The American Journal of Surgery (2014) 208, 45-49

The American Journal of Surgery®

Clinical Science

Line-associated thrombosis as the major cause of hospital-acquired deep vein thromboses: an analysis from National Surgical Quality Improvement Program data and a call to reassess prophylaxis strategies

Jeffrey S. Mino, M.D., M.P.H.*, Jesse R. Gutnick, M.D., Rosebel Monteiro, M.D., Nancy Anzlovar, R.N., Allan E. Siperstein, M.D.

Department of Surgery, Cleveland Clinic Foundation, Cleveland, Ohio, USA

KEYWORDS:
Central venous catheter;
Deep vein thrombosis;
Venous thromboembolus;
Upper-extremity thrombosis;
Thromboprophylaxis

Abstract

BACKGROUND: Quality improvement has mitigated the occurrence of postoperative deep vein thromboses (DVTs); however, despite adherence to protocols, they continue to occur. This study aimed to characterize their rate and distribution at our institution, and appropriate use of thromboprophylaxis.

METHODS: Local American College of Surgeons National Surgical Quality Improvement Program data were queried for general surgery cases complicated by DVT from 2009 to 2011. Medical records were evaluated to ascertain the following: classify DVTs by site, ascertain if appropriate prophylactic measures were instituted, evaluate treatment instituted, evaluate the occurrence of a PE if the DVT was line-associated, and if so, the indication for the central line.

RESULTS: Of 1,857 patients, 39 had postoperative DVTs (2.1%). Fourteen lower-extremity (35.9%) DVTs, 4 central (10%) DVTs, and 21 upper-extremity (53.8%) DVTs (UEDVTs) were captured. All but 2 had appropriate thromboprophylaxis. All but one UEDVT was line-associated. Diagnoses were prompted by symptoms in 72% of the patients. Pulmonary emboli developed in 3 of 39 patients.

CONCLUSIONS: An unexpected finding was that line-associated UEDVTs comprised over half of all DVTs, mostly in patients without cancer. This analysis highlights the need for more selective central-line use; choosing peripheral access may reduce DVT rates further. Improved pharmacoprophylaxis protocols would likely benefit this population.

Deep vein thrombosis (DVT) is a significant complication of the inpatients and especially postoperative populations, resulting in serious morbidity and mortality. In the past, it was the leading cause of operative-related mortality with an estimated 900,000 cases reported each year, of which approximately 300,000 died from fatal pulmonary emboli (PEs).[1,2] As such, the DVT rate has been the target of a number of quality improvement measures aimed at

The authors declare no conflicts of interest.

Study performed at Cleveland Clinic Foundation, Cleveland, Ohio. Presented as poster at the Annual NSQIP Meeting, July 2012, Salt Lake City, Utah.

* Corresponding author. Tel.: +1-216-862-2675; fax: +1-216-862-2675.
E-mail address: minoj@ccf.org

Manuscript received May 29, 2013; revised manuscript June 14, 2013

0002-9610/$ - see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.amjsurg.2013.08.046

reducing this burden. Routine use of antithrombin-3 inhibitors and vitamin K antagonists, in addition to early ambulation and mechanical prophylaxis, has reduced the rate of DVTs significantly and has even further dropped the mortality from a rate of 30% if untreated to .5% to 1.5% with treatment.[3] At our institution, we were initially noted to be higher than average with regard to our postoperative DVT rate before rigorous institution of pharmacologic and mechanical prophylaxis. According to the American College of Surgeons National Surgical Quality Improvement Program Participant Use Data File (ACS-NSQIP PUF), national DVT rates average .7%, while the rate at our institution reached 2.1%. The objectives of this study were to examine the current rate of postoperative DVTs in postsurgical patients at our institution, whether or not appropriate anticoagulation measures were being utilized, and the specific site and cause of DVT.

Methods

After approval by the Institutional Review Board of the Cleveland Clinic Foundation, retrospective data from the NSQIP PUF was extracted for our tertiary care hospital from the ACS-NSQIP PUF between January 2009 and June 2011. The ACS-NSQIP PUF is a Health Insurance Portability and Accountability Act – compliant, multi-institutional data source available to researchers affiliated with ACS-NSQIP hospitals.[4] The PUF contains aggregate data submitted by participating hospitals with associated patient-level information. Data are collected by trained chart reviewers and compiled by the ACS-NSQIP. The use of this database has been well-described elsewhere in the literature.[5,6] Once patients were identified, a review of their Electronic Medical Records was undertaken to classify them by DVT site; ascertain whether or not appropriate prophylactic anticoagulative measures were instituted before surgery; what treatment regimen was instituted once a DVT occurred, if a concomitant PE resulted; whether or not the DVT was the result of a central venous catheter (CVC), and if so, the indication for the CVC. Appropriate prophylaxis complied with the C.H.E.S.T. 9th edition guidelines, and is delineated in Fig. 1.

General surgery patients were chosen as the study population because historically this cohort has the highest DVT rate, thus quality improvement initiatives would have the largest opportunity for improvement.

The primary outcome measure was the occurrence of a postoperative venous thromboembolism (VTE), defined as either a DVT or a PE, within 30 days of the primary procedure. Deep venous thrombosis is defined as the identification of a new blood clot or thrombus within the systemic venous system. This diagnosis is confirmed by duplex ultrasonography, venogram, or computed tomography (CT) in the case of visceral DVTs. ACS-NSQIP defines a PE as a lodging of blood clot in the pulmonary arterial system with subsequent obstruction of blood supply to the lung parenchyma. A PE was considered to have occurred if the patient had a ventilation–perfusion scan interpreted as "high probability" of PE, a positive pulmonary arteriogram, or a positive spiral CT examination or angiogram.

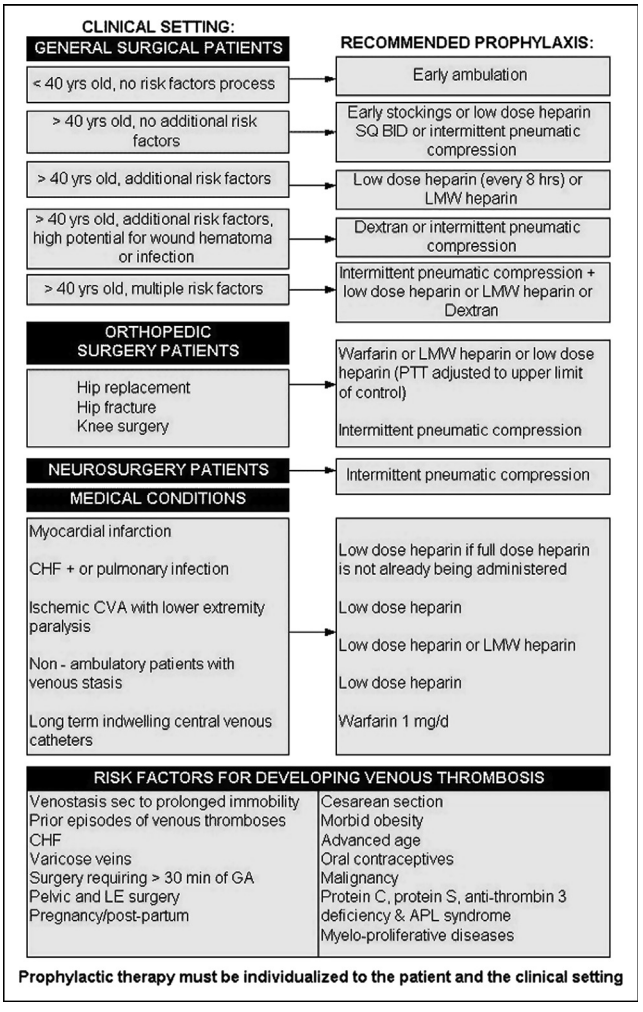

Figure 1 Venous thromboembolism prophylaxis protocol at our institution.

Results

Of 461,231 general surgery patients in NSQIP between 2009 and 2011, 2,943 developed a DVT (.7%). Of this general population, a total of 1,857 postoperative patients were captured in the NSQIP database from our institution, of whom 44 had developed a VTE complication (2.1%). When risk adjustment was performed, the expected rate at our institution was 1.6%. Five individuals were recorded as having a DVT in the NSQIP PUF, but on review of electronic medical records they either had no documentation of such and no confirmatory scans or had been diagnosed previously at an outside hospital, thus these were excluded from the