Organization
Frederick Memorial Hospital

Solution Title
Using Lean to Improve Quality Outcomes – DVT Case Study

Program/Project Description, including Goals:

Hospital Acquired DVTs have become a very serious issue in healthcare, contributing to increased patient harm, mortality and cost of care. Despite detailed guidelines, DVT prophylaxis continues to be underutilized with only about 42% of inpatients with hospital-acquired DVTs having received any type of prophylaxis. At Frederick Memorial Hospital there was an issue with patients experiencing hospital acquired DVTs and was discovered that VTE prophylaxis process was not standardized to ensure all patients are receiving appropriate prevention measures, and the care giver roles and responsibilities were unclear. A total of 8.21 days per cases could be avoided, for a total of 476 days. If Hospital Acquired DVT/PE could be avoided, a cost saving of $15,149 per case could be saved, for a total of $878,642. Without the contributing factor of DVT, a potential 5 lives could be saved. FMH decided to incorporate Lean principals to improve the quality of care and enhance compliance with evidence based care. This session will focus on multi-disciplinary strategies to improving the DVT prophylaxis process and related outcomes through teamwork and reliable utilization of standardized processes, resources and tools. Presenters share a variety of strategies to enhance compliance with DVT prophylaxis compliance, including nursing assessment, physician order set and guidelines as well as using Lean techniques to ensure supplies and equipment are available for patient use. Approaches to incorporate Lean tools and techniques into efforts to improve clinical outcomes will be discussed.

Learning Objectives include:

1. Participants will be able to implement appropriate DVT mechanical and pharmacological prophylaxis.
2. Describe the application of lean performance improvement strategies to improve clinical outcomes and enhance compliance with evidence based care and clinical best practices.
3. Identify strategies to create the necessary collaborative approach to appropriately apply DVT prophylaxis, including the necessary culture change to secure buy-in and ability to provide best practice care.

Process:
The VPMA and the Director of Quality and Performance Improvement requested that we utilize Lean to improve this process. A 5 day Kaizen event, divided into two weeks, was planned for March 18-20 and March 26-27. Preparation meetings were held with key members prior to the event to pre-plan the activity and select the team, which consisted of staff from cross-functional
areas that support the VTE process. The event was kicked off with an overview of Lean, that was provided to the team members, as well as other leaders and interested parties in the organization and the background information on the VTE process was provided to the team. Approximately 35 people attended the Lean overview training.

**Solution:**

Numerous processes have been implemented to ensure the success of this initiative, including VTE Prophylaxis being addressed by the physician upon admission and transfer of care through the use of a standardized VTE order set and process; streamlined the order set & guidelines for easier use; established standard location for VTE order in the electronic medical record; VTE addressed with admission process; established a nurses driven protocol to order mechanical prophylaxis as bridge and follow-up with physician regarding pharmacological prophylaxis; standardized the delivery and cleaning of SCD pumps; standardized documentation of SCD utilization; and eliminated the use of pharmacy consults resulting in no prophylaxis ordered/administered for up to 18 hours.

**Measurable Outcomes:**

Within the 6 months since implementation of first stage of the process and within 3 months of the second phase of the action plan, the number of hospital-acquired DVTs has gone from approximately 5 per month to 2 per month. This has resulted in over 120 avoided inpatient days and $225,000 in avoided costs. There has been increased compliance with ordering of prophylaxis, over 90% receiving prophylaxis, 70% by the first 24 hours, and an additional 8% increase in use of mechanical prophylaxis, gains attributed to better access to supplies and equipment.

**Hospital Acquired DVT cases**

![Graph showing Hospital Acquired DVT cases]

**Sustainability:**
Continual monitoring and data analysis allows for quick analysis of any identified issues or breaks in protocol. The multi-disciplinary team continues to meet on a regular basis to review compliance and makes adjustments to protocols and procedures as needed. There is a plan in place for on-going staff and physician education. All outliers are reviewed by the Assistant VPMA, along with the DVT PI Coordinator and reviewed with the physician(s) involved in the case.

**Role of Collaboration and Leadership:**

The key players were Premier Performance Partners, Assistant VPMA, Chief Hospitalist, nursing, pharmacy, performance improvement, materials management, resource utilization analysis, OR, housekeeping and transport. Healthcare providers across the spectrum had to be aware of and understand the impact of hospital acquired DVTs and the importance of prophylaxis. FMH partnered with Premier through the use of our Operational and Clinical Performance Partners to facilitate and lead us through the process of addressing clinical outcomes through the lean process. This meant breaking down the silo mindset of how patients are treated. The departments involved had to “buy-in” to the importance of this initiative to dedicate the resources and ensure participation. Administrative and physician leadership support was critical in the success of this initiative.

**Innovation:** What makes this Solution innovative? What are its unique attributes?

This solution was innovative in that it used a Lean approach to address quality outcomes. It was a multi-disciplinary effort that was accomplished within a short time, with significant measurable results. The team took evidence based practices and applied them to the unique situation at Frederick Memorial Hospital. In addition, the team included end users in developing the solution and tested solutions in real time to be able to quickly make changes.

**Related Tools and Resources**
See attached.

**Contact Person**
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Frederick Memorial Hospital
Lean Kaizen Event – DVT Prophylaxis
March 18 -20; March 25-27
8:00 am – 3:00 pm

<table>
<thead>
<tr>
<th>Kaizen Event Scheduling</th>
<th>Day 1</th>
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<tr>
<td><strong>Lean Training / Overview</strong></td>
<td>Lean Healthcare Principles Kaizen Event Value Stream Mapping Lean Tools Follow-up</td>
<td>Process Map Observations</td>
<td>Early Observations</td>
<td>Observations of Trial</td>
<td>Complete Improvements</td>
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<tr>
<td><strong>Introductions</strong></td>
<td>Introductions Project Overview</td>
<td>Identify and Compile Opportunities</td>
<td>Team Report Outs</td>
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<tr>
<td><strong>Non-Working Lunch with Team Members</strong></td>
<td>Value Stream Mapping</td>
<td>Value Stream Mapping</td>
<td>Create Future State Process Map</td>
<td>Develop Recommendations for Improvement</td>
<td>Create A3 and MAP</td>
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<tr>
<td></td>
<td>Walk Process Related to Focus of Kaizen Event</td>
<td>Create Future State Process Map</td>
<td>Develop Recommendations for Improvement</td>
<td>Create A3 and MAP</td>
<td>Develop Presentation Examples of Tools Results Action Items Implementation Plan/MAP Plan to Sustain</td>
</tr>
<tr>
<td></td>
<td>Create Current State Process Map</td>
<td>Walk Process Related to Focus of Kaizen Event</td>
<td>Future State Approval</td>
<td>Discuss Next Steps</td>
<td>Deliver Presentation to Management</td>
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<tr>
<td><strong>End of Day</strong></td>
<td>End of Day</td>
<td>Team Reports</td>
<td>End of Day</td>
<td>End of Day</td>
<td>End of Day</td>
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**VTE Prophylaxis for Medical Patients**

**Pharmacologic Prophylaxis**

**Contraindications?**
- Active bleeding or at risk of bleeding
- Uncontrolled hypertension, systolic BP ≥ 180
- Bacterial endocarditis, pericarditis, or thoracic aneurysm
- New onset stroke or at risk of intracerebral bleed
- Severe liver disease
- Known bleeding disorder (consider Hematology Consult)
- Thrombocytopenia, platelet count < 70,000
- Previous Heparin induced thrombocytopenia (Consider Fondaparinux)
- Known Heparin allergy
- Admitted for Comfort Care or Hospice Care
- Already having therapeutic anticoagulation

**Mechanical Prophylaxis**

**Contraindications:**
- Arterial insufficiency
- Peripheral neuropathy
- Active skin infection to affected area
- Recent skin graft to affected area

**Pharmacologic Methods**
- Enoxaparin (Lovenox) 40 mg subcutaneous daily
- Unfractionated Heparin 5,000 units subcutaneous TID
- Pharmacy Consult

Patients receiving LMWH or UFH need platelet counts every 2-3 days beginning day 4 of use of Heparin UFH. If received Heparin UFH within past 100 days, then need baseline repeat platelets count at 24 hours.

**Pharmacologic considerations:**
1) Decrease LMWH if creatinine clearance < 30
2) Consider dose increase of LMWH if wt > 110 kg
3) Consider dose reduction of LMWH if wt < 50 kg

**Is the patient age 40 or over?**
- YES
  - Risk Factors:
    - Acute or exacerbation of CHF
    - Acute infection including pneumonia
    - Active chemotherapy or cancer treatment
    - Dehydration
    - Thrombocytosis
    - Obesity BMI > 30 kg/m2
    - Personal or family history of VTE
    - Pregnancy or ≤ 6 weeks post-partum
    - Use of Hormone Replacement Therapy
    - Use of Estrogen containing birth control pills
    - Varicose veins with phlebitis
- NO
  - Consider if limited mobility

**Is the patient under 40 with any of the following?**
- YES
  - Is the patient under 40 with any of the following?
- NO
  - Mechanical Prophylaxis

**LOW RISK - NONE**
- Early ambulation AND reassess for VTE prophylaxis in early AM of second day (48 hours or less after admit)
- Encourage early ambulation AND reassess for VTE prophylaxis in early AM of second day (48 hours or less after admit)
- Proceed to Pharmacologic Thromboprophylaxis

**Clinician Name: ______________________ Signature: ______________________ Date: __________ Time: ________**
Unless Contraindicated:
All patients admitted following orthopedic trauma should receive combined thromboprophylaxis with pharmacologic **AND** mechanical methods from admission until they are mobile.

**** Excludes hip and knee surgery

### Pharmacologic Prophylaxis Contraindications
- Active bleeding or at risk of bleeding
- Uncontrolled hypertension, systolic BP ≥ 180
- Bacterial endocarditis, pericarditis, or thoracic aneurysm
- New onset stroke or at risk of intracerebral bleed
- Severe liver disease
- Known bleeding disorder (consider Hematology Consult)
- Thrombocytopenia, platelet count < 70,000
- Previous Heparin induced thrombocytopenia (Consider Fondaparinux)
- Known Heparin allergy (Consider Fondaparinux)
- Admitted for Comfort Care or Hospice

### Mechanical Prophylaxis
- Contraindications:
  - Arterial insufficiency
  - Peripheral neuropathy
  - Active skin infection to affected area
  - Recent skin graft to affected area

### Pharmacologic Thromboprophylaxis
Prescribe one of the following:
- Enoxaparin (Lovenox) 40 mg subcutaneous daily
- Fondaparinux (Arixtra) 2.5 mg subcutaneously once daily, start POD # 1 in AM
- Warfarin (Coumadin) ___ mg po qhs ____________ (frequency)
- Unfractioned Heparin 5,000 units subcutaneous TID
  - First dose at **6 hours after surgery**
  - **12 hours after surgery**
  - Or on admission if surgery is delayed
- Pharmacy Consult

Pharmacologic considerations
- Consider dose increase in patients > 110 kg
- Consider dose reduction in patients < 50 kg
- Patients receiving LMWH or UFH need platelet count checking every 3 days

For surgery under spinal/ epidural anesthesia:
- Stop pharmacologic thromboprophylaxis at least 12 hours prior to neuroaxial blockade
- Do not remove epidural catheter within 4 hours of pharmacologic thromboprophylaxis

**Early ambulation AND reassess for VTE prophylaxis in early AM of second day (48 hours or less after admit)**

Proceed to Pharmacologic Thromboprophylaxis

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Clinician Name: ______________________ Signature: ______________________ Date: __________ Time: ________
Unless Contraindicated:
All patients admitted for elective surgery lasting more than 30 minutes should receive combined thromboprophylaxis with the following:

1) Pharmacologic thromboprophylaxis, starting 6-12 hours after surgery until mobile
   (Consider extended thromboprophylaxis for major abdominal or pelvic cavity surgery)
2) Mechanical methods, from admission until mobile

Pharmacologic Prophylaxis
Contraindications?
- Active bleeding or at risk of bleeding
- Uncontrolled hypertension, systolic BP ≥ 180
- Bacterial endocarditis, pericarditis, or thoracic aneurysm
- New onset stroke or at risk of intracerebral bleed
- Severe liver disease
- Known bleeding disorder (consider Hematology Consult)
- Thrombocytopenia, platelet count < 70,000
- Previous Heparin induced thrombocytopenia (Consider Fondaparinux)
- Known Heparin allergy (Consider Fondaparinux)
- Admitted for Comfort Care or Hospice Care

Pharmacologic Methods
Prescribe one of the following:
- Enoxaparin (Lovenox) 40 mg subcutaneous daily, if no signs of bleeding
- Enoxaparin (Lovenox) 40 mg subcutaneously BID, if no signs of bleeding
- Enoxaparin (Lovenox) 30 mg subcutaneously BID, if no signs of bleeding
- Unfractionated Heparin 5,000 units subcutaneous TID
  If patient is post surgery, first dose at:
  - 6 hours after surgery
  - 12 hours after surgery
  - Pharmacy Consult to assist
Pharmacologic considerations:
1) Consider dose increase of LMWH if wt > 110 kg
2) Consider dose reduction of LMWH if wt < 50 kg
3) Patients receiving LMWH or UFH need platelet count checking every 3 days

For surgery under spinal/ epidural anesthesia
- stop pharmacologic thrombophylaxis at least 12 hours prior to neuroaxial blockade
- Do not remove epidural catheter within 4 hours of pharmacologic thromboprophylaxis

Mechanical Prophylaxis
Contraindications:
- Arterial insufficiency
- Peripheral neuropathy
- Active skin infection to affected area
- Recent skin graft to affected area

- SCDs Best Practice
  AND
  Encourage early ambulation

Early ambulation
AND reassess for VTE prophylaxis therapy in early AM of 2nd day (48 hours or less after admit.)