Reduction in Venous Thromboembolism Events: Trauma Performance Improvement and Loop Closure Through Participation in a State-Wide Quality Collaborative

David A Machado-Aranda, MD, FACS, Jill L Jakubus, PA-C, MSc, Wendy L Wahl, MD, FACS, Jill R Cherry-Bukowiec, MD, MSc, FACS, Kathleen B To, MD, FACS, Pauline K Park, MD, FACS, Krishnan Raghavendran, MD, FACS, Lena M Napolitano, MD, FACS, Mark R Hemmila, MD, FACS

BACKGROUND: The Michigan Trauma Quality Improvement Program (MTQIP) is a collaborative quality initiative sponsored by Blue Cross Blue Shield of Michigan and Blue Care Network (BCBSM/BCN). The MTQIP benchmark reports identified our trauma center as a high outlier for venous thromboembolism (VTE) episodes. This study outlines the performance improvement (PI) process used to reduce the rate of VTE using MTQIP infrastructure.

STUDY DESIGN: Trauma patients admitted for $>$ 24 hours, with an Injury Severity Score (ISS) $\geq$ 5, were included in this study. We performed a preliminary analysis examining prophylaxis drug type to VTE, adjusted by patient confounders and timing of first dose, using MTQIP data abstracted for our hospital. It showed that patients receiving enoxaparin had a VTE rate that was half that of those receiving unfractionated heparin (odds ratio 0.46, 95% CI 0.25 to 0.85). Guided by these results, we produced the following plan: consolidation to single VTE prophylaxis agent and dose, focused education of providers, initiation of VTE prophylaxis for all patients—with clear exception rules—and dose withholding minimization. Results were monitored using the MTQIP platform.

RESULTS: After implementation of our focused PI plan, the VTE rate decreased from 6.2% (n = 36/year) to 2.6% (n = 14/year). Our trauma center returned to average performance status within MTQIP.

CONCLUSIONS: Participation in MTQIP provided identification of trauma center outlier status for the outcome of VTE. Analysis of MTQIP data allowed creation of a local action plan. The MTQIP infrastructure supported execution and monitoring of the action plan consistent with loop-closure practices, as advocated by the American College of Surgeons Committee on Trauma, and a positive performance improvement result was achieved with VTE reduction. (J Am Coll Surg 2015;221:661−668. © 2015 by the American College of Surgeons)

Severely injured trauma patients are at increased risk for a venous thromboembolic event (VTE).[1,2] Despite this fact, very little is known about risk-adjusted rates of VTE in trauma centers. The introduction of the American College of Surgeons Trauma Quality Improvement Program has given trauma centers a means to benchmark process measures such as type of drug and timing of initiation of VTE prophylaxis.[3-6] Within our statewide trauma collaborative quality initiative (CQI) we have focused on provision of feedback on risk-adjusted VTE rates

Disclosure Information: Dr Hemmila and Ms Jakubus received salary support from Blue Cross Blue Shield of Michigan/Blue Care Network for conduct of the Michigan Trauma Quality Improvement Program. Dr Hemmila was supported by grants from Blue Cross Blue Shield of Michigan/Blue Care Network and Blue Cross Blue Shield of Michigan Foundation. All other authors have nothing to disclose.

Presented at the American College of Surgeons Annual Trauma Quality Improvement Program Scientific Meeting and Training, Chicago, IL, November 2014.

Received March 25, 2015; Revised April 27, 2015; Accepted May 8, 2015.
From the Division of Acute-Care Surgery, University of Michigan (Machado-Aranda, Jakubus, Cherry-Bukowiec, To, Park, Raghavendran, Napolitano, Hemmila) and the Department of Surgery, St Joseph Mercy Health System (Wahl), Ann Arbor, MI.

Correspondence address: David A Machado-Aranda, MD, FACS, 1500 E Medical Center Dr, 1C421-UH, SPC 5033, Ann Arbor, MI 48104-5033. email: dmachad@med.umich.edu

http://dx.doi.org/10.1016/j.jamcollsurg.2015.05.006
ISSN 1072-7515/15

Abbreviations and Acronyms

BCBSM/BCN = Blue Cross Blue Shield of Michigan and Blue Care Network
CQI = collaborative quality initiative
LMWH = low molecular weight heparin
MTQIP = Michigan Trauma Quality Improvement Program
PI = performance improvement
VTE = venous thromboembolism

and comparisons of VTE prophylaxis practices to participant hospitals.[7]

The Michigan Trauma Quality Improvement Program (MTQIP) is a statewide CQI focused on improving trauma care delivery. MTQIP began in 2008 as a pilot program among 6 participating hospitals, and is now a Blue Cross Blue Shield of Michigan/Blue Care Network (BCBSM/BCN)-sponsored CQI that includes 27 American College of Surgeons Committee on Trauma verified level 1 and 2 trauma centers.[5] The program involves regular scheduled face-to-face meetings with all participant trauma centers for information sharing and collaboration, provision of hardcopy and web-based risk-adjusted feedback performance reports, a robust data validation program, and statewide as well as individual hospital-specific quality improvement efforts using baseline outcomes data and defined targets for reduction of adverse events.

For 2 consecutive MTQIP benchmark reports, the University of Michigan Trauma Service was identified as having an increase in VTE events and was denoted as being a statistically significant high outlier within the collaborative (Fig. 1). This triggered a trauma center performance improvement review. The data presented in this manuscript detail the mechanism of inquiring into and exploring MTQIP data to address the question of why we experienced a VTE event increase. We describe the formulation and implementation of an action plan to address the problem of increased VTE events, and subsequent monitoring of our results using information provided as part of participation in MTQIP.

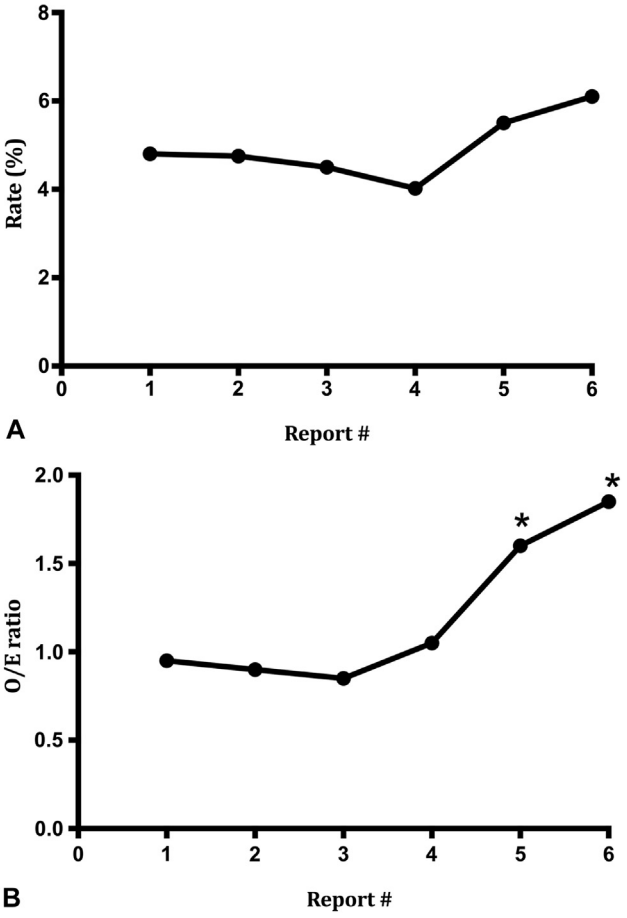

Figure 1. University of Michigan venous thromboembolic event (VTE) rates during reporting periods before implementation of the VTE action plan. (A) Crude VTE for all patients 18 years and older, admitted to the trauma service, with an Injury Severity Score ≥ 5 and at least 24 hours of survival on admission. (B) Risk-adjusted observed-to-expected VTE (O/E) ratio of performance of our trauma center within the Michigan Trauma Quality Improvement Program (MTQIP). *$p < 0.05$ logit-MTQIP analysis.

METHODS

Michigan Trauma Quality Improvement Program

The University of Michigan Health System initiated data collection for trauma quality improvement in August 2004, using the methodology of the National Surgical Quality Improvement Program (NSQIP). MTQIP began in 2008 as a pilot study among 6 trauma centers in Michigan and expanded into a formal CQI with funding from BCBSM/BCN in 2011. Data are entered into the existing trauma registry using standardized data elements and definitions for all adult trauma patients.[8] A data definitions manual that is published online is maintained by MTQIP, updated annually, and references already existing national sources (NSQIP, National Trauma Data Standard, and Centers for Disease Control) whenever possible to achieve data consistency.[9,10] Three times per year, face-to-face collaborative meetings are held, at which feedback reports are distributed, data are reviewed, results are discussed, and best practices are shared. Feedback reports are risk adjusted and detail a center's performance with regard to mortality and morbidity. Each report has a two-thirds overlap with data previously analyzed, and