

# NATIONAL QUALITY FORUM

## Measure Submission and Evaluation Worksheet 5.0

This form contains the information submitted by measure developers/stewards, organized according to NQF's measure evaluation criteria and process. The evaluation criteria, evaluation guidance documents, and a blank online submission form are available on the [submitting standards web page](#).

NQF #: <b>0450</b> NQF Project: <b>Patient Safety Measures-Complications Project</b>
(for Endorsement Maintenance Review) Original Endorsement Date: <b>Jul 31, 2008</b> Most Recent Endorsement Date: <b>Jul 31, 2008</b>
<b>BRIEF MEASURE INFORMATION</b>
De.1 Measure Title: <b>Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI 12)</b>
Co.1.1 Measure Steward: <b>Agency for Healthcare Research and Quality</b>
De.2 Brief Description of Measure: <b>Percent of discharges among cases meeting the inclusion and exclusion rules for the denominator with ICD-9-CM codes for deep vein thrombosis or pulmonary embolism in any secondary diagnosis field.</b>
2a1.1 Numerator Statement: <b>Discharges among cases meeting the inclusion and exclusion rules for the denominator with ICD-9-CM codes for deep vein thrombosis or pulmonary embolism in any secondary diagnosis field.</b>
2a1.4 Denominator Statement: <b>All surgical discharges age 18 and older defined by specific DRGs or MS-DRGs and an ICD-9-CM code for an operating room procedure</b>
2a1.8 Denominator Exclusions: <b>Exclude cases:</b> <ul style="list-style-type: none"> <li>- with principal diagnosis of deep vein thrombosis or pulmonary embolism or secondary diagnosis present on admission</li> <li>- where a procedure for interruption of vena cava is the only operating room procedure</li> <li>- where a procedure for interruption of vena cava occurs before or on the same day as the first operating room procedure</li> <li>- MDC 14 (pregnancy, childbirth, and puerperium)</li> <li>- with missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)</li> </ul>
1.1 Measure Type: <b>Outcome</b> 2a1. 25-26 Data Source: <b>Administrative claims</b> 2a1.33 Level of Analysis: <b>Facility</b>
1.2-1.4 Is this measure paired with another measure? <b>No</b>
De.3 If included in a composite, please identify the composite measure ( <i>title and NQF number if endorsed</i> ): <b>0531    Patient Safety for Selected Indicators (composite)</b>

<b>STAFF NOTES</b> ( <i>issues or questions regarding any criteria</i> )
Comments on Conditions for Consideration:
Is the measure untested? Yes <input type="checkbox"/> No <input type="checkbox"/> If untested, explain how it meets criteria for consideration for time-limited endorsement:
1a. Specific national health goal/priority identified by DHHS or NPP addressed by the measure ( <i>check De.5</i> ): 5. Similar/related <b>endorsed</b> or submitted measures ( <i>check 5.1</i> ): Other Criteria:
Staff Reviewer Name(s):

**1. IMPACT, OPPORTUNITY, EVIDENCE - IMPORTANCE TO MEASURE AND REPORT**

Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All three subcriteria must be met to pass this criterion. See [guidance on evidence](#).

*Measures must be judged to be important to measure and report in order to be evaluated against the remaining criteria. (evaluation criteria)*

**1a. High Impact:** H  M  L  I

*(The measure directly addresses a specific national health goal/priority identified by DHHS or NPP, or some other high impact aspect of healthcare.)*

**De.4 Subject/Topic Areas** (Check all the areas that apply): Surgery : General Surgery

**De.5 Cross Cutting Areas** (Check all the areas that apply): Safety : Complications

**1a.1 Demonstrated High Impact Aspect of Healthcare:** Affects large numbers, Patient/societal consequences of poor quality

**1a.2 If "Other," please describe:**

**1a.3 Summary of Evidence of High Impact** (Provide epidemiologic or resource use data):

Among community hospitals in the Healthcare Cost and Utilization Project, the risk-adjusted rate of this indicator was 7.33 per 1,000 eligible patients in 2008

(<http://qualityindicators.ahrq.gov/Downloads/Software/SAS/V43/Comparative%20Data%20PSI%204.3.pdf>). About 12,647 of these adverse events are estimated to have occurred in US community hospitals in 2008. An earlier version of this PSI (v2.1) had a risk-adjusted rate of 10.05 per 1,000 eligible patients in Veterans Affairs data from FY 2004 (Rosen et al., 2006). International data from the Organization for Economic Cooperation and Development show substantial variation across countries, with a maximum rate of 14.59 per 1,000 eligible patients from the USA (Drosler et al., 2011).

Cases from the Nationwide Inpatient Sample that were flagged by this PSI had 6.6% excess mortality, 5.4 days of excess hospitalization, and \$21,709 in excess hospital charges, relative to carefully matched controls that were not flagged (Zhan and Miller, 2003). This finding was confirmed in the Veterans Affairs hospital system, where cases that were flagged by this PSI had 6.1% excess mortality, 4.5-5.5 days of excess hospitalization, and \$7,205-9,064 in excess hospital costs, relative to carefully matched controls that were not flagged (Rivard et al., 2008). In another study based on State Inpatient Databases from seven states that permit linkage of serial hospitalizations, this indicator was associated with relative risk ratios of 1.35 for inpatient death, 1.28 for readmission within three months, and 1.25 for readmission within one month (after adjusting for age, gender, payer, comorbidities, and specific surgical DRGs, and APR-DRG severity levels)(Friedman et al., 2009).

**1a.4 Citations for Evidence of High Impact cited in 1a.3:** Drösler SE, Romano PS, Tancredi DJ, Klazinga NS. International comparability of Patient Safety Indicators in 15 OECD member countries: A methodological approach of adjustment by secondary diagnoses. Health Serv Res 2011; Jul 15. [Epub ahead of print].

Encinosa WE, Hellinger FJ. The impact of medical errors on ninety-day costs and outcomes: an examination of surgical patients. Health Serv Res 2008;43(6):2067-2085.

Friedman B, Encinosa W, Jiang HJ, Mutter R. Do patient safety events increase readmissions? Med Care 2009; 47(5):583-90.

Greenberg MD, Haviland AM, Yu H, Farley DO. Safety outcomes in the United States: trends and challenges in measurement. Health Serv Res 2009;44(2 Pt 2):739-755.

Rivard PE, Luther SL, Christiansen CL, Zhao S, Loveland S, Elixhauser E, Romano PS, Rosen AK. Using Patient Safety Indicators to estimate the impact of potential adverse events on outcomes. Med Care Res Rev 2008; 65(1):67-87.

Rosen AK, Zhao S, Rivard P et al. Tracking rates of Patient Safety Indicators over time: lessons from the Veterans Administration. Med Care 2006;44(9):850-861.

Viswanathan P, Goswami U, Krishnamurti L. National Healthcare Utilization Trends for Deep Vein Thrombosis in the United States. New Orleans, LA: 51st ASH annual meeting and exposition; 2009.

Zhan C, Miller MR. Excess length of stay, charges, and mortality attributable to medical injuries during hospitalization. JAMA 2003;290(14):1868-1874.

**1b. Opportunity for Improvement:** H  M  L  I

*(There is a demonstrated performance gap - variability or overall less than optimal performance)*

**1b.1 Briefly explain the benefits (improvements in quality) envisioned by use of this measure:**

NQF #0450 Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI 12)

Providers may adopt the processes of care or structures of care of the best performing providers or consumers may select the best performing providers in order to improve overall outcomes

This indicator captures how often a blood clot ends up in the lungs (pulmonary embolism [PE]) or in a large vein (deep vein thrombosis [DVT]) following an operation. Both PE and DVT are common complications that can often be prevented through in-hospital risk assessment and appropriate prophylactic treatments. PSI #12 limits vascular complications codes to secondary diagnosis codes to eliminate complications that were present on admission. It also excludes patients who have principal diagnoses of DVT, as these patients are likely to have had PE/DVT present on admission.

**1b.2 Summary of Data Demonstrating Performance Gap** (*Variation or overall less than optimal performance across providers*):  
[For **Maintenance** – Descriptive statistics for performance results for this measure - distribution of scores for measured entities by quartile/decile, mean, median, SD, min, max, etc.]

The table below highlights variation in the risk-adjusted rate of this indicator based on hospital-level characteristics. These characteristics include physical location, ownership, teaching status, metropolitan location, and hospital size. All hospital characteristics (location, ownership, teaching status, and metropolitan location) were significantly associated with rate of this outcome. These findings provide evidence of opportunities for improvement. For example, hospitals with 300 or more beds and teaching hospitals had significantly higher rates, overall, than hospitals with 100-299 beds and nonteaching hospitals, respectively.

In regard to figures below:

1st figure: estimate per 1,000, risk adjusted rates

2nd figure: standard error

3rd figure: p value relative to marked group (marked group = "c")

4th figure: p value: current year relative to prior year

Key:

"c": Reference for p-value test statistics

"\*\*": Data do not meet criteria for statistical reliability, data quality, or confidentiality

"DNC": Data were not collected

Hospital characteristic:

Location of inpatient treatment:

Northeast c 12.908 0.074 0.060

Midwest 10.758 0.066 0.000 0.731

South 11.437 0.053 0.000 0.000

West 10.966 0.073 0.000 0.102

Ownership/control:

Private, not-for-profit c 11.394 0.037 0.001

Private, for-profit 10.931 0.091 0.000 0.372

Public 12.443 0.091 0.000 0.000

Teaching status:

Teaching 13.584 0.051 0.000 0.171

Nonteaching c 10.040 0.042 0.000

Location of hospital (NCHS):

Large central metropolitan 13.889 0.051 0.000 0.000

Large fringe metropolitan c 12.138 0.078 0.000

Medium metropolitan 9.743 0.070 0.000 0.000

Small metropolitan 8.566 0.094 0.000 0.110

Micropolitan 7.485 0.117 0.000 0.126

Not metropolitan or micropolitan 6.820 0.273 0.000 0.104

Bed size of hospital:

Less than 100 6.808 0.117 0.000 0.001  
 100 - 299 c 9.596 0.054 0.076  
 300 - 499 11.815 0.056 0.000 0.012  
 500 or more 15.225 0.066 0.000 0.000

**1b.3 Citations for Data on Performance Gap:** [*For Maintenance* – Description of the data or sample for measure results reported in 1b.2 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included]

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2007, and AHRQ Quality Indicators, version 3.1.

**1b.4 Summary of Data on Disparities by Population Group:** [*For Maintenance* –Descriptive statistics for performance results for this measure by population group]

The table below highlights variation in the rate of this indicator based on patient characteristics, suggesting possible opportunities for improvement to reduce disparities. When compared to patients with private insurance, for example, patients with an expected payment source of Medicaid had significantly higher rates of this outcome. However, there is no consistent trend across socioeconomic levels, based on the median income of the patient's zip code of residence.

In regard to figures below:

- 1st figure: estimate per 1,000, risk adjusted rates
- 2nd figure: standard error
- 3rd figure: p value relative to marked group (marked group = "c")
- 4th figure: p value: current year relative to prior year

Key:

- "c": Reference for p-value test statistics
- "\*\*": Data do not meet criteria for statistical reliability, data quality, or confidentiality
- "DNC": Data were not collected

Patient characteristic:

Age groups for conditions affecting any age

18-44 c 7.641 0.057 0.031  
 45-64 10.548 0.051 0.000 0.000  
 65 and over 14.499 0.057 0.000 0.000

Age groups for conditions affecting primarily elderly

65-69 c 12.532 0.107 0.050  
 70-74 13.309 0.114 0.000 0.167  
 75-79 15.372 0.123 0.000 0.001  
 80-84 16.759 0.145 0.000 0.000  
 85 and over 15.975 0.163 0.000 0.691

Gender:

Male c 12.713 0.049 0.000  
 Female 10.720 0.044 0.000 0.763

Median income of patient's ZIP code:

First quartile (lowest income) 11.881 0.062 0.000 0.000  
 Second quartile 10.652 0.065 0.000 0.082  
 Third quartile 10.962 0.066 0.000 0.031  
 Fourth quartile (highest income) c 12.379 0.067 0.000

Location of patient residence (NCHS):

Large central metropolitan 13.985 0.061 0.000 0.000  
 Large fringe metropolitan c 12.467 0.066 0.000

NQF #0450 Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI 12)

Medium metropolitan 10.024 0.073 0.000 0.000  
 Small metropolitan 9.179 0.103 0.000 0.263  
 Micropolitan 9.266 0.097 0.000 0.001  
 Not metropolitan or micropolitan 8.662 0.121 0.000 0.002

Expected payment source:

Private insurance c 10.386 0.059 0.286  
 Medicare 11.697 0.043 0.000 0.000  
 Medicaid 14.528 0.127 0.000 0.151  
 Other insurance 12.037 0.174 0.000 0.012  
 Uninsured / self-pay / no charge 11.079 0.170 0.000 0.000

**1b.5 Citations for Data on Disparities Cited in 1b.4:** [*For Maintenance* – Description of the data or sample for measure results reported in 1b.4 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included]

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2007, and AHRQ Quality Indicators, version 3.1.

**1c. Evidence** (Measure focus is a health outcome OR meets the criteria for quantity, quality, consistency of the body of evidence.)  
 Is the measure focus a health outcome? Yes  No  **If not a health outcome, rate the body of evidence.**

Quantity: H  M  L  I  Quality: H  M  L  I  Consistency: H  M  L  I

Quantity	Quality	Consistency	Does the measure pass subcriterion1c?
M-H	M-H	M-H	Yes <input type="checkbox"/>
L	M-H	M	Yes <input type="checkbox"/> IF additional research unlikely to change conclusion that benefits to patients outweigh harms: otherwise No <input type="checkbox"/>
M-H	L	M-H	Yes <input type="checkbox"/> IF potential benefits to patients clearly outweigh potential harms: otherwise No <input type="checkbox"/>
L-M-H	L-M-H	L	No <input type="checkbox"/>

Health outcome – rationale supports relationship to at least one healthcare structure, process, intervention, or service

Does the measure pass subcriterion1c?  
 Yes  IF rationale supports relationship

**1c.1 Structure-Process-Outcome Relationship** (Briefly state the measure focus, e.g., health outcome, intermediate clinical outcome, process, structure; then identify the appropriate links, e.g., structure-process-health outcome; process- health outcome; intermediate clinical outcome-health outcome):

Lower extremity DVT is the underlying source of 90% of acute PEs, which cause 25,000 deaths per year in the United States (National Center for Health Statistics [NCHS], 2006). These events have been shown in numerous studies to be significantly reduced by prophylactic regimens, especially in surgical patients, although these regimens are not always applied in practice. Regimens recommended for the prevention of DVT and PE events include low-dose heparin, adjusted-dose heparin, dextran and warfarin. Low-dose warfarin, external pneumatic compression and gradient elastic stockings, alone or in combination with heparin are also effective in decreasing DVT when applied to appropriate patients. Although some of these preventive measures may not be applicable to subsets of patients, such as major trauma patients, most are relatively simple to use, have minor complications, and require minimal laboratory monitoring. Effective prophylactic regimens differ according to the level of risk and should therefore be tailored to the patient's disease and degree and duration of risk.

Geerts WH, Pineo GF, Heit JA, Bergqvist D, Lassen MR, Colwell CW, Ray JG. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest. 2004 Sep;126(3 Suppl):338S-400S.

**1c.2-3 Type of Evidence** (Check all that apply):  
 Clinical Practice Guideline

**1c.4 Directness of Evidence to the Specified Measure** (State the central topic, population, and outcomes addressed in the body)

of evidence and identify any differences from the measure focus and measure target population):

Not applicable

1c.5 Quantity of Studies in the Body of Evidence (Total number of studies, not articles): Not applicable

1c.6 Quality of Body of Evidence (Summarize the certainty or confidence in the estimates of benefits and harms to patients across studies in the body of evidence resulting from study factors. Please address: a) study design/flaws; b) directness/indirectness of the evidence to this measure (e.g., interventions, comparisons, outcomes assessed, population included in the evidence); and c) imprecision/wide confidence intervals due to few patients or events): Not applicable

1c.7 Consistency of Results across Studies (Summarize the consistency of the magnitude and direction of the effect): Not applicable

1c.8 Net Benefit (Provide estimates of effect for benefit/outcome; identify harms addressed and estimates of effect; and net benefit - benefit over harms):

Not applicable

1c.9 Grading of Strength/Quality of the Body of Evidence. Has the body of evidence been graded? No

1c.10 If body of evidence graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias: Not applicable

1c.11 System Used for Grading the Body of Evidence: Other

1c.12 If other, identify and describe the grading scale with definitions: Not applicable

1c.13 Grade Assigned to the Body of Evidence: Not applicable

1c.14 Summary of Controversy/Contradictory Evidence: Not applicable

1c.15 Citations for Evidence other than Guidelines (Guidelines addressed below):

Not applicable

1c.16 Quote verbatim, the specific guideline recommendation (Including guideline # and/or page #):

Not applicable

1c.17 Clinical Practice Guideline Citation: Not applicable

1c.18 National Guideline Clearinghouse or other URL: Not applicable

1c.19 Grading of Strength of Guideline Recommendation. Has the recommendation been graded? No

1c.20 If guideline recommendation graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias:

1c.21 System Used for Grading the Strength of Guideline Recommendation: Other

1c.22 If other, identify and describe the grading scale with definitions: Not applicable

1c.23 Grade Assigned to the Recommendation: Not applicable

1c.24 Rationale for Using this Guideline Over Others: Not applicable

Based on the NQF descriptions for rating the evidence, what was the developer's assessment of the quantity, quality, and consistency of the body of evidence?

1c.25 Quantity: **Moderate** 1c.26 Quality: **Moderate** 1c.27 Consistency: **Moderate**

Was the threshold criterion, *Importance to Measure and Report*, met?

(1a & 1b must be rated moderate or high and 1c yes) Yes  No

Provide rationale based on specific subcriteria:

**For a new measure if the Committee votes NO, then STOP.**

**For a measure undergoing endorsement maintenance, if the Committee votes NO because of 1b. (no opportunity for improvement), it may be considered for continued endorsement and all criteria need to be evaluated.**

## 2. RELIABILITY & VALIDITY - SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. (**evaluation criteria**)

Measure testing must demonstrate adequate reliability and validity in order to be recommended for endorsement. Testing may be conducted for data elements and/or the computed measure score. Testing information and results should be entered in the appropriate field. Supplemental materials may be referenced or attached in item 2.1. See [guidance on measure testing](#).

S.1 **Measure Web Page** (*In the future, NQF will require measure stewards to provide a URL link to a web page where current detailed specifications can be obtained*). Do you have a web page where current detailed specifications for this measure can be obtained? **Yes**

S.2 If yes, provide web page URL: [http://qualityindicators.ahrq.gov/modules/psi\\_resources.aspx](http://qualityindicators.ahrq.gov/modules/psi_resources.aspx)

2a. RELIABILITY. Precise Specifications and Reliability Testing: H  M  L  I

2a1. Precise Measure Specifications. (*The measure specifications precise and unambiguous.*)

2a1.1 **Numerator Statement** (*Brief, narrative description of the measure focus or what is being measured about the target population, e.g., cases from the target population with the target process, condition, event, or outcome*):

Discharges among cases meeting the inclusion and exclusion rules for the denominator with ICD-9-CM codes for deep vein thrombosis or pulmonary embolism in any secondary diagnosis field.

2a1.2 **Numerator Time Window** (*The time period in which the target process, condition, event, or outcome is eligible for inclusion*):

User may specify the time window; generally one calendar year

2a1.3 **Numerator Details** (*All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, codes with descriptors, and/or specific data collection items/responses*):

ICD-9-CM Deep vein thrombosis diagnosis codes:

45111

PHLEBITIS AND THROMBOSIS OF FEMORAL VEIN (DEEP) (SUPERFICIAL)

45119

PHLEBITIS AND THROMBOPHLEBITIS OF DEEP VESSEL OF LOWER EXTREMITIES – OTHER

4512

PHLEBITIS AND THROMBOPHLEBITIS OF LOWER EXTREMITIES UNSPECIFIED\*

45181

PHLEBITIS AND THROMBOPHLEBITIS OF ILIAC VEIN

4519

PHLEBITIS AND THROMBOPHLEBITIS OF OTHER SITES - OF UNSPECIFIED SITE\*

45340

DVT-EMBLSM LOWER EXT NOS (OCT04)

45341

DVT-EMB PROX LOWER EXT (OCT04)

45342

DVT-EMB DISTAL LOWER EXT (OCT04)

4538

OTHER VENOUS EMBOLISM AND THROMBOSIS OF OTHER SPECIFIED VEINS\*

4539  
 OTHER VENOUS EMBOLISM AND THROMBOSIS OF UNSPECIFIED SITE\*  
 \* Does not apply on or after October 1, 2009.

ICD-9-CM Pulmonary embolism diagnosis codes:  
 4151  
 PULMONARY EMBOLISM AND INFARCTION  
 41511  
 IATROGENIC PULMONARY EMBOLISM AND INFARCTION  
 41519  
 PULMONARY EMBOLISM AND INFARCTION, OTHER

**2a1.4 Denominator Statement** *(Brief, narrative description of the target population being measured):*  
 All surgical discharges age 18 and older defined by specific DRGs or MS-DRGs and an ICD-9-CM code for an operating room procedure

**2a1.5 Target Population Category** *(Check all the populations for which the measure is specified and tested if any):* Adult/Elderly Care

**2a1.6 Denominator Time Window** *(The time period in which cases are eligible for inclusion):*  
 User may specify the time window; generally one calendar year

**2a1.7 Denominator Details** *(All information required to identify and calculate the target population/denominator such as definitions, codes with descriptors, and/or specific data collection items/responses):*

See Patient Safety Indicators Appendices:

- Appendix A – Operating Room Procedure Codes
- Appendix D – Surgical Discharge DRGs
- Appendix E – Surgical Discharge MS-DRGs

Link to PSI appendices:

<http://qualityindicators.ahrq.gov/Downloads/Software/SAS/V43/TechnicalSpecifications/PSI%20Appendices.pdf>

**2a1.8 Denominator Exclusions** *(Brief narrative description of exclusions from the target population):*

Exclude cases:

- with principal diagnosis of deep vein thrombosis or pulmonary embolism or secondary diagnosis present on admission
- where a procedure for interruption of vena cava is the only operating room procedure
- where a procedure for interruption of vena cava occurs before or on the same day as the first operating room procedure
- MDC 14 (pregnancy, childbirth, and puerperium)
- with missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing) or principal diagnosis (DX1=missing)

**2a1.9 Denominator Exclusion Details** *(All information required to identify and calculate exclusions from the denominator such as definitions, codes with descriptors, and/or specific data collection items/responses):*

ICD-9-CM Interruption of vena cava procedure code:

387  
 INTERRUPTION OF VENA CAVA

**2a1.10 Stratification Details/Variables** *(All information required to stratify the measure results including the stratification variables, codes with descriptors, definitions, and/or specific data collection items/responses):*

Not applicable

**2a1.11 Risk Adjustment Type** *(Select type. Provide specifications for risk stratification in 2a1.10 and for statistical model in 2a1.13):* Statistical risk model    **2a1.12** If "Other," please describe:

**2a1.13 Statistical Risk Model and Variables** *(Name the statistical method - e.g., logistic regression and list all the risk factor*

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*variables. Note - risk model development should be addressed in 2b4.):*

The predicted value for each case is computed using a hierarchical model (logistic regression with hospital random effect) and covariates for gender, age (in 5-year age groups), modified CMS DRG, and the AHRQ Comorbidity category. The reference population used in the regression is the universe of discharges for states that participate in the HCUP State Inpatient Data (SID) for the years 2008, a database consisting of 42 states and approximately 30 million adult discharges. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Age 18 to 24  
 Age 25 to 29  
 Age 30 to 34  
 Age 35 to 39  
 Age 40 to 44  
 Age 45 to 49  
 Age 50 to 59  
 Age 65 to 74  
 Age 75 to 79  
 Age 80 to 84  
 Age 85+  
 MDRG 101  
 MDRG 102  
 MDRG 103  
 MDRG 104  
 MDRG 105  
 MDRG 107  
 MDRG 108  
 MDRG 401  
 MDRG 402  
 MDRG 502  
 MDRG 503  
 MDRG 505  
 MDRG 507  
 MDRG 508  
 MDRG 509  
 MDRG 511  
 MDRG 514  
 MDRG 519  
 MDRG 601  
 MDRG 602  
 MDRG 603  
 MDRG 604  
 MDRG 611  
 MDRG 701  
 MDRG 705  
 MDRG 801  
 MDRG 802  
 MDRG 804  
 MDRG 805  
 MDRG 806  
 MDRG 807  
 MDRG 808  
 MDRG 811  
 MDRG 815  
 MDRG 1001

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MDRG 1003  
 MDRG 1006  
 MDRG 1101  
 MDRG 1102  
 MDRG 1103  
 MDRG 1104  
 MDRG 1107  
 MDRG 1109  
 MDRG 1201  
 MDRG 1301  
 MDRG 1302  
 MDRG 1303  
 MDRG 1304  
 MDRG 1707  
 MDRG 1708  
 MDRG 1709  
 MDRG 1801  
 MDRG 1802  
 MDRG 2104  
 MDRG 2406  
 MDRG 2407  
 MDRG 2408  
 MDRG 2501  
 MDRG 7701  
 MDRG 7702  
 MDC 1  
 MDC 4  
 MDC 5  
 MDC 7  
 MDC 11  
 MDC 12  
 MDC 16  
 MDC 17  
 MDC 18  
 MDC 21  
 MDC 22  
 MDC 24  
 MDC 25  
 TRANSFER Transfer-in  
 COMORB CHF  
 COMORB VALVE  
 COMORB PULMCIRC  
 COMORB PERIVASC  
 COMORB HTN\_C  
 COMORB PARA  
 COMORB NEURO  
 COMORB CHRNLUNG  
 COMORB DM  
 COMORB HYPOTHY  
 COMORB RENLFAIL  
 COMORB AIDS  
 COMORB LYMPH  
 COMORB METS  
 COMORB TUMOR

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COMORB OBESE  
 COMORB WGHTLOSS  
 COMORB BLDLOSS  
 COMORB ANEMDEF  
 COMORB ALCOHOL  
 COMORB DRUG  
 COMORB PSYCH  
 COMORB DEPRESS

2a1.14-16 **Detailed Risk Model Available at Web page URL** (or attachment). Include coefficients, equations, codes with descriptors, definitions, and/or specific data collection items/responses. Attach documents only if they are not available on a webpage and keep attached file to 5 MB or less. NQF strongly prefers you make documents available at a Web page URL. Please supply login/password if needed:

URL

<http://qualityindicators.ahrq.gov/Downloads/Software/SAS/V43/Risk%20Adjustment%20Tables%20PSI%204.3.pdf>

Not applicable

2a1.17-18. **Type of Score:** [Rate/proportion](#)

2a1.19 **Interpretation of Score** (*Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score*): [Better quality = Lower score](#)

2a1.20 **Calculation Algorithm/Measure Logic** (*Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.*):

Each indicator is expressed as a rate, is defined as outcome of interest / population at risk or numerator / denominator. The AHRQ Quality Indicators (AHRQ QI) software performs six steps to produce the rates. 1) Discharge-level data is used to mark inpatient records containing the outcome of interest and 2) the population at risk. For provider indicators, the population at risk is also derived from hospital discharge records; for area indicators, the population at risk is derived from U.S. Census data. 3) Calculate observed rates. Using output from steps 1 and 2, rates are calculated for user-specified combinations of stratifiers. 4) Calculate expected rates. Regression coefficients from a reference population database are applied to the discharge records and aggregated to the provider or area level. For indicators that are not risk-adjusted, this is the reference population rate. 5) Calculate risk-adjusted rate. Use the indirect standardization to account for case-mix. For indicators that are not risk-adjusted, this is the same as the observed rate. 6) Calculate smoothed rate. A Univariate shrinkage factor is applied to the risk-adjusted rates. The shrinkage estimate reflects a reliability adjustment unique to each indicator

2a1.21-23 **Calculation Algorithm/Measure Logic Diagram URL or attachment:**

URL

<http://qualityindicators.ahrq.gov/Downloads/Resources/Publications/2011/QI%20Empirical%20Methods%2005-03-11.pdf>

Not applicable

2a1.24 **Sampling (Survey) Methodology.** If measure is based on a sample (or survey), provide instructions for obtaining the sample, conducting the survey and guidance on minimum sample size (response rate):

Not applicable

2a1.25 **Data Source** (*Check all the sources for which the measure is specified and tested*). If other, please describe:

[Administrative claims](#)

2a1.26 **Data Source/Data Collection Instrument** (*Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.*): [HCUP State Inpatient Databases \(SID\)](#). [Healthcare Cost and Utilization Project \(HCUP\)](#). Agency for Healthcare Research and Quality, Rockville, MD.

2a1.27-29 **Data Source/data Collection Instrument Reference Web Page URL or Attachment:** [URL](#)

<http://www.hcup-us.ahrq.gov/sidoverview.jsp>

Not applicable

2a1.30-32 Data Dictionary/Code Table Web Page URL or Attachment:

URL

<http://qualityindicators.ahrq.gov/Downloads/Software/WinQI/V43/AHRQ%20QI%20Software%20Instructions,%20WinQI.pdf>

Not applicable

2a1.33 Level of Analysis (Check the levels of analysis for which the measure is specified and tested): Facility

2a1.34-35 Care Setting (Check all the settings for which the measure is specified and tested): Hospital/Acute Care Facility

2a2. Reliability Testing. (Reliability testing was conducted with appropriate method, scope, and adequate demonstration of reliability.)

2a2.1 Data/Sample (Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2008. Agency for Healthcare Research and Quality, Rockville, MD. Consists of approximately 30 million adult discharges and 4,000 hospitals.

2a2.2 Analytic Method (Describe method of reliability testing & rationale):

The signal to noise ratio is the ratio of the between hospital variance (signal) to the within hospital variance (noise). The formula is  $\text{signal} / (\text{signal} + \text{noise})$ . The ratio itself is only a diagnostic for the degree of variance in the risk-adjusted rate systematically associated with the provider. Therefore, what matters is the magnitude of the variance in the "smoothed" rate (that is, the variance in the risk-adjusted rate after the application of the univariate shrinkage estimator based on the signal ratio).

2a2.3 Testing Results (Reliability statistics, assessment of adequacy in the context of norms for the test conducted):

What the data demonstrate is systematic variation in the provider level rate of 1.468 to 9.866 per 1000 from the 5th to 95th percentile after a signal ratio of 0.907 is applied as the shrinkage estimator (that is, after accounting for variation due to random factors).

2b. VALIDITY. Validity, Testing, including all Threats to Validity: H  M  L  I

2b1.1 Describe how the measure specifications (measure focus, target population, and exclusions) are consistent with the evidence cited in support of the measure focus (criterion 1c) and identify any differences from the evidence:

No identified differences

2b2. Validity Testing. (Validity testing was conducted with appropriate method, scope, and adequate demonstration of validity.)

2b2.1 Data/Sample (Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

The first study (Kaafarani HMA, et al. Validity of selected Patient Safety Indicators: opportunities and concerns. J Am Coll Surg 2011; 212(6):924-34) examined the criterion validity, specifically the positive predictive value (PPV), of 12 selected PSIs using clinical data abstracted from the Veterans Health Administration (VA) electronic medical record (EMR) as the gold standard.

The second study (White RH, et al. How valid is the ICD-9-CM based AHRQ Patient Safety Indicator for postoperative venous thromboembolism? Medical Care 2009; 47(12):1237-43) recruited hospitals for participation in the Validation Pilot Project through the AHRQ Quality Indicators (QI) technical support listserv and conducted web-based informational sessions to introduce the study and outline expectations of participants. Participation was voluntary and without compensation. We asked participants to commit to test PSI 12 as well as four other PSIs included in Phase I of the Validation Pilot Project. The 47 participating hospitals from 29 states included a spectrum of different sizes, ownership types, and academic affiliations.

The third study (Sadeghi B, et al. Improved coding of postoperative deep vein thrombosis and pulmonary embolism in administrative data (AHRQ PSI 12) after introduction of new ICD-9-CM diagnosis codes. Under review) involved two samples: (1) Fifteen academic medical centers that collaborated with UHC to identify VTE cases related to total knee arthroplasty, and to identify potentially modifiable risk factors for these events; and (2) Seven volunteer hospitals that joined AHRQ's PSI Validation Pilot project in 2010 and agreed to review cases flagged by PSI 12, using a standard instrument and guidelines, after widespread adoption of "present on admission" (POA) coding.

Finally, Henderson et al. (Henderson KE, et al. Clinical validation of the AHRQ Postoperative Venous Thromboembolism Patient Safety Indicator. *Joint Comm J Qual Patient Safe* 2009;35(7):370-6) used natural language processing supplemented by pharmacy and billing record reviews to identify potential false negative cases, and reported on the overall performance of PSI 12 at one academic medical center.

**2b2.2 Analytic Method** (*Describe method of validity testing and rationale; if face validity, describe systematic assessment*):

Calculation of the positive predictive value, which is defined as the percentage of reported events that are confirmed as true events based upon application of a "criterion (gold) standard." Sensitivity is defined as the percentage of all eligible events (based upon the same criterion standard) that are reported by hospitals in the administrative data set used for validation. In the cited studies, the criterion standard was based on review of randomly sampled medical records by a trained nurse abstractor, using a standard data collection tool and guidelines, with secondary review of clinical details by an academic surgeon. Confidence intervals (95%) were estimated with adjustment for clustering of observations within hospitals, as appropriate.

**2b2.3 Testing Results** (*Statistical results, assessment of adequacy in the context of norms for the test conducted; if face validity, describe results of systematic assessment*):

The first two studies of the validity of postoperative VTE diagnoses, based on PSI 12 specifications, reported positive predictive values (PPVs) of 43% (95% confidence interval [CI], 34-53%) in VA hospitals, 44% (95% CI, 37-51%) in academic medical centers, and 48% (95% CI, 42-52%) in a national sample of volunteer hospitals. False-negative errors were extremely rare, with an estimated sensitivity in the academic sample of 100% for identifying acute lower extremity or pelvic VTE and 95.5% for identifying any acute venous thrombosis. The VA study assessed the interrater reliability between chart abstractors and reported an estimate of 97%.

In a combined analysis of 573 PSI-flagged cases from the second and third of these samples, 74 (12.9%) had a documented prior/chronic VTE, which was presumably present at admission, 73 (12.7%) had an acute VTE before the operation, 19 (3.3%) had an acute VTE of undetermined timing, 83 (14.5%) had acute upper extremity thrombosis (of which 58 were disqualified solely for this reason), 34 (5.9%) had superficial vein thrombosis (25 were disqualified solely for this reason), and 12 (2.1%) had thrombosis of unknown site (9 were disqualified solely for this reason). Only 48 (8.4%) of flagged cases had no mention of VTE in the abstracted record. It should be noted that preoperative but hospital-acquired VTEs were classified as false positives, even though many argue that these should be considered as true positives (because many are related to delays in surgery or ineffective preoperative prophylaxis).

After reviewing these data with various stakeholders, AHRQ concluded that PSI 12 captured upper extremity and superficial thromboses because the existing ICD-9-CM diagnosis codes lacked specificity; codes for these diagnoses were available under the "thrombophlebitis" heading (451.xx), but not under the currently preferred "thrombosis" heading (453.xx). In addition, coders reported confusion about how to code chronic thromboses that are diagnosed after admission and are therefore reported as not present on admission (on Medicare claims and in states that require present-on-admission coding). Based on these findings and other studies in the peer-reviewed literature, AHRQ proposed and the ICD-9-CM Coordination and Maintenance Committee implemented an entirely new set of ICD-9-CM codes for superficial, upper extremity, and chronic venous thromboses. These codes are now excluded from the definition of PSI 12, which prompted AHRQ to reexamine the PPV of this indicator.

In this follow-up study (Sadeghi et al., under review), the PPV was very high (99%) in a cohort of 126 patients admitted to academic medical centers for total knee arthroplasty (TKA) and flagged by PSI 12, using POA information. TKA patients represent a population that is high risk based on the surgical procedure, but is medically stable (because of the elective nature of TKA) and thus relatively unlikely to have chronic VTE. In addition, UHC hospitals are academic medical centers that may not represent the clinical practice in other hospitals. The NPV among 463 TKA patients at the same academic medical centers was 99.3%, suggesting a sensitivity of at least 84% (if the underlying prevalence is 4% or greater in this population). The PPV in a broader sample of 171 surgical patients flagged by PSI 12 from 7 teaching and nonteaching hospitals was somewhat lower (81%), but still much higher than what was reported from earlier studies, before POA information became widely available.

Finally, Henderson et al. (2009) reported a PPV of 54% (95% CI, 45-63%) from one large academic medical center, which was entirely consistent with other findings before the advent of POA reporting and before the ICD-9-CM codes for upper extremity thrombosis were implemented. Of greater interest is their sensitivity estimate of 87%, based on an NPV of 99.7% (95% CI, 99.5-99.9%). This estimate is consistent with the similarly high sensitivity estimates reported by White et al. and Sadeghi et al.

Face validity was systematically assessed using an expert panel process, as described in our original submission documents (McDonald KM, Romano PS, Geppert J, Davies SM, Duncan BW, Shojania KG. Measures of Patient Safety Based on Hospital Administrative Data: The Patient Safety Indicators. Technical Review Number 5. Rockville, MD: Agency for Healthcare Research and Quality, 2002). The methodology for the structured review was adapted from the RAND/UCLA Appropriateness Method and consisted of an initial independent assessment of each indicator by clinician panelists using an initial questionnaire, a conference call among all panelists, followed by a final independent assessment by clinician panelists using the same questionnaire. Specifically, a multi-specialty expert panel gave this indicator an overall usefulness rating of 7 (on a scale of 1-9) with indeterminate agreement, and a preventability rating of 7 with indeterminate agreement.

**POTENTIAL THREATS TO VALIDITY.** (*All potential threats to validity were appropriately tested with adequate results.*)

**2b3. Measure Exclusions.** (*Exclusions were supported by the clinical evidence in 1c or appropriately tested with results demonstrating the need to specify them.*)

**2b3.1 Data/Sample for analysis of exclusions** (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2008. Agency for Healthcare Research and Quality, Rockville, MD. Consists of approximately 30 million adult discharges and 4,000 hospitals.

**2b3.2 Analytic Method** (*Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference*):

We conducted an analysis of each exclusion to determine whether the exclusion was still necessary give the availability of present on admission data. Only those exclusion that are "related to POA" were evaluated.

Exclusion Criterion	Related to POA	Related to Preventability	Little or No Risk
Exclusion 1 (Exclude if only OR procedure)	X	-	-
Exclusion 2 (Exclude if procedure occurs before or same day as 1st OR procedure)	-	X	-
Exclusion 3 (Exclude MDC 14)	-	-	X

If the user's data lacks present on admission information, then the likelihood that the outcome of interest and the covariates are present on admission is estimated using a Markov Chain Monte Carlo (MCMC) estimation procedure. That likelihood is then used to adjust the observed and expected rates.

**2b3.3 Results** (*Provide statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses*):

Based on the analysis, we have made the following recommendations for future revisions of this indicator

- No changes are recommended for PSI #12.
- Retain exclusion 1 for reasons of face validity.
- Retain exclusion 2 because it is central to the definition of the measure. The IVC procedure implies a pre-existing DVT.
- Retain exclusion 3; the MDC 14 exclusions are not candidates to be dropped in this work

**2b4. Risk Adjustment Strategy.** (*For outcome measures, adjustment for differences in case mix (severity) across measured entities was appropriately tested with adequate results.*)

**2b4.1 Data/Sample** (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2008. Agency for Healthcare Research and Quality, Rockville, MD. Consists of approximately 30 million adult discharges and 4,000 hospitals.

**2b4.2 Analytic Method** (*Describe methods and rationale for development and testing of risk model or risk stratification including selection of factors/variables*):

Risk-adjustment models use a standard set of categories based on readily available classification systems for demographics, severity of illness and comorbidities. Within each category, covariates are initially selected based on a minimum of 30 cases in the outcome of interest. Then a stepwise regression process on a development sample is used to select a parsimonious set of covariates where  $p < .05$ . Model is then tested on a validation sample

If the user's data lacks present on admission information, then the likelihood that the outcome of interest and the covariates are present on admission is estimated using a Markov Chain Monte Carlo (MCMC) estimation procedure. That likelihood is then used to adjust the observed and expected rates.

**2b4.3 Testing Results** (*Statistical risk model: Provide quantitative assessment of relative contribution of model risk factors; risk model performance metrics including cross-validation discrimination and calibration statistics, calibration curve and risk decile plot, and assessment of adequacy in the context of norms for risk models. Risk stratification: Provide quantitative assessment of relationship of risk factors to the outcome and differences in outcomes among the strata*):

c-statistic 0.745

**2b4.4 If outcome or resource use measure is not risk adjusted, provide rationale and analyses to justify lack of adjustment:** Not applicable

**2b5. Identification of Meaningful Differences in Performance.** (*The performance measure scores were appropriately analyzed and discriminated meaningful differences in quality.*)

**2b5.1 Data/Sample** (*Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). 2008. Agency for Healthcare Research and Quality, Rockville, MD. Consists of approximately 30 million adult discharges and 4,000 hospitals.

**2b5.2 Analytic Method** (*Describe methods and rationale to identify statistically significant and practically/meaningfully differences in performance*):

Posterior probability distribution parameterized using the Gamma distribution

**2b5.3 Results** (*Provide measure performance results/scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningful differences in performance*):

Raw Rates (numerator / denominator):

5th	25th	Median	75th	95th
0.001468	0.002924	0.004395	0.006297	0.009866

**2b6. Comparability of Multiple Data Sources/Methods.** (*If specified for more than one data source, the various approaches result in comparable scores.*)

**2b6.1 Data/Sample** (*Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

Not applicable

**2b6.2 Analytic Method** (*Describe methods and rationale for testing comparability of scores produced by the different data sources specified in the measure*):

Not applicable

**2b6.3 Testing Results** (*Provide statistical results, e.g., correlation statistics, comparison of rankings; assessment of adequacy in the context of norms for the test conducted*):

Not applicable

**2c. Disparities in Care:** H  M  L  I  NA  (*If applicable, the measure specifications allow identification of disparities.*)

**2c.1 If measure is stratified for disparities, provide stratified results** (*Scores by stratified categories/cohorts*): In regard to figures below:

1st figure: estimate per 1,000, risk adjusted rates

2nd figure: standard error

3rd figure: p value relative to marked group (marked group = "c")

4th figure: p value: current year relative to prior year

Key:

"c": Reference for p-value test statistics

NQF #0450 Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI 12)

“\*”: Data do not meet criteria for statistical reliability, data quality, or confidentiality

“DNC”: Data were not collected

Patient characteristic:

Age groups for conditions affecting any age:

18-44 c 7.641 0.057 0.031

45-64 10.548 0.051 0.000 0.000

65 and over 14.499 0.057 0.000 0.000

Age groups for conditions affecting primarily elderly:

65-69 c 12.532 0.107 0.050

70-74 13.309 0.114 0.000 0.167

75-79 15.372 0.123 0.000 0.001

80-84 16.759 0.145 0.000 0.000

85 and over 15.975 0.163 0.000 0.691

Gender:

Male c 12.713 0.049 0.000

Female 10.720 0.044 0.000 0.763

Median income of patient’s ZIP code:

First quartile (lowest income) 11.881 0.062 0.000 0.000

Second quartile 10.652 0.065 0.000 0.082

Third quartile 10.962 0.066 0.000 0.031

Fourth quartile (highest income) c 12.379 0.067 0.000

Location of patient residence (NCHS):

Large central metropolitan 13.985 0.061 0.000 0.000

Large fringe metropolitan c 12.467 0.066 0.000

Medium metropolitan 10.024 0.073 0.000 0.000

Small metropolitan 9.179 0.103 0.000 0.263

Micropolitan 9.266 0.097 0.000 0.001

Not metropolitan or micropolitan 8.662 0.121 0.000 0.002

Expected payment source:

Private insurance c 10.386 0.059 0.286

Medicare 11.697 0.043 0.000 0.000

Medicaid 14.528 0.127 0.000 0.151

Other insurance 12.037 0.174 0.000 0.012

Uninsured / self-pay / no charge 11.079 0.170 0.000 0.000

2c.2 If disparities have been reported/identified (e.g., in 1b), but measure is not specified to detect disparities, please explain:

Not applicable

2.1-2.3 Supplemental Testing Methodology Information:

URL

[http://qualityindicators.ahrq.gov/Downloads/Modules\\_Non\\_Software/Modules%20Development%20Bullet/psi\\_development.zip](http://qualityindicators.ahrq.gov/Downloads/Modules_Non_Software/Modules%20Development%20Bullet/psi_development.zip)

Not applicable

Steering Committee: Overall, was the criterion, *Scientific Acceptability of Measure Properties*, met?

(Reliability and Validity must be rated moderate or high) Yes  No

Provide rationale based on specific subcriteria:

**If the Committee votes No, STOP**

### 3. USABILITY

Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making. (evaluation criteria)

**C.1 Intended Purpose/ Use** (Check all the purposes and/or uses for which the measure is intended): [Public Reporting, Quality Improvement \(Internal to the specific organization\)](#)

**3.1 Current Use** (Check all that apply; for any that are checked, provide the specific program information in the following questions): [Public Reporting, Quality Improvement \(Internal to the specific organization\)](#)

**3a. Usefulness for Public Reporting:** H  M  L  I   
 (The measure is meaningful, understandable and useful for public reporting.)

**3a.1. Use in Public Reporting - disclosure of performance results to the public at large** (If used in a public reporting program, provide name of program(s), locations, Web page URL(s)). If not publicly reported in a national or community program, state the reason AND plans to achieve public reporting, potential reporting programs or commitments, and timeline, e.g., within 3 years of endorsement: [**For Maintenance** – If not publicly reported, describe progress made toward achieving disclosure of performance results to the public at large and expected date for public reporting; provide rationale why continued endorsement should be considered.]

This measure is used for public reporting in 16 realms.

Arizona (NY QIO)  
 Why Not the Best?  
<http://www.whynotthebest.org/>

Colorado (state hospital association)  
 Colorado Hospital Report Card  
[http://www.cohospitalquality.org/index.php?option=com\\_frontpage&Itemid=1](http://www.cohospitalquality.org/index.php?option=com_frontpage&Itemid=1)

Florida (state)  
 Florida Health Finder  
<http://www.floridahealthfinder.gov/>

Illinois (state hospital association)  
 Illinois Hospitals Caring for You  
[www.illinoishospitals.org](http://www.illinoishospitals.org)

Iowa (Iowa Healthcare Collaborative)  
 Iowa Healthcare Collaborative  
<http://www.ihconline.org/asp/publicreporting/iowareport.aspx>

Kentucky (Norton Healthcare, a hospital system)  
 Norton Healthcare Quality Report  
<http://www.nortonhealthcare.com/body.cfm?id=157>

Kentucky (state hospital association)  
 Kentucky Hospital Association Quality Data  
<http://info.kyha.com/QualityData/IQISite/>

Louisiana (state)  
 Louisiana Health Finder  
<http://www.healthfinderla.gov/default.aspx>

Maine (state)  
 Maine Health Data Organization  
<http://gateway.maine.gov/mhdo2008Monahrq/home.html>

Minnesota (Minnesota Community Measurement)  
 Minnesota Health Scores  
[www.mnhealthscores.org](http://www.mnhealthscores.org)

Nevada (state hospital association)  
 Nevada Hospital Association Hospital Performance <http://www.nvhospitalquality.net/>

New Jersey (state)  
 Find and Compare Quality Care in NJ Hospitals  
<http://www.nj.gov/health/healthcarequality/>

New York (health care coalition)  
 New York State Hospital Report Card  
<http://www.myhealthfinder.com/>

Oklahoma (state)  
 Oklahoma Hospital Report  
<http://www.ok.gov/health/documents/08%20Hospital%20AR.pdf>

Rhode Island (NY QIO)  
 Why Not the Best?  
<http://www.whynotthebest.org/>

**3a.2. Provide a rationale for why the measure performance results are meaningful, understandable, and useful for public reporting.** If usefulness was demonstrated (e.g., focus group, cognitive testing), describe the data, method, and results: A research team from the School of Public Affairs, Baruch College, under contracts with the Department of Public Health, Weill Medical College and Battelle, Inc., has developed a pair of Hospital Quality Model Reports at the request of the Agency for Healthcare Research & Quality (AHRQ). These reports are designed specifically to report comparative information on hospital performance based on the AHRQ Quality Indicators (QIs). The work was done in close collaboration with AHRQ staff and the AHRQ Quality Indicators team. The Model Reports (discussed immediately above) are based on:

- Extensive search and analysis of the literature on hospital quality measurement and reporting, as well as public reporting on health care quality more broadly;
- Interviews with quality measurement and reporting experts, purchasers, staff of purchasing coalitions, and executives of integrated health care delivery systems who are responsible for quality in their facilities;
- Two focus groups with chief medical officers of hospitals and/or systems and two focus groups with quality managers from a broad mix of hospitals;
- Four focus groups with members of the public who had recently experienced a hospital admission; and
- Four rounds of cognitive interviews (a total of 62 interviews) to test draft versions of the two Model Reports with members of the public with recent hospital experience, basic computer literacy but widely varying levels of education

**3.2 Use for other Accountability Functions (payment, certification, accreditation).** If used in a public accountability program, provide name of program(s), locations, Web page URL(s): **Not applicable**

**3b. Usefulness for Quality Improvement:** H  M  L  I   
 (The measure is meaningful, understandable and useful for quality improvement.)

**3b.1. Use in QI.** If used in quality improvement program, provide name of program(s), locations, Web page URL(s): **[For Maintenance – If not used for QI, indicate the reasons and describe progress toward using performance results for improvement].**

The Patient Safety Indicators (PSIs) are a set of indicators providing information on potential in hospital complications and adverse events following surgeries, procedures, and childbirth. The PSIs were developed after a comprehensive literature review, analysis

of ICD-9-CM codes, review by a clinician panel, implementation of risk adjustment, and empirical analyses.

The PSIs can be used to help hospitals identify potential adverse events that might need further study; provide the opportunity to assess the incidence of adverse events and in hospital complications using administrative data found in the typical discharge record; include indicators for complications occurring in hospital that may represent patient safety events; and, indicators also have area level analogs designed to detect patient safety events on a regional level.

[http://qualityindicators.ahrq.gov/modules/psi\\_overview.aspx](http://qualityindicators.ahrq.gov/modules/psi_overview.aspx)

The following are several entities that use the measure in quality improvement:

1) Norton Healthcare

Norton is a multi-hospital system located in Kentucky

2) Minnesota Hospital Association

3) University Healthcare Consortium (UHC)

UHC is an alliance of 103 academic medical centers and 219 of their affiliated hospitals. UHC reports this and other AHRO QIs to their member hospitals for their internal quality improvement purposes.

4) Premier

Premier uses the measure in their "QUEST" tool, which is used by hundreds of hospitals in their quality assurance and improvement work.

**3b.2. Provide rationale for why the measure performance results are meaningful, understandable, and useful for quality improvement. If usefulness was demonstrated (e.g., QI initiative), describe the data, method and results:**

The AHRO QI support line receives approximately 150 user queries per month and almost 50 user per month download the AHRO QI PSI software. Users have used the PSI since the release in 2003.

Users can readily use the risk-adjusted rate and the observed to expected results to identify opportunities for improvement for specific patient populations based on default stratifiers or risk adjustment model covariates. In addition, comparative data from the AHRO SID and NIS databases provides relative performance information.

Overall, to what extent was the criterion, *Usability*, met? H  M  L  I

Provide rationale based on specific subcriteria:

**4. FEASIBILITY**

Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)

4a. Data Generated as a Byproduct of Care Processes: H  M  L  I

4a.1-2 How are the data elements needed to compute measure scores generated? (Check all that apply).

Data used in the measure are:

Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims)

4b. Electronic Sources: H  M  L  I

4b.1 Are the data elements needed for the measure as specified available electronically (Elements that are needed to compute measure scores are in defined, computer-readable fields): ALL data elements in electronic claims

4b.2 If ALL data elements are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources:

4c. Susceptibility to Inaccuracies, Errors, or Unintended Consequences: H  M  L  I

4c.1 Identify susceptibility to inaccuracies, errors, or unintended consequences of the measurement identified during testing and/or operational use and strategies to prevent, minimize, or detect. If audited, provide results:  
[Coding professionals follow detail guidelines, are subject to training and credentialing requirements, peer review and audit.](#)

4d. Data Collection Strategy/Implementation: H  M  L  I

A.2 Please check if either of the following apply (*regarding proprietary measures*):

4d.1 Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues (*e.g., fees for use of proprietary measures*):

[The AHRQ QI software has been publicly available at no cost since 2001; Users have over ten years of experience using the AHRQ QI software in SAS and Windows.](#)

Overall, to what extent was the criterion, *Feasibility*, met? H  M  L  I

Provide rationale based on specific subcriteria:

### OVERALL SUITABILITY FOR ENDORSEMENT

Does the measure meet all the NQF criteria for endorsement? Yes  No

Rationale:

**If the Committee votes No, STOP.**

**If the Committee votes Yes, the final recommendation is contingent on comparison to related and competing measures.**

### 5. COMPARISON TO RELATED AND COMPETING MEASURES

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure before a final recommendation is made.

5.1 If there are related measures (*either same measure focus or target population*) or competing measures (*both the same measure focus and same target population*), list the NQF # and title of all related and/or competing measures:

[0376 : Incidence of Potentially Preventable Venous Thromboembolism](#)

5a. Harmonization

5a.1 If this measure has EITHER the same measure focus OR the same target population as [NQF-endorsed measure\(s\)](#):  
 Are the measure specifications completely harmonized? No

5a.2 If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden:

[PSI 12 does not include in the numerator 453.87 \(Acute venous embolism and thrombosis of other thoracic veins \), 453.89 \(Acute venous embolism and thrombosis of other specified veins\) and 453.9 \( Acute venous embolism and thrombosis of other specified veins NOS\) for discharges on or after October 1, 2009 because the measure focus is on acute lower extremity DVT. Empirical analysis data has confirmed that dropping these unspecified codes improves specificity without loss of sensitivity. Obstetric VTE codes are also not included as cases in MDC 14 \(pregnancy, childbirth and puerperium\) are excluded.](#)

5b. Competing Measure(s)

5b.1 If this measure has both the same measure focus and the same target population as NQF-endorsed measure(s):  
 Describe why this measure is superior to competing measures (*e.g., a more valid or efficient way to measure quality*); OR provide a rationale for the additive value of endorsing an additional measure. (*Provide analyses when possible*):

### CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner): [Agency for Healthcare Research and Quality, 540 Gaither Road,](#)

NQF #0450 Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI 12)

Rockville, Maryland, 20850
Co.2 Point of Contact: John, Bott, Contractor, AHRQ Quality Indicators Measure Expert Center for Delivery, Organization and Markets, John.Bott@ahrq.hhs.gov, 301-427-1317-
Co.3 Measure Developer if different from Measure Steward: Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, Maryland, 20850
Co.4 Point of Contact: John, Bott, Contractor, AHRQ Quality Indicators Measure Expert Center for Delivery, Organization and Markets, John.Bott@ahrq.hhs.gov, 301-427-1317-
Co.5 Submitter: John, Bott, Contractor, AHRQ Quality Indicators Measure Expert Center for Delivery, Organization and Markets, John.Bott@ahrq.hhs.gov, 301-427-1317-, Agency for Healthcare Research and Quality
Co.6 Additional organizations that sponsored/participated in measure development: University of California-Davis Stanford University Battelle Memorial Institute
Co.7 Public Contact: John, Bott, Contractor, AHRQ Quality Indicators Measure Expert Center for Delivery, Organization and Markets, John.Bott@ahrq.hhs.gov, 301-427-1317-, Agency for Healthcare Research and Quality

ADDITIONAL INFORMATION

<p>Workgroup/Expert Panel involved in measure development</p> <p>Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development. Multi-specialty Panel and Surgical Panel members are listed in the technical report: <a href="http://qualityindicators.ahrq.gov/Downloads/Modules_Non_Software/Modules%20Development%20Bullet/psi_development.zip">http://qualityindicators.ahrq.gov/Downloads/Modules_Non_Software/Modules%20Development%20Bullet/psi_development.zip</a></p>
<p>Ad.2 If adapted, provide title of original measure, NQF # if endorsed, and measure steward. Briefly describe the reasons for adapting the original measure and any work with the original measure steward: This indicator was originally proposed by lezzoni et al. as part of the Complications Screening Program (CSP "sentinel events")</p>
<p>Measure Developer/Steward Updates and Ongoing Maintenance</p> <p>Ad.3 Year the measure was first released: 2003</p> <p>Ad.4 Month and Year of most recent revision: 08, 2011</p> <p>Ad.5 What is your frequency for review/update of this measure? Annual</p> <p>Ad.6 When is the next scheduled review/update for this measure? 03, 2012</p>
<p>Ad.7 Copyright statement: Not applicable</p>
<p>Ad.8 Disclaimers: Not applicable</p>
<p>Ad.9 Additional Information/Comments: Not applicable</p>
<p>Date of Submission (MM/DD/YY): 09/14/2011</p>