ICSI

INSTITUTE FOR CLINICAL SYSTEMS IMPROVEMENT

Health Care Guideline:
Venous Thromboembolism Prophylaxis

Eighth Edition
September 2011

The information contained in this ICSI Health Care Guideline is intended primarily for health professionals and the following expert audiences:

- physicians, nurses, and other health care professional and provider organizations;
- health plans, health systems, health care organizations, hospitals and integrated health care delivery systems;
- health care teaching institutions;
- health care information technology departments;
- medical specialty and professional societies;
- researchers;
- federal, state and local government health care policy makers and specialists; and
- employee benefit managers.

This ICSI Health Care Guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. If you are not one of the expert audiences listed above you are urged to consult a health care professional regarding your own situation and any specific medical questions you may have. In addition, you should seek assistance from a health care professional in interpreting this ICSI Health Care Guideline and applying it in your individual case.

This ICSI Health Care Guideline is designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and is not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. An ICSI Health Care Guideline rarely will establish the only approach to a problem.

Health Care Guideline and Order Set:
Venous Thromboembolism Prophylaxis

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All annotation table headings with an "A" and those that refer to other annotation table headings link to annotation content.

Text in blue throughout the document also provides links.

Main Table
Thromboembolic Prophylaxis for Adult Hospitalized Patients
A Compendium of Consensus Recommendations from
The American College of Chest Physicians (ACCP),
The American Academy of Orthopaedic Surgeons (AAOS), and
The American Society of Regional Anesthesiologists (ASRA)

1. General Recommendations[A]

1-1 All patients should have venous thromboembolism risk assessed and addressed upon hospital admission, change in level of care, and discharge.

1-2 All patients should have proper education regarding venous thromboembolism risk, signs and symptoms, and treatment/prophylaxis methods available.

1-3 All patients should be encouraged to ambulate as early as possible, and as frequently as possible.

1-4 All patients with moderate to high risk of venous thromboembolism should have pharmacologic prophylaxis based on the recommendations in this table – unless contraindicated. If pharmacologic therapy is contraindicated, then mechanical prophylaxis with intermittent pneumatic compression (IPC) is recommended.

2. Patient-Related Thromboembolic Risk Factors

Prior history of deep vein thrombosis/pulmonary embolism (probably the most important predictor of the development of a new venous thromboembolism)
Active cancer or myeloproliferative disorder
Admission to the intensive care unit
Extended immobility or estimated length of stay of 4 or more days
Age greater than 60
Thrombophilia – congenital or acquired
Uncompensated Congestive Heart Failure (CHF)
Acute respiratory failure
Acute infection
Inflammatory bowel disease
Nephrotic syndrome
Rheumatoid/collagen vascular disorder
BMI ≥ 40
Estrogen-based therapy (contraceptives and replacement therapies)

3. Special Situations/Procedures – High Risk of Bleeding[A]

Active significant bleeding, craniotomy within two weeks, Hx intracerebral hemorrhage within two weeks, active intracranial lesions/neoplasms/monitoring devices, vascular access/biopsy sites inaccessible to hemostatic control within 24 hours, bacterial endocarditis, proliferative retinopathy	**Thromboembolic prophylaxis: intermittent pneumatic compression (IPC)**

4. Special Situations – Hx Heparin-Induced Thrombocytopenia (HIT), Thrombocytopenia, Coagulopathy

Hx HIT, Thrombocytopenia (platelet count < 50,000), Hx coagulopathy (e.g., hemophilia, von Willebrand's)	**Thromboembolic prophylaxis: mechanical prophylaxis and consult an anticoagulation expert to discuss options for pharmacologic prophylaxis**

5. Special Situations – Dose Adjustment of Antithrombotics[A]

	Dalteparin	Enoxaparin	Fondaparinux	Unfractionated Heparin
BMI ≥ 40	6,250 units subQ every 24 hours	40 mg subQ every 12 hours or 50 mg subQ every 24 hours	No dosing recommendation available	5,000 units subQ every 8 hours or continuous IV infusion
BMI < 18.5	Consider lower dose and monitor	30 mg subQ every 24 hours if < 45 kg	Contraindicated if < 50 kg	Consider 5,000 units every 12 hours if weight < 50 kg
Renal Impairment (creatinine clearance < 30)*	5,000 units subQ every 24 hours	30 mg subQ every 24 hours	Contraindicated	5,000 units subQ every 8-12 hours depending on risk factors

* Consider use of unfractionated heparin (UFH) in renal impairment or dialysis patients as heparin does not need to be dose adjusted in these populations.

A = Items with specific annotations

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6.	Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics[A]					
	Dalteparin	**Enoxaparin**	**Fondaparinux**	**Unfractionated Heparin**	**Warfarin**	
	Prophylactic Dose, Single-Daily Dosing: Insertion – at least 12 hours after the last dose. Subsequent dose at least 4 hours after catheter insertion Removal – at least 12 hours after the last dose. Subsequent dose at least 4 hours after catheter removal **Prophylactic Dose, Twice-Daily Dosing:** Insertion – epidural catheter not recommended Removal – May initiate twice daily dosing at least 4 hours after catheter removal **Therapeutic Dose:** See ICSI Antithrombotic Therapy Supplement	**Prophylactic Dose, Single-Daily Dosing:** Insertion – at least 12 hours after the last dose. Subsequent dose at least 4 hours after catheter insertion Removal – at least 12 hours after the last dose. Subsequent dose at least 4 hours after catheter removal **Prophylactic Dose, Twice-Daily Dosing:** Insertion – epidural catheter not recommended Removal – May initiate twice daily dosing at least 4 hours after catheter removal **Therapeutic Dose:** See ICSI Antithrombotic Therapy Supplement	Insertion – fondaparinux not recommended prior to insertion Removal – at least 36 hours after the last dose of fondaparinux. Subsequent dose at least 12 hours after catheter removal	Insertion – at least 4 hours after the last dose of unfractionated heparin Removal – at least 4 hours after the last dose of unfractionated heparin Dose subsequent at least 1 hour after catheter removal	Insertion – no consensus regarding highest acceptable INR Removal – within 48 hours of initiation of warfarin and INR ≤ 1.5	

Venous Thromboembolism Prophylaxis Recommendations:

7.	Hospitalized Non-Surgical Patients						
	Dalteparin	**Enoxaparin**	**Fondaparinux**	**Unfractionated Heparin**	**Warfarin**	**Aspirin**	**Duration**
Hospitalized non-surgical patient + no additional risk factors	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required, aspirin not recommended	Not Applicable
Hospitalized non-surgical patient + additional risk factor	5,000 units subQ every 24 hours	40 mg subQ every 24 hours	2.5 mg subQ every 24 hours	5,000 units subQ every 8-12 hours	If on warfarin for other indications, probably sufficient VTE prophylaxis	May use aspirin for other indications, but not sufficient alone for VTE prophylaxis	Until discharge

A = Items with specific annotations

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8. Major Procedures (Inpatient), Caesarean, Laparoscopic or Outpatient Procedures[A]

Consider bleeding risk; see Table 3

		Dalteparin	Enoxaparin	Fondaparinux	Unfractionated Heparin	Warfarin	Aspirin	Duration
Low VTE Risk	**Outpatient procedure + no additional risk factors**	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Not applicable
	Laparoscopic procedure + no additional risk factors*							
	Caesarean + no additional risk factors							
Moderate VTE Risk	**Outpatient procedure + additional risk factors**	2,500 units subQ 1-2 hour preop, then every 24 hours	40 mg subQ 2 hour preop, then every 24 hours	Not recommended	5,000 units subQ every 12 hours postop	Not recommended	Not recommended	Until discharge
	Laparoscopic procedure + additional risk factors*							
	Caesarean + additional risk factors**							
High VTE Risk	**Any procedure + active malignancy**	2,500 units subQ 1-2 hour preop, then every 24 hours	40 mg subQ 2 hour preop, then every 24 hours	Not recommended	5,000 units subQ every 8 hours postop	Not recommended	Not recommended	Up to 4 weeks postop
	Any procedure + Hx DVT/PE	5,000 units subQ 1-2 hour preop, then every 24 hours	40 mg subQ 2 hour preop, then every 24 hours	Not recommended	5,000 units subQ every 8 hours postop	Not standard, but if used prophylactic LMWH should be given until INR therapeutic (*consensus based, due to lack of data*)	Not recommended	Up to 4 weeks postop

9. Bariatric Surgery

	Dalteparin	Enoxaparin	Fondaparinux	Unfractionated Heparin	Warfarin	Aspirin	Duration
All bariatric procedures	5,000 – 7,500 units subQ 1-2 hour preop, then every 24 hours (± mechanical prophylaxis)	40 mg subQ every 12 hours (± mechanical prophylaxis)	No dosing recommendation available	5,000 units subQ every 8 hours or intravenous infusion (target antiXa level 0.15-2.0) (± mechanical prophylaxis)	Not recommended	Not recommended	Until discharge or up to 10 days postop *(Raftopoulos, 2008)*

* Laparoscopic trans-urethoural resection of the prostate (TURP) is associated with a higher risk of bleeding. Refer to American Urological Association guideline.

** ACOG's consensus-based recommendation is to hold neuraxial blockade for 10-12 hours after the last prophylactic dose of LMWH or 24 hours after the last therapeutic dose of LMWH.

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10. Orthopedic Surgery – Hip Fracture, Hip/Knee Arthroplasty[A]

All options recommended equally unless otherwise

Rivaroxaban	Dalteparin	Enoxaparin	Fondaparinux	Unfractionated Heparin	Warfarin	Aspirin	Duration
Due to the July 1, 2011, timing of FDA approval of rivaroxaban for VTE prophylaxis in hip/knee arthroplasty, the work group was not able to incorporate dosing recommendations in this guideline edition.	5,000 units subQ every 24 hours beginning 12-24 hours postop + mechanical prophylaxis If surgery is delayed, initiate between admission and surgery. Must stop at least 12 hours prior to neuraxial anesthesia, and wait at least 4 hours after insertion before the next dose (with **no** additional hemostasis-altering drugs). (See section #6 of this table "Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics")	30 mg subQ every 12 hours beginning 12 hours postop + mechanical prophylaxis If surgery is delayed, initiate between admission and surgery. Must stop at least 12 hours prior to neuraxial anesthesia. Epidural catheter not recommended with twice-daily regimens (may initiate twice daily dosing at least 4 hours after catheter removal). (See section #6 of this table "Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics")	2.5 mg subQ every 24 hours beginning 6-8 hours postop + mechanical prophylaxis Note: fondaparinux not recommended preoperative. If surgery is delayed, initiate LMWH between admission and surgery. Epidural catheter not recommended with twice daily regimens. (See section #6 of this table "Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics")	Not recommended	INR 2.5 (2.0-3.0) beginning postop day of surgery + mechanical prophylaxis Note: warfarin not recommended preoperative. If surgery is delayed, initiate LMWH between admission and surgery. Spinal anesthetic OK, but if used with an epidural catheter, the catheter should be removed within 48 hours and INR ≤ 1.5. (See section #6 of this table "Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics")	See discussion in Annotation #10 American College of Chest Physicians (ACCP): Recommends against the use of aspirin alone for all patient groups. American Academy of Orthopaedic Surgeons (AAOS): May consider aspirin in combination with mechanical prophylaxis in patients with no additional VTE risk factors. Not recommended in patients with additional VTE risk factors. Note: aspirin not recommended preoperative. If surgery is delayed, initiate LMWH between admission and surgery.	10-35+ days postop

A = Items with specific annotations

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11. Orthopedic Surgery – Knee Arthroscopy

All options recommended equally unless otherwise indicated

	Dalteparin	Enoxaparin	Fondaparinux	Unfractionated Heparin	Warfarin	Aspirin	Duration
Knee arthroscopy + no risk factors	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required	Prophylaxis not required, unfractionated heparin not recommended	Prophylaxis not required	Prophylaxis not required, aspirin not recommended	Not applicable
Knee arthroscopy + risk factor	5,000 units subQ every 24 hours beginning 12-24 hours postop + mechanical prophylaxis If surgery is delayed, initiate between admission and surgery. Must stop at least 12 hours prior to neuraxial anesthesia, and wait at least 4 hours after insertion before the next dose (with **no** additional hemostasis-altering drugs) (See section #6 of this table, "Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics")	30 mg subQ every 12 hours beginning 12 hours postop + mechanical prophylaxis If surgery is delayed, initiate between admission and surgery. Must stop at least 12 hours prior to neuraxial anesthesia Epidural catheter not recommended with twice-daily regimens (may initiate twice daily dosing at least 4 hours after catheter removal) (See section #6 of this table, "Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics")	2.5 mg subQ every 24 hours beginning 6-8 hours postop + mechanical prophylaxis Epidural catheter not recommended	Not recommended	INR 2.5 (2.0-3.0) beginning day of surgery + mechanical prophylaxis Spinal anesthetic OK, but if used with an epidural catheter, the catheter should be removed within 48 hours and INR ≤ 1.5	Not recommended	10-35 days postop

A = Items with specific annotations

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12.	**Heparin Induced Thrombocytopenia Monitoring[A]**	
Medical/Obstetric (HIT risk < 0.1%)	Medical and obstetric patients receiving only LMWH or medical patients receiving only UFH intravascular catheter flushes.	Platelet monitoring not required
Medical/Obstetric (HIT risk 0.1 - 1%)	Medical and obstetric patients receiving *prophylactic-dose* UFH or receiving *LMWH after first receiving UFH*.	Monitor platelets • Obtain baseline platelet count; then monitor platelets every 2 days from day 4-14, or until the UFH is stopped, whichever occurs first. • Patients who have received UFH within the past 100 days or those patients in whom exposure is uncertain – start monitoring platelets within 24 hours of starting UFH or LMWH.
Postoperative (HIT risk > 1% or HIT risk 0.1 - 1%)	Postoperative patients receiving *prophylactic-dose* UFH (HIT risk >1%) or LMWH or *UFH intravascular* catheter flushes (HIT risk 0.1 - 1%):	Monitor platelets • Obtain baseline platelet count; then monitor platelets every 2 days from day 4-14, or until the UFH is stopped, whichever occurs first. • Patients who have received UFH within the past 100 days or those patients in whom exposure is uncertain – start monitoring platelets within 24 hours of starting UFH or LMWH.
Patient receiving fondaparinux		Platelet monitoring not required
Patients who received UFH/LMWH within 100 days or patients with uncertain exposure		Obtain baseline platelet count; then monitor platelets within 24 hours of starting UFH or LMWH. Continue monitoring every 2 days until day 14 or until UFH/LMWH has been stopped, whichever occurs first.
13.	**Out of scope of this guideline:** Burns, CABG, multiple trauma, neurosurgery, spine surgery, thoracic surgery	

A = Items with specific annotations

References

American Academy of Orthopedic Surgeons Clinical Guideline on Prevention of Symptomatic Pulmonary Embolism Patients Undergoing Total Hip or Knee Arthroplasty, 2008. (Guideline)

Geerts WH, Bergquist D, Pineo GF, et al. Prevention of venous thromboembolism. Chest 2008;133:381S-453S. (Guideline)

Horlocker TT, Wedel DJ, Rowlingson JC, et al. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American society of regional anesthesia and pain medicine evidence-based guidelines (third edition). *Reg Anesth Pain Med* 2010;35:64-101. (Guideline)

Warkentin TE, Greinacher A, KosterA, Lincoff AM. Treatment and prevention of heparin-induced thrombocytopenia: American college of chest physicians evidence-based clinical practice guidelines (8th edition). *Chest* 2008;133;340-80. (Guideline)

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Disclosure of Potential Conflict of Interest

In the interest of full disclosure, ICSI has adopted a policy of revealing relationships work group members have with companies that sell products or services that are relevant to this guideline topic. It is not assumed that these financial interests will have an adverse impact on content. They are simply noted here to fully inform users of the guideline.

Greg Brown, MD, PhD has disclosed corporate ownership in Karemetrix, LLC and Orthopaedic Solutions LLC; he serves on the speaker's bureau for Synthes and receives grant support from Smith & Nephew related to a hip fracture outcomes study; his advisory council service includes ASTM F04.39 Human Clinical Trials Subcommittee Chair and ISO TC 150 SC 5 Subcommittee Chair for the American Academy of Orthopaedic Surgeons.

The organization of Bruce Burnett, MD received grant support from Boehringer-Ingelheim for research into dabigatran, which ended in 2010.

No other work group members have potential conflicts of interest to disclose.

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Evidence Grading

A consistent and defined process is used for literature search and review for the development and revision of ICSI guidelines. Literature search terms for the current revision of this document include venous thromboembolism prevention and control, aspirin, hip arthroplasty, knee arthroplasty, low-molecular-weight heparin, risk stratification/factors, graduated compression stockings, pneumatic compression, pressure ulcer. Formal searches spanned the time frame 18 months prior to the start of the revision. Additionally, ICSI Venous Thromboembolism Prophylaxis work group members bring forth a wide variety of articles to include in the review by their colleagues.

Following a review of several evidence rating and recommendation writing systems, ICSI has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

GRADE has advantages over other systems including the current system used by ICSI. Advantages include:

- Developed by a widely representative group of international guideline developers
- Explicit and comprehensive criteria for downgrading and upgrading quality of evidence ratings
- Clear separation between quality of evidence and strength of recommendations that includes a transparent process of moving from evidence evaluation to recommendations
- Clear, pragmatic interpretations of strong versus weak recommendations for clinicians, patients, and policy makers
- Explicit acknowledgement of values and preferences and
- Explicit evaluation of the importance of outcomes of alternative management strategies.

At ICSI we have established a GRADE Implementation Team to provide overall direction for this transition. We intend to complete the transition in phases. In 2011 the following work to transition to GRADE will be done:

- Select documents will undergo complete implementation of GRADE

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- For all other documents beginning March 2011:
  - All original ICSI Class A (RCTs) and ICSI Class B (Cohort) studies were reviewed by work group members and the quality of evidence assessed using GRADE. Other literature was labeled by ICSI staff according to Crosswalk between ICSI Evidence Grading System and GRADE.
  - New literature was reviewed and graded by work group members using the new ICSI GRADE system.
  - Key Points in all documents become Recommendations.

Crosswalk between ICSI Evidence Grading System and GRADE

Design of Study Current ICSI System		ICSI GRADE System
Class A:	Randomized, controlled trial	**High**, if no limitation **Moderate**, if some limitations **Low**, if serious limitations
Class B:	[observational] Cohort study	 **High,** if well done with large effect **Moderate,** if well done with effect **Low,** most studies
Class C:	[observational] Non-randomized trial with concurrent or historical controls Case-control study Population-based descriptive study Study of sensitivity and specificity of a diagnostic test	 **Low** **Low** ***Low**
* Following individual study review, may be elevated to Moderate or High depending upon study design		
Class D:	[observational] Cross-sectional study Case series Case report	 **Low**
Class M:	Meta-analysis Systematic review Decision analysis Cost-effectiveness analysis	**Meta-analysis** **Systematic Review** **Decision Analysis** **Cost-Effectiveness Analysis**
Class R:	Consensus statement Consensus report Narrative review Guideline	**Low** **Low** **Low** **Guideline**
Class X:	Medical opinion	**Low**
Class Not Assignable		**Reference**

Evidence Definitions:

High Quality Evidence = Further research is very unlikely to change our confidence in the estimate of effect.

Moderate Quality Evidence = Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low Quality Evidence = Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate or any estimate of effect is very uncertain.

Supporting Literature:
In addition to evidence that is Graded and used to formulate recommendations, additional pieces of literature will be used to inform the reader of other topics of interest. This literature is not given an evidence grade and is instead identified as a **Reference** throughout the document.

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Foreword

Introduction

The purpose of this document is to provide primary care clinicians with strategies to reduce morbidity and mortality of adult hospitalized patients. This guideline follows closely the American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition) *(Geerts, 2008 [Guideline])* and the American Society of Regional Anesthesia and Pain Medicine guidelines *(American Society of Regional Anesthesia and Pain Medicine, 2002 [Guideline])*. An area of divergence from the American College of Chest Physicians guideline recommendations is that the use of aspirin following orthopedic procedures is included among several prophylactic options.

Goals of Venous Thromboembolism Prophylaxis

The goals of venous thromboembolism prophylaxis are to reduce all-cause mortality and/or morbidity associated with surgical procedures and/or hospitalization.

Evidence "Gaps"/Research Opportunities

Because surgical and hospital procedures are constantly changing, the impact of venous thromboembolism prophylaxis on mortality and morbidity may also be constantly changing. Therefore, all methods of thromboembolism prophylaxis require periodic reassessment by randomized controlled trials. There are two areas that are in urgent need of randomized controlled trials:

1. Patients who require orthopedic procedures – a comparison of aspirin with each of the other pharmacologic thromboprophylactic agents (low-molecular-weight heparins, fondaparinux, warfarin)
2. Patients who require aspirin and clopidogrel due to vascular stents – a comparison of aspirin + clopidogrel (alone) with aspirin + clopidogrel + each additional pharmacologic thromboprophylactic agent (unfractionated heparin, low-molecular-weight heparins, fondaparinux, warfarin)

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Scope and Target Population

This guideline addresses risk assessment for venous thromboembolism, risk assessment for bleeding, and mechanical and pharmacologic therapies to reduce the occurrence of venous thromboembolism in adult hospitalized patients.

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Aims

1. Increase the percentage of hospitalized patients 18 years of age and older who are assessed for venous thromboembolism risk within 24 hours of admission. *(Main Table, Section #1)*
2. Increase the percentage of hospitalized patients 18 years of age and older who are evaluated for venous thromboembolism prophylaxis upon change in level of care, providers and/or upon discharge. *(Main Table, Section #1)*
3. Increase the percentage of hospitalized patients 18 years of age and older at risk for venous thromboembolism who have received education within 24 hours of admission into inpatient care setting for venous thromboembolism that includes venous thromboembolism risk, signs and symptoms, early and frequent mobilization and clinically appropriate treatment/prophylaxis methods. *(2011 Joint Commission National Patient Safety Goal; Main Table, Section #1)*

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4. Improve the safety of using medications by reducing the likelihood of patient harm associated with the use of anticoagulation therapy in inpatient care setting for patients 18 years of age and older. *(2011 Joint Commission National Patient Safety Goal)*
5. Increase the percentage of at-risk hospitalized patients 18 years of age and older receiving appropriate prophylaxis treatment. *(Main Table, Section #1)*
6. Reduce the risk of complications from pharmacologic prophylaxis for hospitalized and discharged patients 18 years of age and older. *(2011 Joint Commission National Patient Safety Goal, Main Table, Section #1)*
7. Increase the percentage of surgery patients 18 years of age and older who receive appropriate venous thromboembolism prophylaxis. *(Main Table, Sections #8-11)*

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Clinical Highlights

- All patients should be evaluated for venous thromboembolism risk upon hospital admission, change in level of care, providers and prior to discharge. *(Main Table Section #1; Aim #1)*
- All patients should receive proper education regarding venous thromboembolism risk, signs and symptoms, early and frequent mobilization, and clinically appropriate treatment/prophylaxis methods. *(Main Table Section #1; Aim #3)*
- All hospitalized patients who are high risk for venous thromboembolism should receive anticoagulation prophylaxis unless contraindicated. *(Main Table, Sections #2-4)*
- Aspirin alone is not recommended for routine venous thromboembolism prophylaxis following hip/knee arthroplasty but may be considered in combination with mechanical prophylaxis methods in patients without additional risk factors. Further study is needed. *(Main Table, Sections #10-11 and Annotation #10)*
- For all patients receiving spinal or epidural anesthesia, precautions should be taken when using anticoagulant prophylaxis to reduce the risk of epidural perispinal hematoma. *(Main Table, Section #6; Annotation #6; Aims #4, 5)*
- Risk of venous thromboembolism development continues beyond hospitalization, and the need for post-discharge anticoagulation should be assessed. *(Main Table, Section #1)*

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Implementation Recommendation Highlights

1. Implement a defined anticoagulation management program to individualize the care provided to each patient receiving anticoagulation therapy. *(2011 Joint Commission National Safety Goal)*
2. (Clinics and Hospitals): Develop systems for monitoring the effects of anticoagulation therapy (heparin, low-molecular-weight heparin, warfarin and other anticoagulants) to include monitoring of outpatient therapy:

   - Use of standardized practices/protocols that include patient involvement.

   (2011 Joint Commission National Safety Goal)
3. When heparin is administered intravenously and continuously, the organization should use programmable infusion pumps.

   (2011 Joint Commission National Safety Goal)

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4. Develop systems for providing patient/family education that includes the importance of follow-up monitoring, compliance issues, dietary restrictions, and potential adverse drug reactions and interactions.

    - Patient education to include documentation of the patient's own awareness of his/her risk for venous thromboembolism, signs and symptoms of venous thromboembolism and when/how to seek treatment, and demonstrated understanding of the prescribed anticoagulation regimen.

    (2011 Joint Commission National Safety Goal)

5. Develop a policy for providing organizational education regarding anticoagulation therapy to prescriber(s), staff, patients and families.

    (2011 Joint Commission National Safety Goal)

6. Develop protocols for the initiation and maintenance of anticoagulation therapy appropriate to the medication used, to the condition being treated, and to the potential for drug interactions.

    (2011 Joint Commission National Safety Goal)

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Related ICSI Scientific Documents

Guidelines

- Antithrombotic Therapy Supplement
- Heart Failure in Adults
- Diagnosis and Treatment of Chest Pain and Acute Coronary Syndrome (ACS)
- Diagnosis and Initial Treatment of Ischemic Stroke
- Venous Thromboembolism Diagnosis and Treatment

Order Set

- Admission for Ischemic Stroke for Patients Not Receiving tPA
- Prevention of Ventilator-Associated Pneumonia

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Annotations

1. General Recommendations

Although no specific studies exist to document the value of patient education and early ambulation to reduce venous thromboembolism risk, the work group believes these measures are important for all venous thromboembolism risk patients, including those who are high risk.

Mechanical prophylaxis devices available for venous thromboembolism prophylaxis include graduated compression stockings and intermittent pneumatic compression devices. Graduated compression stockings (GCS) are specialized hosiery that provide graduated pressure on the lower legs and feet to help prevent thrombosis. Graduated compression stockings use stronger elastics to create significant pressure on the legs, ankles and feet. Graduated compression stockings should be tightest at the ankles and gradually become less constrictive towards the knees and thighs.

Although mechanical prophylaxis devices have been evaluated extensively in clinical studies, their efficacy in venous thromboembolism prevention remains unclear. These studies have often failed to define exactly what device was used, and frequently the devices were used in combination with other prophylaxis methods, making it difficult to demonstrate their efficacy. The 2008 American College of Chest Physicians Clinical Practice Guideline recommends "that mechanical methods of thromboprophylaxis be used primarily in patients at high risk of bleeding (1A), or possibly as an adjunct to anticoagulant-based thromboprophylaxis (2A)." *(Geerts, 2008 [Guideline])*. Mechanical prophylaxis devices, particularly thigh-high graduated compression stockings, can have harmful consequences, most commonly related to skin irritation and breakdown. Though routinely used, there is little evidence supporting the efficacy of GCS in the prevention of venous thromboembolism (VTE).

"Antiembolism" stockings such as TEDS, which provide relatively little compression (ankle 15 mm Hg, calf 8 mm Hg), are designed for non-ambulatory patients. The manufacturers of elastic stockings recommend higher compression (minimum ankle 30 mm Hg, minimum calf 20 mm Hg) for ambulatory patients. The tolerance and acceptability of higher compression elastic stockings are unclear. Though the work group understands that, in practice, mechanical means are widely used as an adjunct to pharmaceutical prophylaxis, the work group has not found compelling evidence of efficacy. Mechanical devices as a sole means of prophylaxis have not been demonstrated as efficacious.

- Graduated compression stockings (GCS) should not be applied to patients with known severe peripheral arterial disease. GCS have been associated with skin lesions, breaks, ulcers, blisters and necrosis.
- Where mechanical prophylaxis is recommended, the choice should be intermittent pneumatic compressions (IPC) with or without GCS. In particular, the American College of Obstetricians and Gynecologists consensus-based recommendation is "Placement of pneumatic compression devices before Caesarean delivery is recommended for all women not already receiving thromboprophylaxis."

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3. Special Situations/Procedures – High Risk of Bleeding

Recommendations:

- Each patient and procedure should be evaluated for risk of bleeding.

Certain situations and/or low risk procedures lend themselves to bleeding and therefore may require only early ambulation or intermittent pneumatic compression devices for deep vein thrombosis (DVT) prophylaxis *(Forrest, 2009 [Guideline])*.

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5. Special Situations – Dose Adjustment of Antithrombotics

Recommendations:

- In certain patient populations, heparin is recommended over low-molecular-weight (LMWH) heparins due to the LMWHs lower reliability.

Renal insufficiency is the best example, depending on the antithrombotic agent chosen, dose adjustments may be necessary in certain patient populations. Extremely high body/mass ratio (BMI), low weight and renal impairment are examples of when antithrombotic agents may be contraindicated, and decreased dosing should occur or certain agents may be preferred *(Nutescu, 2009 [Guideline])*.

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6. Special Situations – Neuraxial Blockade in Patients Receiving Antithrombotics

Recommendations:

- Closely monitor all patients who receive neuraxial blockade for developing back pain or signs and symptoms of spinal cord compression (weakness, saddle numbness, numbness, incontenience) after injections, during infusions and after discontinuation of infusions.
- Both insertion and removal of neuraxial catheters are significant events. Carefully consider the timing of those events and the timing of any anticoagulation drugs. Take into account the pharmacokinetics and pharmacodynamics of the specific anticoagulant drugs.
- The emergence of new drugs and unexpected clinical scenarios can render any guideline obsolete. Consult an anesthesiologist who is experienced in regional anesthesia, it is essential for novel situations.
- The American Society of Regional Anesthesia and Pain Medicine (ASRA) has developed extensive, peer-reviewed guidelines for the practice of regional anesthesia in the presence of anticoagulation and can be used for detailed management. Access these guidelines at http://www.asra.com.

(Horlocker, 2010 [R])

Neuraxial blockade is not a contraindication for pharmacologic prophylaxis. It is important to consider the use and timing of medications with neuraxial blockade. When an epidural is used for anesthesia, it is most appropriate to wait until the catheter is removed before starting pharmacologic prophylaxis. Neuraxial blockade should generally be avoided in patients with a clinical bleeding disorder.

Neuraxial blockade (spinal or epidural anesthesia) is a valuable tool for both anesthesiologists and surgeons. The Cochrane Reviews and other sources have listed the usefulness of neuraxial blockade for both intraoperative anesthesia and postoperative analgesia. There are groups of patients that demonstrate improved morbidity and mortality with the use of regional rather than general anesthesia. Similarly the usefulness of venous thromboembolism prophylaxis in preventing morbidity and mortality in surgical patients has been well established. However, there is concern about an increased risk of perispinal hematoma in patients receiving antithrombotic medications for venous thromboembolism prophylaxis in the setting of neuraxial blockade.

Perispinal hematoma is a rare but serious complication of neuraxial blockade. Thus, it is important to consider both the use and the timing of antithrombotic medications in these patients.

(Geerts, 2004 [Guideline]; Tyagi, 2002 [Low Quality Evidence]; Millar, 1996 [Low Quality Evidence])

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5. Postoperative warfarin

   As thromboprophylaxis with warfarin is initiated, the ASRA guideline suggests that neuraxial catheters should be removed when the INR is less than 1.5. This value was derived from studies correlating hemostasis with clotting factor activity levels greater than 40%. The ASRA (2010) guideline also suggests that neurologic assessment be continued for at least 24 hours after catheter removal for these patients. These comments represent mere suggestions, rather than recommendations, because suggestions are based on general consensus that there is conflicting evidence or opinion from case reports or expert opinion.

   In patients with INR greater than 1.5 but less than 3, we recommend that removal of indwelling catheters should be done with caution and the medication record reviewed for other medications that may influence hemostasis that may not effect the INR (e.g., NSAIDs, aspirin, clopidogrel, ticlopidine, UFH, LMWH). This recommendation is derived from case reports or expert opinion with conflicting evidence or opinion on the usefulness of the information. ASRA recommends that neurologic status be assessed before catheter removal and continued until the INR has stabilized at the desired prophylaxis level. This recommendation is based on general agreement from information derived from case reports and expert opinion.

   In patients with an INR greater than three, the ASRA recommends that the warfarin dose be held or reduced in patients with indwelling neuraxial catheters. This recommendation is based on general agreement in the efficacy of either randomized clinical trials or meta-analysis. Due to conflicting evidence or opinion on the usefulness of the information from case reports or expert opinion, ASRA made no definitive recommendation regarding management to facilitate removal of neuraxial catheters in patients with therapeutic levels of anticoagulation during neuraxial catheter infusion *(Horlocker, 2010 [Guideline])*.

6. Postoperative low-molecular-weight heparins (LMWHs)

   Patients who will receive postoperative LMWH thromboprophylaxis may safely undergo single-injection and continuous catheter techniques. The management of these patients is based on total daily dose, dosing schedule, and the timing of the first postoperative dose. The following recommendations are based on general agreement from case reports and/or expert opinion *(Horlocker, 2010 [Guideline])*.

   Single daily dosing

   The first postoperative LMWH dose should be administered six (6) to eight (8) hours postoperatively. The second postoperative dose should occur no sooner than 24 hours after the first dose. Indwelling neuraxial catheters may be safely maintained. However, the catheter should be removed a minimum of 10 to 12 hours after the last dose of LMWH. Subsequent LMWH dosing should occur a minimum of four hours after catheter removal. No additional hemostasis-altering medications should be administered due to the additive effects *(Horlocker, 2010 [Guideline])*.

   Twice daily dosing

   This dosage regimen is associated with an increased risk of spinal hematoma. The first dose of LMWH should be administered no earlier than 24 hours postoperatively, regardless of anesthetic technique, and only in the presence of adequate (surgical) hemostasis. Indwelling catheters should be removed before initiation of LMWH thromboprophylaxis. If a continuous technique is selected, the epidural catheter may be left indwelling overnight, but must be removed before the first dose of LMWH. Administration of LMWH should be delayed for four hours after catheter removal *(Horlocker, 2010 [Guideline])*.

Postoperative low-molecular-weight heparins (LMWH):

If a continuous epidural technique is selected for the patient's surgical procedure, the epidural catheter may be left indwelling overnight, but must be removed before the first dose of LMWH is given. Administration of LMWH should be delayed for at least four hours after the epidural catheter is removed. For patients

who are on higher (treatment) doses of LMWH such as Enoxaparin 1 mg/kg every 12 hours, or dalteparin 120 units/kg every 12 hours, epidural catheter is not recommended. However, if the patient does have an indwelling catheter and twice daily dosing is chosen, the catheter should be removed and dosing delayed for at least four hours after catheter removal *(Horlocker, 2010 [Guideline])*.

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8. Major Procedures (Inpatient), Caesarean, Laparoscopic or Outpatient Procedures

For management of the pregnant patient, please see the new practice bulletin, "Thromboembolism in Pregnancy" *(American College of Obstetricians and Gynecologists, The, 2011 [Guideline])*.

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10. Orthopedic Surgery – Hip Fracture, Hip/Knee Arthroplasty

Use of Aspirin Following Hip/Knee Arthroplasty

Although it remains controversial, interest persists in the orthopedic community regarding the use of aspirin for venous thromboembolism prophylaxis following hip fracture and hip/knee arthroplasty. The debate is occurring in Minnesota and across the United States. The work group has provided a pro/con forum to illustrate this debate. The American College of Chest Physicians (ACCP) guidelines recommend against the use of aspirin alone for VTE prophylaxis in this patient population. The American Academy of Orthopaedic Surgeons (AAOS) recommendations include aspirin as a therapeutic option in this patient population except in patients with elevated VTE risk and standard bleeding risk. Further study is needed.

- **Con:**

  The American College of Chest Physicians recommendations against aspirin are based on the failure of aspirin to demonstrate a similar reduction in the rate of venographically proven deep vein thrombosis compared to other anticoagulants *(Geerts, 2004 [Guideline])*. The endpoints of a venographically proven deep vein thrombosis has long been the diagnostic standard in thromboprophylaxis trials because of the sensitivity of detecting deep vein thrombosis and the availability of images for blinded study adjudication for most of the studies that compared aspirin, low-molecular-weight heparin, unfractionated heparin and other anticoagulants.

  There is some evidence that aspirin may provide some protection against venous thromboembolism; however, that is based on methodologically limited studies *(Geerts, 2004 [Guideline])*. Additionally, while there may be disagreement between the endpoint of a venographically proven deep vein thrombosis and a symptomatic deep vein thrombosis/pulmonary embolism as an endpoint, aspirin was not shown to be significantly beneficial compared to other anticoagulation agents *(Westrich, 1996 [Moderate Quality Evidence])*.

  Fatal pulmonary embolism and non-fatal pulmonary embolism/deep vein thrombosis are not the only concern when evaluating venous thromboembolism prophylaxis therapy. It is important to acknowledge that venous thromboembolism is also the source of significant, long-term morbidity from its non-fatal sequelae, and it is important to reduce all venous thromboembolism events, even non-fatal events, because of the impact on the quality of life for patients *(Prandoni, 1996 [Low Quality Evidence])*. Other anticoagulation agents reduce the rate of deep vein thrombosis significantly more than aspirin *(Gent, 1996 [Moderate Quality Evidence])*. A meta-analysis published in Lancet demonstrated a reduction of risk for pulmonary embolism and deep vein thrombosis by one-third; however, what the study was not designed to show was whether aspirin is as effective as

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who are on higher (treatment) doses of LMWH such as Enoxaparin 1 mg/kg every 12 hours, or dalteparin 120 units/kg every 12 hours, epidural catheter is not recommended. However, if the patient does have an indwelling catheter and twice daily dosing is chosen, the catheter should be removed and dosing delayed for at least two hours after catheter removal *(Horlocker, 2010 [Guideline])*.

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  The American College of Chest Physicians recommendations against aspirin are based on the failure of aspirin to demonstrate a similar reduction in the rate of venographically proven deep vein thrombosis compared to other anticoagulants *(Geerts, 2004 [Guideline])*. The endpoints of a venographically proven deep vein thrombosis has long been the diagnostic standard in thromboprophylaxis trials because of the sensitivity of detecting deep vein thrombosis and the availability of images for blinded study adjudication for most of the studies that compared aspirin, low-molecular-weight heparin, unfractionated heparin and other anticoagulants.

  There is some evidence that aspirin may provide some protection against venous thromboembolism; however, that is based on methodologically limited studies *(Geerts, 2004 [Guideline])*. Additionally, while there may be disagreement between the endpoint of a venographically proven deep vein thrombosis and a symptomatic deep vein thrombosis/pulmonary embolism as an endpoint, aspirin was not shown to be significantly beneficial compared to other anticoagulation agents *(Westrich, 1996 [Moderate Quality Evidence])*.

  Fatal pulmonary embolism and non-fatal pulmonary embolism/deep vein thrombosis are not the only concern when evaluating venous thromboembolism prophylaxis therapy. It is important to acknowledge that venous thromboembolism is also the source of significant, long-term morbidity from its non-fatal sequelae, and it is important to reduce all venous thromboembolism events, even non-fatal events, because of the impact on the quality of life for patients *(Prandoni, 1996 [Low Quality Evidence])*. Other anticoagulation agents reduce the rate of deep vein thrombosis significantly more than aspirin *(Gent, 1996 [Moderate Quality Evidence])*. A meta-analysis published in Lancet demonstrated a reduction of risk for pulmonary embolism and deep vein thrombosis by one-third; however, what the study was not designed to show was whether aspirin is as effective as

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other anticoagulation agents in preventing post-discharge venous thromboembolism *(Pulmonary Embolism Prevention (PEP) Trial Collaborative Group, 2000 [High Quality Evidence])*. Randomized controlled studies comparing aspirin to anticoagulant prophylaxis or placebo are needed to help determine aspirin's true efficacy.

Lastly, it is true that surgical procedures change rapidly and it is unknown what the overall burden of disease for deep vein thrombosis is with these new approaches to surgery, anesthesia and post-operative rehabilitation. Further randomized controlled studies to help determine the incidence of venous thromboembolism associated with these less-invasive techniques are needed before final recommendations can be made.

- **Pro:**

  The American College of Chest Physicians recommendations against aspirin for VTE prophylaxis following total hip and knee arthroplasty are based on the failure of aspirin to demonstrate a similar reduction in the rate of venographically proven deep vein thrombosis compared to other anticoagulants in these patient populations. However, the value of this particular measure (a positive venogram, even in the absence of any clinical symptoms) has been questioned. Several studies have shown comparable and low rates for aspirin using symptomatic endpoints, including symptomatic deep vein thrombosis, symptomatic non-fatal pulmonary embolism, fatal pulmonary embolism and all-cause mortality *(Cusick, 2009 [Low Quality Evidence]; Jameson, 2010 [Low Quality Evidence]; Lotke, 2006 [Low Quality Evidence]; Sarmiento, 2005 [Low Quality Evidence]; Brookenthal, 2001 [Meta-analysis]; Freedman, 2000 [Meta-analysis]; Westrich, 2000 [Meta-analysis]; Sarmiento, 1999 [Low Quality Evidence])*. In addition, one study using a positive duplex ultrasound as an endpoint (even in the absence of any clinical symptoms) found no difference in the incidence of a positive duplex ultrasound between total knee arthroplasty patients treated with aspirin compared to those treated with enoxaparin *(Westrich, 2006 [Low Quality Evidence])*. One can conclude that although some studies have demonstrated that aspirin has not been as effective as other anticoagulants at reducing the rate of venographically proven deep vein thrombosis (even in the absence of any clinical symptoms) following hip and knee arthroplasty, there is no apparent difference between aspirin and other anticoagulants with regard to the rate of symptomatic events, including symptomatic deep vein thrombosis, symptomatic non-fatal pulmonary embolism, fatal pulmonary embolism, or all-cause mortality. In fact, Sharrock, et al., reviewed 15,839 total hip and knee arthroplasty patients treated with various anticoagulants post-operatively and found that those patients treated with potent anticoagulants had a higher all-cause mortality rate than those treated with aspirin *(Sharrock, 2008 [Meta-analysis])*.

  The most appropriate endpoint following total hip or total knee arthroplasty would be some measure of overall outcome, taking into account all factors that would ultimately impact the result of the surgical intervention. Unfortunately, a study comparing overall outcome in patients receiving different anticoagulants following these procedures does not exist. One of the major concerns regarding anticoagulant therapy has been the risk of excessive hemorrhage that may be seen with the more potent anticoagulants. The increased risk of bleeding associated with such agents may create different complications that may compromise the overall outcome more than a positive venogram. A recent study from the Mayo Clinic found that patients that returned to the operating room for evacuation of a hematoma following total knee arthroplasty had a significantly increased risk for developing infection and/or undergoing subsequent major surgery *(Galat, 2008 [Moderate Quality Evidence])*. Burnett, et al., reported a series of 290 total hip and knee arthroplasty patients treated with a 10-day course of Lovenox postoperatively. The high rate of re-admission and complications related to hemorrhage actually caused these investigators to terminate the study prior to completion *(Burnett, 2007 [Low Quality Evidence])*. Bleeding events following hip and knee arthroplasty are not benign occurrences.

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It is important to recognize that the entire process of total hip and knee arthroplasty is changing rapidly. One consistent goal has been to mobilize these patients as rapidly as possible following surgery, utilizing a multimodal approach. This approach includes an increasing emphasis on pre-operative education for patients, a trend to regional anesthesia, new less invasive surgical techniques, decreasing reliance on narcotic medications post-operatively, and increasingly aggressive rehabilitation protocols. Patients are now frequently out of bed and ambulating the day of surgery. Given all these changes, one should legitimately ask whether or not modern hip and knee arthroplasty patients should still be considered at high risk for VTE events. A recent study by Sugano including 3,016 Asian patients undergoing major hip surgery, none of whom received any type of anti-coagulation post-operatively, found a 0.13% incidence of symptomatic DVT, 0.03% incidence of symptomatic PE, and 0% incidence of fatal PE *(Sugano, 2009 [Low Quality Evidence])*. All the studies upon which the ACCP recommendation against aspirin is based were completed at a time when things were much different than they are today. In addition, the majority of authors involved in establishing the ACCP guidelines receive compensation from pharmaceutical companies that manufacture the very products that these guidelines endorse. This potential conflict of interest cannot be ignored.

As the debate surrounding the use of aspirin continues, the American Academy of Orthopaedic Surgeons has published recommendations on the prevention of symptomatic pulmonary embolism in patients undergoing total hip or knee arthroplasty *(American Academy of Orthopaedic Surgeons Clinical Guidelines, 2008 [Guideline])*. These recommendations are based on a systematic review of the literature conducted by the Center for Clinical Evidence Synthesis at Tufts New England Medical Center. The recommendations risk stratify patients based on venous thromboembolism risk (standard or elevated) and risk of major bleeding (standard or elevated). This risk stratification results in four patient groups:

1. Standard venous thromboembolism risk, standard bleeding risk
2. Elevated venous thromboembolism risk, standard bleeding risk
3. Standard venous thromboembolism risk, elevated bleeding risk
4. Elevated venous thromboembolism risk, elevated bleeding risk

Recommended chemoprophylactic agents include (in alphabetical order) aspirin, low-molecular-weight heparin, synthetic pentasaccharides, and warfarin in all groups except the elevated venous thromboembolism risk, standard bleeding risk group. In this particular group, recommended agents include (in alphabetical order) low-molecular-weight heparin, synthetic pentasaccharides, and warfarin.

In summary, there continues to be much debate and controversy regarding the optimal method of VTE prophylaxis following hip and knee arthroplasty. Although VTE events may have a negative impact on the overall outcome for these patients, other events, such as excessive hemorrhage, may have a negative impact, as well. Studies evaluating the overall outcome following these procedures in a modern setting with patients treated with a variety of postoperative VTE prophylaxis regimens are needed to determine the optimal way to manage these patients.

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12. Heparin-Induced Thrombocytopenia Monitoring

Heparin-induced thrombocytopenia (HIT) is a potential side effect of heparin and LMWH therapy. Post-operative patients and patients receiving unfractionated heparin (UFH) are at the highest risk of developing this complication. Refer to the Main Table, Section #12 for guidelines on monitoring for HIT *(Warkentin, 2008 [Guideline])*.

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This section provides resources, strategies and measurement specifications for use in closing the gap between current clinical practice and the recommendations set forth in the guideline.

The subdivisions of this section are:

- Aims and Measures
  - Measurement Specifications
- Implementation Recommendations
- Resources
- Resources Table

Aims and Measures

1. Increase the percentage of hospitalized patients 18 years of age and older who are assessed for venous thromboembolism risk within 24 hours of admission. *(Main Table, Section #1)*

   Measure for accomplishing this aim:

   a. Percentage of hospitalized patients who have a venous thromboembolism risk assessment within 24 hours of admission to the hospital.

2. Increase the percentage of hospitalized patients (18 years of age and older) who are evaluated for venous thromboembolism prophylaxis upon change in level of care, providers and/or upon discharge. *(Main Table, Section #1)*

   Measure for accomplishing this aim:

   a. Percentage of patients who are evaluated for venous thromboembolism prophylaxis upon referral or transfer to another setting, service, practitioner or level of care within or outside the organization.

3. Increase the percentage of hospitalized patients 18 years of age and older at risk for venous thromboembolism who have received education within 24 hours of admission into inpatient care setting for venous thromboembolism that includes venous thromboembolism risk, signs and symptoms, early and frequent mobilization and clinically appropriate treatment/prophylaxis methods. *(Main Table, Section #1; 2011 Joint Commission National Patient Safety Goal)*

   Measure for accomplishing this aim:

   a. Percentage of hospitalized patients at risk for venous thromboembolism who have documented venous thromboembolism education that includes: *(composite measure)*

      - Venous thromboembolism risk
      - Signs and symptoms
      - Early and frequent mobilization
      - Clinically appropriate treatment/prophylaxis methods available within 24 hours of admission

4. Improve the safety of using medications by reducing the likelihood of patient harm associated with the use of anticoagulation therapy in inpatient care settings for patients 18 years of age and older. *(2011 Joint Commission National Safety Goal)*

   Measures for accomplishing this aim:

   a. Percentage of patients who have a baseline international normalized ratio (INR) drawn when initially prescribed warfarin.

   b. Percentage of patients on warfarin with current international normalized ratio that is used to monitor and adjust therapy.

   c. Percentage of patients on prescribed heparin and low-molecular-weight heparin who have appropriate baseline laboratory tests documented.

   d. Percentage of patients on prescribed heparin or low-molecular-weight heparin who have appropriate ongoing laboratory tests that are used to adjust therapy.

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5. Increase the percentage of at-risk hospitalized patients 18 years of age and older receiving appropriate prophylaxis treatment within 24 hours of admission. *(Main Table, Section #1)*

   Measure for accomplishing this aim:

   a. Percentage of patients undergoing procedures for which VTE prophylaxis is indicated in all patients who had an order for low-molecular-weight heparin (LMWH), low-dose unfractionated heparin (LDUH), adjusted-dose warfarin, fondaparinux or mechanical prophylaxis to be given within 24 hours prior to incision time or within 24 hours after surgery end time. *(AMA-PCP/NCQA, CMS Physician Quality Reporting Initiative Measure Set 2011 – Measure #23)*

6. Reduce the risk of complications from pharmacologic prophylaxis for hospitalized and discharged patients 18 years of age and older. *(2011 Joint Commission National Patient Safety Goals, Main Table, Section #1)*

   Measures for accomplishing this aim:

   a. Percentage of hospitalized patients receiving heparin therapy for venous thromboembolism prophylaxis who have a baseline platelet count before starting heparin, and then a platelet count every other day.

   b. Percentage of hospitalized adult patients (18 years and older) with a creatinine clearance less than 30 mL/min in the medical record who receive a reduced dose of anticoagulation therapy.

   c. Percentage of discharged patients who are readmitted to the hospital for conditions related to venous thromboembolism within 30 days of discharge.

7. Increase the percentage of surgery patients (18 years of age and older) who receive appropriate venous thromboembolism prophylaxis within 24 hours prior to anesthesia to 24 hours after anesthesia. *(Main Table, Sections #8-11)*

   Measures for accomplishing this aim:

   a. Percentage of surgery patients with recommended venous thromboembolism prophylaxis ordered anytime from hospital arrival to 24 hours after anesthesia end time. *(SCIP-VTE 1, NQF endorsed, required for CMS reporting)*

   b. Percentage of surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to anesthesia start time to 24 hours after anesthesia end time. *(SCIP-VTE-2, NQF endorsed, required for CMS reporting)*

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Measurement Specifications

Measurement #1a

Percentage of hospitalized patients who have a venous thromboembolism risk assessment within 24 hours of admission.

Population Definition

Patients 18 years and older admitted to the hospital for a medical condition or surgery.

Data of Interest

$$\frac{\text{\# of patients who are assessed for venous thromboembolism risk within 24 hours of admission}}{\text{\# of hospitalized patients}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery who are assessed for venous thromboembolism risk within 24 hours of admission to the hospital.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine the documentation of a completed venous thromboembolism risk assessment.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as increase in the rate.

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Measurement #2a

Percentage of hospitalized patients who are evaluated for venous thromboembolism prophylaxis upon referral or transfer to another setting, service, practitioner or level of care within or outside the organization.

Population Definition

Patients 18 years and older admitted to the hospital for a medical condition or surgery.

Data of Interest

$$\frac{\text{\# of patients evaluated for venous thromboembolism prophylaxis upon referral or transfer to another setting, service, practitioner or level of care within or outside the organization}}{\text{\# of hospitalized patients}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery evaluated for venous thromboembolism prophylaxis upon referral or transfer to another setting, service, practitioner or level of care within or outside the organization.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether patients were evaluated for venous prophylaxis before referral or transfer.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as increase in the rate.

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Measurement #3a

Percentage of hospitalized patients at risk for venous thromboembolism who have venous thromboembolism education within 24 hours of admission that includes 1) venous thromboembolism risk, 2) signs and symptoms, 3) early and frequent mobilization, and 4) clinically appropriate treatment/prophylaxis methods.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery.

Data of Interest

$$\frac{\text{\# of hospitalized patients at risk for venous thromboembolism who have venous thromboembolism education within 24 hours of admission that includes 1) venous thromboembolism risk, 2) signs and symptoms, 3) early and frequent mobilization, and 4) clinically appropriate treatment/prophylaxis methods}}{\text{\# of hospitalized patients at risk for venous thromboembolism}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery at risk for venous thromboembolism who have venous thromboembolism education within 24 hours of admission that includes 1) venous thromboembolism risk, 2) signs and symptoms, 3) clinically appropriate treatment/prophylaxis methods, and 4) early and frequent mobilization.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery at-risk for venous thromboembolism.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether patients at risk for venous thromboembolism were provided education within 24 hours of admission to the hospital.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This composite process, measure is based on 2011 Joint Commission National Patient Safety Goal. Improvement is noted as increase in the rate.

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Measurement #4a

Percentage of hospitalized patients who have a baseline international normalized ratio when initially prescribed warfarin.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery and prescribed warfarin.

Data of Interest

$$\frac{\text{\# of patients on warfarin who have a baseline international normalized ratio}}{\text{\# of hospitalized patients prescribed warfarin}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery and on warfarin who have a baseline international normalized ratio.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery and prescribed warfarin.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether patients who are initially prescribed warfarin have a baseline international normalized ratio.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This process measure is based on 2011 Joint Commission National Patient Safety Goal. Improvement is noted as increase in the rate.

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Measurement #4b

Percentage of hospitalized patients on warfarin with current international normalized ratio that it is used to monitor and adjust therapy.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery and prescribed warfarin.

Data of Interest

$$\frac{\text{\# of patients on warfarin for whom current international normalized ratio is used to monitor and adjust therapy}}{\text{\# of hospitalized patients on warfarin who have current international normalized ratio}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery and on warfarin for whom current international normalized ratio is used to monitor and adjust therapy.

Denominator: Number of adult patients hospitalized for a medical condition or surgery who are on warfarin and have current international normalized ratio.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether patients who are on ongoing warfarin and have current international normalized ratio, and whether it is used to monitor and adjust therapy.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This process measure is based on 2011 Joint Commission National Patient Safety Goal. Improvement is noted as increase in the rate.

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Measurement #4c

Percentage of hospitalized patients on prescribed heparin or low-molecular-weight heparin who have appropriate baseline laboratory tests documented.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery and prescribed heparin and low-molecular-weight heparin.

Data of Interest

$$\frac{\text{\# of hospitalized patients who have appropriate baseline laboratory tests documented}}{\text{\# of hospitalized patients prescribed heparin and low-molecular-weight heparin}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery and on heparin or low-molecular-weight heparin who have appropriate baseline laboratory tests documented.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery prescribed heparin or low-molecular-weight heparin.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether patients who are prescribed heparin or low-molecular-weight heparin have appropriate baseline laboratory tests.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This process measure is based on 2011 Joint National Patient Safety Goal. Improvement is noted as increase in the rate.

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Measurement #4d

Percentage of adult hospitalized patients on prescribed heparin or low-molecular-weight heparin who have appropriate ongoing laboratory tests drawn and used to adjust therapy.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery and prescribed heparin and low-molecular-weight heparin.

Data of Interest

$$\frac{\text{\# of hospitalized patients who have appropriate ongoing laboratory tests drawn and used to adjust therapy}}{\text{\# of hospitalized patients prescribed heparin or low-molecular-weight heparin}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery and on heparin or low-molecular-weight heparin who have appropriate ongoing laboratory tests drawn and used to adjust therapy.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery who are prescribed heparin or low-molecular-weight heparin.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether patients who are on heparin or low-molecular-weight heparin have appropriate ongoing laboratory tests available.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This process measure is based on 2011 Joint Commission National Patient Safety Goal. Improvement is noted as increase in the rate.

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Measurement #5a

Percentage of patients undergoing procedures for which VTE prophylaxis is indicated in all patients who had an order for low-molecular-weight heparin (LMWH), low-dose unfractionated heparin (LDUH), adjusted-dose warfarin, fondaparinux or mechanical prophylaxis to be given within 24 hours prior to incision time or within 24 hours after surgery end time.

Notes

This measure is from the Centers for Medicare and Medicaid Services (CMS), Physician Quality Reporting Initiative (PQRI) Measure Set 2011, Measure #23. Measures developers are American Medical Association-sponsored Physician Consortium on Performance Improvement (AMA-PCPI) and National Committee for Quality Assurance (NCQA).

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Measurement #6a

Percentage of adult hospitalized patients receiving heparin therapy for venous thromboembolism prophylaxis who have a baseline platelet count before starting heparin, and then a platelet count every other day.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery.

Data of Interest

$$\frac{\text{\# of hospitalized patients receiving heparin therapy who have a baseline platelet count before starting heparin, and then a platelet count every other day}}{\text{\# of hospitalized patients receiving heparin therapy}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery and on heparin therapy for venous thromboembolism prophylaxis who have a baseline platelet count before starting heparin, and then a platelet count every other day.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery and receiving heparin therapy for venous thromboembolism prophylaxis.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether those patients who are on heparin therapy for venous thromboembolism prophylaxis had a baseline platelet count before starting heparin.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as increase in the rate.

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Measurement #6b

Percentage of adult hospitalized patients with creatinine clearance less than 30 mL/min in the medical record who receive a reduced dose of anticoagulation therapy.

Population Definition

Patients 18 years of age and older admitted to the hospital for a medical condition or surgery with creatinine clearance less than 30 mL/min.

Data of Interest

$$\frac{\text{\# of hospitalized patients with creatinine clearance less than 30 mL/min who receive a reduced dose of anticoagulation therapy}}{\text{\# of hospitalized patients (18 years of age and older) with creatinine clearance less than 30 mL/min}}$$

Numerator/Denominator Definitions

Numerator: Number of adult patients hospitalized for a medical condition or surgery and with creatinine clearance less than 30 mL/min who receive a reduced dose of anticoagulation therapy.

Denominator: Number of adult patients who are hospitalized for a medical condition or surgery with creatinine clearance less than 30 mL/min.

Method/Source of Data Collection

From discharge records, a list of all adult patients hospitalized during the target period. The medical records can be reviewed to determine whether those patients with creatinine clearance less than 30 mL/min received a reduced dose of anticoagulation therapy.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as increase in the rate.

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Measurement #6c

Percentage of discharged patients who are readmitted to the hospital for conditions related to venous thromboembolism within 30 days of discharge.

Population Definition

Patients 18 years of age and older discharged after hospitalization for a medical condition or surgery.

Data of Interest

$$\frac{\text{\# of discharged patients who are readmitted for conditions related to venous thromboembolism within 30 days of discharge}}{\text{\# of discharged patients}}$$

Numerator/Denominator Definitions

Numerator: Number of adult discharged patients who are readmitted to the hospital for conditions related to venous thromboembolism within 30 days of discharge.

Denominator: Number of adult patients who are discharged after hospitalization for a medical condition or surgery.

Method/Source of Data Collection

A list of all discharged adult patients during the previous target period. The medical records can be reviewed to determine the documentation of readmission for conditions related to venous thromboembolism.

Time Frame Pertaining to Data Collection

Monthly.

Notes

This is a process measure, and improvement is noted as decrease in the rate.

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Measurement #7a

Percentage of surgery patients with recommended venous thromboembolism prophylaxis ordered anytime from hospital arrival to 24 hours after anesthesia end time.

Notes

This is a SCIP-VTE-1 measure and is NQF-endorsed consensus standard for hospital care. This measure is required for reporting to the Centers for Medicare and Medicaid Services (CMS).

Full specifications for this measure can be found at the Joint Commission Web site at:

http://www.jointcommission.org/specifications_manual_for_national_hospital_inpatient_quality_measures/

Web site link up to date as of March 2011.

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Measurement #7b

Percentage of surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to anesthesia start time to 24 hours after anesthesia end time.

Notes

This is a SCIP-VTE-2 measure and is NQF-endorsed consensus standard for hospital care. This measure is required for reporting to the Centers for Medicare and Medicaid Services (CMS).

Full specifications for this measure can be found at the Joint Commission Web site at:

http://www.jointcommission.org/specifications_manual_for_national_hospital_inpatient_quality_measures/

Web site link up to date as of March 2011.

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Implementation Recommendations

Prior to implementation, it is important to consider current organizational infrastructure that address the following:

- System and process design
- Training and education
- Culture and the need to shift values, beliefs and behaviors of the organization

The following system changes were identified by the guideline work group as key strategies for health care systems to incorporate in support of the implementation of this guideline.

1. Implement a defined anticoagulation management program to individualize the care provided to each patient receiving anticoagulation therapy. *(2011 Joint Commission National Safety Goal)*
2. (Clinics and Hospitals): Develop systems for monitoring the effects of anticoagulation therapy (heparin, low-molecular-weight heparin, warfarin and other anticoagulants) to include monitoring of outpatient therapy:

   - Use of standardized practices/protocols that include patient involvement.

   (2011 Joint Commission National Safety Goal)
3. When heparin is administered intravenously and continuously, the organization should use programmable infusion pumps.

   (2011 Joint Commission National Safety Goal)
4. Develop systems for providing patient/family education that includes the importance of follow-up monitoring, compliance issues, dietary restrictions, and potential adverse drug reactions and interactions.

   - Patient education to include documentation of the patient's own awareness of his/her risk for venous thromboembolism, signs and symptoms of venous thromboembolism, activity level when/how to seek treatment, and demonstrated understanding of the prescribed anticoagulation regimen.

   (2011 Joint Commission National Safety Goal)
5. Develop a policy for providing organizational education regarding anticoagulation therapy to prescriber(s), staff, patients and families.

   (2011 Joint Commission National Safety Goal)
6. Develop protocols for the initiation and maintenance of anticoagulation therapy appropriate to the medication used, to the condition being treated, and to the potential for drug interactions.

   (2011 Joint Commission National Safety Goal)

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Resources

Criteria for Selecting Resources

The following resources were selected by the guideline work group as additional resources for providers and/or patients. The following criteria were considered in selecting these resources.

- The site contains information specific to the topic of the guideline.
- The content is supported by evidence-based research.
- The content includes the source/author and contact information.
- The content clearly states revision dates or the date the information was published.
- The content is clear about potential biases, noting conflict of interest and/or disclaimers as appropriate.

Resources Available to ICSI Members Only

ICSI has a wide variety of knowledge resources that are ***only*** available to ICSI members (these are indicated with an asterisk in far left-hand column of the Resources table). In addition to the resources listed in the table, ICSI members have access to a broad range of materials including tool kits on CQI processes and Rapid Cycling that can be helpful. To obtain copies of these or other Resources, go to http://www.icsi.org/improvement_resources. To access these materials on the Web site, you must be logged in as an ICSI member.

The resources in the table on the next page that are not reserved for ICSI members are available to the public free-of-charge.

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Resources Table

*	Author/Organization	Title/Description	Audience	Web Sites/Order Information
	Anticoagulation Europe (ACE) and sanofi-aventis	The Web site is an educational public health awareness campaign, spear-headed by ACE and Sanofi-Aventis. Both parties are joint authors of the content. Sanofi-Aventis is a for-profit pharmaceutical company. ACE is a registered charity committed to the prevention of thrombosis and the provision of information and support for people already receiving anti-coagulant and anti-platelet therapy.	Patients and Families	http://www.stoptheclot.com
	Anticoagulation Forum	The forum is a multidisciplinary non-profit organization of health care professionals across the country. The site is useful for finding clinics in other states and professional meetings relevant to anticoagulation.	Health Care Professionals	http://www.acforum.org
	Care Clinical Research	The Web site provides resource on cardiovascular and respiratory diseases, by a clinical research company engaged in drug and device research. All information is peer reviewed by a select panel of professionals and laypersons. It includes information specific to antithrombotic therapy.	Health Care Professionals; Patients and Families	http://www.careinternet.net
	Park Nicollet Health Services	Deep Vein Thrombosis	Patients and Families	http://www.icsi.org/cardiovascular_8490/deep_vein_thrombosis_.html

* Available to ICSI members only.

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ICSI Order Sets utilize two types of boxes for orders. One is the open box that clinicians will need to check for the order to be carried out. The second box is a pre-checked box and are those orders that have strong evidence and/or are standard of care and require documentation if the clinician decides to "uncheck" the order.

There is increasing evidence that pre-checked boxes are more effective in the delivery of care than physician reminders, even within the computerized medical record environment. Organizations are recognizing the benefit of using pre-checked boxes for other orders to promote efficiency. Organizations are encouraged, through a consensus process, to identify those orders to utilize pre-checked boxes to increase efficiency, reduce calls to clinicians, and to reduce barriers for nursing and other professionals to provide care that is within their scope.

Patient information would be part of the medical record in electronic ordering. Institutions will need to add this section per their organization's policy.

Physician information would not be necessary in electronic ordering. How to contact would not be actionable in electronic ordering.

Throughout the Order Set you will note Annotation numbers. These Annotation numbers correspond with the guideline itself and provide associated discussion and evidence when available.

It is assumed that clinicians will supplement this information from standard pharmaceutical sources to inform their decisions for individual patients.

Order Set

This order set pertains to those orders for venous thromboembolism (VTE) prophylaxis in adults who are hospitalized. This order set will not include admission, discharge or other orders specific to the patient's condition outside of VTE prophylaxis.

Legend:
☐ Open boxes are orders that a clinician will need to order by checking the box.
☑ Pre-checked boxes are those orders with strong supporting evidence and/or regulatory requirements that require documentation if not done.

Patient Information *(Two are required.)*

Last Name: _____
First Name: _____
Date of Birth: ___/___/_____
Patient's age: _____
ID #: _____

Is patient already on therapeutic anticoagulation (e.g., warfarin/heparin products – UFH or LMWH)? (*Antiplatelet drugs do not apply [e.g., aspirin/clopidogrel]*)
☐ No ☐ Yes, drug name: _____
Is drug to be continued? ☐ No ☐ Yes (*Additional prophylaxis is not required)*

Allergies/adverse drug reactions

☐ None
☐ Yes, Name: _____ Type of reaction: _____

VTE Risk Factors **If presence of one or more risk factors, pharmacologic prophylaxis is recommended**	
Prior history of DVT/PE	Acute respiratory failure
Active cancer or myloproliferative disorders	Acute infection
Admission to the ICU	Inflammatory bowel disease
Extended immobility or estimated length of stay 4 days or more	Nephrotic syndrome
60 years of age or more	Rheumatoid/Collagen vascular disorder
Thrombophilia – acquired or congenital	BMI greater than or equal to 30
Uncompensated heart failure	Estrogen-based therapies Other _____

Anticoagulation Special Circumstances* **Delay or withhold anticoagulation until patient has been assessed for risks and benefits of anticoagulation**	
High risk of bleeding	**History of HIT** (***contraindicated for heparin products – UFH, LMWH)***
Active major, significant bleeding (e.g., cerebral hemorrhage)	Thrombocytopenia (platelets less than 50,000 mm_3)
High-risk for re-bleeding, e.g., significant hemorrhage, intracerebral hemorrhage within the last 2 weeks or subarachnoid hemorrhage until treated and repaired. (*Disseminated intravascular coagulation [DIC] hemorrhage due to malignancy does not apply.)*	History of coagulopathy (acquired/congenital – *e.g., hemophilia, von Willebrand's, idiopathic thrombocytopenia*
Vascular access/biopsy sites inaccessible to hemostatic control within the past 24 hours	
Bacterial endocarditis *(listed precaution by the manufacturer for LMWH)*	Other_____
Active intracranial lesions/neoplasms/monitoring devices	Other_____
Craniotomy within 2 weeks	Other_____
Proliferative retinopathy *(listed precaution by the manufacturer)*	Other_____
Epidural/indwelling catheter	Other_____

* Consider consultation with an anticoagulation expert to assess risks and benefits of anticoagulation.

Pharmacologic prophylaxis is contraindicated due to: (*See mechanical prophylaxis recommendations)*
☐ _____

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Medications

Pharmacologic prophylaxis

Choose one: (*Aspirin or platelet inhibitors are not recommended as monotherapy)*

☐ Unfractionated heparin (UFH) 5,000 units subcutaneous every 8 hours beginning at admission. (***Notify physician*** *and* ***discontinue*** *unfractionated heparin if platelet count drops 50% or more from baseline value.)*

☐ Unfractionated heparin (UFH) 5,000 units subcutaneous every 12 hours beginning at admission. (***Notify physician*** *and* ***discontinue*** *unfractionated heparin if platelet count drops 50% or more from baseline value.)*

☐ Dalteparin (***Notify physician*** *and* ***discontinue*** *dalteparin if platelet count drops 50% or more from baseline value.)*
- ☐ 5,000 units subcutaneous every 24 hours beginning at admission

☐ Enoxaparin (***Notify physician*** *and* ***discontinue*** *enoxaparin if platelet count drops 50% or more from baseline value.)*
- ☐ For creatinine clearance greater than or equal to 30 mL/min, 40 mg subcutaneous every 24 hours beginning at admission
- ☐ For creatinine clearance less than 30 mL/min, 30 mg subcutaneous every 24 hours beginning at admission
- ☑ For renal dialysis patients, consider unfractionated heparin (UFH)
- ☐ For patients with BMI greater than or equal to 40, 40 mg subcutaneous every 12 hours or 50 mg subcutaneous every 24 hours

☐ Fondaparinux 2.5 mg subcutaneous every 24 hours
- ☐ Contraindicated if weight < 50 kg or CrCl < 30 ml/min
- ☐ For creatinine clearance less than 30 mL/min, consider UFH

☑ **Notify physician** if bleeding occurs

Obtain orders and initiate the following:
- Platelet count at baseline, then every other day from day 4-14 or until UFH/LMWH has been stopped, whichever occurs first.
- Initiate patient education

Mechanical Prophylaxis

☐ Pneumatic compression: *(Recommended if patient is bed bound or has contraindications to pharmacologic prophylaxis or planning Caesarean delivery)*
- ☐ thigh high ☐ knee high

☐ Venous foot pumps

Lab/diagnostics ***(Baseline labs if not obtained in the ED or physician office)***

☑ **Baseline Labs (if not obtained in the ED or physician's office)**
- Hemoglobin
- Platelet count
- Creatinine

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☑ **Platelet monitoring**
- Medical and obstetric patients receiving only LMWH or medical patients receiving only UFH intravascular catheter flushes: Platelet monitoring not required
- UFH exposure within 100 days, or exposure uncertain: Baseline platelet count then monitor at 24 hours and continue monitoring every other day until day 14 or until UFH/LMWH has been stopped, which ever occurs first
- All other patients: Platelet count every other day from days 4-14

☑ **Initiate patient education**

Authorized Prescriber Signature: _____

Printed Name: _____

Date/Time of Orders:_____/_____/_____ _____:_____

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The subdivision of this section is:

- References

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Links are provided for those new references added to this edition (author name is highlighted in blue).

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Document History

2011

- Implemented GRADE approach to classing the strength of articles
- Use of new Summary of Changes template
- Incorporated Order Set into the guideline

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ICSI Document Development and Revision Process

Overview

Since 1993, the Institute for Clinical Systems Improvement (ICSI) has developed more than 60 evidence-based health care documents that support best practices for the prevention, diagnosis, treatment or management of a given symptom, disease or condition for patients.

Document Development and Revision Process

The development process is based on a number of long-proven approaches. ICSI staff first conducts a literature search to identify pertinent clinical trials, meta-analysis, systematic reviews, regulatory statements and other professional guidelines. The literature is reviewed and graded based on the ICSI Evidence Grading System.

ICSI facilitators identify gaps between current and optimal practices. The work group uses this information to develop or revise the clinical flow and algorithm, drafting of annotations and identification of the literature citations. ICSI staff reviews existing regulatory and standard measures and drafts outcome and process measures for work group consideration. The work group gives consideration to the importance of changing systems and physician behavior so that outcomes such as health status, patient and provider satisfaction, and cost/utilization are maximized.

Medical groups, who are members of ICSI, review each guideline as part of the revision process. The medical groups provide feedback on new literature, identify areas needing clarification, offer recommended changes, outline successful implementation strategies and list barriers to implementation. A summary of the feedback from all medical groups is provided to the guideline work group for use in the revision of the guideline.

Implementation Recommendations and Measures

Each guideline includes implementation strategies related to key clinical recommendations. In addition, ICSI offers guideline-derived measures. Assisted by measurement consultants on the guideline development work group, ICSI's measures flow from each guideline's clinical recommendations and implementation strategies. Most regulatory and publicly reported measures are included but, more importantly, measures are recommended to assist medical groups with implementation; thus, both process and outcomes measures are offered.

Document Revision Cycle

Scientific documents are revised every 12-24 months as indicated by changes in clinical practice and literature. Each ICSI staff monitors major peer-reviewed journals every month for the guidelines for which they are responsible. Work group members are also asked to provide any pertinent literature through check-ins with the work group mid-cycle and annually to determine if there have been changes in the evidence significant enough to warrant document revision earlier than scheduled. This process complements the exhaustive literature search that is done on the subject prior to development of the first version of a guideline.

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