx of Inflammatory Bowel Disease	Malignancy	Family hx VTE *(1 degree relative)*	
Procedure with local anesthesia	Surgery- arthroscopic		
Swollen legs or Varicose veins	Surgery > 45 mins		
Sepsis (< 1 mo)			
Serious lung dx *ex. Pneumonia* (<1 mo)			

1 point **(For Women Only)**
Oral contraceptives or HRT
Pregnancy or postpartum (< 1 month)
Hx of unexplained stillborn infant, spontaneous abortion (≥3), premature birth with toxemia or growth restricted infant

Points	Risk	Recommendation
0	Very Low VTE Risk	Early and frequent ambulation
1-2	Low VTE Risk	Mechanical Prophylaxis
3-4	Moderate VTE Risk and Low Bleed Risk	Pharmacologic Prophylaxis
≥ 5	High VTE Risk and Low Bleed Risk	Mechanical AND Pharmacologic Prophylaxis
> 2	High **Bleed** Risk	Mechanical Prophylaxis

VTE Prophylaxis Regimens for High VTE Risk General Surgery Patients[2,12,13,15,16,20,27-34]

Patient Population	**VTE Prophylaxis Regimens**	
	Preferred Option	Alternative Option
High VTE Risk	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 40 mg SQ every 24 hrs[a]
Renal impairment (CrCl < 30 mL/min)* *Not on hemodialysis	Heparin 5000 units SQ every 8-12 hrs[a]	Enoxaparin 30 mg SQ every 24 hrs[b]
Bariatric Surgery	Enoxaparin 40 mg SQ every 12 hrs[a]	Heparin 5000 units SQ every 8-12 hrs[c]
Major Trauma	Enoxaparin 30 mg SQ every 12 hrs[a]	Enoxaparin 0.5 mg/kg every 12 hrs Heparin 5000 units SQ every 8-12 hrs[c]
Abdominal/Pelvic Surgery for Cancer	Enoxaparin 40 mg SQ every 24 hrs[b]	Heparin 5000 units SQ every 8-12 hrs[c]

High Bleed Risk	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]
Cardiac Surgery	Heparin 5000 units SQ every 8-12 hrs	Enoxaparin 40 mg SQ every 24 hrs
Craniotomy	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]
Spinal Surgery	Intermittent pneumatic compression devices (IPC)[a]	Graduated compression stockings (GCS) or Venous foot pumps (VFP)[c]
Thoracic Surgery	Heparin 5000 units SQ every 8-12 hrs	Enoxaparin 40 mg SQ every 24 hrs
Trauma Surgery	Enoxaparin 30 mg every 12 hrs[a]	Enoxaparin 0.5 mg/kg every 12 hrs Heparin 5000 units SQ every 8-12 hrs[c]

a: *UW Health GRADE Moderate quality evidence, strong recommendation*

b: *UW Health GRADE Low quality evidence, strong recommendation*

c: *UW Health GRADE Low quality evidence, weak/conditional recommendation*

Appendix C. VTE Prophylaxis in Orthopedic Surgery

VTE prophylaxis regimens for orthopedic surgeries[35-43]

	Standard VTE Risk	Elevated VTE Risk	High Bleed Risk
Total Hip, Total Knee, or Shoulder Arthroplasty	Apixaban 2.5 mg PO BID[a] ASA 81 mg BID[b] ASA 325 mg QD - BID[b] Enoxaparin 40 mg SQ daily[a] Enoxaparin 30 mg SQ every 12 hrs[a] *Fondaparinux 2.5 mg daily[b] Rivaroxaban 10 mg PO daily[a] Warfarin (target INR 1.8-2.2)[b]	Apixaban 2.5 mg PO BID[a] Enoxaparin 30 mg SQ every 12 hrs[a] Enoxaparin 40 mg SQ daily[a] *Fondaparinux 2.5 mg daily[b] Rivaroxaban 10 mg PO daily[a] Warfarin (target INR 1.8-2.2)[b]	Mechanical prophylaxis
Hip Fracture Surgery	All patients considered at elevated VTE risk: Apixaban 2.5 mg BID Enoxaparin 30 mg SQ every 12 hrs[a] Enoxaparin 40 mg Sq every 24 hrs[a] *Fondaparinux 2.5 mg daily[b] Rivaroxaban 10 mg PO daily[a] Warfarin (target INR 1.8-2.2)[b]		Mechanical prophylaxis

* May be considered for patients with heparin allergy

a: *UW Health GRADE Moderate quality evidence, strong recommendation*

b: *UW Health GRADE Very Low quality evidence, strong recommendation*

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