

Figure 2.1: Hospital Harm – Postoperative Venous Thromboembolism (VTE)

Inputs (resources)	Activities (what the hospital does)	Outputs (direct results of the activities)	Outcomes	Impact (broad, systemic changes influenced by the quality program)
Electronic health record (EHR) and associated data Hospital staff (nurses, doctors, pharmacists, nutrition staff, and others who care for the patient and input data into the EHR) Clinical practice guidelines for VTE prevention in an inpatient setting (American College of Clinical Pharmacy, the American Society of Hematology, the European Society of Cardiology / the European Respiratory Society, the National Institute for Health and Care Excellence, and Venous Thromboembolism Prophylaxis and Treatment in Patients With Cancer: ASCO Guideline Update)	Pharmacological prophylaxis (e.g., anticoagulants) appropriately dosed and timed to reduce the risk of VTE and not increase the risk of bleeding ^{1,3,5-7,9} Mechanical prophylaxis (e.g., intermittent compression devices and graduated compression stockings) used to prevent VTE ^{1,3,5-7,9} Adaption of clinical guidelines into local protocols to prevent events of VTE for patients undergoing surgical procedures and at risk ² Use of VTE risk-assessment or screening tools and physician alerts to accurately detect patients at risk for developing VTE and minimize inappropriate over-prophylaxis administration ²	Data showing how many patients experience a post-operative VTE event during hospitalization Reduction in VTE-related clinical complications such as post-thrombotic syndrome and chronic thromboembolic pulmonary hypertension among hospital population⁸ Reduction in VTEs	Improvements in hospital practices for monitoring and detecting post-operative VTE events ² Improvements in patient satisfaction Improvements in patient safety through reduction of post-operative VTE, defined as a pulmonary embolism or deep vein thrombosis, in patients at risk ^{10,11}	Increased patient confidence in and satisfaction with the medical system Health care costs/ resources: Reduction in hospital length of stay, health-care-associated costs. Examples of costs related to subsequent clinical comorbidities include post-thrombotic syndrome, chronic thromboembolic pulmonary hypertension, and VTE-related readmissions.^{4,8} Reduced mortality and hospital readmissions.¹⁴

Feedback Mechanisms
If Centers for Medicaid & Medicare Services (CMS) decides to implement this measure into the Hospital Inpatient Quality (IQR) Program, hospitals will submit eCQM data for this measure to the CMS Hospital IQR Program and receive annual performance results. Subsequently, public reporting of results will be available on the Care Compare and Provider Data Catalog websites.
Assumptions (underlying beliefs about the quality program and context)
Prevention: VTE is a leading cause of preventable death in hospitalized patients, ^{12,14} and VTE events post-surgical procedure are preventable. ¹² VTE events can be mitigated through hospital prevention through appropriate mechanical and chemical prophylaxis. ¹³
Resource availability: Hospitals have mechanisms for staff to monitor and address the formation of VTE after surgical procedures, and EHR systems are being used consistently across.
Adherence to latest guidelines and patient compliance: Health care providers will follow the latest evidence-based guidelines for VTE management and patients will comply with staff instructions.
External factors (conditions outside the quality program's control)
Regulations: Changes in regulations, compliance requirements, and government policies.
Clinical guidelines: Updates may require revision to measure or hospital protocols.
Technological advancement: N/A.

References:

- [1] Anderson, D. R., Morgano, G. P., Bennett, C., Dentali, F., Francis, C. W., Garcia, D. A., Kahn, S. R., Rahman, M., Rajasekhar, A., Rogers, F. B., Smythe, M. A., Tikkinen, K. a. O., Yates, A. J., Baldeh, T., Balduzzi, S., Brožek, J. L., Ikobaltzeta, I. E., Johal, H., Neumann, I., . . . Dahm, P. (2019). American Society of Hematology 2019 guidelines for management of venous thromboembolism: prevention of venous thromboembolism in surgical hospitalized patients. *Blood Advances*, 3(23), 3898–3944. <https://doi.org/10.1182/bloodadvances.2019000975>
- [2] Geerts, W. (2009). Prevention of venous thromboembolism: a key patient safety priority. *Journal of Thrombosis and Haemostasis*, 7, 1–8. <https://www.sciencedirect.com/science/article/pii/S1538783622174040>
- [3] Gould, M. K., Garcia, D. A., Wren, S. M., Karanicolas, P. J., Arcelus, J. I., Heit, J. A., & Samama, C. M. (2012). Prevention of VTE in nonorthopedic surgical patients. *CHEST Journal*, 141(2), e227S-e277S. <https://doi.org/10.1378/chest.11-2297>

- [4] Grosse, S. D., Nelson, R. E., Nyarko, K. A., Richardson, L. C., & Raskob, G. E. (2016). The economic burden of incident venous thromboembolism in the United States: A review of estimated attributable healthcare costs. *Thrombosis research*, 137, 3–10. <https://doi.org/10.1016/j.thromres.2015.11.033>
- [5] Key, N. S., Khorana, A. A., Kuderer, N. M., Bohlke, K., Lee, A. Y. Y., Arcelus, J. I., Wong, S. L., Balaban, E. P., Flowers, C. R., Gates, L. E., Kakkar, A. K., Tempero, M. A., Gupta, S., Lyman, G. H., & Falanga, A. (2023). Venous Thromboembolism Prophylaxis and Treatment in Patients With Cancer: ASCO Guideline Update. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*, 41(16), 3063–3071. <https://doi.org/10.1200/JCO.23.00294>
- [6] Konstantinides, S. V., Meyer, G., Becattini, C., Bueno, H., Geersing, G., Harjola, V., Huisman, M. V., Humbert, M., Jennings, C. S., Jiménez, D., Kucher, N., Lang, I. M., Lankeit, M., Lorusso, R., Mazzolai, L., Meneveau, N., Áinle, F. N., Prandoni, P., Pruszczyk, P., . . . Zamorano, J. L. (2019). 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *European Respiratory Journal*, 54(3), 1901647. <https://doi.org/10.1183/13993003.01647-2019>
- [7] National Institute for Health and Care Excellence. (2020, March 26; updated August 2, 2023). Venous thromboembolic diseases: Diagnosis, management and thrombophilia testing (NICE guideline NG158). <https://www.nice.org.uk/guidance/ng158>
- [8] Secemsky, E. A., Rosenfield, K., Kennedy, K. F., Jaff, M., & Yeh, R. W. (2018). High Burden of 30-Day Readmissions After Acute Venous Thromboembolism in the United States. *Journal of the American Heart Association*, 7(13), e009047. <https://doi.org/10.1161/JAHA.118.009047>
- [9] Stevens, S. M., Woller, S. C., Baumann Kreuziger, L., Doerschug, K., Geersing, G. J., Klok, F. A., King, C. S., Murin, S., Vintch, J. R. E., Wells, P. S., Wasan, S., & Moores, L. K. (2024). Antithrombotic Therapy for VTE Disease: Compendium and Review of CHEST Guidelines 2012-2021. *Chest*, 166(2), 388–404. <https://doi.org/10.1016/j.chest.2024.03.003>
- [10] The Centers for Disease Control and Prevention. Data and Statistics on Venous Thromboembolism. (2024, May 15). Venous Thromboembolism (Blood Clots). <https://www.cdc.gov/blood-clots/data-research/facts-stats/index.html>
- [11] The Centers for Disease Control and Prevention. Understanding your risk for Healthcare-Associated VTE (Blood Clots). (2024, May 15). Venous Thromboembolism (Blood Clots). <https://www.cdc.gov/blood-clots/risk-factors/ha-vte.html>
- [12] Centers for Disease Control and Prevention. (2025, January 27). *Data and statistics on venous thromboembolism*. U.S. Department of Health & Human Services. <https://www.cdc.gov/blood-clots/data-research/facts-stats/index.html>
- [13] 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>

[14] Neeman, E., Liu, V., Mishra, P., et al. (2022). Trends and risk factors for venous thromboembolism among hospitalized medical patients. *JAMA Network Open*, 5(11), e2240373. <https://doi.org/10.1001/jamanetworkopen.2022.40373>