

Performance Improvement

Optimizing the Prevention of Venous Thromboembolism: Recent Quality Initiatives and Strategies to Drive Improvement

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Venous thromboembolism (VTE) is considered the most common preventable cause of hospital-related death in the United States.¹ More than 12 million patients, or nearly a third of hospital discharges, are classified as being at risk of VTE.² Thromboprophylaxis substantially reduces the incidence of VTE in these patients.^{3,4} However, many patients at risk of VTE do not receive any thromboprophylaxis or are given inappropriate thromboprophylaxis, defined as the incorrect type at the wrong dose or for an insufficient duration. Indeed, one study showed that appropriate VTE prophylaxis is provided to only one third of hospitalized medical patients at risk of VTE.⁵ In recognition of the need to improve the prevention and care of VTE, a number of organizations have established performance measures to reduce the health care and economic burden of VTE in the United States (*see Appendix 1 in online version*). This article reviews these ongoing national quality initiatives and discusses strategies to help hospitals and health care professionals (HCPs) optimize current VTE prophylaxis practices.

Methods

In June 2008 and June 2009, before the final acceptance of this article, a computerized literature search was performed using PubMed and MEDLINE, and this was complemented by manual searches of relevant journals and Web sites to identify additional literature related to VTE prevention and quality improvement (QI).

Findings

There are many performance measure initiatives derived from public agencies and private organizations, including the National Quality Forum (NQF), The Joint Commission, and the Agency for Healthcare Research and Quality (AHRQ). These measures aim to improve quality of care and reduce unnecessary health care costs.

NQF. The NQF recognized that VTE is an important patient safety issue and has formulated the “NQF-Endorsed™ Set of Safe Practices. This consists of 30 safe practices, 2 of

Article-at-a-Glance

Background: Venous thromboembolism (VTE) is associated with a substantial health care and economic burden, yet many VTE events are preventable. Despite the availability of evidence-based guidelines detailing effective thromboprophylaxis strategies, the underuse and inappropriate prescribing of VTE prophylaxis are common. Current national quality initiatives were reviewed to identify strategies that may help hospitals and health care professionals optimize current VTE prophylaxis practices.

Methods: A computerized literature search was performed using PubMed and MEDLINE, and this was complemented by hand searches of relevant journals and Web sites to identify additional literature related to VTE prevention and quality improvement.

Findings: Many organizations, including the Centers for Medicare & Medicaid Services, the National Quality Forum, the Joint Commission, and the Agency for Healthcare Research and Quality have developed performance measures, quality indicators, public reporting initiatives, incentive programs, and “negative reimbursement” that are designed to help improve VTE prevention.

Conclusions: It remains the responsibility of individual hospitals to identify specific areas in which they can improve their VTE prophylaxis rates to obtain positive results from the reporting initiatives and incentive programs. If performance measures are to be met, all hospital departments will need to implement effective VTE prevention policies, including early risk assessment, appropriate prophylaxis prescribing, monitoring, and follow-up. Multifaceted, integrated initiatives involving risk assessment tools, decision support, electronic alert systems, and hospitalwide education, with a mechanism for audit and feedback, may help ensure that all health care professionals comply with VTE-prevention policies and initiatives.

which focus on VTE. If adopted, these would have a major positive impact on the safety of patients.⁶ In the 2006 update, NQF Safe Practice number 28 recommends that each patient be evaluated on admission, and regularly thereafter, for VTE risk level and that evidence-based methods of appropriate thromboprophylaxis be used if required. NQF Safe Practice number 29 recommends that patients on long-term oral anticoagulants should be carefully monitored by a qualified health professional.

The NQF process measures include a statement of organizational policy and 17 key characteristics of preferred practices that health care organizations must address in their efforts to ensure quality VTE management.¹ The policy statement recommends that “every healthcare facility shall have a written policy appropriate for its scope that is evidence based and that drives continuous quality improvement related to VTE risk assessment, prophylaxis, diagnosis, and treatment.” These process measures provided a framework from which a set of performance measures were developed in collaboration with the Joint Commission.⁷ This led to the endorsement of six performance measures in May 2008⁸ (see Appendix 2 in online article). Of these, VTE-1 assesses the proportion of patients who received any VTE prophylaxis, and VTE-2 measures the provision of VTE prophylaxis in the ICU. There are three treatment-related measures: VTE-4, VTE-6, and VTE-7. VTE-6 focuses on the monitoring of treatment, specifically assessing patients with VTE who are receiving unfractionated heparin (UFH) with dosage/platelet count monitoring according to protocol (or nomogram). The other treatment measures determine whether patients with VTE are receiving anticoagulation overlap therapy when required (VTE-4) and if there are clear and concise VTE discharge instructions for those on long-term anticoagulation (VTE-7). VTE-8, an outcome measure, assesses the number of patients diagnosed with hospital-acquired VTE who did not receive VTE prophylaxis.

In 2006, NQF also endorsed two process measures for prophylaxis in surgical patients as part of the Surgical Care Improvement Project (SCIP). SCIP aims to improve the safety of surgical care by reducing the incidence of preventable surgical complications.⁹ SCIP-VTE-1 measures the proportion of surgery patients with appropriate VTE prophylaxis ordered anytime from hospital arrival to 48 hours post-surgery. SCIP-VTE-2 measures the proportion of surgery patients who received appropriate VTE prophylaxis within 24 hours before surgery to 24 hours postsurgery⁹ (Appendix 2).

Leapfrog Group. The Leapfrog Group is a member-supported program driven by a growing consortium of over 155

Fortune 500 companies and other large private and public health care purchasers that spend over 60 billion dollars each year on health care for more than 37 million Americans across the US.¹⁰ The Leapfrog Group uses the two VTE-related safety practices endorsed by the NQF (numbers 28 and 29) in its public reporting initiative, the Leapfrog Group Survey.¹¹ The survey is designed to identify whether measures of accountability are in place, through individual performance reviews or compensation, to ensure that improvements in safety practices are being achieved. Hospitals are asked whether they have conducted educational initiatives and skill-development programs (a) to make HCPs aware of the need for VTE prevention and appropriate prophylaxis and (b) to enable physicians to adequately assess patients and determine the appropriate thromboprophylaxis for each patient based on his or her risk assessment at admission. For long-term anticoagulation, HCPs are surveyed regarding whether they are being made aware of the importance of careful monitoring and being educated as to how monitoring is conducted. To meet all of these needs, hospitals are asked if they have implemented any hospitalwide policies, procedures or formal performance improvement programs. Hospitals completing the survey are eligible to participate in the Leapfrog Hospital Rewards Program, which recognizes hospitals that demonstrate excellence and/or sustained quality and efficiency improvement.¹²

AHRQ. In another public reporting initiative, the AHRQ has developed a set of patient safety indicators (PSIs) to measure the safety of hospital care by analyzing inpatient discharge data.¹³ The AHRQ-approved PSIs screen for adverse events that patients experience as a result of exposure to the health care system that are considered amenable to prevention by changes at the provider or system level. The AHRQ PSIs can be used in public reporting of hospital-specific quality and for payment (for example, provider selection, pay-for-performance) programs. Postoperative VTE is the focus of PSI 12, one of 20 provider-level PSIs. However, PSI 12 does not include patients who have a principal diagnosis of deep vein thrombosis (DVT), who are likely to have had pulmonary embolism (PE)/DVT present on admission. Short-term readmissions for VTE are excluded because most state administrative databases are unable to track readmissions.¹⁴ In addition, AHRQ has published a brochure on preventing hospital-acquired VTE, which includes key principles for effective QI interventions.¹⁵

CENTERS FOR MEDICARE & MEDICAID SERVICES QUALITY INITIATIVES

Many of the recently developed VTE-related initiatives are

part of a general drive by the Centers for Medicare & Medicaid Services (CMS) to improve quality of care and reduce unnecessary health care costs. CMS is collaborating with a range of public and private organizations, such as the AHRQ, NQF, and the Joint Commission, to develop and implement a set of pay-for-performance initiatives that support quality-of-care improvements for Medicare beneficiaries.¹⁶ As part of the 2005 Deficit Reduction Act, Congress required the Department of Health and Human Services to develop a plan for implementing value-based purchasing. This led to the development of the Hospital-Acquired Conditions Initiative, which CMS implemented. This initiative limits hospital reimbursement for hospital-acquired medical conditions that are reasonably preventable through adherence to evidence-based guidelines.¹⁷ From fiscal year 2009 (starting in October 2008), the initiative has required hospitals to report any Medicare claims associated with 10 preventable hospital-acquired conditions, including DVT and PE. Medicare will no longer pay hospitals the increased costs of treatment that are related to these conditions, so this policy is likely to carry much weight.

CMS is also expanding its hospital quality measure reporting program, with a reduction in hospital payment if the hospital does not voluntarily report the standardized quality measures. Currently, hospitals are required to report 30 quality measures on their claims for Medicare inpatient services to qualify for a full update to their fiscal year 2009 payment rates.¹⁸ CMS has developed and sponsors the partnership of organizations constituting SCIP, whose VTE national initiatives with evidence-based performance measures (SCIP-VTE-1 and SCIP-VTE-2) need reporting for Medicare claims. Two additional VTE-related outcome measures, SCIP-VTE 3 and SCIP-VTE 4 (Appendix 2), were considered in an earlier draft but were not developed further.^{19,20} In fiscal year 2009, CMS is proposing to add 43 quality measures to the list to get the full inflation update for fiscal year 2010, bringing the total number of measures to 72.¹⁸ The proposed additions include 6 VTE-related measures endorsed by the NQF.

CMS has also developed the Physician Quality Reporting Initiative, a voluntary program that currently includes 119 quality measures.²⁰ This initiative provides a financial incentive to eligible HCPs who participate in the program. For example, those who successfully report a designated set of quality measures may earn a bonus payment of 1.5% of the total allowed charges for covered Medicare physician fee schedule services. The need to provide adequate VTE prevention is acknowledged in two measures included in the Physician Quality Reporting Initiative 2008. Measure number 23, “Perioperative

Care: VTE Prophylaxis (When Indicated in All Patients),” establishes the percentage of patients (aged > 18 years) undergoing procedures for VTE prophylaxis who had an order for low-molecular-weight heparin (LMWH), low-dose UFH, adjusted-dose warfarin, fondaparinux, or mechanical prophylaxis within 24 hours prior to incision time or within 24 hours after surgery end time. The duration of VTE prophylaxis is not specified in the measure because of the variations in guideline recommendations for different patient populations. Measure number 31, “Stroke and Stroke Rehabilitation: DVT Prophylaxis for Ischemic Stroke or Intracranial Hemorrhage,” assesses the percentage of patients aged > 18 years with a diagnosis of ischemic stroke or intracranial hemorrhage and who received DVT prophylaxis by the end of hospital day 2. This measure acknowledges the need for DVT prevention in all patients who have suffered a stroke or an intracranial hemorrhage resulting in decreased mobility. The appropriate type of prophylaxis differs according to the diagnosis. For example, the initial use of intermittent pneumatic compression is recommended in patients with an acute intracranial hemorrhage, whereas subcutaneous UFH, LMWH, and heparinoids should be considered for DVT prophylaxis in at-risk patients with acute ischemic stroke.

CURRENT VTE-PREVENTION PRACTICES

Despite the widespread availability of evidence-based guidelines, such as those from the American College of Chest Physicians (ACCP),³ several studies have reported that VTE prophylaxis practices remains suboptimal.^{5,21-24} To be fully appropriate, thromboprophylaxis needs to be the recommended drug and dose, for the correct duration specific for that particular patient population. In a study using discharge records ($N = 85,970$) from 225 hospitals in the United States, 73% of surgical patients identified as being at risk of VTE received some form of prophylaxis, but only 32% of them received appropriate prophylaxis.²¹ In a similar study, 62% of 196,104 medical patients received some prophylaxis, but appropriate prophylaxis was administered to only 34% of them.⁵ When adherence to the 2004 7th ACCP guidelines was assessed in 429 hospitals ($N = 390,024$) in the United States, only 16% of surgical patients and 13% of medical patients received appropriate prophylaxis.²² Similarly, in another study, only 27% of 72,337 patients with cancer received appropriate prophylaxis.²⁵ The most common reason for inappropriate prophylaxis (46% of hospital discharges) was that no prophylaxis was administered, despite the absence of contraindications to anticoagulation. Another study investigated the prophylaxis prescription

patterns and incidence of symptomatic VTE in a 10-year period following the implementation of thromboprophylaxis guidelines.²⁶ Of the 37,615 surgical patients studied, 0.5% experienced a VTE event. Although there was partial or complete compliance with the guidelines for a relatively high proportion of patients (84%), 37% of the VTE events were considered to be preventable.

Underuse and inappropriate prescribing thromboprophylaxis is not restricted to the United States. A cross-sectional study, Epidemiologic International Day for the Evaluation of Patients at Risk of Venous Thromboembolism in the Acute Hospital Care Setting (ENDORSE), assessed the proportion of at-risk patients who received effective prophylaxis in 358 hospitals in 32 countries.²³ Only 64% and 48% of surgical and medical patients respectively received any form of thromboprophylaxis. Within these groups, appropriate prophylaxis was administered to only 59% of surgical and 40% of medical patients. The International Medical Prevention Registry on Venous Thromboembolism (IMPROVE) study performed in 12 countries, including the United States, highlighted that prophylaxis was only administered to 61% of acutely ill medical patients eligible for prophylaxis according to ACCP recommendations.²⁴ However, the duration of prophylaxis was not assessed in this study.

STRATEGIES TO IMPROVE VTE PREVENTION IN THE HOSPITAL SETTING

From both clinical and economic perspectives, it is important for hospitals to improve current VTE prophylaxis use. A recent study of the clinical and economic outcomes of VTE prophylaxis in patients at risk of VTE demonstrated that VTE incidence and the associated health care costs were significantly lower in patients receiving appropriate VTE prophylaxis than no prophylaxis.²⁷ The total average hospital costs per patient were estimated to be \$1,264 for enoxaparin prophylaxis, \$1,585 for UFH prophylaxis, and \$2,245 for no prophylaxis. These results demonstrate that, although the pharmacy cost is higher with appropriate prophylaxis, overall costs are reduced because of a lower incidence of clinical complications and their associated cost.

A common reason for inappropriate prophylaxis is a lack of familiarity with evidence-based guidelines.^{24,28} Hospital audit studies have consistently shown that there is confusion about what constitutes appropriate prophylaxis in patients with differing levels of risk.²⁴ Several strategies have been developed to aid HCPs with accurate risk assessment and selection of appropriate preventative measures. Key results from selected studies

evaluating these strategies^{29–36} are presented in Table 1 (page 562).

Risk assessment models (RAMs) may be useful in identifying patients at risk, determining the level of risk, and delineating appropriate prophylaxis.^{29,37} Simple and clinically relevant RAMs are available to facilitate VTE risk assessment in hospitalized medical patients and are currently being validated in prospective studies.³⁸ A VTE RAM integrated into a VTE-prevention protocol and computerized provider order entry system was recently validated in a prospective study of adult inpatients in a 325-bed university hospital³⁶ (Table 1). The results showed that the percentage of patients on adequate prophylaxis improved annually (67%, 92%, 98%; $p < .001$), resulting in a significant reduction in hospital-acquired VTE. The use of a risk assessment checklist has also proved successful. In a study of women undergoing a cesarean section, 28% of patients at moderate risk of VTE received appropriate prophylaxis at the beginning of the study, which increased to 68% following the introduction of a checklist that obstetricians were asked to complete pre-operatively³⁰ (Table 1). However, until a more comprehensive validation of the different RAMs is complete, there are still questions regarding the optimal in-hospital prophylaxis strategy.³⁹

The use of electronic alerts is also valuable in preventing VTE.^{31,32} In a study of surgical and medical patients, the use of a computer alert linked to prophylaxis guidelines significantly increased orders for prophylaxis from 15% to 34% ($p < .001$) and significantly reduced the risk of symptomatic VTE at 90 days by 41% compared with controls ($p = .001$ ³¹; Table 1). However, in a study of patients undergoing major surgery, computerized reminder systems combined with altered care procedures increased the rate of prophylaxis without significantly decreasing the rate of symptomatic VTE³² (Table 1). Decision support can also be linked to computerized alerts. For example, in a French orthopedic surgery department that implemented a computerized decision support system, physicians adhered to guidelines in 95% of cases versus 83% when it was not in use. This also changed physician behavior; the risk of inappropriate prescription decreased by 73%.⁴⁰ Similar results were reported in a prospective study that used a multiple-strategy approach, including computer prompts, to increase adherence with ACCP guidelines.⁴¹ In this study, guideline adherence increased from 60% at baseline to 90% in the study period and 100% in the follow-up period ($p = .01$).

Raising the awareness of VTE as a disease may also help drive improvement in VTE prophylaxis practices. The Coalition to Prevent DVT, which consists of more than 50

Table 1. Studies of Quality Improvement (QI) Strategies for Venous Thromboembolism (VTE) Prophylaxis*

Study (N)	Patient Group	Hospital Type	QI Strategy	Elements	Results Outcome	Proportion of Patients (%)		P Value
						No QI	QI	
Ref. 30 (200)	Surgical	Teaching	Reminder, decision support, audit	Risk assessment checklist	Appropriate prophylaxis, low- and moderate-risk patients	43	79	NA
Ref. 31 (2,506)	Medical and surgical	Teaching, tertiary	Reminder, decision support	Electronic alerts linked to prophylaxis guidelines	Prophylaxis Symptomatic VTE	14.5 8.2	33.5 4.9	< .001 .001
Ref. 32	Surgical	Teaching, community	Reminder, decision support	Computerized reminders	Prophylaxis Symptomatic VTE	89.9 1.0	95.0 1.2	< .0001
Ref. 33 (287)	Medical	Teaching, tertiary	Education, decision support	Educational sessions, VTE risk stratification and prevention regimens	Prophylaxis in high-risk patients (low-risk patients)	40 (31)	72 (64)	NA
Ref. 34 (312)	Medical	Teaching, urban	Education, decision support, audit, feedback	Staff meetings, pocket cards, posters, monthly audit, feedback	Appropriate prophylaxis	43	85	< .01
Ref. 35 (641)	Medical	Teaching, community	Education	In-service presentations, newsletters, quality assurance presentations, involvement of pharmacists	Optimal prophylaxis based on clinical trial data	11	44	< .001
Ref. 36 (2,894 audits)	Medical and surgical (excluding obstetrics and psychiatry)	Teaching	Decision support, education, audit, feedback	Three-tier VTE risk assessment protocol, computerized provider entry orders, audits	Adequate prophylaxis	2	98	NA

* Adapted from Reference 29: Michota F.A.: Bridging the gap between evidence and practice in venous thromboembolism prophylaxis: The quality improvement process. *J Gen Intern Med* 22:1762–1770, Dec. 2007. NA, not available; NS, not significant.

members from nationally known medical societies, patient advocacy groups, and other public health organizations, aims to educate the public, HCPs, and policymakers about the risk factors, symptoms, and signs associated with VTE.⁴² The coalition holds annual meetings, organizes an annual DVT Awareness Month, and launched National DVT Screening Day in 2008. The Office of the Surgeon General call-to-action also aims to increase awareness about DVT and PE. This initiative emphasizes the importance of evidence-based practices, encourages research, and advocates a coordinated, multifaceted plan to reduce the disease burden of VTE in the United States.⁴³ Moreover, the ACCP guidelines recommend that every general hospital develop a formal, active strategy that addresses VTE prevention.³ The guidelines endorse a written, hospitalwide VTE prophylaxis policy and the use of computerized

reminders, preprinted order sets for VTE prophylaxis, and periodic audit and feedback.

A novel tool for estimating the incidence of VTE in individual hospitals has been developed by the Institute for Healthcare Improvement (IHI). Through the 5 Million Lives Campaign, the IHI is supporting SCIP to further the uptake of practices that will reduce surgical complications, including VTE. Toward this end, it has created a calculator tool to estimate the number of hospital-acquired VTE events occurring at a particular hospital and the proportion of these that are potentially preventable.⁴⁴ Additional VTE prophylaxis tools, including sample order forms for VTE prophylaxis that contain risk assessment components, have been made available by the Society for Hospital Medicine (<http://www.hospitalmedicine.org/Content/NavigationMenu/QualityImprovement/QIClinicalTools/>)

[Quality Improvement.htm](#)).

Improving the education of HCPs involved in the prevention and management of VTE is essential, and improvements in the rate of VTE prophylaxis have been demonstrated in studies evaluating educational strategies, such as staff meetings, posters, educational sessions, and monthly audits (Table 1).^{33–35} For example, a pharmacy-driven educational program, which included presentations and newsletters directed at nursing staff, house staff, pharmacists, and physicians, significantly increased the use of prophylaxis from 43% to 58% ($p < .001$) and increased optimal prophylaxis from 11% to 44% ($p < .001$) in medically ill patients.³⁵ Dobesh et al. also provided key articles and guidelines for VTE prevention to serve as a resource for pharmacists, physicians, nurses, residents, and students responsible for the care of patients who may be at risk for VTE.⁴⁵ This compilation may serve as an important resource to help medical staff make informed evidence-based decisions on appropriate VTE prophylaxis.

Integrated QI initiatives incorporating several active strategies are more likely to change practices and improve performance than a single strategy used in isolation.^{29,34,46} A study combining regular physician education, decision support tools, and audit and feedback processes demonstrated a significant improvement in the proportion of medically ill patients receiving appropriate prophylaxis, from 43% at baseline to 85% after 18 months ($p < .01$ versus baseline).³⁴ In another study, QI strategies, including an active, multifaceted combination of provider education, provider reminders with decision support, and audit with feedback, increased the rate of prophylaxis from 63% in 2002 to 96% in 2005 in a tertiary care hospital center.⁴⁷ Furthermore, the hospital-acquired DVT rate decreased significantly, from 2.6 to 0.2 per 1,000 discharges ($p = .007$).

The AHRQ brochure on preventing hospital-acquired VTE emphasizes some of the key elements required to achieve an improvement in quality performance, including a proven quality initiative framework; institutional support; investment in time, equipment, and personnel; a multidisciplinary team focused on reaching VTE prophylaxis targets; and standardized VTE risk assessment and prophylaxis protocols.¹⁵

Conclusions

Many recent initiatives have been developed to improve hospital performance in VTE-prevention and management to reduce the clinical and economic burden of this prevalent but highly preventable disease. It is the responsibility of individual hospitals to identify areas in which they can improve their VTE prophylaxis measures. To obtain positive results from the

reporting initiatives and incentive programs and to achieve the various performance measures, all hospital departments will need to implement effective VTE prevention policies, including early risk assessment, appropriate prophylaxis prescribing, monitoring, and follow-up. One useful resource for effective QI could be the brochure released by the AHRQ. Multiple, integrated QI initiatives involving risk assessment tools, decision support, electronic alert systems, education, and audits should be instigated to ensure that all HCPs comply with VTE-prevention policies. ■

The authors received editorial support in the preparation of this manuscript, funded by sanofi-aventis, New Jersey. The authors are fully responsible for content and editorial decisions for this manuscript.

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Online-Only Content

See the online version of this article for

Appendix 1. Web Sites Providing Information About Quality Initiatives in the United States and Recent Updates on Performance Measures for Improving Venous Thromboembolism (VTE) Prophylaxis

Appendix 2. Joint Commission/National Quality Forum (NQF) and Surgical Care Improvement Project (SCIP) Core Measures for Prevention and Care of Venous Thromboembolism (VTE)

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Appendix 1. Web Sites Providing Information About Quality Initiatives in the United States and Recent Updates on Performance Measures for Improving Venous Thromboembolism (VTE) Prophylaxis*

Organization	Specification/Purpose	Web Site (Reference)
SCIP	Overview: Describes SCIP and its goals	http://www.cfmc.org/hospital/hospital_scip.htm
NQF	1. Home page: Provides an overview of the NQF initiatives	1. http://www.qualityforum.org
	2. States the consensus standards for VTE Safe Practices	2. http://www.qualityforum.org/Measures_List.aspx
The Joint Commission	1. Home page: Joint Commission activities	1. http://www.jointcommission.org
	2. Resources for the performance measures	2. http://www.jointcommission.org/PerformanceMeasurement/PerformanceMeasurement/
Leapfrog Group	1. Home page: Describes the aims of the Leapfrog group	1. http://www.leapfroggroup.org/home
	2. Leapfrog Hospital Survey, detailed report on the 2009 Survey (Version 5.1)	2. https://leapfrog.medstat.com/pdf/final.pdf
AHRQ	1. Home page: Outlines AHRQ initiatives	1. http://www.ahrq.gov/
	2. Provides downloadable material for the patient safety indicators	2. http://www.qualityindicators.ahrq.gov/psi_download.htm (ref. 13)
	3. Provides link and contents for the VTE-prevention guide	3. http://www.ahrq.gov/qual/vtguide/ (ref. 15)
CMS	1. Home page: Overview of services provided by the CMS	1. http://www.cms.hhs.gov/
	2. PQRI: Describes the PQRI and provides links to resources	2. http://www.cms.hhs.gov/PQRI/
	3. P4P initiatives: Press release regarding P4P	3. http://www.cms.hhs.gov/apps/media/press/release.asp?counter=1343 (ref. 16)
Coalition to Prevent DVT	Home page: Reports the role and aims of the coalition	https://www.preventdvt.org/
Surgeon General Call to Action	1. Home page: Reports the role of the office of the Surgeon General	1. http://www.surgeongeneral.gov
	2. Guidance document provides further encouragement supporting the call to action	2. http://www.surgeongeneral.gov/topics/deepvein/calltoaction/call-to-action-on-dvt-2008.pdf (ref. 43)

* SCIP, Surgical Care Improvement Project; NQF, National Quality Forum; AHRQ, Agency for Health Care Research and Quality; CMS, Centers for Medicare & Medicaid Services; PQRI, Physicians Quality Reporting Initiative; P4P, pay-for-performance; DVT, deep-vein thrombosis.

Appendix 2. Joint Commission/National Quality Forum (NQF) and Surgical Care Improvement Project (SCIP) Core Measures for Prevention and Care of Venous Thromboembolism (VTE)*

Risk Assessment and Prophylaxis (px)

Medical patients

NQF VTE-1 (TAP A recommendation)

Process measure that assesses the number of patients who receive any VTE px or have documentation explaining why no VTE px was given within 24 h of hospital admission or surgery end time. Only includes patients who received any VTE px within 24 h of admission, inpatient stay ≥ 48 h, not transferred to an ICU within 24 h of hospital admission, not coded with an ICD-9-CM *Principal Procedure Code* of SCIP VTE selected surgeries within 24 h of admission

NQF VTE-2 (TAP A recommendation)

Process measure to determine and improve the number of patients that are reassessed for the need of px upon admission to an ICU or have documentation explaining why no VTE px was given within 24 h after the initial ICU admission. Only includes patients who received any VTE px within 24 h of admission, in-patient ICU stay ≥ 48 h, not coded with an ICD-9-CM *Principal Procedure Code* of SCIP VTE selected surgeries within 24 h of admission

Surgical patients

SCIP-VTE-1

-Process measure on the number of patients who have px ordered
-Measures the proportion of patients who **were ordered a recommended** form of px

SCIP-VTE-2

-Process guideline on the number of patients who actually receive VTE px
-Measures the proportion of patients who actually received ACCP-recommended VTE px
-SCIP-VTE-1 and -2 measurements have the same requirements regarding the use of medication and/or mechanical px. Measures VTE px if in-patient stay is < 120 days, ≥ 72 h, and surgery ≥ 1 h in duration

Treatment

Medical patients

NQF VTE-4 (TAP A recommendation)

Process measure to determine whether VTE patients are receiving overlap therapy for ≥ 5 days prior to discontinuation of the parenteral therapy if an international normalized ratio of 2 was obtained, or being discharged on parenteral and warfarin therapy if discharged in < 5 days in order to ensure that the patient is protected while waiting on order to achieve consistent levels of anticoagulation

NQF VTE-6 (TAP A recommendation)

Process measure that assesses the number of patients receiving intravenous UFH therapy with documentation that the dosages and platelet counts are monitored by protocol or nomogram, in order for patients with VTE to reach therapeutic levels of anticoagulation as soon as possible with minimal bleeding complications

Platelet count monitoring protocol requirement leads to closer monitoring for heparin-induced thrombocytopenia

NQF VTE-7 (TAP A recommendation)

Process measure that assesses if VTE patients that receive warfarin are discharged from homecare or home hospice after receiving written discharge instructions about the four educational components (follow-up monitoring, compliance issues, dietary restrictions, and potential for adverse drug reactions/interactions) which may help to prevent complications, and increase patient understanding of their condition and the critical need for compliance

Outcome Measures

Medical patients

NQF VTE-8 (TAP B recommendation)

Outcome measure that assesses the number of patients diagnosed with VTE during hospitalization (not present at admission) that did not receive VTE px. Includes patients with a hospital length of stay > 48 h.

Surgical patients

SCIP-VTE-3

Outcome measure of intra- or post-operative PE diagnosed during index hospitalization and within 30 days of surgery

SCIP-VTE-4

Outcome measure on intra- or post-operative DVT diagnosed during index hospitalization and within 30 days of surgery

* ACCP, American College of Chest Physicians; DVT, deep-vein thrombosis; ICD-9-CM, *International Classification of Diseases, Ninth Revision, Clinical Modification*; ICU, intensive care unit; PE, pulmonary embolism; TAP, Technical Advisory Panel; UFH, unfractionated heparin.

Sources: The Joint Commission: *Performance Measurement Initiatives. Venous Thromboembolism (VTE) Core Measure Set-Last Updated 4/2009.* <http://www.jointcommission.org/PerformanceMeasurement/PerformanceMeasurement/VTE.htm> (last accessed Sep. 17, 2009) and The Joint Commission: *Surgical Care Improvement Project Core Measure Set.* <http://www.jointcommission.org/PerformanceMeasurement/PerformanceMeasurement/SCIP+Core+Measure+Set.htm> (last accessed Sep. 17, 2009)