

Failure Mode and Effects Analysis

Venous Thromboembolism Prophylaxis



Partnership for Patient Care



A Collaborative of the Delaware Valley Healthcare Council • Independence Blue Cross • ECRI Institute

Partnership for Patient Care Program Overview

The Partnership for Patient Care (PPC) is a collaborative between the Health Care Improvement Foundation (HCIF), hospitals in southeastern Pennsylvania, Independence Blue Cross (IBC), and other stakeholders designed to make the Greater Philadelphia area the safest place in the nation to receive healthcare. HCIF has partnered with ECRI Institute and the Institute for Safe Medication Practices — two local, internationally recognized leaders in patient safety.

The Partnership for Patient Care promotes best practices and evidence-based medicine to improve the safety and quality of healthcare at the region's hospitals. Using a regional, strategic, and cohesive approach, the Partnership provides education, tools, technical assistance, resources, and an interactive forum to facilitate hospitals' efforts to more rapidly implement best practices.

In 2007, the PPC agenda is focused on several initiatives: prevention of Methicillin-resistant *Staphylococcus aureus* (MRSA); management of anticoagulants; and proactive hazard analysis and strategies designed to prevent patient falls, ensure reconciliation of medications upon discharge, and prevent deep vein thrombosis. All of the issues addressed by the 2007 agenda have been identified as key targets for intervention by national and statewide patient safety organizations.

A core component of this PPC program focuses on a regional approach to conducting proactive risk analyses (PRA) using failure mode and effects analysis (FMEA) methodology to proactively strengthen patient safety. Hospitals in the region can select to actively participate in one or more of the regional FMEA topics each year. The Partnership's regional FMEA approach provides education, tools, technical assistance, resources, and an interactive forum to facilitate the hospital's efforts in conducting their FMEAs.

The Partnership for Patient Care provides a solid foundation for hospitals to continue their meaningful work in incorporating evidence-based best practices in strengthening patient safety.

Proactive Risk Assessment Program Collaborators:

Health Care Improvement Foundation (HCIF) is a nonprofit foundation. Its mission is the support innovative efforts to improve health services to enhance public trust and confidence in the region's healthcare delivery system through the promotion of best practices in community health and patient safety in the Delaware Valley. *Website: www.dvhc.org/hcif*

ECRI Institute is an independent, nonprofit health services research agency that focuses on improving the safety, quality, and cost-effectiveness of health care. It is widely recognized as the world's most trusted organization for unbiased, reliable information on health care technology, health care risk and quality management, and healthcare environmental management. It is designated as an Evidence-based Practice Center by the U.S. Agency for Healthcare Research and Quality and is a Collaborating Center of the World Health Organization (WHO). *Website: www.ecri.org*

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1.0 Executive Summary

A core component of the Partnership for Patient Care (PPC) program focuses on a regional approach to conducting proactive risk analyses (PRA) and specifically uses failure mode and effects analysis (FMEA) methodology to proactively strengthen patient safety. FMEA is a formalized evaluation technique used to proactively evaluate high-risk clinical processes for ways in which failures can occur and to redesign the process or underlying system to mitigate risks. The goal is to eliminate or minimize the potential for failures, to stop failures before harm reaches the patient, or to minimize the consequences of the failure. Hospitals in the region can select to actively participate in one or more of the regional FMEA topics each year. The PPC's regional FMEA approach provides education, tools, technical assistance, resources, and an interactive forum to facilitate the hospitals' efforts in conducting their FMEAs.

This special report synthesizes the results and benefits PPC's FMEA on venous thromboembolism (VTE) prophylaxis. This topic was chosen based on its broad application across regional hospitals, regional advisory group input, synergy with national patient safety/quality initiatives, and the evidence base related to VTE prophylaxis. Eighteen hospital sites actively participated in this regional FMEA. It should be noted that some participating hospitals have more than one site or campus, in which case the sites worked together to complete an FMEA.

Mitigation strategies to reduce risk associated with potential failure modes varied from hospital to hospital, depending on their unique circumstances. However, the following mitigation strategies were most frequently implemented amongst participating hospitals. In addition, hospitals indicated that implementing these mitigation strategies seemed to have the greatest impact on strengthening VTE prophylaxis and patient safety:

- Assess all patients for risk of VTE upon admission
- Develop a standardized protocol for VTE risk assessment
- Delineate responsibility for completing VTE risk assessment
- Utilize hospitalist as backup coverage to insure completion of VTE assessments on admission
- Place a flag on patient's chart to alert physician of a VTE risk assessment need
- Incorporate alerts into computerized provider order entry system to indicate a patient is at risk for VTE
- Delineate responsibility for documenting VTE risk assessment in medical record
- Incorporate VTE risk assessment into nursing assessment
- Incorporate VTE risk and care plan in patient hand-off communications among staff
- Develop protocol for VTE prophylaxis to specify updating risk assessment per routine time intervals and specific situations that may prompt reassessment (e.g., post surgery, transfer to ICU)
- Implement daily VTE re-assessment by nurses
- Develop and implement combined form for VTE risk assessment and VTE prophylaxis order set
- Develop standardized VTE prophylaxis order sets
- Engage physicians in development of VTE prophylaxis order sets to gain physician buy-in for their use

- Maintain a par level¹ of VTE risk assessment and VTE prophylaxis order forms in each care area
- Develop an equipment distribution plan for sequential compression stockings and their power packs to minimize delays in treatment
- Maintain a par level of patient education materials in each care area
- Incorporate “teach back” in patient education protocol to determine whether the patient understands what is being taught
- Implement physician grand rounds and provide CMEs for physicians related to VTE prevention
- Use chart review findings to target VTE prophylaxis re-education, as needed
- Present hospital-specific VTE data to physicians and staff to demonstrate the need for improving VTE prevention.

Baseline and Follow-up Self-Assessment Surveys were conducted during the FMEA process to assess the extent to which hospitals had implemented evidence-based practices for effective patient safety particular to the VTE prophylaxis process. The baseline survey was conducted early in the FMEA process prior to any efforts for development of mitigation strategies; the follow-up survey was conducted upon completion of the FMEA process after hospitals had implemented their mitigation strategies. Our survey analysis is organized by the key areas of culture, infrastructure, and practices. Based on a comparison of follow-up to baseline survey results, the Partnership for Patient Care and participating hospitals have successfully strengthened patient safety with regards to VTE prophylaxis in the region. It is anticipated that patient safety will be further strengthened as hospitals continue to work on mitigation strategies and their implementation.

Survey results² can be summarized as follows:

- Significant progress was demonstrated in strengthening patient safety as demonstrated by the 20.0% overall improvement in comparing aggregate follow-up to baseline scores (follow-up score of 78, baseline score of 65).
- Greatest improvement was shown in the key area of **Culture** (36.8% improvement). Highlights of significant improvement in this category include:
 - The hospital has provided education and training about VTE risk factors to caregivers responsible for either risk assessment or patient education within the last year (59.2% improvement).
 - Within the last year, the hospital has provided education and training to caregivers about the specific medications it has approved for VTE prophylaxis (45.1% improvement).
 - Caregivers receive periodic feedback about the effectiveness of the hospital’s VTE prophylaxis process (70.0% improvement).
- A 22.1% improvement was shown in the key area of **Infrastructure**. Highlights of significant improvement in this category include:
 - The caregiver responsible for assessing VTE risk is clearly delineated (26.4% improvement).

¹ Predetermined minimum level to maintain per each care area based on anticipated utilization in that particular care area

² It should be noted that survey results exceeded 100% improvement for some questions, indicating that the follow-up scores for those questions more than doubled in comparison to the baseline scores. Refer to Figures 10-12 for question-specific scores for both the baseline and follow-up surveys.

- The physician ordering VTE prophylaxis is guided by a form that contains prompts (105.7% improvement).
- The hospital systematically tracks adverse events associated with the VTE prophylaxis process (30.2% improvement).
- The hospital has implemented process measures to monitor the effectiveness of its VTE prophylaxis process (43.5% improvement).
- A 16.9% improvement was shown in the key area of **Practices**. Highlights of significant improvement in this category include:
 - The hospital has approved a protocol for VTE prophylaxis for various types of at-risk patients (53.8% improvement).
 - The hospital's VTE prophylaxis protocol is consistent with nationally recognized guidelines (23.9% improvement).
 - The hospital's VTE prevention protocol specifies both the baseline laboratory testing and ongoing laboratory monitoring required for each type of antithrombotic medication (60.4% improvement).
 - The hospital has approved a protocol that specifies the indications for using various mechanical methods of prophylaxis (28.8% improvement).
 - On average, 90-100% of elective surgical patients are assessed for VTE risk during either the pre-operative visit or preadmission testing (24.2% improvement).
 - On average, a VTE risk assessment is completed for 90-100% of patients within 24 hours of hospital admissions (32.6% improvement).
 - The nurse always documents an assessment of the patient's VTE risk in the medical record (31.0% improvement).
 - On average, 90-100% of anticoagulant orders for VTE prophylaxis are reviewed by the pharmacy before the medication is dispensed (18.7% improvement).
 - When the physician decides not to provide VTE prophylaxis, the physician always documents the reasons in the medical record (27.5% improvement).
 - The hospital promotes early and persistent ambulation, as appropriate (18.8% improvement).

The Partnership for Patient Care has effectively provided a solid foundation for hospitals to continue their meaningful work in incorporating evidence-based best practices in strengthening patient safety. Correspondingly, the hospitals' commitment to patient safety greatly contributed to the regional FMEA success. PPC's cohesive approach to regional FMEA has benefited participating hospitals by providing

- An interactive forum for hospitals to share ideas and experiences;
- A collaborative approach for hospitals to work together, rather than individually, thereby maximizing the value derived from proactive risk assessment;
- Provision of research summaries with evidence-based best practices, risk data, national quality initiative summaries, standards and guidelines from regulatory and professional organizations, and resource lists;
- Tools to support the FMEA process; and
- Hands-on technical assistance to facilitate clinical process analysis and to assist hospitals in developing risk reduction (mitigation) strategies and implementing them effectively.

2.0 Introduction

This special report summarizes the approach and results of PPC's regional FMEA on VTE prophylaxis, which was conducted in 2007.

VTE refers to an occlusion within the venous system. It includes deep vein thrombosis (DVT), a blood clot typically of the lower extremities formed in a deep vein that can break free and travel, and pulmonary emboli (PE) defined as a deep vein thrombosis that has traveled to the lung and blocks the pulmonary artery.

According to the National Heart, Lung, and Blood Institute, each year more than 600,000 people in the United States have a PE, and more than 60,000 of them die. According to the American College of Chest Physicians, approximately 10% of hospital deaths are attributed to PE caused by DVT. Massive PE usually occurs without warning. In 70-80% of patients who die of PE, this diagnosis was not even considered prior to death. Most thrombi are confined to the calf or are clinically silent and do not have adverse consequences. However, research has shown that many symptomatic VTE develop from DVT that were initially silent. The risk for VTE continues after hospital discharge; the data suggests a symptomatic VTE case fatality rate at 1 year as high as 34%.³

According to the Pennsylvania Health Care Cost Containment Council (PHC4), in 2005, there were 163 deaths from PE and 40 deaths from DVT, in discharges where a blood clot was listed as the principle diagnosis. The hospitals reported \$146 million in charges for the 5,861 PE cases, averaging 5.6 days of stay and \$112 million for the 7,645 DVT cases, averaging 4.3 days of stay. 2005 statewide data shows that hemorrhagic stroke and hip fracture surgical repair have the highest readmission rate for venous thrombosis/PE among conditions for which data is analyzed. Infectious pneumonia had the greatest number of venous thrombosis/PE readmissions; however, the readmit rate was lower due to the high number of statewide index for hospitalizations for this diagnosis.

In the Agency for Health Research and Quality's (AHRQ's) 2001 report, "Making Healthcare Safer: A Critical Analysis of Patient Safety Practices," it ranked VTE prophylaxis as its highest priority among the 79 patient safety interventions it had assessed. This recommendation was based on evidence that thromboprophylaxis is effective in preventing adverse patient outcomes while decreasing overall costs and is underused. The AHRQ report concluded that PE is the most common preventable cause of hospital death and that appropriate use of thromboprophylaxis is the number one strategy to improve patient safety in hospitals.

The Surgical Care Improvement Project (SCIP) National Quality Measures include the VTE Measure Set that was recently updated to incorporate the 2004 American College of Chest Physicians Guidelines. The rationale for VTE measures includes the following: "Despite the evidence that VTE is one of the most common postoperative complications and prophylaxis is the most effective strategy to reduce

³ Geerts WH, Pineo GF, Heit JA, et al. Prevention of venous thromboembolism: The Seventh AACP Conference on Antithrombotic and Thrombolytic Therapy. *Chest* 2004 Sep; 126 (3 Suppl):338S-400S.

morbidity and mortality, it is often underused.”⁴ Even though there is significant evidence regarding prophylaxis as a means to prevent VTEs, effective implementation can be difficult.

PPC’s regional approach involved a proactive multidisciplinary analysis of the VTE prophylaxis process at participating hospitals to enable more effective implementation of the evidence base and mitigation (risk reduction) strategies for VTE prophylaxis. The specific approach involved designated hospital participants (e.g., quality or patient safety officer and clinical staff) participating in a training seminar on in a training seminar on FMEA methodology followed by series of interactive topic-specific workshops. At the onset of the workshops, participants were provided with a research summary on VTE prophylaxis. In addition, a variety of FMEA tools (e.g., program manual with FMEA guide, FMEA worksheets, mitigation strategies checklist, and protocol development checklist) were provided throughout the FMEA process. Hospital participants worked with their individual hospital FMEA teams in parallel to conduct their own hospital-specific FMEA based on the unique circumstances at their facilities.

All hospital participants had access to a dedicated PPC collaboration website; all Program tools were available on the website. In addition, topic-specific FMEA progress from each workshop was posted to the website, so that individual hospital teams could use the materials and ideas that were generated at the workshop, as applicable. In addition, each hospital FMEA team periodically posted its progress with the FMEA to the collaborative website, as the team completed each FMEA step and the corresponding FMEA worksheet.

Participating hospitals receive all the PPC topic-specific FMEA reports regardless of topic(s) in which they actively participated. Hospitals that did not actively participate in the VTE prophylaxis FMEA can use this report as a foundation for conducting their own FMEA or can simply adapt pertinent mitigation strategies to their own clinical processes.

⁴ Centers for Medicare and Medicaid Services (CMS) and Joint Commission. Specifications Manual for National Hospital Quality Measures, Version 2.2 [online]. 2006 Dec [cited 2007 Jan26]. Available for Internet: <http://www.jointcommission.org/PerformanceMeasurement/PerformanceMeasurement/Current+NHQM+Manual.htm>.

3.0 FMEA Workshop Progress

During each workshop, facilitators worked with hospital participants to conduct one or more of 10 FMEA steps. Each workshop focused on how to conduct the FMEA steps and to maximize the value derived from the FMEA process. The workshops provided hospital participants with an interactive forum for sharing ideas and experiences as well as hands-on assistance to identify and overcome challenges. After each workshop, the hospital participants worked with their individual hospital FMEA teams to apply and modify the FMEA steps covered in the workshops to their hospital's unique circumstances.

The workshops used a simplified, standardized approach to conduct the regional FMEA:

1. Selecting a High-Risk Clinical Process (completed prior to the first workshop)
2. Organizing the FMEA Team (covered in the FMEA Quick Start Checklist prior to the first workshop)
3. Mapping the Clinical Process
4. Identifying Potential Failure Modes
5. Identifying the Effects of Failure Modes
6. Prioritizing Process Breakdowns or Failures
7. Determining Why Failures Occur or Determining Root Causes
8. Developing Mitigation Strategies and Redesigning the Process
9. Implementing and Evaluating the Redesign
10. Monitoring the Effectiveness of the Redesign

Workshop progress with the regional FMEA was based on the collective input of the participants, including both the common elements experienced by hospitals and individual hospital variations. Participants were encouraged to share the workshop progress with their hospitals' FMEA teams, thereby providing a foundation of ideas to spur the progress and maximize the value of each hospital's individual FMEA based on its unique process steps and circumstances.

Hospital FMEA participants had the option of replicating the standardized FMEA workshop approach with their individual FMEA teams, if desired. However, hospitals were also encouraged to modify the workshop approach based on their previous FMEA experience or utilize alternative FMEA methodologies that had proven effective in their previous FMEAs.

The tables in Figure 1, 2, and 3 represent the cumulative regional FMEA progress from the five workshops. Each chart illustrates the collective input of the hospital participants—sometimes reflecting common elements amongst participants; sometimes reflecting the consensus of participants; and sometimes reflecting the variations between hospital participants. This collective input was intended to promote sharing of ideas and experiences and to generate new ideas.

Figure 1. Process Flowchart: This top-down block diagram was created as a result of the first workshop, which focused on mapping the clinical process. The scope of the regional FMEA focused on the venous thromboembolism subprocesses of “venous thromboembolism risk assessment” and

“selection of VTE prophylaxis method(s): Antithrombotic medication and/or mechanical prophylaxis.”
The block diagram lists all process steps under each of these subprocesses.

Figure 2. FMEA Worksheet for High-Priority Failure Modes: The FMEA worksheet was completed incrementally for all clinical process steps and corresponding failure modes as each FMEA step was conducted at the workshops. For each failure mode, the following rating criteria were used:

Severity: How serious are the consequences or effects of this failure on the patient?

Probability of occurrence: How frequently is this failure likely to occur?

Detectability: How easily is the failure recognized or discovered before harm reaches the patients?

The rating scale for each criterion was based on a scale of 1 to 5, as follows:

Severity: 1 (Minor or no effect) to 5 (Severe or terminal outcome)

Probability of Occurrences: 1 (Remote or nonexistent) to 5 (Very high, almost inevitable)

Detectability: 1 (Certain to detect, almost always immediately) to 5 (Almost certain not to detect)

Failure modes were then prioritized for further investigation and action by calculating the Risk Priority Number (RPN)

$$(\text{Severity} \times \text{Probability of Occurrence} \times \text{Detectability})$$

and then using a collectively determined RPN threshold. For this regional FMEA, the RPN threshold for considering a failure mode as high-priority (requiring further action and investigation) was greater than or equal to 60.

Figure 2 shows only the high priority failure modes as determined in the workshops. The other process steps and corresponding lower priority failure modes are not shown. The mitigation strategies are the intended actions to address the causes of the failure modes, thereby reducing the risks associated with the failure mode by eliminating or minimizing the potential for failures, stopping failures before harm reaches the patient, or minimizing the consequences of the failure. Mitigation strategies may be directed at redesigning the clinical process or the underlying system.

Figure 3. Evaluation Measures per Mitigation Strategy: This chart includes the comprehensive list of mitigation strategies and corresponding evaluation measures that were generated during the workshops. Mitigation strategies are categorized as High, Moderate, or Low depending on anticipated risk reduction impact and sustainability of risk reduction and are ranked accordingly. Evaluation measures provide a means to evaluate the success of process redesign by collecting baseline data prior to implementation of the mitigation strategies, and follow-up data after implementation.

Figure 1. Process Flowchart

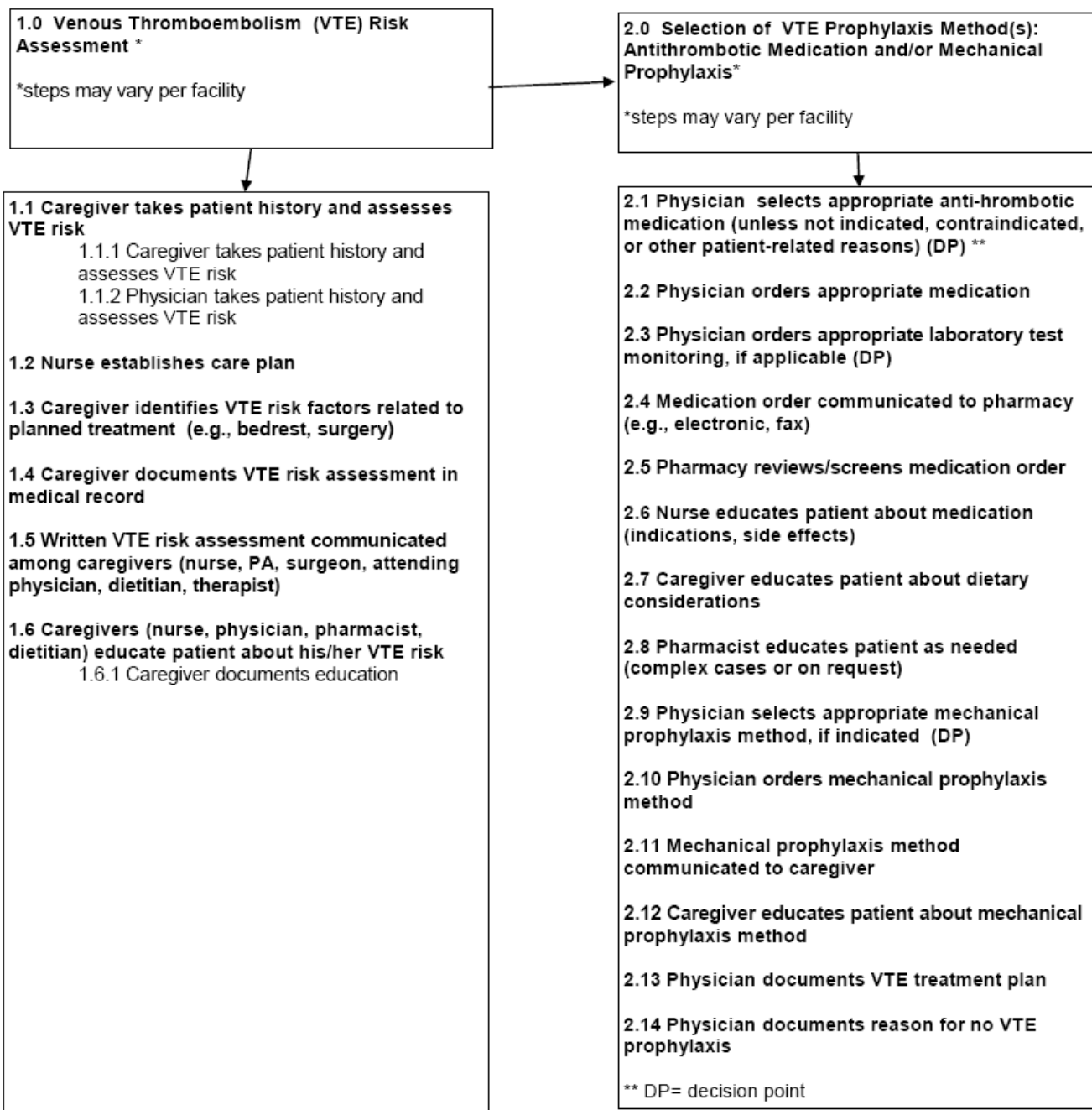


Figure 2. FMEA Worksheet for High-Priority Failure Modes

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet <i>Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5</i> <small>*Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability</small>								
Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.0 VTE Risk Assessment 1.1 Caregiver takes patient history and assesses VTE risk (parallel sub-steps) 1.1.1 Caregiver takes patient history and assesses VTE risk	1.1.1.a Risk assessment inaccurate	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	5	75	No risk assessment tool Tool less than adequate Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Hospital has not identified need for translating particular language Patient's communication barriers not identified or addressed History from patient less than adequate (e.g., poor historian, dementia) Family not available to assist with history	Develop standardized protocol for VTE risk assessment by type of patient Delineate responsibility for completing VTE risk assessment Establish timeframe for completion of VTE risk assessment Incorporate VTE risk assessment completion in change of shift hand-offs Delineate back-up responsibility for VTE risk assessment if caregiver is unavailable (e.g., charge nurse, house officer) Incorporate assessment in order set Incorporate VTE risk assessment in nursing assessment Place flags on chart to alert physician of a VTE assessment need Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Contact primary care physician for medical history

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
								Incorporate “teach back” in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide patient history form in English and other languages Provide voice activated translator device Enlist family for assistance in completion of patient history
1.1.1 Caregiver takes patient history and assesses VTE risk	1.1.1.b Risk assessment not updated	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	4	4	80	No risk assessment tool Tool less than adequate Tool not available No protocol for risk assessment Responsibility for updating not clearly delineated Protocol less than adequate (e.g., timeframe not defined) Staff training/education less than adequate Agency and per diem staff training and education less than adequate Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient’s communication barriers not identified or addressed Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient/family not available	Delineate responsibility for updating VTE risk assessment. Delineate responsibility for back-up for updating VTE assessment if nurse is unavailable (e.g., charge nurse) Develop standardized protocol for VTE risk assessment per type of patient Develop/modify protocol for VTE prophylaxis to specify updating risk assessment per routine time intervals and per specific situation that may prompt reassessment (e.g., post surgery, transfer to ICU, discharge to home) Review charts per designated timeframe to flag need for updating assessment Incorporate assessment in order set Incorporate VTE risk assessment in nursing assessment Place flag on chart to alert physician of a need for updating reassessment Incorporate VTE risk in hand-off communications amongst caregivers Have senior leadership send a clear message that VTE prevention is an organizational goal

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
								Emphasize importance of VTE prevention in staff education Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Contact primary care physician for medical history Incorporate “teach back” in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide patient history form in English and other languages Provide voice activated translator device Enlist family for assistance in completion of patient history
1.1.1 Caregiver takes patient history and assesses VTE risk	1.1.1.c Delay in risk assessment	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	No risk assessment tool/Tool less than adequate Tool not available No protocol for risk assessment Protocol less than adequate (e.g., timeframe not defined) Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities)	Develop standardized protocol for VTE risk assessment by type of patient Delineate responsibility for completing VTE risk assessment Establish timeframe for completion of VTE risk assessment Incorporate VTE risk assessment completion in change of shift hand-offs Delineate back-up responsibility for VTE risk assessment if caregiver is unavailable (e.g., charge nurse, house officer) Incorporate assessment in order set Incorporate VTE risk assessment in nursing assessment

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
							Hand-off communication between staff less than adequate Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient not available Family not available to assist with history	Place flags on chart to alert physician of a VTE assessment need Incorporate VTE risk in hand-off communications amongst caregivers Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Contact primary care physician for medical history Incorporate "teach back" in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide patient history form in English and other languages Provide voice activated translator device Enlist family for assistance in completion of patient history
1.1.1 Caregiver takes patient history and assesses VTE risk	1.1.1.d Risk assessment not done	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	4	5	100	No risk assessment tool Tool less than adequate Tool not available No protocol for risk assessment Protocol less than adequate (e.g., timeframe not defined)	Develop standardized protocol for VTE risk assessment by type of patient Delineate responsibility for completing VTE risk assessment Establish timeframe for completion of VTE risk assessment Incorporate VTE risk assessment completion in

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
							Responsibility for risk assessment not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Lack of managerial oversight Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient/family not available	change of shift hand-offs Delineate back-up responsibility for VTE risk assessment if caregiver is unavailable (e.g., charge nurse, house officer) Incorporate assessment in order set Incorporate VTE risk assessment in nursing assessment Place flags on chart to alert physician of a VTE assessment need Incorporate VTE risk in hand-off communications amongst caregivers Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Contact primary care physician for medical history Incorporate "teach back" in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement interpreter certification program for staff Provide patient history form in English and other languages Provide voice activated translator device Enlist family for assistance in completion of patient history
1.2 Nurse establishes care plan	1.2.b Care plan inaccurate	Other assessments can't be completed; miscommunication among caregivers; lack	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and	Delineate roles and responsibility for multidisciplinary care plan Establish timeframe for updating care plan

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
		of patient education; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*					education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities)	Incorporate care plan in hand-offs communications between caregivers Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters)
1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)	1.3.b Incomplete risk factors	Other assessments may be inaccurate; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	No risk assessment tool Tool less than adequate Staff training and education less than adequate Agency and per diem staff training and education less than adequate Translator not available Patient's communication barriers not identified Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient Family not available to assist with history	Develop standardized protocol for VTE risk assessment by type of patient Delineate responsibility for completing VTE risk assessment Establish timeframe for completion of VTE risk assessment Incorporate VTE risk assessment completion in change of shift hand-offs Delineate back-up responsibility for VTE risk assessment if caregiver is unavailable (e.g., charge nurse, house officer) Incorporate assessment in physician order set Incorporate VTE risk assessment in nursing assessment Incorporate VTE risk in hand-off communications Place flags on chart to alert physician of a VTE assessment need Place flag on chart to alert physician of a need for updating reassessment Have senior leadership send a clear message that VTE prevention is an organizational goal

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
								Emphasize importance of VTE prevention in staff education Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Contact primary care physician for medical history Incorporate “teach back” in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide patient history form in English and other languages Provide voice activated translator device Enlist family for assistance in completion of patient history
1.4 Caregiver documents VTE risk assessment in medical record	1.4.c Delayed documentation	Other assessments can't be completed or may be inaccurate; lack of communication among caregivers; wrong/no treatment; delay in treatment; development of PE/DVT; complications of treatment; unnecessary rework; downstream negative effects*	5	4	4	80	Protocol less than adequate No protocol Responsibility for documentation not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Ease of documentation less than adequate Current documentation form does not incorporate DVT risk	Delineate responsibility for documenting VTE risk assessment in medical record Delineate backup responsibility (e.g., charge nurse, house officer) for documenting risk assessment in medical record. Incorporate VTE risk assessment documentation requirements (including standardized location in the treatment plan) in VTE risk assessment protocol Place flags on chart to alert physician of a VTE assessment need Incorporate VTE assessment in physician order set Develop standardized VTE order sets Incorporate VTE risk assessment in nursing assessment.

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
							Nurse/caregiver not available (e.g., competing priorities) Physician order less than adequate/incomplete Interdependency with other processes	Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters)
1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk	1.6.a Education not done	Therapy failure; patient unable to comply; missed patient education opportunity; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission, ADEs/medication errors; downstream negative effects*	5	4	4	80	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational tools less than adequate No educational tools Patient not available	Delineate roles and responsibility for educating patient on VTE risk. Delineate backup responsibility for education patient on VTE risk. Implement closed circuit/closed captioning programming on VTE risk/prevention for patients/family Develop educational brochure on VTE risk/prevention. Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Document VTE education completion in medical chart Incorporate "teach back" in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide educational brochure in English and other languages Provide voice activated translator device

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk	1.6.c Education inadequate	Therapy failure; patient unable to comply/confused; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission, ADEs/medication errors; unnecessary rework; downstream negative effects*	5	3	4	60	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational tools less than adequate No educational tools Patient not available	Delineate roles and responsibility for educating patient on VTE risk. Delineate backup responsibility for education patient on VTE risk. Implement closed circuit/closed captioning programming on VTE risk/prevention for patients/family Develop educational brochure on VTE risk/prevention. Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Incorporate "teach back" in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide educational brochure in English and other languages Provide voice activated translator device
1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk	1.6.e Delay in education	Therapy failure; patient unable to comply; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission,	5	4	4	80	Responsibility not clearly delineated Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language	Delineate roles and responsibility for educating patient on VTE risk. Delineate backup responsibility for education patient on VTE risk. Emphasize the importance of VTE prevention in staff education Implement closed circuit/closed captioning programming on VTE risk/prevention for patients/family

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
		ADEs/medication errors; unnecessary rework; downstream negative effects*					Educational tools not available Equipment not available Patient not available Patient not cooperative	Develop educational brochure on VTE risk/prevention. Document VTE education completion in medical chart Incorporate “teach back” in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Provide educational brochure in English and other languages Provide voice activated translator device
2.6 Nurse educates patient about medication (indications, side effects)	2.6.a Education not done	Missed patient education opportunity; patient unable to comply with instructions; improper follow up care; incorrect/inappropriate treatment; no treatment; therapy failure; development of PE/DVT; complications of treatment; readmission; ADEs/medication errors; downstream negative effects*	5	3	4	60	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Communication hand-off less than adequate Translator not available Patient’s communication barriers not identified or addressed Hospital has not identified need for translating particular language Education material not available Equipment not available Patient not available	Delineate responsibility for educating patient on medications Delineate backup responsibility for educating patient on medications Document completion of medications education in medical chart Incorporate completion of medications education in hand-off communications Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Document VTE education completion in medical chart Provide patient with printed sheets medication education sheets Request pharmacy consult for patient education, as needed

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
								Incorporate “teach back” in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Develop educational brochure on VTE risk/prevention Provide educational brochure in English and other languages Provide voice activated translator device
2.6 Nurse educates patient about medication (indications, side effects)	2.6.b Education delayed	Patient unable to comply with instructions; improper follow up care; incorrect/ inappropriate treatment; no treatment; therapy failure; development of PE/DVT; complications of treatment; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	4	4	80	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Communication hand-off less than adequate Translator not available Patient’s communication barriers not identified Hospital has not identified need for translating particular language Education material not available Equipment not available Patient not available	Delineate responsibility for educating patient on medications Delineate backup responsibility for educating patient on medications Document completion of medications education in medical chart Incorporate completion of medications education in hand-off communications Have senior leadership send a clear message that VTE prevention is an organizational goal Emphasize importance of VTE prevention in staff education Incorporate VTE prevention in orientation and reinforce in annual competencies Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters) Document VTE education completion in medical chart Provide patient with printed sheets medication education sheets Request pharmacy consult for patient education, as needed Incorporate “teach back” in patient education protocol to determine whether the patient understands

Venous Thromboembolism (VTE) Prophylaxis FMEA Worksheet

Threshold for High-priority Failure Modes: RPN ≥ 60; Criteria Rating: 1-5

**Downstream negative effects: increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Potential Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
								Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Develop educational brochure on VTE risk/prevention Provide educational brochure in English and other languages Provide voice activated translator device
2.7 Caregiver educates patient about dietary considerations	2.7.b Education delayed	Patient unable to comply with instructions; therapy failure; development of PE/DVT; complications of treatment; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	3	4	60	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational materials not available Patient not available	Document VTE education completion in medical chart Provide patient with printed medication education sheets including dietary considerations Request dietary consult for patient education, as needed Incorporate "teach back" in patient education protocol to determine whether the patient understands Incorporate communication limitations in patient profile Implement language line Implement interpreter certification program for staff Develop educational brochure on VTE risk/prevention Provide educational brochure in English and other languages Provide voice activated translator device

Figure 3. Evaluation Measures per Mitigation Strategy Worksheet

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
Contact primary care physician for medical history	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p>	<p>Periodic evaluations of admissions for completion of VTE risk assessment</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24 hours of admission</p> <p>VTE risk assessment completed/documented within 24 hours of ICU admission</p> <p>VTE risk assessment completed/documented preoperatively for elective surgery</p>
Incorporate VT risk assessment in physician order set	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.a Risk factors not identified</i></p> <p><i>1.3.b Incomplete risk factors</i></p> <p><i>1.3.c Inaccurate risk factors</i></p> <p>1.4 Caregiver documents VTE risk assessment in medical record</p> <p><i>1.4.c Delayed documentation</i></p>	<p>Audit physician assessment/admissions sheet</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24 hours of admission</p> <p>VTE risk assessment completed/documented within 24 hours of ICU admission</p> <p>VTE risk assessment completed/documented preoperatively for elective surgery</p>
Develop standardized VTE order sets	Moderate	<p>1.4 Caregiver documents VTE risk assessment in medical record</p> <p><i>1.4.c Delayed documentation</i></p>	<p>Periodic evaluations of admissions for completion of VTE risk assessment</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24 hours of admission</p> <p>VTE risk assessment completed/documented within 24 hours of ICU admission</p> <p>VTE risk assessment completed/documented preoperatively for elective surgery</p>
Place flags on chart to alert physician of a VTE assessment need	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p>	<p>Audit physician assessment/admissions sheet</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24</p>

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
		<p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b <i>Incomplete risk factors</i></p> <p>1.4 Caregiver documents VTE risk assessment in medical record 1.4.c <i>Delayed documentation</i></p>	<p>hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery</p>
Develop standardized protocol for VTE risk assessment by type of patient	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.a <i>Risk assessment inaccurate</i> 1.1.1.b <i>Risk assessment not updated</i> 1.1.1.c <i>Delay in risk assessment</i> 1.1.1.d <i>Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b <i>Incomplete risk factors</i></p>	<p>Periodic evaluations of admissions for completion of VTE risk assessment Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery</p>
Establish timeframe for completion of VTE risk assessment	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.a <i>Risk assessment inaccurate</i> 1.1.1.c <i>Delay in risk assessment</i> 1.1.1.d <i>Risk assessment not done;</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b <i>Incomplete risk factors</i></p>	<p>Periodic evaluations of admissions for completion of VTE risk assessment Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery</p>
Delineate responsibility for completing VTE risk assessment	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.a <i>Risk assessment inaccurate</i> 1.1.1.c <i>Delay in risk assessment</i> 1.1.1.d <i>Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b <i>Incomplete risk factors</i></p>	<p>Nurse report cards Periodic evaluations of admissions for completion of VTE risk assessment Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery</p>

Mitigation Strategy	Risk Reduction Impact	Process Step Failure Mode	Evaluation Measures
Delineate back-up responsibility for VTE assessment if caregiver is unavailable (e.g., charge nurse, house officer)	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk <i>1.1.1.a Risk assessment inaccurate</i> <i>1.1.1.c Delay in risk assessment</i> <i>1.1.1.d Risk assessment not done</i> 1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) <i>1.3.b Incomplete risk factors</i>	Periodic evaluations of admissions for completion of VTE risk assessment Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery
Delineate responsibility for documenting VTE risk assessment in medical record	Moderate	1.4 Caregiver documents VTE risk assessment in medical record <i>1.4.c Delayed documentation</i>	Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery
Delineate backup responsibility (e.g., charge nurse, house officer) for documenting risk assessment in medical record	Moderate	1.4 Caregiver documents VTE risk assessment in medical record <i>1.4.c Delayed documentation</i>	Periodic evaluations of admissions for completion of VTE risk assessment Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery
Incorporate VTE risk assessment documentation requirements (including standardized location in the treatment plan) in the VTE risk assessment protocol	Moderate	1.4 Caregiver documents VTE risk assessment in medical record <i>1.4.c Delayed documentation</i>	Periodic evaluations of admissions for completion of VTE risk assessment Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery

Mitigation Strategy	Risk Reduction Impact	Process Step Failure Mode	Evaluation Measures
Incorporate VTE risk assessment in nursing assessment	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk <i>1.1.1.a Risk assessment inaccurate</i> <i>1.1.1.b Risk assessment not updated</i> <i>1.1.1.c Delay in risk assessment</i> <i>1.1.1.d Risk assessment not done</i> 1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) <i>1.3.b Incomplete risk factors</i> 1.4 Caregiver documents VTE risk assessment in medical record <i>1.4.c Delayed documentation</i>	Nurse report cards Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery
Incorporate VTE risk assessment completion in change of shift hand-offs	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk <i>1.1.1.a Risk assessment inaccurate</i> <i>1.1.1.c Delay in risk assessment</i> <i>1.1.1.d Risk assessment not done</i> 1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) <i>1.3.b Incomplete risk factors</i>	Staff survey VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of admission VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented preoperatively for elective surgery
Incorporate VTE risk in hand-off communications amongst caregivers	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk <i>1.1.1.b Risk assessment not updated</i> <i>1.1.1.c Delay in risk assessment</i> <i>1.1.1.d Risk assessment not done</i> 1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) <i>1.3.b Incomplete risk factors</i>	Staff survey VTE preventable occurrences
Develop/modify protocol for VTE prophylaxis to specify updating risk assessment per routine time intervals and per specific situation that may prompt reassessment (e.g., post surgery, transfer to ICU, discharge to home)	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk <i>1.1.1.b Risk assessment not updated</i>	Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented per specific situation that may prompt reassessment
Establish timeframe for updating care plan	Moderate	1.2 Nurse establishes care plan <i>1.2.b Care plan inaccurate</i>	Nurse report cards Routine chart review VTE preventable occurrences VTE risk assessment completed/documented per specific situation that may prompt reassessment

Mitigation Strategy	Risk Reduction Impact	Process Step Failure Mode	Evaluation Measures
Delineate responsibility for updating VTE risk assessment	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.b Risk assessment not updated	Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented per specific situation that may prompt reassessment
Delineate back up responsibility for updating VTE assessment if nurse is unavailable (e.g., charge nurse)	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.b Risk assessment not updated	VTE preventable occurrences
Review charts per designated timeframe to flag need for updating assessment	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.b Risk assessment not updated	Routine chart review VTE preventable occurrences VTE risk assessment completed/documented per specific situation that may prompt reassessment
Place flag on chart to alert physician of a need for updating reassessment	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.b Risk assessment not updated 1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b Incomplete risk factors	Routine chart review VTE preventable occurrences VTE risk assessment completed/documented within 24 hours of ICU admission VTE risk assessment completed/documented per specific situation that may prompt reassessment
Delineate roles and responsibility for educating patient on VTE risk	Moderate	1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk 1.6.a Education not done 1.6.c Education inadequate 1.6.e Delay in education	Nurse report cards Patient interviews Patient survey Routine chart review VTE preventable occurrences
Delineate responsibility for educating patient on dietary considerations	Moderate	2.7 Caregiver educates patient about dietary considerations 2.7.b Education delayed	Patient interviews Patient survey Staff survey VTE preventable occurrences
Delineate backup responsibility for educating patient on dietary considerations	Moderate	2.7 Caregiver educates patient about dietary considerations 2.7.b Education delayed	Patient interviews Patient survey Staff survey VTE preventable occurrences
Request dietary consult for patient education, as needed	Moderate	2.7 Caregiver educates patient about dietary considerations 2.7.b Education delayed	Patient interviews Patient survey Routine chart review VTE preventable occurrences

Mitigation Strategy	Risk Reduction Impact	Process Step Failure Mode	Evaluation Measures
Incorporate completion of dietary education in hand-off communications	Moderate	2.7 Caregiver educates patient about dietary considerations <i>2.7.b Education delayed</i>	Staff survey VTE preventable occurrences
Request pharmacy consult for patient education, as needed	Moderate	2.6 Nurse educates patient about medication (indications, side effects) <i>2.6.a Education not done</i> <i>2.6.b Education delayed</i>	Patient interviews Patient survey Routine chart review VTE preventable occurrences
Delineate backup responsibility for educating patient on medications	Moderate	2.6 Nurse educates patient about medication (indications, side effects) <i>2.6.a Education not done</i> <i>2.6.b Education delayed</i>	Nurse report cards Patient interviews Patient survey Routine chart review VTE preventable occurrences
Incorporate completion of medications education in hand-off communications	Moderate	2.6 Nurse educates patient about medication (indications, side effects) <i>2.6.a Education not done</i> <i>2.6.b Education delayed</i>	Staff survey VTE preventable occurrences
Delineate roles and responsibility for multidisciplinary care plan	Moderate	1.2 Nurse establishes care plan <i>1.2.b Care plan inaccurate</i>	Routine chart review Staff survey VTE preventable occurrences
Incorporate care plan in hand-offs communications between caregivers	Moderate	1.2 Nurse establishes care plan <i>1.2.b Care plan inaccurate</i>	Staff survey VTE preventable occurrences
Implement language line	Moderate	1.1.1 Caregiver takes patient history and assesses VTE risk <i>1.1.1.a Risk assessment inaccurate</i> <i>1.1.1.b Risk assessment not updated</i> <i>1.1.1.c Delay in risk assessment</i> <i>1.1.1.d Risk assessment not done</i> 1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) <i>1.3.b Incomplete risk factors</i> 1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk <i>1.6.a Education not done</i> <i>1.6.c Education inadequate</i> <i>1.6.e Delay in education</i> 2.6 Nurse educates patient about medication (indications, side effects) <i>2.6.a Education not done</i> <i>2.6.b Education delayed</i> 2.7 Caregiver educates patient about dietary considerations <i>2.7.b Education delayed</i>	Patient interviews Patient survey VTE preventable occurrences

Mitigation Strategy	Risk Reduction Impact	Process Step Failure Mode	Evaluation Measures
Provide voice activated translator device	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	<p>Patient interviews</p> <p>Patient survey</p> <p>Periodic evaluations of admissions for completion of VTE risk assessment</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24 hours of admission</p>
Enlist family for assistance in completion of patient history	Moderate	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done;</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p>	<p>Periodic evaluations of admissions for completion of VTE risk assessment</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24 hours of admission</p> <p>VTE risk assessment completed/documented within 24 hours of ICU admission</p> <p>VTE risk assessment completed/documented preoperatively for elective surgery</p>
Provide patient history form in English and other languages	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p>	<p>Periodic evaluations of admissions for completion of VTE risk assessment</p> <p>Routine chart review</p> <p>VTE preventable occurrences</p> <p>VTE risk assessment completed/documented within 24 hours of admission</p> <p>VTE risk assessment completed/documented within 24 hours of ICU admission</p> <p>VTE risk assessment completed/documented preoperatively for elective surgery</p>

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
Incorporate communication limitations in patient profile	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Routine chart review VTE preventable occurrences
Implement closed circuit/closed captioning programming on VTE risk/prevention for patients/family	Low	<p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p>	Patient interviews Patient survey Staff survey VTE preventable occurrences
Develop educational brochure on VTE risk/prevention	Low	<p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Patient interviews Patient survey VTE preventable occurrences

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
Provide educational brochure in English and other languages	Low	<p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Patient interviews Patient survey VTE preventable occurrences
Emphasize importance of VTE prevention in staff education	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.2 Nurse establishes care plan</p> <p><i>1.2.b Care plan inaccurate</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.4 Caregiver documents VTE risk assessment in medical record</p> <p><i>1.4.c Delayed documentation</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Completion of staff education on VTE prevention Staff survey VTE preventable occurrences
Provide patient with printed medication education sheets including dietary considerations	Low	<p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Patient interviews Patient survey VTE preventable occurrences

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
Document VTE education completion in medical chart	Low	<p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Routine chart review VTE preventable occurrences
Incorporate “teach back” in patient education protocol to determine whether the patient understands	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Patient interviews Patient survey VTE preventable occurrences
Implement interpreter certification program for staff	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p><i>1.6.e Delay in education</i></p>	VTE preventable occurrences

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
		<p>2.6 Nurse educates patient about medication (indications, side effects) 2.6.a <i>Education not done</i> 2.6.b <i>Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations 2.7.b <i>Education delayed</i></p>	
<p>Designate unit-based nurse educator or nurse champion to educate nurses on critical thinking related to VTE prevention</p>	<p>Low</p>	<p>1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.a <i>Risk assessment inaccurate</i> 1.1.1.b <i>Risk assessment not updated</i> 1.1.1.c <i>Delay in risk assessment</i> 1.1.1.d <i>Risk assessment not done</i></p> <p>1.2 Nurse establishes care plan 1.2.b <i>Care plan inaccurate</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b <i>Incomplete risk factors</i></p>	<p>Staff survey VTE preventable occurrences</p>
<p>Incorporate VTE prevention in orientation and reinforce in annual competencies</p>	<p>Low</p>	<p>1.1.1 Caregiver takes patient history and assesses VTE risk 1.1.1.a <i>Risk assessment inaccurate</i> 1.1.1.b <i>Risk assessment not updated</i> 1.1.1.c <i>Delay in risk assessment</i> 1.1.1.d <i>Risk assessment not done</i></p> <p>1.2 Nurse establishes care plan 1.2.b <i>Care plan inaccurate</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery) 1.3.b <i>Incomplete risk</i></p> <p>1.4 Caregiver documents VTE risk assessment in medical record 1.4.c <i>Delayed documentation</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk 1.6.a <i>Education not done</i> 1.6.c <i>Education inadequate</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects) 2.6.a <i>Education not done</i> 2.6.b <i>Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations 2.7.b <i>Education delayed</i></p>	<p>Completion of staff education on VTE prevention VTE preventable occurrences</p>

Mitigation Strategy	Risk Reduction Impact	Process Step <i>Failure Mode</i>	Evaluation Measures
Implement an awareness campaign to reinforce VTE prevention (e.g., email, posters)	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.2 Nurse establishes care plan</p> <p><i>1.2.b Care plan inaccurate</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.4 Caregiver documents VTE risk assessment in medical record</p> <p><i>1.4.c Delayed documentation</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	Nurse report cards Staff survey VTE preventable occurrences
Have senior leadership send a clear message that VTE prevention is an organizational goal	Low	<p>1.1.1 Caregiver takes patient history and assesses VTE risk</p> <p><i>1.1.1.a Risk assessment inaccurate</i></p> <p><i>1.1.1.b Risk assessment not updated</i></p> <p><i>1.1.1.c Delay in risk assessment</i></p> <p><i>1.1.1.d Risk assessment not done</i></p> <p>1.2 Nurse establishes care plan</p> <p><i>1.2.b Care plan inaccurate</i></p> <p>1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)</p> <p><i>1.3.b Incomplete risk factors</i></p> <p>1.4 Caregiver documents VTE risk assessment in medical record</p> <p><i>1.4.c Delayed documentation</i></p> <p>1.6 Caregivers (nurse, physician, pharmacist, dietitian) educate patient about his/her VTE risk</p> <p><i>1.6.a Education not done</i></p> <p><i>1.6.c Education inadequate</i></p> <p>2.6 Nurse educates patient about medication (indications, side effects)</p> <p><i>2.6.a Education not done</i></p> <p><i>2.6.b Education delayed</i></p> <p>2.7 Caregiver educates patient about dietary considerations</p> <p><i>2.7.b Education delayed</i></p>	VTE preventable occurrences

4.0 FMEA Examples from Hospitals

Hospital participants worked with their own hospitals' multidisciplinary FMEA teams to conduct a hospital-specific FMEA in parallel to the progress of PPC's regional workshops. Hospital FMEA teams could utilize the FMEA methodology and tools provided during the workshop, but they were also encouraged to modify the regional methodology or to use alternative FMEA methodologies and tools, based on their hospitals' previous FMEA experience and what had proven to be effective. This section provides a few examples of the individual hospitals' FMEAs.

4.1 Hospital A

Hospital A conducted its FMEA on VTE prophylaxis including the following sub-processes:

- VTE risk assessment
- Selection of VTE prophylaxis
- Implementation of VTE prophylaxis

Within each of these sub-processes, individual steps were identified. Figure 4 shows the progress of Hospital A's FMEA including the following:

- Identification of potential failure modes and effects
- Determining criteria ratings for Severity, Probability of Occurrence, and Detectability
- Prioritizing failure modes with an RPN threshold greater than or equal to 6
- Determining possible causes
- Mitigation strategies (recommended redesign)

Figure 4. Hospital A FMEA Worksheet for High Priority Failure Modes

Venous Thromboembolism (VTE) Prophylaxis Hospital A FMEA Worksheet for High-Priority Failure Modes <i>Threshold for High-Priority Failure Modes: RPN ≥ 6; Criteria Rating Scale: 1-5</i>								
<i>*Downstream negative effects: increased costs, increased length of stay/staff morale/physician satisfaction/patient satisfaction negatively impacted and potential liability and/or lack of compliance.</i>								
Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
Scheduler provides pre-printed surgical orders for MD signature	Not provided to physician	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	3	3	1	9	Forms not available in physician offices Forms not sent by hospital to office in timely manner	Educate office staff on how to order forms for stocking in physician offices Office staff to order forms for stocking in offices instead of Hospital sending stock periodically
Physician takes patient history and assesses VTE risk (parallel sub-steps)	Risk assessment not completed; Risk assessment inaccurate	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	2	4	40	No risk assessment tool Physician not available Assessment forms not available	Add recommended prophylaxis to each surgical pre-printed order set
Signs order forms for VTE prophylaxis and sends to hospital preadmission testing	Forms not sent; VTE not ordered	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	2	4	40	Office staff ran out of forms VTE prophylaxis not placed on physician order sets	Office staff to assign key staff member to maintain stock of order forms Add recommended prophylaxis to each surgical pre-printed order set
Hospital receives order forms	Forms not received in preadmission testing	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	3	3	1	9	Staff in office misplaced orders/forms Staff failed to send forms to hospital	Each morning preadmission staff reviews next day case load for needed forms, lab work and other studies and then contacts physician office if forms are missing
Patient arrives for preadmission testing	Patient doesn't show	Surgery delayed; not performed; complication of treatment; downstream negative effects*	2	3	1	6	Patient misunderstood date Case was canceled by office staff	All received paperwork is compared with the patient list the afternoon before preadmission testing Patients who do not call the day before to obtain time of testing are called by preadmission staff

Venous Thromboembolism (VTE) Prophylaxis
Hospital A FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN ≥ 6; Criteria Rating Scale: 1-5

**Downstream negative effects: increased costs, increased length of stay/staff morale/physician satisfaction/patient satisfaction negatively impacted and potential liability and/or lack of compliance.*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
Preadmission nurse identifies correct paperwork, physician order forms for patient	Incorrect paperwork and orders selected	Lack of treatment; wrong assessment; wrong tests; miscommunication among caregivers; Delay in treatment.	4	3	3	36	Office staff are unsure of paperwork needed	Conduct thorough education program for related physician office staff and preadmission testing staff
Preadmission nurse performs education and documents on education record	Education not performed or incomplete; Education not documented	Lack of patient education; miscommunication among caregivers.	2	3	3	18	Step-by-step process for processing patients through preadmission testing is not in place	Develop process for each preadmission step Assign education to nursing staff Develop hand-off communication process from Surgical PA exam completion to nurse who will then take patient to perform pre-op education step
Patient admitted to ambulatory care unit on day of surgery	Patient does not show for surgery	Miscommunication among caregivers; delay in treatment; lack of treatment.	3	2	1	6	Patient misunderstood date Case was canceled by office staff	Ambulatory Care staff reviews next day case load each morning for needed forms, lab work, other studies-contacts physician office if missing
VTE pre-printed (Pre-op) orders reviewed by nurse	Interprets order incorrectly; Does not follow order	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; unnecessary rework; complications of treatment; downstream negative effects*	4	3	4	48	Staff not educated on pre-printed orders Pre-printed orders ambiguous Orders not screened by nursing staff prior to implementation of order set	Complete sign-off of pre-printed orders by preadmission testing and ambulatory care nurses to ensure orders are understandable prior to printing Educate nursing staff on order set and include as part of new staff orientation to preadmission testing and ambulatory care
Pre-op VTE order for mechanical prophylaxis implemented in ACC	Order not implemented	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; unnecessary rework; complications of treatment; downstream negative effects*	4	3	3	36	VTE prophylaxis orders not routinely signed off by staff who implement order Staff workload excessive	Have staff sign off on each pre-op order to ensure completion prior to patient going to OR Clinical Leader to review next day case load to ensure adequate staffing

Venous Thromboembolism (VTE) Prophylaxis
Hospital A FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN ≥ 6; Criteria Rating Scale: 1-5

**Downstream negative effects: increased costs, increased length of stay/staff morale/physician satisfaction/patient satisfaction negatively impacted and potential liability and/or lack of compliance.*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
Patient transported to OR with VTE measures in place	VTE measures discontinued during transport to OR	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; unnecessary rework; complications of treatment; downstream negative effects*	4	4	1	16	Staff removes intermittent pressure stockings Staff not educated on importance of VTE prophylaxis	Educate staff on importance of VTE prophylaxis and leaving compression stockings on patient Have staff routinely check patient just prior to transport to ensure and advise staff of need to keep them in place
VTE measures continued during surgery in OR Suite	VTE measures discontinued in OR suite	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; unnecessary rework; complications of treatment; downstream negative effects*	4	4	1	16	Staff removes intermittent pressure stockings Staff not educated on importance of VTE prophylaxis	Educate staff on importance of VTE prophylaxis and leaving compression stockings on patient Have staff routinely check patient just prior to placing in OR suite to ensure and advise staff of need to keep them in place
VTE measures continued in PACU	VTE measures not continued in PACU	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	4	4	1	16	Staff removes intermittent pressure stockings Staff not educated on importance of VTE prophylaxis	Educate staff on importance of VTE prophylaxis and leaving compression stockings on patient Hand-off communication by OR staff to PACU staff always includes need for established VTE prophylaxis measures
Patient transported to nursing unit	VTE measures discontinued; Equipment not available	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	4	4	1	16	Staff removes intermittent pressure stockings Staff not educated on VTE prophylaxis PACU staff do not transport compression power-pack with patient Ordering of power pack takes several hours to receive from central supply	Educate staff on importance of VTE prophylaxis and leaving compression stockings on patient Transport power pack with patient and leave with patient to ensure immediate application process once patient is on nursing unit Ensure adequate number of power packs to have on hand

4.2 Hospital B

Hospital B conducted its FMEA on VTE prophylaxis including the following sub-processes:

- VTE risk assessment
- Selection of VTE prophylaxis

Within each of these sub-processes, individual steps were identified. Figure 5 shows the top-down block diagram of the Hospital B's process for DVT prevention. Figure 6 shows the progress of Hospital B's FMEA including the following:

- Identification of potential failure modes and effects
- Determining criteria ratings for Severity, Probability of Occurrence, and Detectability
- Prioritizing failure modes with an RPN threshold greater than or equal to 30
- Determining possible causes
- Mitigation strategies (recommended redesign)

Figure 5. Hospital B Process Flowchart

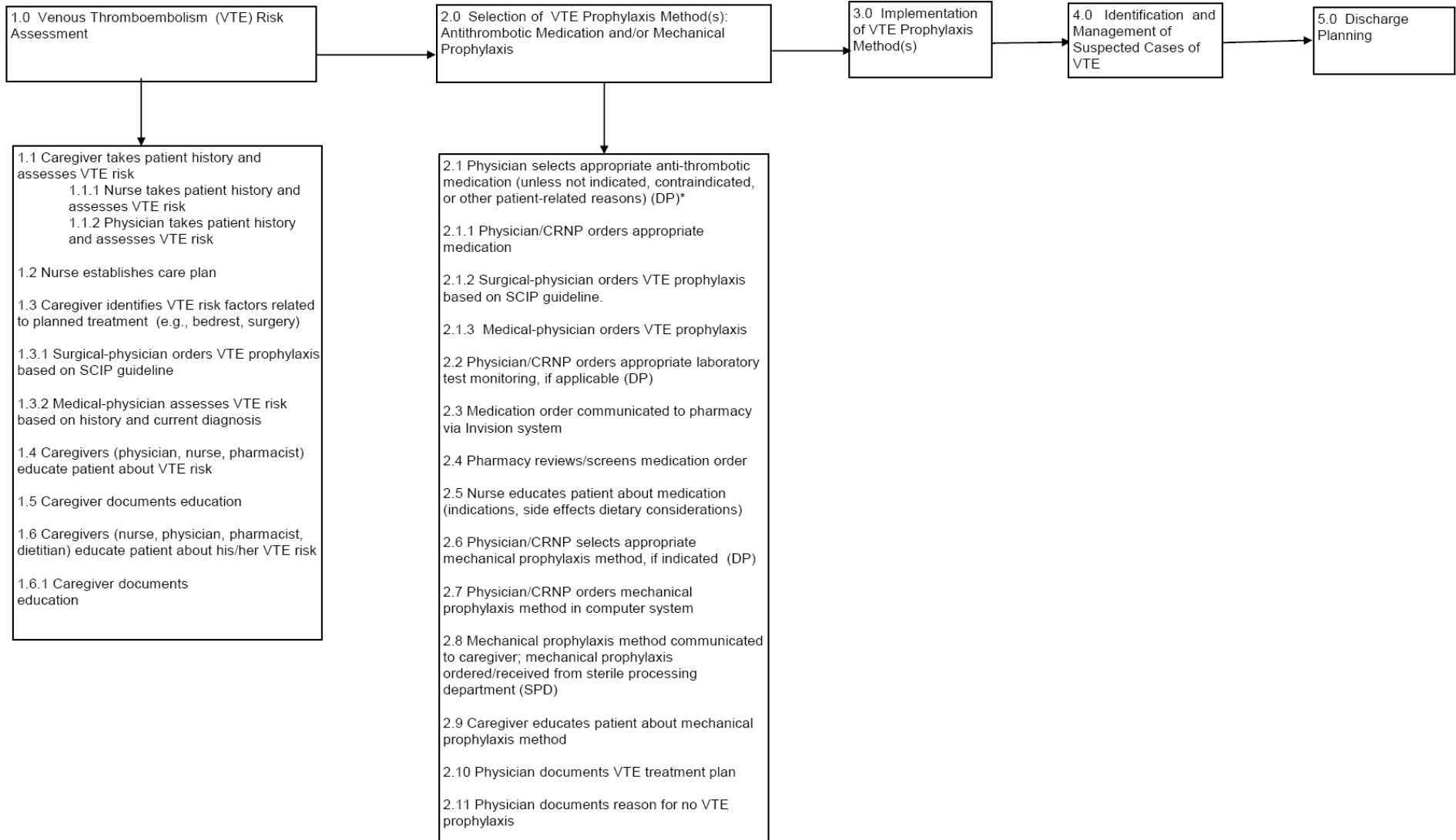


Figure 6. Hospital B FMEA Worksheet for High Priority Failure Modes

Venous Thromboembolism (VTE) Prophylaxis Hospital B FMEA Worksheet for High-Priority Failure Modes <i>Threshold for High-Priority Failure Modes: RPN ≥30; Criteria Rating Scale: 1-5</i>								
<i>*Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability</i>								
Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.0 VTE Risk Assessment 1.1 Caregiver takes patient history and assesses VTE risk (parallel sub-steps) 1.1.1 Nurse takes patient history and assesses VTE risk	1.1.1.a Risk assessment inaccurate	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	5	75	No risk assessment tool Tool less than adequate Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Hospital has not identified need for translating particular language Patient's communication barriers not identified or addressed History from patient less than adequate (e.g., poor historian, dementia) Family not available to assist with history	Implement risk assessment tool Incorporate assessment in order set Delineate/assign responsibility to assess VTE risk Incorporate VTE assessment into hand-off communication Identify a specific time frame for completion of initial assessment for VTE risk
1.1.1 Nurse takes patient history and assesses VTE risk	1.1.1.b Risk assessment not updated	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	4	4	80	No risk assessment tool Tool less than adequate Tool not available No protocol for risk assessment Responsibility for updating not clearly delineated Protocol less than adequate (e.g., timeframe not defined) Staff training and education less than adequate Agency and per diem staff training and education less than adequate Hand-off communication between staff less than adequate	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Re-educate staff on use of language line

Venous Thromboembolism (VTE) Prophylaxis
Hospital B FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN ≥30; Criteria Rating Scale: 1-5

**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
							Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient not available Family not available	
1.1.1 Nurse takes patient history and assesses VTE risk	1.1.1.c Delay in risk assessment	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	No risk assessment tool/Tool less than adequate Tool not available No protocol for risk assessment Protocol less than adequate (e.g., timeframe not defined) Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Hand-off communication between staff less than adequate Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient not available Family not available to assist with history	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Re-educate staff on use of language line

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Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.1.1 Nurse takes patient history and assesses VTE risk	1.1.1.d Risk assessment not done	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	4	5	100	No risk assessment tool Tool less than adequate Tool not available No protocol for risk assessment Protocol less than adequate (e.g., timeframe not defined) Responsibility for risk assessment not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Lack of managerial oversight Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language History from patient less than adequate (e.g., poor historian, dementia) Patient/family not available	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Re-educate staff on use of language line
1.1.2 Physician takes patient history and assesses VTE risk	1.1.2.a Risk assessment inaccurate	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	2	4	40	No risk assessment tool Tool less than adequate Staff training and education less than adequate Patient's communication barriers not identified or addressed History from patient less than adequate (e.g., poor historian, dementia) Family/translator not available to assist with history Patient's communication barriers not identified or addressed	Implement risk assessment tool Incorporate assessment in order set Delineate/assign responsibility to assess VTE risk Incorporate VTE assessment into hand-off communication Identify a specific time frame for completion of initial assessment for VTE risk Re-educate staff on use of language line

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Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.1.2 Physician takes patient history and assesses VTE risk	1.1.2.b Risk assessment not updated	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	2	4	40	No risk assessment tool Tool less than adequate Staff training and education less than adequate Patient's communication barriers not identified or addressed History from patient less than adequate (e.g., poor historian, dementia) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed Unclear as responsibility to update Information not communicated to physician	Implement risk assessment tool Incorporate assessment in order set Delineate/assign responsibility to assess VTE risk Incorporate VTE assessment into hand-off communication Identify a specific time frame for completion of initial assessment for VTE risk Re-educate staff on use of language line
1.1.2 Physician takes patient history and assesses VTE risk	1.1.2.c Delay in risk assessment	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	3	45	Physician not aware patient has arrived Protocol less than adequate No protocol Responsibility for assessment not clearly delineated Ease of documentation less than adequate	Implement risk assessment tool Incorporate assessment in order set Delineate/assign responsibility to assess VTE risk Incorporate VTE assessment into hand-off communication Identify a specific time frame for completion of initial assessment for VTE risk Re-educate staff on use of language line
1.1.2 Physician takes patient history and assesses VTE risk	1.1.2.d Risk assessment not done	Wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	2	3	30	Physician not aware patient has arrived Protocol less than adequate No protocol Responsibility for assessment not clearly delineated Ease of documentation less than adequate	Implement risk assessment tool Incorporate assessment in order set Delineate/assign responsibility to assess VTE risk Incorporate VTE assessment into hand-off communication Identify a specific time frame for completion of initial assessment for VTE risk Re-educate staff on use of language line

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Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.2 Nurse establishes care plan	1.2.a Care plan not done	Other assessments can't be completed; miscommunication among caregivers; lack of patient education; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Nursing Steering Council to revise patient care plan to include VTE risk reduction
1.2 Nurse establishes care plan	1.2.b Care plan inaccurate	Other assessments can't be completed; miscommunication among caregivers; lack of patient education; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Nursing Steering Council to revise patient care plan to include VTE risk

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**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.2 Nurse establishes care plan	1.2.c Care plan incomplete	Other assessments can't be completed; miscommunication among caregivers; lack of patient education; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Nursing Steering Council to revise patient care plan to include VTE risk
1.2 Nurse establishes care plan	1.2.d Care plan delayed	Other assessments can't be completed; miscommunication among caregivers; lack of patient education; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed Nurse workload	Implement assessment tool Delineate responsibility for risk assessment Incorporate DVT risk in hand-off communications Identify a specific time frame for completion of initial assessment for VTE risk Access Nursing Steering Council to define process for nurse education on VTE risk assessment and risk reduction strategies Nursing Steering Council to revise patient care plan to include VTE risk

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Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)	1.3.a Risk factors not identified	Other assessments may be inaccurate; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed	Incorporate VTE prompt on standard daily physician's progress note Educational series for physicians (grand rounds) with risk management Nursing Steering Council to revise patient care plan to include VTE risk
1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)	1.3.b Incomplete risk factors	Other assessments may be inaccurate/wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Staff training and education less than adequate Agency and per diem staff training and education less than adequate Responsibility for care plan not clearly delineated Hand-off communication between staff less than adequate Nurse/caregiver not available (e.g., competing priorities) Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed	Incorporate VTE prompt on standard daily physician's progress note Educational series for physicians (grand rounds) with risk management Nursing Steering Council to revise patient care plan to include VTE risk

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**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)	1.3.c Inaccurate risk factors	Other assessments may be inaccurate; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; downstream negative effects*	5	3	4	60	Inaccurate history Incomplete history Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed	Incorporate VTE prompt on standard daily physician's progress note Educational series for physicians (grand rounds) with risk management Nursing Steering Council to revise patient care plan to include VTE risk
1.3 Caregiver identifies VTE risk factors related to planned treatment (e.g., bed rest, surgery)	1.3.d Planned treatment not clearly identified	Other assessments may be inaccurate; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; physician does not clearly document plan of care in chart; downstream negative effects*	4	3	3	36	Inaccurate history Incomplete history Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed Physician does not write a complete note Physician has bad handwriting in chart Physician does not communicate plan of care with team	Incorporate VTE prompt on standard daily physician's progress note Educational series for physicians (grand rounds) with risk management
1.3.1 Surgical physician orders VTE prophylaxis based on SCIP guideline. 1.3.1 Medical physician assesses VTE prophylaxis based on history and current diagnosis.	1.3.1c Delayed documentation	Other assessments can't be completed or may be inaccurate; lack of communication among caregivers; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of	5	4	4	80	Inaccurate history Incomplete history Family not available to assist with history Translator not available Patient's communication barriers not identified or addressed Surgeon/Resident unaware of SCIP algorithm SCIP guideline not easily found Computerized order entry system down	Incorporate assessment in order set Incorporate assessment in nursing documentation

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**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
		treatment; unnecessary rework; downstream negative effects*					No risk assessment tool Tool less than adequate Tool not available No protocol for risk assessment Protocol less than adequate (e.g., timeframe not defined)	
1.4 Caregivers (physician, Nurse, pharmacist, dietitian) educate patient about VTE risk.	1.4.a Education not done	Therapy failure; patient unable to comply; missed patient education opportunity; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission; ADEs/medication errors; downstream negative effects*	5	4	4	80	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational tools less than adequate No educational tools Patient not available	Identify nurse as primary educator Nursing Steering Council to identify educational resources for patients Revise current education documentation tool to include VTE risk reduction Identify risk reduction assessment starts at admission Identify and empower other health care providers as educators
1.4 Caregivers (physician, Nurse, pharmacist, dietitian) educate patient about VTE risk.	1.4.b Education incomplete	Therapy failure; patient unable to comply; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission; ADEs/medication	5	2	4	40	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language	Identify nurse as primary educator Nursing Steering Council to identify educational resources for patients Revise current education documentation tool to include VTE risk reduction Identify risk reduction assessment starts at admission Identify and empower other health care providers as educators

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**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
		errors; unnecessary rework; downstream negative effects*					Educational tools less than adequate No educational tools Patient not available	
1.4 Caregivers (physician, Nurse, pharmacist, dietitian) educate patient about VTE risk.	1.4.c Education inadequate	Therapy failure; patient unable to comply/confused; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	3	4	60	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational tools less than adequate No educational tools Patient not available	Identify nurse as primary educator Nursing Steering Council to identify educational resources for patients Revise current education documentation tool to include VTE risk reduction Identify risk reduction assessment starts at admission Identify and empower other healthcare providers as educators
1.4 Caregivers (physician, Nurse, pharmacist, dietitian) educate patient about VTE risk.	1.4 d Education incorrect/conflicting	Therapy failure; patient unable to comply/confused; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	2	4	40	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational tools less than adequate No educational tools Patient not available	Identify nurse as primary educator Nursing Steering Council to identify educational resources for patients Revise current education documentation tool to include VTE risk reduction Identify risk reduction assessment starts at admission Identify and empower other health care providers as educators

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**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.4 Caregivers (physician, Nurse, pharmacist, dietitian) educate patient about VTE risk.	1.4.e Delay in education	Therapy failure; patient unable to comply; wrong treatment; no treatment; delay in treatment; development of PE/DVT; complications of treatment; lack of follow up care; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	4	4	80	Responsibility not clearly delineated Nurse/caregiver not available (e.g., competing priorities) Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Educational tools not available Equipment not available Patient not available Patient not cooperative	Identify nurse as primary educator Nursing Steering Council to identify educational resources for patients Revise current education documentation tool to include VTE risk reduction Identify risk reduction assessment starts at admission Identify and empower other health care providers as educators
2.6 Nurse educates patient about medication (indications, side effects, dietary considerations)	2.6.a Education not done	Missed patient education opportunity; patient unable to comply with instructions; improper follow up care; incorrect/inappropriate treatment; no treatment; therapy failure; Development of PE/DVT; complications of treatment; readmission; ADEs/medication errors; downstream negative effects*	5	3	4	60	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Communication hand-off less than adequate Translator not available Patient's communication barriers not identified or addressed Hospital has not identified need for translating particular language Education material not available Equipment not available Patient not available	Identify nurse as primary educator Nursing Steering Council to identify resources for educating patient Nursing Steering Council to develop education for Nurses on VTE risk assessment, risk reduction and treatment

Venous Thromboembolism (VTE) Prophylaxis
Hospital B FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN ≥30; Criteria Rating Scale: 1-5

**Downstream negative effects : increased cost, increased length of stay, reputation/staff morale/physician satisfaction/patient satisfaction negatively impacted, and/or potential liability*

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
2.6 Nurse educates patient about medication (indications, side effects, dietary considerations)	2.6.b Education delayed	Patient unable to comply with instructions; improper follow up care; Incorrect/inappropriate treatment; no treatment; therapy failure; development of PE/DVT; complications of treatment; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	4	4	80	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Communication hand-off less than adequate Translator not available Patient's communication barriers not identified Hospital has not identified need for translating particular language Education material not available Equipment not available Patient not available	Identify nurse as primary educator Nursing Steering Council to identify resources for educating patient Nursing Steering Council to develop education for nurses on VTE risk assessment, risk reduction and treatment
2.6 Nurse educates patient about medication (indications, side effects, dietary considerations)	2.6.c Education incomplete/incorrect	Patient confused/unable to comply; improper follow up care; incorrect/inappropriate treatment; no treatment; therapy failure; develop PE/DVT; complications of treatment; readmission; ADEs/medication errors; unnecessary rework; downstream negative effects*	5	2	4	40	Responsibility not clearly delineated Staff training and education less than adequate Agency and per diem staff training and education less than adequate Nurse/caregiver not available (e.g., competing priorities) Communication hand-off less than adequate Translator not available Patient's communication barriers not identified Hospital has not identified need for translating particular language Education material not available Equipment not available Patient not available	Identify nurse as primary educator Nursing Steering Council to identify resources for educating patient Nursing Steering Council to develop education for nurses on VTE risk assessment, risk reduction and treatment

4.3 Hospital C

Hospital C conducted its FMEA on VTE prophylaxis including the following sub-processes:

- VTE risk assessment
- Selection of VTE prophylaxis

Within each of these sub-processes, individual steps were identified. Figure 7 shows the top-down block diagram of the Hospital B's process for DVT prevention. Figure 8 shows the progress of Hospital C's FMEA including the following:

- Identification of potential failure modes and effects
- Determining criteria ratings for Severity, Probability of Occurrence, and Detectability
- Prioritizing failure modes with an RPN threshold greater than or equal to 60
- Determining possible causes
- Mitigation strategies (recommended redesign)

Figure 7. Hospital C Process Flowchart

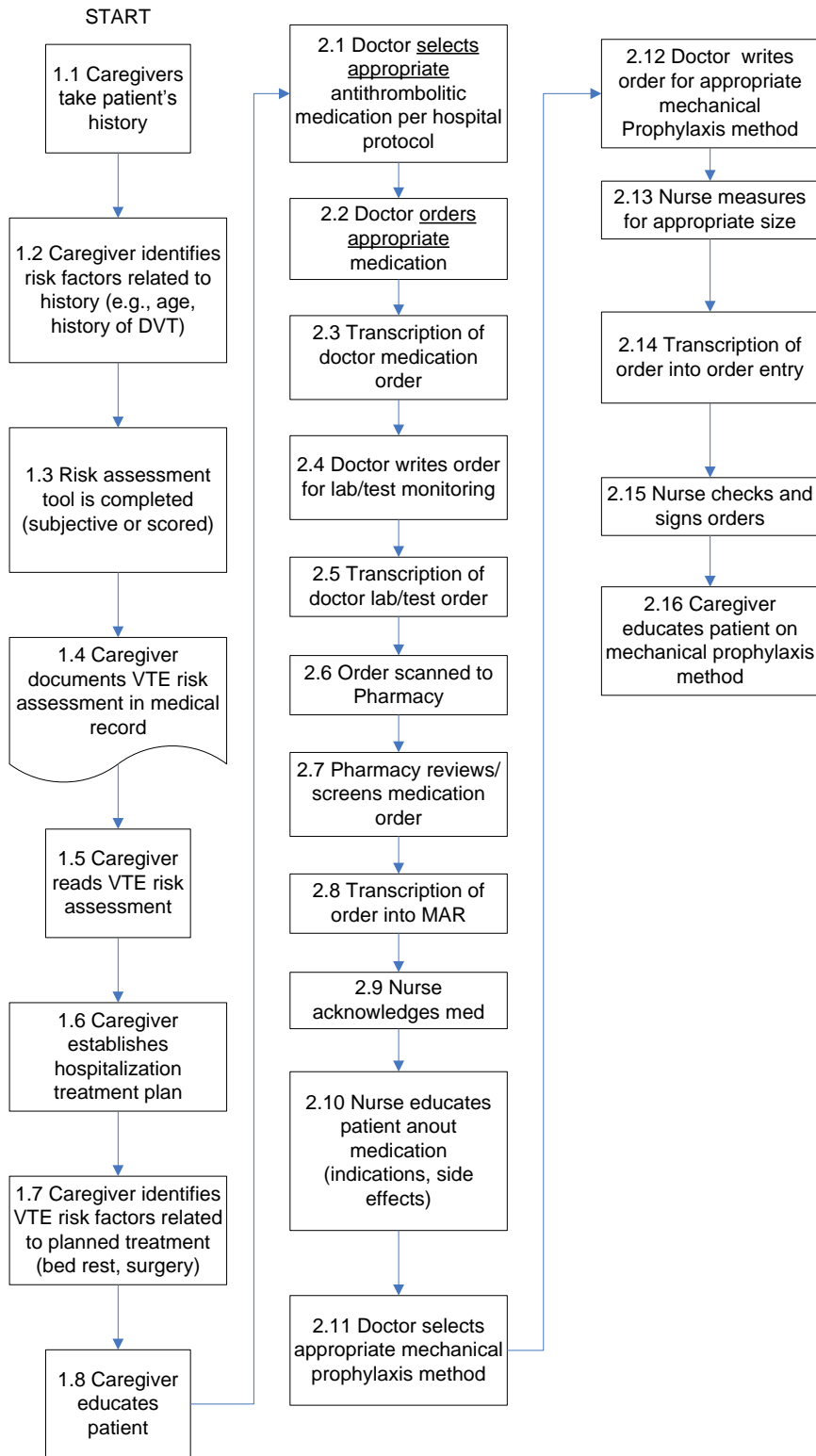


Figure 8. Hospital C FMEA Worksheet for High Priority Failure Mode

Venous Thromboembolism (VTE) Prophylaxis Hospital C FMEA Worksheet for High-Priority Failure Modes <i>Threshold for High-Priority Failure Modes: RPN > 60; Criteria Rating Scale: 1-5</i>								
Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.1 Caregiver takes patient history	1.1c Inaccurate history	Wrong treatment; no treatment; development of VTE; delay in treatment; complications	5	4	4	80	Poor historian Family member unavailable Nurse is rushed Add on to schedule Documentation issues	Delineate responsibility for documentation to admission nurse Delineate back-up responsibility for documentation to charge nurse
1.3 Risk assessment tool is completed (subjective or scored)	1.3c Assessment not updated	Wrong treatment; no treatment; development of VTE; delay in treatment; complications	5	4	4	80	Nurse forgot Too busy Documentation issues Overlooked Not a priority Lack of information	Delineate responsibility for updating assessment Create a protocol establishing how often the assessment needs to be updated (i.e., every day, every shift, and every change in nurse) Complete assessment when patient is transferred to new unit If the computers are down, print downtime forms Incorporate assessments in order sets Implement risk assessment tool
1.4 Caregivers documents VTE risk assessment in medical record	1.4a Not documented	Lack of communication; rework/duplication of work; other assessments can't be completed; wrong treatment; no treatment; development of VTE; delay in treatment; complications.	5	4	5	100	Documentation issues Unclear responsibility Too busy Caregiver forgets Not a priority	Educate staff Delineate responsibility for documentation Create a protocol establishing how often the assessment needs to be updated (i.e., every day, every shift, and every change in nurse) Complete assessment when patient is transferred to new unit If the computers are down, print downtime forms Incorporate assessments in order sets Implement risk assessment tool

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Hospital C FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN > 60; Criteria Rating Scale: 1-5

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.4 Caregivers documents VTE risk assessment in medical record	1.4b Incomplete documentation	Lack of accurate communication; rework/duplication of work; other assessments can't be completed or may be inaccurate; wrong treatment; no treatment; development of VTE; delay in treatment; complications	5	4	5	100	Documentation issues Unclear responsibility Too busy Caregiver forgets Not a priority Lack of information	Implement forcing function (determine which fields are required to be completed) Educate staff Delineate responsibility for documentation to admission nurse Delineate back-up responsibility for documentation to charge nurse Create a protocol establishing how often the assessment needs to be updated (ie every day, every shift, every change in nurse) Complete assessment when patient is transferred to new unit If the computers are down, print downtime forms Incorporate assessments in order sets Implement risk assessment tool
1.4 Caregivers documents VTE risk assessment in medical record	1.4d Delay in documentation	Delay in communication; rework/duplication of work; other assessments can't be completed or may be inaccurate; wrong treatment; no treatment; development of VTE; delay in treatment; complications	5	5	4	100	Nurse was busy (too many patients because short staffed) Nurse forgot Didn't file Entered wrong Computers down No computers available Patient unaware of or unable to give history and family unavailable Patient not on floor (at test) Process is not defined	Implement forcing function in admission assessment (incorporate required timeframe for completion of documentation) Delineate responsibility for documentation to admission nurse Delineate back-up responsibility for documentation to charge nurse Incorporate time frame for documentation into protocol Incorporate assessment in order set

Venous Thromboembolism (VTE) Prophylaxis
Hospital C FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN > 60; Criteria Rating Scale: 1-5

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.5 Caregiver reads VTE risk assessment	1.5a Not read/acknowledged	Other assessments can't be completed or may be inaccurate; unnecessary rework; wrong treatment; no treatment; development of VTE; delay in treatment; complications	5	4	4	80	No time Multiple priorities Forgot Not available No continuity of care Poor communication	Educate staff
1.6 Caregiver establishes hospitalization treatment plan	1.6b Delay in treatment plan	Wrong treatment; no treatment; development of VTE; delay in treatment and education; complications	5	5	4	100	No time Multiple priorities Forgot Not available No continuity of care Poor communication Other emergent issues	Develop protocol for incorporation of VTE interventions, as appropriate, in treatment plan Educate staff
1.7 Caregiver identifies VTE risk factors related to planned treatment (bed rest, surgery, etc.)	1.7a Risk factors not identified	Other assessment may be inaccurate; wrong treatment; no treatment; delay in treatment; development of VTE; complications of treatment.	5	5	4	100	No time Multiple priorities Forgot Not available Family member not available Patient is a poor historian Poor communication Other emergent issues	Implement assessment tool Physicians need to validate contraindications as part of their order set/prompt Develop language tool kit with contact information for various resources (i.e., staff that are fluent in other languages)
1.7 Caregiver identifies VTE risk factors related to planned treatment (bed rest, surgery, etc.)	1.7b Incomplete risk factors	Other assessment may be inaccurate; wrong treatment; no treatment; delay in treatment; development of VTE; complications of treatment	5	3	4	60	Not all questions on assessment were answered No tool/inadequate tool Tool not user friendly Tool does not match patient population Patient is a poor historian Lack of communication	Implement assessment tool Physicians need to validate contraindications as part of their order set/prompt Develop language tool kit with contact information for various resources (ie staff that are fluent in other languages)

Venous Thromboembolism (VTE) Prophylaxis
Hospital C FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN > 60; Criteria Rating Scale: 1-5

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.8 Caregiver educates patient about his/her VTE risk	1.8b Ineffective/inadequate education	Therapy can fail; patient unable to comply/confused; wrong treatment; no treatment; delay in treatment; development of VTE; complications; readmissions; adverse effects	5	3	4	60	Caregiver forgot Patient unable to be educated Caregiver unaware Language barriers (no interpreter) Patient unwilling Time constraints Finance issues Equipment availability Caretaker unavailable Learning barriers (literacy level, disabilities, cultural barriers)	Utilize booklets and videos Delineate responsibility for education to admission nurse Delineate back-up responsibility for education to charge nurse Provide handbook with information at admission Incorporate information on discharge instructions Develop language tool kit with contact information for various resources (i.e., staff that are fluent in other languages) Incorporate education in pre admission process
1.8 Caregiver educates patient about his/her VTE risk	1.8c Not documented	Unnecessary rework	5	4	4	80	Not a priority Forgot Documentation issues	Delineate responsibility for education to admission nurse Delineate back-up responsibility for education to charge nurse
1.8 Caregiver educates patient about his/her VTE risk	1.8d Delay in education	Therapy can fail; patient unable to comply; wrong treatment; no treatment; delay in treatment; development of VTE; complications; readmissions; adverse effects	5	4	5	100	Caregiver forgot/unaware Patient unable to be educated Language barriers (no interpreter) Patient unwilling Time constraints/Finance issues Equipment availability Caretaker unavailable Learning barriers (literacy level, disabilities, cultural barriers) Patient not available (at test)	Delineate responsibility for education to admission nurse Delineate back-up responsibility for education to charge nurse Provide handbook with information at admission Incorporate information on discharge instructions Develop language tool kit with contact information for various resources (i.e., staff that are fluent in other languages) Utilize booklets and videos

Venous Thromboembolism (VTE) Prophylaxis
Hospital C FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN > 60; Criteria Rating Scale: 1-5

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
1.8 Caregiver educates patient about his/her VTE risk	1.8e Not done	Therapy can fail; patient unable to comply; wrong treatment; No treatment; delay in treatment; development of VTE; complications; readmissions; adverse effects	5	3	4	60	Caregiver forgot Patient unable to be educated Caregiver unaware Language barriers (no interpreter) Patient unwilling Time constraints Finance issues Equipment availability Caretaker unavailable Learning barriers (literacy level, disabilities, cultural barriers) Patient not available (at a test)	Delineate responsibility for education to admission nurse Delineate back-up responsibility for education to charge nurse Provide handbook with information at admission Incorporate information on discharge instructions Develop language tool kit with contact information for various resources (ie staff that are fluent in other languages) Utilize booklets and videos
2.1 Physician selects appropriate antithrombotic medication per hospital protocol	2.1b Wrong medication selected	Therapy failure; no treatment; wrong treatment; adverse event; delay in proper treatment; duplication of work; readmission; development of VTE; complication.	5	4	4	80	No standard of care Does not follow protocol	Provide education on protocol Develop order set
2.1 Physician selects appropriate antithrombotic medication per hospital protocol	2.1c Delay in medication selection	Therapy failure; no treatment; wrong treatment; adverse event; delay in proper treatment; readmission; development of VTE; complications	5	4	4	80	Busy Forgot Other priorities Did not check assessment Other emergent issues	Provide education on protocol

Venous Thromboembolism (VTE) Prophylaxis
Hospital C FMEA Worksheet for High-Priority Failure Modes
Threshold for High-Priority Failure Modes: RPN > 60; Criteria Rating Scale: 1-5

Process Step	Failure Modes	Potential Effects	Severity	Probability of Occurrence	Detectability	Risk Priority Number (RPN)	Possible Causes	Mitigation Strategies (Recommended Redesign)
2.2 Physician orders appropriate Medication	2.2b Ordered incorrectly	No treatment; wrong treatment; adverse event; delay in proper treatment; duplication of work; medication error; readmission; development of VTE; complications; unnecessary rework	5	4	4	80	Protocol not clear Does not follow protocol Wrong chart Physician in a rush Assessment not checked	Provide education on protocol Develop order set
2.2 Physician orders appropriate Medication	2.2c Delay in order	No treatment; wrong treatment; adverse event; delay in proper treatment; readmission; development of VTE; complications	5	4	4	80	Too many priorities Assessment not available Other medical issues Overlooked	Provide education on protocol
2.4 Physician writes order for lab/test monitoring	2.4a Not ordered	No treatment; wrong treatment; adverse event; delay in proper treatment; medication error; readmission; development of VTE; complications	5	4	4	80	Other priorities Labs not available Overlooked Poor documentation Other medical issues	Provide education on protocol Develop order set
2.10 Nurse educates patient about medication (indications, side effects)	2.10.c Education incomplete/incorrect	Therapy can fail; patient unable to comply; complications; readmissions; adverse effects; development of VTE; incorrect/inappropriate treatment; no treatment	5	4	4	80	Nurse lacks knowledge Too busy Documentation not complete Patient unable to comprehend Materials are not easily accessible	Delineate responsibility for education to admission nurse Delineate back-up responsibility for education to charge nurse Provide handbook with information at admission Incorporate information on discharge instructions Develop language tool kit with contact information for various resources (ie staff that are fluent in other languages) Utilize booklets and videos

5.0 Conclusions

Mitigation strategies to reduce risk associated with potential failure modes varied from hospital to hospital, depending on their unique circumstances. Strategies focused on:

- Improving the timely completion of VTE risk assessment and re-assessment
- Ensuring that all caregivers are aware of a patient's VTE risk
- Developing standardized VTE prophylaxis order sets
- Ensuring necessary equipment and supplies are readily available
- Providing effective patient education
- Raising staff awareness and providing staff education

The following mitigation strategies were most frequently implemented amongst participating hospitals. In addition, hospitals indicated that implementing these mitigation strategies seemed to have the greatest impact on strengthening patient safety:

- Assess all patients for risk of VTE upon admission
- Develop a standardized protocol for VTE risk assessment
- Delineate responsibility for completing VTE risk assessment
- Utilize hospitalist as backup coverage to insure completion of VTE assessments on admission
- Place a flag on patient's chart to alert physician of a VTE risk assessment need
- Incorporate alerts into computerized provider order entry system to indicate a patient is at risk for VTE
- Delineate responsibility for documenting VTE risk assessment in medical record
- Incorporate VTE risk assessment into nursing assessment
- Incorporate VTE risk and care plan in patient hand-off communications among staff
- Develop protocol for VTE prophylaxis to specify updating risk assessment per routine time intervals and specific situations that may prompt reassessment (e.g., post surgery, transfer to ICU)
- Implement daily VTE re-assessment by nurses
- Develop and implement combined form for VTE risk assessment and VTE prophylaxis order set
- Develop standardized VTE prophylaxis order sets
- Engage physicians in development of VTE prophylaxis order sets to gain physician buy-in for their use
- Maintain a par level of VTE risk assessment and VTE prophylaxis order forms in each care area
- Develop an equipment distribution plan for sequential compression stockings and their power packs to minimize delays in treatment
- Maintain a par level of patient education materials in each care area
- Incorporate "teach back" in patient education protocol to determine whether the patient understands what is being taught
- Implement physician grand rounds and provide CMEs for physicians related to VTE prevention
- Use chart review findings to target VTE prophylaxis re-education, as needed
- Present hospital-specific VTE data to physicians and staff to demonstrate the need for improving VTE prevention

Hospitals used a variety of process and outcome measures to determine if implementation of each mitigation strategy met with their expectations. Evaluation measures that were commonly used included the following:

- Number of preventable VTEs/1,000 patient days
- Readmissions attributable to hospital-acquired VTE
- Routine observation to determine if interventions are being maintained
- Chart reviews for VTE risk assessment completion and VTE prophylaxis interventions integrated into the care plan

In addition, Baseline and Follow-up Self-Assessment Surveys were conducted during the FMEA process to assess the extent to which hospitals had implemented evidence-based practices for effective patient safety particular to the VTE prophylaxis process. The baseline survey was conducted in May/June 2007, during the FMEA process, but prior to any efforts related to the development of mitigation strategies. The follow-up survey was conducted in September/October 2007 upon completion of the FMEA process after hospitals had implemented their mitigation strategies. Most hospitals worked on implementing their mitigation strategies during the summer or fall of 2007. A total of 13 hospitals completed the baseline survey, and 13 hospitals completed the follow-up survey. It should be noted that one hospital closed as an acute care facility during the FMEA and therefore completed the baseline, but not the follow-up survey. In addition, one hospital completed the follow-up survey that did not complete the baseline survey.

Hospital designees were asked to complete the baseline and follow-up surveys during their individual FMEA team meetings, with the collective input of their teams. FMEA Survey questions focus on those sub-processes covered in the FMEA workshops. Scores for the survey responses were assigned based on a 0 to 100 point scale. A higher score related to a more positive response to the question. All scores reflect the respondents' (FMEA teams') perception of their facilities at the time of taking the survey. Our survey analysis is organized by the key areas of Culture, Infrastructure, and Practices.

Based on a comparison of follow-up to baseline survey results, the Partnership for Patient Care and participating hospitals have successfully strengthened patient safety with regards to VTE prophylaxis in the region. It is anticipated that patient safety will be further strengthened as hospitals continue to work on mitigation strategies and their implementation.

Survey results⁵ can be summarized as follows:

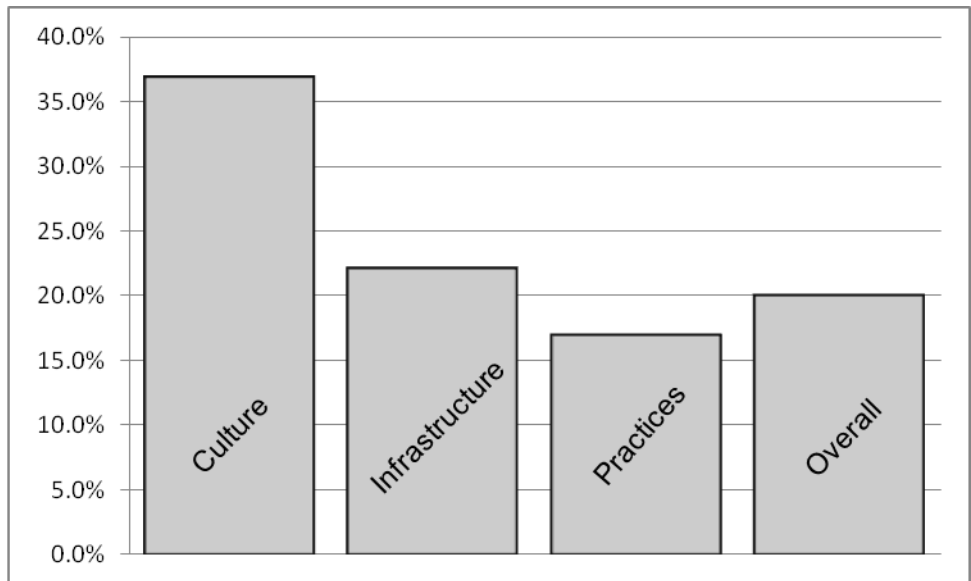
- Significant progress was demonstrated in strengthening patient safety as demonstrated by the 20.0% overall improvement in comparing aggregate follow-up to baseline scores (follow-up score of 78, baseline score of 65).
- Greatest improvement was shown in the key area of **Culture** (36.8% improvement). Highlights of significant improvement in this category include:
 - The hospital has provided education and training about VTE risk factors to caregivers responsible for either risk assessment or patient education within the last year (59.2% improvement).

⁵ It should be noted that survey results exceeded 100% improvement for some questions, indicating that the follow-up scores for those questions more than doubled in comparison to the baseline scores. Refer to Figures 10-12 for question-specific scores for both the baseline and follow-up surveys.

- Within the last year, the hospital has provided education and training to caregivers about the specific medications it has approved for VTE prophylaxis (45.1% improvement).
- Caregivers receive periodic feedback about the effectiveness of the hospital's VTE prophylaxis process (70.0% improvement).
- A 22.1% improvement was shown in the key area of **Infrastructure**. Highlights of significant improvement in this category include:
 - The caregiver responsible for assessing VTE risk is clearly delineated (26.4% improvement).
 - The physician ordering VTE prophylaxis is guided by a form that contains prompts (105.7% improvement).
 - The hospital systematically tracks adverse events associated with the VTE prophylaxis process (30.2% improvement).
 - The hospital has implemented process measures to monitor the effectiveness of its VTE prophylaxis process (43.5% improvement).
- A 16.9% improvement was shown in the key area of **Practices**. Highlights of significant improvement in this category include:
 - The hospital has approved a protocol for VTE prophylaxis for various types of at-risk patients (53.8% improvement).
 - The hospital's VTE prophylaxis protocol is consistent with nationally recognized guidelines (23.9% improvement).
 - The hospital's VTE prevention protocol specifies both the baseline laboratory testing and ongoing laboratory monitoring required for each type of antithrombotic medication (60.4% improvement).
 - The hospital has approved a protocol that specifies the indications for using various mechanical methods of prophylaxis (28.8% improvement).
 - On average, 90-100% of elective surgical patients are assessed for VTE risk during either the pre-operative visit or preadmission testing (24.2% improvement).
 - On average, a VTE risk assessment is completed for 90-100% of patients within 24 hours of hospital admissions (32.6% improvement).
 - The nurse always documents an assessment of the patient's VTE risk in the medical record (31.0% improvement).
 - On average, 90-100% of anticoagulant orders for VTE prophylaxis are reviewed by the pharmacy before the medication is dispensed (18.7% improvement).
 - When the physician decides not to provide VTE prophylaxis, the physician always documents the reasons in the medical record (27.5% improvement).
 - The hospital promotes early and persistent ambulation, as appropriate (18.8% improvement).

The graph in Figure 9 demonstrates the progress of the region's hospitals in implementation of evidence-based best practices for strengthening patient safety upon completion of the FMEA.

Figure 9. Follow-up to Baseline Survey Results: % Improvement



Figures 10 through 12 summarize the survey results in the key areas of Culture, Infrastructure, and Practices correspondingly.

Figure 10. Survey Results: Culture

Culture		
Key Element (Survey Question #)	Baseline Score	Follow-up Score
The hospital has provided education and training about VTE risk factors to caregivers responsible for either risk assessment or patient education within the last year. (12)	49	78
Within the last year, the hospital has provided education and training to caregivers about the specific medications it has approved for VTE prophylaxis. (23)	51	74
Senior leadership at the hospital has demonstrated a commitment to improving patient safety by supporting the provision of VTE prophylaxis for all inpatients at risk. (29)	86	91
Caregivers receive periodic feedback about the effectiveness of the hospital’s VTE prophylaxis process. (32)	40	68
Total Aggregate Score for Culture	57	78

Figure 11. Survey Results: Infrastructure

Infrastructure		
Key Element (Survey Question #)	Baseline Score	Follow-up Score
The caregiver responsible for assessing VTE risk is clearly delineated. (5)	72	91
Caregivers are aware of the VTE risk level of each inpatient under their care. (11)	60	72
Information about the patient’s history of drug allergies and adverse reactions to anticoagulants is always readily available to the physician ordering VTE prophylaxis. (14)	92	95
Essential laboratory test results are readily available to the physician ordering VTE prophylaxis. (15)	88	94
The physician ordering VTE prophylaxis is guided by a form that contains prompts. (16)	35	72
On average, pharmacists have ready access to all essential patient information needed to safely dispense the medication for 90-100% of anticoagulant orders for VTE prophylaxis. (18)	86	94
The hospital systematically tracks adverse events associated with the VTE prophylaxis process. (30)	63	82
The hospital has implemented process measures to monitor the effectiveness of its VTE prophylaxis process. (31)	46	66
Total Aggregate Score for Infrastructure	68	83

Figure 12. Survey Results: Practices

Practices		
Key Element (Survey Question #)	Baseline Score	Follow-up Score
The hospital has approved a protocol for VTE prophylaxis for various types of at-risk patients. (1)	52	80
The hospital’s VTE prophylaxis protocol is consistent with nationally recognized guidelines. (2)	71	88
The hospital’s VTE prevention protocol specifies both the baseline laboratory testing and ongoing laboratory monitoring required for each type of antithrombotic medication. (3)	48	77
The hospital has approved a protocol that specifies the indications for using various mechanical methods of prophylaxis. (4)	66	85
On average, 90-100% of elective surgical patients are assessed for VTE risk during either the preoperative visit or preadmission testing (6)	62	77
On average, a VTE risk assessment is completed for 90-100% of patients within 24 hours of hospital admissions. (7)	43	57
On average, a VTE risk assessment is completed for 90-100% of patients within 24 hours of ICU admission. (8)	72	80
The physician always documents an assessment of the patient’s VTE risk in the medical record. (9)	60	68
The nurse always documents an assessment of the patient’s VTE risk in	42	55

Practices		
Key Element (Survey Question #)	Baseline Score	Follow-up Score
the medical record. (10)		
Before initiating treatment, caregivers always explain to patients the reasons they are at risk for VTE. (13)	66	75
On average, 90-100% of anticoagulant orders for VTE prophylaxis are reviewed by the pharmacy before the medication is dispensed. (17)	75	89
The pharmacist intervenes and resolves identified problems with anticoagulant orders before VTE prophylaxis is initiated. (19)	85	83
The physician always orders appropriate laboratory monitoring when initiating VTE prophylaxis. (20)	83	85
The physician always documents the patient's VTE prophylaxis treatment plan in the medical record. (21)	68	66
When the physician decides not to provide VTE prophylaxis, the physician always documents the reasons in the medical record. (22)	51	65
Patient education regarding the importance of using mechanical methods for VTE prophylaxis is very effective. (24)	68	72
The hospital promotes early and persistent ambulation, as appropriate. (25)	69	82
Before initiating anticoagulant treatment, the caregiver explains to the patient/family what the medication is for (indications). (26)	80	80
Before initiating anticoagulant treatment, the caregiver explains to the patient/family the side effects of possible complications of the medication. (27)	72	74
Before initiating anticoagulant treatment, the caregiver explains to the patient/family the nutritional supplements to avoid and other dietary considerations, if applicable. (28)	69	72
Total Aggregate Score for Infrastructure	65	76

The Partnership for Patient Care (PPC) has effectively provided a solid foundation for hospitals to continue their meaningful work in incorporating evidence-based best practices in strengthening patient safety. Correspondingly, the hospitals' commitment to patient safety greatly contributed to the regional FMEA success. PPC's cohesive approach to regional FMEA has benefited participating hospitals by providing:

- An interactive forum for hospitals to share ideas and experiences;
- A collaborative approach for hospitals to work together, rather than individually, thereby maximizing the value derived from proactive risk assessment;
- Provision of research summaries with evidence-based best practices, risk data, national quality initiative summaries, standards and guidelines from regulatory and professional organizations, and resource lists;
- Tools to support the FMEA process; and
- Hands-on technical assistance to facilitate clinical process analysis and to assist hospitals in developing risk reduction (mitigation) strategies and implementing them effectively.

For more information on the Partnership for Patient Care and its regional proactive risk assessment component core component, please contact:

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