2025 Pre-Rulemaking Measure Review
Preliminary Assessment

MUC ID	Title
MUC2025-067	Hospital Harm - Postoperative Venous Thromboembolism
Measure Steward & Developer	**Proposed CMS Programs**
Centers for Medicare & Medicaid Services (CMS)	Hospital Inpatient Quality Reporting Program Link: Hospital Inpatient Quality Reporting Program Hospital-Acquired Condition Reduction Program Link: Hospital-Acquired Condition Reduction Program Medicare Promoting Interoperability Program Link: Promoting Interoperability Program

Measure Overview

Rationale (excerpt from submission): In-hospital postoperative venous thromboembolism (VTE) encompasses both deep vein thrombosis (DVTs) and pulmonary embolisms (PEs). DVT is associated with poor clinical outcomes, including post-thrombotic syndrome in the leg, anticoagulation-related bleeding, and death.[1] By implementing evidence-based strategies, health care providers can significantly reduce incidences of VTE and improve patient outcomes.

During 2019, 2021, and 2022, patients in the United States experienced 51,586 perioperative VTEs.[2] This volume of detected, preventable safety events illustrates that there are continued opportunities to reduce the rate of postoperative VTEs.

In terms of processes of care that clinicians can utilize to prevent these safety events, one study found evidence that combining hospital interventions, such as mechanical and pharmacological prophylaxis, can reduce the incidence of DVT among patients undergoing surgery or admitted with trauma.[3] Another study found that interruptions or delays in the prescription of VTE prophylaxis in surgical patients are associated with a 2- to 3-fold increased risk of VTE.[4] Furthermore, there are clinical guidelines to support and improve clinical decision-making in the prevention of VTE. As such, hospitals have evidence-based strategies to prevent VTEs in the inpatient setting. These findings suggest that there are opportunities to lower postoperative VTE rates through hospital intervention.

[1] Bysshe, T., Gao, Y., Heaney-Huls, K., Hockenberry, J., Hovey, L., Laffan, A. M., Lee, S., Murphy, D. J. &, Watts, E. (2017). Estimating the additional hospital inpatient cost and mortality associated with selected Hospital-Acquired conditions. Agency for Healthcare Research and Quality. https://www.norc.org/content/dam/norc-org/documents/standard-projects-pdf/hac-cost-report2017.pdf

[2] AHRQ PSI Technical Documentation, Version v2024, Agency for Healthcare Research and Quality, Rockville, MD. https://qualityindicators.ahrq.gov/measures/psi_resources. Accessed March 29th, 2025

[3] Kakkos, S., Kirkilesis, G., Caprini, J. A., Geroulakos, G., Nicolaides, A., Stansby, G., & Reddy, D. J. (2022). Combined intermittent pneumatic leg compression and pharmacological prophylaxis for prevention of venous thromboembolism. The Cochrane database of systematic reviews, 1(1), CD005258. https://doi.org/10.1002/14651858.CD005258.pub4

[4] Henke, P. K., Kahn, S. R., Pannucci, C. J., Secemksy, E. A., Evans, N. S., Khorana, A. A., Creager, M. A., & Pradhan, A. D. (2020). Call to action to prevent venous thromboembolism in hospitalized patients: A policy statement from the American Heart Association. Circulation, 141(24). https://doi.org/10.1161/cir.0000000000000769

Measure Overview
CMS-provided program rationale: Implementing this measure into CMS programs will incentivize hospitals to take steps to prevent VTEs and improve patient outcomes. Hospitals can take well-established, evidence-based strategies to reduce incidence of this outcome. Additionally, this measure furthers the goal of shifting toward outcome measures and away from process measures.
Description: The proportion of inpatient encounters for patients age 18 and older, who have at least one surgical procedure performed inside the operating room during the encounter, and who suffer the harm of a postoperative venous thromboembolism (VTE) during the encounter or within 30 days after the first surgical procedure. This measure is adjusted by patient-level risk factors (bleeding disorders, cancer, respiratory operations, central venous catheter insertion, vascular surgeries, obesity, stroke, and history of VTE).
Measure background: New measure never reviewed by the Measure Applications Partnership (MAP) Workgroup or PRMR; never used in a Medicare program.
Numerator: Inpatient encounters for patients with a postoperative venous thromboembolism (VTE) within 30 days of the first surgical procedure. Evidence of a postoperative VTE is determined by either Criterion A, B or C: • Criterion A: A qualifying inpatient encounter, excluding encounters where the first surgical procedure was an intracranial or spinal surgery procedure, with a diagnostic imaging study performed during the qualifying inpatient encounter and within 30 days or less after the end of the first surgical procedure performed and at least one of the following: An anticoagulation medication order within 24 hours after the end of the diagnostic imaging study during the qualifying inpatient encounter. An anticoagulation medication order is evidenced by: Enoxaparin (Lovenox) >80 mg per day Apixaban (Eliquis) >=10 mg per day Rivaroxaban (Xarelto) >=20 mg per day Fondaparinux (Arixtra) >= 5 mg per day Dalteparin sodium (Fragmin)>= 10,000 IU per day; or A heparin intravenous administration within 24 hours after the end of the diagnostic imaging study, with at least 2 aPTT heparin therapy monitoring tests or at least 2 Anti Factor Xa Assays within 35 hours of the start of heparin intravenous therapy administration all which occur during the qualifying inpatient encounter; or Placement of an inferior vena cava (IVC) filter within 24 hours after the end of the diagnostic imaging study and during the qualifying inpatient encounter; or A diagnosis of VTE which was not present on admission during the qualifying inpatient encounter. OR • Criterion B: A qualifying inpatient encounter, where the first surgical procedure was for an intracranial or spinal surgery, and a diagnostic imaging study was performed during the qualifying inpatient encounter and the diagnostic imagining study occurred between 5 days and up to 30 days after the end of the first surgical procedure and at least one of the following: An anticoagulation medication order within 24 hours after the end of the diagnostic

Measure Overview
imaging study during the qualifying inpatient encounter. An anticoagulation medication order is evidenced by: Enoxaparin (Lovenox) >80 mg per day Apixaban (Eliquis) >=10 mg per day Rivaroxaban (Xarelto) >=20 mg per day Fondaparinux (Arixtra) >= 5 mg per day Dalteparin sodium (Fragmin)>= 10,000 IU per day; or A heparin intravenous administration within 24 hours after the diagnostic imaging study, with at least 2 aPTT heparin therapy monitoring tests or at least 2 Anti Factor Xa Assays within 35 hours of the start of heparin intravenous therapy administration, all of which occur during the qualifying inpatient encounter; or Placement of an inferior vena cava (IVC) filter within 24 hours after the end of the diagnostic imaging study and during the qualifying inpatient encounter; or A diagnosis of VTE which was not present on admission during the qualifying inpatient encounter. OR • Criterion C: A VTE that occurs during a subsequent inpatient encounter and within 30 days or less after the end of the first surgical procedure that occurred during the qualifying inpatient encounter as evidenced by: A diagnosis of VTE during the subsequent encounter; and Anticoagulation therapy ordered or prescribed during the subsequent encounter. **Exclusions:** N/A
Denominator: Inpatient encounters for patients age 18 and older where a surgical procedure was performed inside the operating room during the encounter. **Exclusions:** Inpatient encounters for: • Patients with an obstetric-related diagnosis during the inpatient encounter • Patients with a venous thromboembolism (VTE) diagnosis present on admission • Patients who had extracorporeal membrane oxygenation (ECMO) during the inpatient encounter • Patients with acute brain or spinal injury or hemorrhage present on admission • Patients who had a thrombectomy procedure which occurred before or on the same day as the first surgical procedure during the inpatient encounter • Patients who had intracranial or spinal surgery during the inpatient encounter who were discharged less than 5 days after the end of the surgery • Patients who have a duration of stay less than 2 calendar days **Exceptions:** N/A

Measure Overview	
Substantive changes from prior version (if applicable): N/A	
Measure type: Outcome	**Measure is a composite:** No **Measure is digital and/or an eCQM:** Yes **Measure is a paired or group measure:** No
Level of analysis: Facility	**Data source(s):** Digital-Electronic Health Record (EHR) Data
Care setting(s): Hospital inpatient acute care facility	**Risk adjustment or stratification:** Yes, risk adjustment
CBE endorsement status: Not endorsed	**CBE endorsement history:** Measure was submitted for endorsement in the Fall 2025 measure evaluation cycle. The CBE has not yet reviewed or issued an endorsement decision.
Is measure currently used in CMS programs? No	**Measure addresses statutorily required area?** No

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Evaluation

Meaningfulness

Importance	
Type of evidence:	Clinical Guidelines or U.S. Preventive Services Task Force (USPSTF) Guidelines; Grey Literature; Peer-Reviewed Systematic Review [MUC Entry/Review Information Tool (MERIT) Submission Form]
Importance: As outlined in the literature cited for the measure rationale, in-hospital postoperative VTE is associated with poor clinical outcomes. Evidence provided from the peer-reviewed research and clinical guidelines shows that combining hospital interventions such as mechanical and pharmacological prophylaxis as well as following clinical guidelines can reduce the incidence of VTE in surgical and trauma patients. However, recent data from VA hospitals and academic hospitals show wide variability in prevention performance, indicating significant room for improvement. Additionally, evidence from antibiotic stewardship programs demonstrates that data-driven, system-wide interventions can successfully improve care processes and outcomes, suggesting similar opportunities exist for VTE prevention. Clinical guidelines noted by the developer include patient management recommendations to clinicians within hospitals to reduce the occurrence of postoperative VTE events. These guidelines indicate that there are care processes hospitals can use to guide care and to improve their performance on this outcome measure focused on postoperative VTE events.	
Rating: Met	

Conformance
Measure alignment with conceptual intent: This measure intends to reduce incidences of VTE through implementation of evidence-based strategies. The measure's numerator, denominator, and exclusions are clearly defined and directly support the intent of this measure. Specifically, the numerator includes patients with a postoperative VTE within 30 days of the first surgical procedure from the denominator of all patients aged 18 and older where a surgical procedure was performed inside the operating room during the encounter. The denominator exclusions are appropriate to the population and measure intent. This measure aligns with the Hospital Inpatient Quality Reporting Program to improve the quality of inpatient care provided to all patients, the Hospital-Acquired Condition Reduction Program to improve patients' safety and implement best practices to reduce their rates of infections associated with health care, and the Medicare Promoting Interoperability Program to adopt, implement, upgrade, and demonstrate meaningful use of certified EHR technology.
Rating: Met

Feasibility	
eCQM feasibility testing/analysis conducted:	Yes, eCQM testing was performed [MERIT submission form; eCQM Feasibility Scorecard]

Feasibility: For this eCQM, all data elements are in defined fields in electronic sources and some data elements align with United States Core Data for Interoperability (USCDI)/USCDI+ Quality standard definitions. This eCQM was tested in three EHR systems and demonstrated a high level of feasibility. The feasibility scorecard addresses the following domains:

- Availability: the extent to which the data are readily available in a structured format across EHR systems.
- Accuracy: the extent to which the information contained in the data is correct.
- Standards: the extent to which the data element is coded using a nationally accepted terminology standard (vocabulary) and mapped to the Quality Data Model (QDM).
- Workflow: the extent to which capturing the data element impacts the typical workflow for that user.

Feasibility testing identified no data elements requiring review within the testing sites. The measure can be implemented without significant workflow changes.

Rating: Met

Validity	
Validity testing method(s):	Face validity [MERIT submission form; Data Element Validity]
Testing level(s)	Patient/Encounter
Was this measure tested in the same target population as the CMS program?	N/A

Validity: Face validity was established by seven clinicians with expertise in internal medicine, trauma, and neurocritical care, who were interviewed using a scale of strongly disagree/disagree/agree/strongly agree. Four out of seven clinicians agreed that the risk-adjusted version of the measure can distinguish between hospitals with good and poor quality of care. Three clinicians disagreed: one stated a baseline surveillance rate should be included for accuracy; the second recommended pairing the measure with a related process measure to better assess quality; and the third stated that hospital outcomes cannot accurately distinguish between the quality of care delivered by hospitals, as those outcomes are influenced by hospital location and patient population.

Disagreement among clinician interview participants weakens the case for face validity, and in the absence of formal validity testing, the measure may require further evaluation before considered scientifically acceptable for use in CMS programs.

During collaboration on this PA, the developer noted that two related process measures are already implemented in the Hospital IQR Program

Validity
and stated that, while one clinician questioned the measure's ability to distinguish hospital quality due to external factors, the inclusion of a risk adjustment model is expected to address most concerns. For patient/encounter testing, the developers calculated percent agreement for critical data elements with chart-abstracted data as the "gold standard." Agreement rates of individual elements were strong, and sensitivity and specificity ranged from moderate to excellent for all groups and sites with the following two exceptions: sensitivity of classifying cases as denominator exclusions was just under the threshold for moderate at one site, and at another site the sensitivity of classifying cases into as exclusions in the second site was limited due to diagnoses that were not captured in structured fields. **Considerations for the committee:** The committee should evaluate whether the patient- and encounter-level testing, along with the face validity assessment—though meeting minimum criteria—are sufficient to establish scientific acceptability for use in the selected CMS programs.
Threats to validity: Key risk factors identified were available for testing, including age, sex, comorbidities, and health behaviors/health choices. The measure developers noted for patient/encounter testing, while the data elements used for risk adjustment for both test sites had 80-100% agreement, there was an exception with obesity risk, for which agreement was 60% and 65% at the two sites.
Rating: Met

Reliability	
Reliability testing method(s):	Signal-to-Noise [MERIT Submission Form]
Testing level:	Facility
Reliability discussion: The developers assessed signal-to-noise reliability using EHR data from 34 hospitals that included 50,203 encounters in 2022 and 50,708 encounters in 2023 using empirical Bayesian estimation. The signal-to-noise reliability estimates were consistent across hospitals for 2022 with the 10th percentile observing a reliability score of 0.9998 and the 90th percentile observing a reliability score of 0.9999. The signal-to-noise reliability estimates using data from 2023 did not change from the 2022 reported results. For both years, reliability results are approximately 1, indicating high reliability, exceeding the 0.6 reliability testing threshold.	
Additional reliability analyses: No additional reliability analyses were performed.	
Rating: Met	

Usability	
Usability considered in application:	Yes, the submission materials briefly discuss the measure's usability within relevant programs.

Usability
Usability discussion: The measure is well-suited for the Hospital Inpatient Quality Reporting Program because it provides insight to postoperative outcomes for patients and aligns with two measures, Venous Thromboembolism Prophylaxis (VTE-1) and Intensive Care Unit Venous Thromboembolism Prophylaxis (VTE-2), incentivizing proper administration of postoperative VTE prophylaxis in the hospital setting. The measure is also highly usable in the Hospital-Acquired Condition Reduction Program as it aims to reduce a harmful event, VTE, within 30 days of the first surgical procedure. The measure is also suited for the Medicare Promoting Interoperability Program as it utilizes EHR data and offers greater reliability for capturing patient harm and risk factors than Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI-12), which does not utilize EHR data. In reviewing potential unintended consequences noted in the submission materials, Battelle raised a concern that hospital performance may be affected by surveillance bias or that more aggressive use of anticoagulants, which could result in subsequent major bleeding events, could be mitigated by a complementary measure titled Hospital Harm – Anticoagulant-Related Major Bleeding. In response to this concern, the developer provided additional context during collaboration on this PA. During development of this measure, the developer made changes to the specifications to reduce risk of surveillance bias. The development team used the approach followed by the stewards of Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate (PSI - 12) to address the same concern. Specifically, they updated the measure's specifications to only capture (1) proximal (groin/thigh), not distal (calf) vein thromboses diagnosis; and (2) not include solitary subsegmental pulmonary emboli diagnosis.
Rating: Met

Appropriateness of Scale

Appropriateness of Scale	
Similar or related measures in program(s):	VTE-1: Venous Thromboembolism Prophylaxis is a related measure within the Hospital Inpatient Quality Reporting Program. VTE-2: Intensive Care Unit Venous Thromboembolism Prophylaxis is a related measure within the Hospital Inpatient Quality Reporting Program. CMS Patient Safety and Adverse Events Composite (CMS PSI 90) has a relevant component, the PSI-12: Perioperative Pulmonary Embolism or Deep Vein Thrombosis Rate. This is a related measure used in the Hospital Acquired Conditions Reporting Program
Measure balance, burden, and value across target populations/measured entities: This measure is well-suited for use across diverse populations and care settings, with minimal burden and high value. While there are similar/related measures within the program, this measure evaluates the incidence of patient safety as opposed to evaluating the process of coding the event on a claim. The measure offers a complement to currently used measures by leveraging EHR data, which may enhance accuracy, detail, and timeliness in identifying patient harm and risk factors. In contrast, PSI-12 relies on claims data limited to Medicare fee-for-service patients and diagnosis codes. The new	

Appropriateness of Scale
measure builds on VTE-1 and VTE-2 by focusing on the occurrence of VTE events as an outcome rather than process compliance. Regarding balance of this measure's performance, burden, and benefit across populations, the developer's literature review and analysis do not indicate a potential for differential benefit or harm to specific subgroups of participating entities or their patient populations. **Considerations for the committee:** Based on clinical and professional experience, the committee should consider the distribution of benefit and risks/burdens of the measure within the proposed program population.

Time-to-Value Realization

Time-to-Value Realization	
Plan for near- and long-term impacts after implementation:	Yes, near- and long-term impacts are identified in submission materials.
Measure implementation impacts over time: The developer notes that this measure aims to prevent VTE after surgical procedures, which would reduce complications associated with VTEs and would, in turn, increase patient satisfaction and lower health care costs by reducing hospital length of stay and associated costs of subsequent clinical comorbidities. **Considerations for the committee:** • What are the potential near- and long-term impacts of this measure on measured entities, Hospital Inpatient Quality Reporting Program, Hospital-Acquired Condition Reduction, and Medicare Promoting Interoperability programs, and patient populations? • Will benefits and burdens associated with this measure be realized within an appropriate implementation time frame? • How will this measure mature through revisions in the future if added to the Hospital Inpatient Quality Reporting Program, Hospital-Acquired Condition Reduction Program, and Medicare Promoting Interoperability Program measure sets?	