

# The Risk of Venous Thromboembolism is Not Equal for all Patients Who Undergo Total Joint Replacement

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## Keywords

arthroplasty, Caprini risk assessment model, apixaban, rivaroxaban

Date received: 30 January 2019; revised: 22 February 2019; accepted: 25 February 2019.

Venous thromboembolism (VTE) is a well-recognized potential complication of several forms of orthopedic surgery.<sup>1</sup> The current guidelines suggest extended use of VTE pharmacological prophylaxis for patients who undergo either total hip arthroplasty (THA) or total knee arthroplasty (TKA). However, the selection of an optimal prophylactic agent, risk stratification, and duration of the at-risk period remain poorly defined. Researchers have tried to adapt multiple assessment tools to bridge this gap. Krauss et al propose the use of the Caprini risk score in the postarthroplasty population.<sup>2</sup> Moreover, Cronin et al complement this publication with concise guidelines for scoring that facilitates the implementation of proper VTE prophylaxis strategies.<sup>3</sup> Ideally, a risk stratification methodology should be easy to implement, be capable to reliably discriminate patients with the highest risk of the development of postoperative VTE, and translate to the VTE risk reduction when used to define the optimal prophylaxis approach.

To this end, the Caprini risk score has been extensively validated in surgical patients. In a meta-analysis of 14 776 patients by Pannucci et al, patients with a Caprini risk score > 8 had a significant reduction in thrombosis if they received prophylaxis (odds ratio: 0.41, 95% confidence interval: 0.26-0.65); conversely in patients with a score of less than 6 (75% of the total study population), chemoprophylaxis was not effective.<sup>4</sup> This raises the question as to whether sole use of aspirin for lower risk patients is adequate; indeed the incidence of VTE at 90 days was only 0.64% among the patients randomized to aspirin in a recent randomized controlled trial among patients who underwent THA or TKA.<sup>5</sup> However, all patients (n = 3424) in this study received 10 mg of rivaroxaban for the first 5 days and 1.29% developed clinically important bleeding. There was no stratified analysis by VTE risk and risk groups were systematically excluded.

In the current edition of *The Journal*, the idea of personalization of prophylaxis is studied in 1078 patients who

underwent THA, THA revision, or TKA. Patients had their VTE risk quantified on the date of surgery. Patients with low risk received 6 weeks of aspirin 325 mg twice daily. The patients with a high risk score and who underwent THA or THA revision received 35 days of prophylactic rivaroxaban or apixaban, whereas those who underwent TKA or TKA revision were prescribed 2 weeks of direct oral anticoagulant followed by aspirin. The authors classified risk using an abbreviated, internally adopted, list of characteristics including: thrombophilia, prior VTE, malignancy, staged surgery, and morbid obesity. Key variables to derive the Caprini score were prospectively collected, which allowed the authors to retrospectively reclassify the entire group with Caprini scores according to the figure in the completion guidelines paper. The performance of the Caprini score in the postarthroplasty population was compared to the department-established guidelines. The key results were

1. A Caprini score of 10 provided the best performance for prediction of VTE risk. This is consistent with the model suggested by Cassidy et al, who found lower rates of risk-adjusted VTE after implementing personalized prevention strategies including 30 days of posthospitalization prophylaxis for patients with a Caprini risk score of 10 or above.<sup>6</sup> Moreover, 7 of

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the 8 symptomatic VTE events occurred among patients with a Caprini score of 10 or above. The one patient who was missed by the Caprini score was diagnosed with a thrombophilia during subsequent evaluation.

2. A recalculation of the Caprini score at discharge versus on the operative date changed the score for 7.2% of the patients, which demonstrates the fluid nature of VTE risk and the need to reevaluate the plan for prophylaxis upon discharge.
3. The abbreviated score was inferior to the Caprini score which underscores the need to align practice to well-validated risk prediction models.

These results shed light on the value of the Caprini score to accurately identify low-risk patients even after major arthroplasty. In addition, there is a growing body of evidence demonstrating a lower VTE incidence among patients who receive extended VTE prevention based on their level of risk. Caprini risk score is not cumbersome and has, in fact, been demonstrated to be easily and reliably measured with a brief face-to-face interaction.<sup>7</sup> Refinements of the Caprini score have aimed to further simplify the risk stratification process. In 2 separate publications, Fuentes et al and Paz Rios et al have created a patient oriented version of the Caprini score which has now been validated in English, Spanish, Arabic, and Polish languages.<sup>8,9</sup> Their refinement established patients to self-score by deconstructing the jargon into easier concepts that patients with less than a high school-level education would be able to answer.

While one should not dismiss the well-earned reputation of alternative surgical risk scores, it appears that the Caprini risk score is best positioned for universal implementation. The next milestone in risk prediction will be a demonstration that the scoring process is capable of reducing postoperative VTE-related mortality. A reduction in VTE-related mortality after implementation of a compulsory risk stratification strategy, is no longer theoretical, but a desirable target that health-care teams should be compelled to achieve.<sup>10,11</sup> Notably, nationwide annual VTE-related mortality decreased in England after implementing the practice of mandatory risk stratification. Additionally, 2 prediction models from the United Kingdom with adequate discrimination and calibration that estimate individuals' risk of total joint arthroplasty have been validated.<sup>12</sup> Orthopedic surgery has positioned itself to accomplish this goal. The 2 manuscripts in this volume will further reinforce the validity of the Caprini score in VTE risk stratification among THA and TKA patients and their implementation will undoubtedly add to improved clinical outcomes.

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