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# Discordance between surgical care improvement project adherence and postoperative outcomes: implications for new Joint Commission standards



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## ABSTRACT

**Background:** Infectious (INF) and venous thromboembolism (VTE) complication rates are targeted by surgical care improvement project (SCIP) INF and SCIP VTE measures. We analyzed how adherence to SCIP INF and SCIP VTE affects targeted postoperative outcomes (wound complication [WC], deep vein thrombosis, and pulmonary embolism [PE]) using all-payer data. **Materials and methods:** A retrospective review (2007–2011) was conducted using Healthcare Cost and Utilization Project State Inpatient Database Florida and Medicare's Hospital Compare. The association between SCIP adherence rates and outcomes across 355 included surgical procedures was measured using multilevel mixed-effects linear regression models.

**Results:** One hundred sixty acute care hospitals and 779,922 patients were included. Over 5 y, SCIP INF-1, -2, and -3 adherence improved by 12.5%, 8.0%, and 20.9%, respectively, whereas postoperative WC rate decreased by 14.8%. When controlling for time, SCIP INF-1 adherence was associated with improvement of postoperative WC rates ( $\beta = -0.0044$ ,  $P = 0.005$ ), whereas SCIP INF-2 adherence was associated with increased WCs ( $\beta = 0.0031$ ,  $P = 0.018$ ). SCIP VTE-1, -2 adherence improved by 14.6% and 20.2%, respectively, whereas postoperative deep vein thrombosis rate increased by 7.1% and postoperative PE rate increased by 3.7%. SCIP VTE-1 and -2 adherence were both associated with increased postoperative PE when controlling for time (SCIP VTE-1:  $\beta = 0.0019$ ,  $P < 0.001$ ; SCIP VTE-2:  $\beta = 0.0015$ ,  $P < 0.001$ ). Readmission analysis found SCIP INF-1 adherence to be associated with improved 30-d WC rates when controlling for patient and hospital characteristics ( $\beta = -0.0021$ ,  $P = 0.032$ ), whereas SCIP INF-3 adherence was associated with increased 30-d WC rates when controlling for time ( $\beta = 0.0007$ ,  $P = 0.04$ ).

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*Conclusions:* Only SCIP INF-1 adherence was associated with improved outcomes. The Joint Commission has retired SCIP INF-2, -3, and SCIP VTE-2 and made SCIP INF-1 and VTE-1 reporting optional. Our study supports continued reporting of SCIP INF-1.

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## Introduction

Nosocomial infections (INIs) were first tracked at a national level in 1970 when the Centers for Disease Control and Prevention initiated the National Nosocomial Infections Surveillance that eventually transitioned to the National Healthcare Safety Network. Decades of surveillance found that rates of surgical site INIs varied from hospital to hospital resulting from inconsistent use of preoperative antibiotic administration. In 2002, Centers for Medicare and Medicaid Services created the National Surgical Infection Prevention Project with the goal of standardizing and implementing surgical process measures at a national level. When Surgical Infection Prevention transitioned to surgical care improvement project in 2006, additional recommendations for reduction of surgical INI, venous thromboembolism (VTE), and cardiac events were introduced with the goal of reducing surgical complications by 25% by 2010.<sup>1</sup>

In particular, infectious and VTE complication rates are targeted by the SCIP INI and SCIP VTE measures, respectively. While these SCIP measures were constructed on evidence-based guidelines, now a decade since the inception of the project, they have been shown to have mixed effects on surgical complications. Based on prior retrospective analyses, adherence to SCIP INI measures has been associated with mixed outcomes, whereas SCIP VTE measures have not demonstrated a demonstrable effect on thromboembolic disease.<sup>1–6</sup> Furthermore, the Joint Commission has recently included SCIP INIs and SCIP VTEs in the Flexible ORYX Performance Measure Reporting Options since 2015.<sup>7</sup> As such, hospital administrators can choose to report the now optional SCIP INIs and SCIP VTEs measures.

Given the limited and short-term analyses that exist in the literature to date, the present analysis provides a large, population-based assessment of hospital-specific SCIP measure compliance. This also marks the first study to include longitudinal follow-up of all patients, ensuring that SCIP-related complications that occur postdischarge are captured by our analysis. We hypothesized that increased hospital-wide adherence to SCIP measures improves associated postoperative outcomes. This study analyzed the trend of SCIP adherence of all reporting hospitals in a single state over a 5-y period, as well as the trends of postoperative complications and 30-d outcomes of all patients who underwent SCIP-relevant procedures in the state over the same 5-y period.

## Methods

### Data sources

Hospital-level SCIP data were queried from Medicare's Hospital Compare, a publically available data source for quality of

care measures of all Medicare-certified hospitals. This study spanned from 2007 through 2011, during which five SCIP measures were available, three for INI prevention and two for VTE prevention: prophylactic antibiotic received within 1 h before surgical incision (SCIP INI-1), surgery patients who were given the right kind of antibiotic to help prevent INI (SCIP INI-2), surgery patients whose preventive antibiotics were stopped at the right time (SCIP INI-3), surgery patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries (SCIP VTE-1), and patients who got treatment at the right time to help prevent blood clots after certain types of surgery (SCIP VTE-2).

Patient-level data were abstracted from the Healthcare Cost and Utilization Project State Inpatient Database (HCUP SID) for the state of Florida (2007–2011). Florida inpatient data were chosen given the availability of an American Hospital Association identification number, used to link Medicare's Hospital Compare data to patient-level encounters. The HCUP SID is sponsored by the Agency for Healthcare Research and Quality and was created to inform decisions at a national, state, and community level. HCUP SID files include all inpatient discharge records for all-payers in participating states. Patient information is deidentified to protect the privacy of patients and physicians. More than 100 clinical and nonclinical variables are included.

### Patient-level data

All patients with a principal procedure included in the list of 354 SCIP-relevant surgeries ([Appendix A, Table 5.10](#) for International Classification of Diseases, Version 9, Clinical Modification [ICD-9-CM] codes), as determined by the Centers for Medicare and Medicaid Services, were included in our study. Procedures span all surgical specialties, including general surgery, neurosurgery, obstetrics and gynecology, orthopedics, otolaryngology, and urology. Postoperative complications assessed during the index admission included mortality, deep vein thrombosis (DVT), pulmonary embolism (PE), and wound complication (WC). Postoperative complications were identified using ICD-9-CM diagnosis codes, while diagnosis codes present on admission were excluded. ICD-9 codes applicable to each complication were modified from *Worni et al.*<sup>8</sup> and *Gonzalez et al.*<sup>9</sup> ([Table 1](#)). Longitudinal follow-up using variables inherent in the HCUP SID was performed to measure 30-d postoperative outcomes. A 30-d postoperative complication was defined as the development of a DVT, PE, or WC requiring an inpatient readmission within 30-d of discharge after surgery.

### Statistical approach

Adherence to each SCIP measure and related postoperative complications for all reporting hospitals were averaged for

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