Supplemental Digital Appendix 1

**Venous Thromboembolism Interprofessional Team Roster, University of Kansas Hospital**

DO, Assistant Professor, General & Geriatric Medicine

RN, Clinical Nurse Specialist, Nursing Clinical Excellence

RN, Nursing Director, Quality & Regulatory Compliance

MD, Associate Professor, Pathology & Laboratory Medicine

RN, Clinical Nurse II, CTSP

RN, Nursing Informatics Specialist, Nursing Informatics

DO, Internal Medicine Resident

MD, Assistant Professor, General & Geriatric Medicine

MD, Assistant Professor, Anesthesiology

MD, Assistant Professor, Radiology

PharmD, Interim Pharmacy Operations Manager, Pharmacy Inpatient Services

RN, Quality Outcomes Coordinator, Organizational Improvement

RN, Trauma Performance Improvement Coordinator, Trauma Services

RN, Clinical Surveillance Triage Nurse, Outcomes Management

MD, Professor Continuing Education

RN, Nursing Informatics Specialist, Nursing Informatics

Director of Programs, Continuing Education
Supplemental Digital Appendix 2

Pareto diagram of themes associated with (causes of) venous thromboembolism (VTE) in hospitalized patients, University of Kansas Hospital. PICC: Peripheral Inserted Central Catheter, SCD: Subcutaneous Compression Devices, IVC: Inferior Venal Caval Device.

Supplemental Digital Appendix 3

Evidence-Based Educational Content Delivery Strategies for Health Professionals

Instructional Methods
- Pre course reading
- Short lectures
- Group Projects
- Case Studies
- Case & Problem based learning
- Role play
- Small Group Discussions
- Group led problem solving

Instructional Materials and Media
- Text
- Simulation
- Audience Response Systems

Instructional Strategies
- Independent study
- Direct Instruction
- Indirect instruction

Satellite Activities
- Pod Casts
- Group led problem solving
- ITV
- Library & internet resources

Course Development
Supplemental Digital Appendix 4

**Peripheral Catheter Central Line Access Algorithm, University of Kansas Hospital**

- **Peripheral IV needed**
  - Nurse/ Radiology Tech assesses available veins

- **Veins seen, nurse attempts**
  - IV Started
  - 1 unsuccessful stick per patient on unit

- **No vein seen or patient says "IV Team Only"**
  - Consult IV Team
  - IV Therapy Attempts up to 2 sticks

**************FOR PHLEBOTOMY***************

If Unsuccessful after 2 attempts:
Contact Lab Troubleshooter at 913-917-7022

- Mon – Fri  0330 – 2000
- Sat – Sun  0330 - 1300

**ADULT NON-EMERGENT VENOUS ACCESS ALGORITHM**
Supplemental Digital Appendix 5

Venous Thromboembolism (VTE) Badge Buddy, University of Kansas Hospital

**Risk Factors**

- **5 Risk Factors**
  - Acute spinal cord injury w/ paralysis
  - Multiple trauma (<1 month)
  - Stroke (<1 month)
- **3 Risk Factors**
  - Age: >70
  - Prior history of thrombosis
  - Known thrombophilia
  - Shock / Dehydration
  - Sepsis
- **2 Risk Factors**
  - Age: 61-70
  - Central Venous Access
  - Immobilization (>72 hours)
  - Active malignancy and/or oncologic treatment: surgery, chemotherapy, radiotherapy
- **1 Risk Factor**
  - Age: 40-60 years
  - Confining air/ground travel (>4h w/in 1 week of admission)
  - HRT / oral contraceptive use
  - Myeloproliferative disease
  - Chronic Heart Failure
  - Tobacco Use
  - Pregnancy/postpartum (<1 month)
  - Inflammatory bowel disease
  - Nephrotic syndrome
  - Sickle cell disease
  - Varicose vein/leg swelling or venous stasis
  - Obesity (BMI >29)
  - Severe COPD or other serious lung disease

**VTE Risk**

- Moderate (2 factors) = 2-4%
- High (3-4 factors) = 4-8%
- Very High (5 factors) = 10-20%

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**Relative or Absolute** Contraindication to Pharmacologic Prophylaxis

- Active bleeding*
- Heparin use with the presence or history if HIT* – Fondaparinux is recommended
- Lumbar puncture or epidural anesthesia within 24 hours
- Coagulopathy (INR >1.5) or thrombocytopenia (platelet count < 60,000)
- Recent intraocular or intracranial surgery or lesions
- Significant renal insufficiency (CrCl < 30) dose carefully – may also use UFH
- Hypertensive crisis

**Special Considerations**

- Impaired renal function: CrCl <30 ml/min (Use of fondaparinux is contraindicated)
  - Enoxaparin dosing: 30 mg Qday
  - Obesity
    - BMI 40-50 kg/m2: Enoxaparin 40 mg BID
    - BMI >50 kg/m2: Enoxaparin 60 mg BID
  - Hemodialysis – UFH is the preferred agent
  - Weight <50kg – Fondaparinux should not be used in patients <50kg

**KUH Agents:** Warfarin < Heparin < Enoxaparin 30 < Enoxaparin 40 < Fondaparinux 2.5 (Restricted)

*All Surgical Patients need VTE prophylaxis within 24hrs post-surgery- Refer to Adult VTE Prophylaxis – General Surgery order set or the specific surgery order set for guidelines.*
Supplemental Digital Appendix 6

Practice Management Guideline for Venous Thromboembolism (VTE) Prophylaxis, University of Kansas Hospital

The University of Kansas Hospital: Practice Management Guideline VTE Prophylaxis

**Background:** Pulmonary embolism resulting from deep vein thrombosis (DVT) – collectively referred to as VTE – is the most common preventable cause of hospital death. Pharmacologic methods to prevent VTE are safe, effective, cost-effective, and advocated by authoritative guidelines. The Agency for Healthcare Research and Quality calls thromboprophylaxis against VTE the “number one patient safety practice.”

**Standard:** Upon admission to The University of Kansas Hospital, the patient will be assessed for risk of VTE by the provider or pharmacist. The provider will order appropriate VTE prophylaxis and document in the medical record if pharmacological prophylaxis is contraindicated. If the patient experiences a change in risk level, condition, or sight/unit of care occurs, the patient will be reassessed for risk of VTE with appropriate prophylaxis ordered.

### VTE PROPHYLAXIS ASSESSMENT

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
<th>Very High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTE Risk = 0.4%</td>
<td>VTE Risk = 2-4%</td>
<td>VTE Risk = 4-8%</td>
<td>VTE Risk = 10-20%</td>
</tr>
</tbody>
</table>

**Low Risk:**
- VTE Risk = 0.4%
- One risk factor OR

**Moderate Risk:**
- VTE Risk = 2-4%
- Two risk factors OR

**High Risk:**
- VTE Risk = 4-8%
- Three to four risk factors OR

**Very High Risk:**
- VTE Risk = 10-20%
- Five risk factors OR

### RECOMMENDED PROPHYLAXIS

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate/High Risk</th>
<th>Very High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early aggressive ambulation</td>
<td>Intermittent pneumatic compression devices (must be in use 20/24 hours for effectiveness; usage alone is clearly inferior to chemical prophylaxis and should be reserved for patients who have contraindications to therapy) AND Early aggressive ambulation</td>
<td>Intermittent pneumatic compression devices, Early aggressive ambulation AND</td>
</tr>
<tr>
<td>Enoxaparin 40 mg SC Qday OR</td>
<td>Enoxaparin 40 mg SC Qday OR</td>
<td>Enoxaparin 40 mg SC Qday OR</td>
</tr>
<tr>
<td>Heparin 5,000 SC Q8 hours OR</td>
<td>Heparin 5,000 SC Q8 hours OR</td>
<td>Heparin 5,000 SC Q8 hours OR</td>
</tr>
<tr>
<td>Heparin 5000 units SC Q12 hours if &gt; 75 years of weight &lt; 50 kg</td>
<td>Fondaparinux 2.5 mg SC Qday OR</td>
<td>Fondaparinux 2.5 mg SC Qday OR</td>
</tr>
<tr>
<td>Warfarin INR 2-3</td>
<td></td>
<td>Warfarin INR 2-3</td>
</tr>
</tbody>
</table>

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**RISK FACTORS**

- Age: 40-60 years (1 risk factor)
- Age: 61-70 (2 risk factors)
- Age: > 70 (3 risk factors)
- Recent or present immobilization (>72 hours)
- Prior history of thrombosis (3 risk factors)
- Confining air/ground travel (>4h within one week of admission)
- Hormonal replacement therapy/oral contraceptive use
- Myeloproliferative disease
- Known thrombophilia
- Chronic Heart Failure
- Tobacco use
- Spinal cord injury w/ paralysis (3 risk factors)
- Pregnancy/postpartum (< 1 month)
- Inflammatory bowel disease
- Nephrotic syndrome
- Sickle cell disease
- Active Malignancy and/or oncologic treatment: surgery, chemotherapy, radiotherapy
- Dehydration
- Varicose veins/leg swelling or venous stasis
- Obesity (BMI > 29)
- Central Venous Access
- Severe chronic obstructive pulmonary disease
- Sepsis

**RELATIVE OR ABSOLUTE CONTRAINDICATION TO PHARMACOLOGIC PROPHYLAXIS**

- Lumbar puncture or epidural anesthesia within 24 hours
- Active bleeding
- Coagulopathy (INR > 1.5) or thrombocytopenia (platelet count < 60,000)
- Presence or history of HIT (Heparin induced thrombocytopenia) – fondaparinux recommended
- Recent intraocular or intracranial surgery or lesions
- Significant renal insufficiency (Creatinine clearance < 30 dose carefully) – may also use UFH
- Hypertensive crisis

### SPECIAL CONSIDERATIONS:

**Impaired renal function: CrCl < 30 ml/min**

- Enoxaparin dosing: 30 mg Qday
- Use of fondaparinux is contraindicated in patients
- UFH preferred agent

- Surgical Care Improvement Project (SCIP) CONSIDERATIONS: Select surgical procedures have specific VTE Recommendations for prophylaxis ordered anytime from hospital arrival to 24 hours after Anesthesia End Time. Please refer to VTE prophylaxis options for surgery on back.

### SPECIAL CONSIDERATIONS: Obesity

- BMI 40-50 kg/m²: Enoxaparin 40 mg BID
- BMI > 50 kg/m²: Enoxaparin 60 mg BID
- Fondaparinux should not be used in patients <50 kg

### SPECIAL CONSIDERATIONS: Hemodialysis

- UFH preferred agent

### DRUG COST

<table>
<thead>
<tr>
<th>Drug</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warfarin</td>
<td>$</td>
</tr>
<tr>
<td>Heparin</td>
<td>$</td>
</tr>
<tr>
<td>Enoxaparin</td>
<td>$$</td>
</tr>
<tr>
<td>Fondaparinux</td>
<td>$$$</td>
</tr>
</tbody>
</table>

**VTE Prophylaxis Options for Surgery**

<table>
<thead>
<tr>
<th>Surgery Type</th>
<th>Recommended Prophylaxis Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracranial Neurosurgery</td>
<td>Any of the following:</td>
</tr>
<tr>
<td></td>
<td>Intermittent pneumatic compression devices (IPC) with or without graduated compression stockings (GCS)</td>
</tr>
<tr>
<td></td>
<td>Low – dose unfractionated heparin (LDUH)</td>
</tr>
<tr>
<td></td>
<td>Low molecular weight heparin (LMWH)²</td>
</tr>
<tr>
<td></td>
<td>LDUH or LMWH² combined with IPC or GCS</td>
</tr>
</tbody>
</table>

<p>| General Surgery | Any of the following: |
|                | Low – dose unfractionated heparin (LDUH) |
|                | Low molecular weight heparin (LMWH) |</p>
<table>
<thead>
<tr>
<th>Medical Procedure</th>
<th>Pharmacologic Prophylaxis Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gynecologic Surgery</td>
<td>• LDUH or LMWH combined with IPC or GCS</td>
</tr>
<tr>
<td></td>
<td>Any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Low-dose unfractionated heparin (LDUH)</td>
</tr>
<tr>
<td></td>
<td>• Low molecular weight heparin (LMWH)</td>
</tr>
<tr>
<td></td>
<td>• Intermittent pneumatic compression devices (IPC)</td>
</tr>
<tr>
<td></td>
<td>• LDUH or LMWH combined with IPC or GCS</td>
</tr>
<tr>
<td>Urologic Surgery</td>
<td>Any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Low-dose unfractionated heparin (LDUH)</td>
</tr>
<tr>
<td></td>
<td>• Low molecular weight heparin (LMWH)</td>
</tr>
<tr>
<td></td>
<td>• Intermittent pneumatic compression devices (IPC)</td>
</tr>
<tr>
<td></td>
<td>• LDUH or LMWH combined with IPC or GCS</td>
</tr>
<tr>
<td>Elective Total Hip Replacement</td>
<td>Any of the following <strong>WITHIN 24 hours of surgery</strong></td>
</tr>
<tr>
<td></td>
<td>• Low molecular weight heparin (LMWH)</td>
</tr>
<tr>
<td></td>
<td>• Factor Xa Inhibitor (fondaparinux)</td>
</tr>
<tr>
<td></td>
<td>• Oral Factor Xa Inhibitor ³</td>
</tr>
<tr>
<td>Elective Total Knee Replacement</td>
<td>Any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Low molecular weight heparin (LMWH)</td>
</tr>
<tr>
<td></td>
<td>• Factor Xa Inhibitor (fondaparinux)</td>
</tr>
<tr>
<td></td>
<td>• Oral Factor Xa Inhibitor ³</td>
</tr>
<tr>
<td></td>
<td>• Warfarin</td>
</tr>
<tr>
<td></td>
<td>• Intermittent pneumatic compression devices (IPC)</td>
</tr>
<tr>
<td></td>
<td>• Venous foot pump</td>
</tr>
<tr>
<td>Hip Fracture Surgery</td>
<td>Any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Low-dose unfractionated heparin (LDUH)</td>
</tr>
<tr>
<td></td>
<td>• Low molecular weight heparin (LMWH)</td>
</tr>
<tr>
<td></td>
<td>• Factor Xa Inhibitor (fondaparinux)</td>
</tr>
<tr>
<td></td>
<td>• Warfarin</td>
</tr>
</tbody>
</table>

¹ Patients who receive neuroaxial anesthesia or have a documented reason for not administering pharmacologic prophylaxis may pass the performance measure if either appropriate pharmacologic or mechanical prophylaxis is ordered.

² Current guidelines recommend postoperative low molecular weight heparin for Intracranial Neurosurgery.

³ The US Food and Drug Administration has approved Xarelto (rivaroxaban) to reduce the risk of blood clots, deep vein thrombosis (DVT) and pulmonary embolism (PE) following hip or knee replacement surgery ONLY.
Supplemental Digital Appendix 7

**Pharmacy - Patient Acuity Score Card, University of Kansas Hospital**

![Pharmacy patient acuity score card](image)

**Legend:**

Screen shot of Pharmacy patient acuity score card. The left most column lists patients pharmacy related calculated score. Red arrow indicate worsening of pharmacy score, i.e. score change, = maintenance of acuity score and green arrows improvement. The middle column scores clinical patient data, i.e. obtained drug levels for needed drugs (i.e. antibiotic drug level), monitored drugs, creatinine clearance, drugs resulting in needed laboratory results (i.e. anticoagulation) and drug change from IV to PO. The right most column is the active surveillance of the organization’s key initiative, i.e. Venous Thromboembolism (VTE) prophylaxis, vaccinations, medicine reconciliation, discharge orders, etc.

Pharmacists utilize this comprehensive acuity score card to surveil appropriate VTE prophylaxis for each patient.