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Procedure-specific Risks of Thrombosis and Bleeding in Urological Non-cancer Surgery: Systematic Review and Meta-analysis

Kari A.O. Tikkinen [a,], Samantha Craigie [b,c], Arnav Agarwal [b,d], Reed A.C. Siemieniuk [b,e], Rufus Cartwright [f,g], Philippe D. Violette [h,q], Giacomo Novara [i], Richard Naspro [j], Chika Agbassi [k], Bassel Ali [b], Maha Imam [b,l], Nofisat Ismaila [b], Denise Kam [k], Michael K. Gould [m], Per Morten Sandset [n,o], Gordon H. Guyatt [b,p]*

[a] *Departments of Urology and Public Health, University of Helsinki and Helsinki University Hospital, Helsinki, Finland;* [b] *Department of Health Research Methods, Evidence, and Impact, McMaster University, Hamilton, ON, Canada;* [c] *Michael G. DeGroote National Pain Centre, McMaster University, Hamilton, ON, Canada;* [d] *School of Medicine, University of Toronto, Toronto, ON, Canada;* [e] *Department of Medicine, University of Toronto, Toronto, ON, Canada;* [f] *Department of Epidemiology and Biostatistics, Imperial College London, London, UK;* [g] *Department of Urogynaecology, St Mary's Hospital, London, UK;* [h] *Department of Surgery, Division of Urology, Woodstock General Hospital, Woodstock, ON, Canada;* [i] *Department of Surgical, Oncological, and Gastroenterological Sciences, Urology Clinic, University of Padua, Padua, Italy;* [j] *Department of Urology, ASST Papa Giovanni XXIII, Bergamo, Italy;* [k] *Department of Oncology, McMaster University, Hamilton, ON, Canada;* [l] *Faculty of Pharmacy, University of Waterloo, Kitchener, ON, Canada;* [m] *Department of Research and Evaluation, Kaiser Permanente Southern California, Pasadena, CA, USA;* [n] *Institute of Clinical Medicine, University of Oslo, Oslo, Norway;* [o] *Department of Haematology, Oslo University Hospital, Oslo, Norway;* [p] *Department of Medicine, McMaster University, Hamilton, ON, Canada;* [q] *McMaster Department of Surgery Division of Urology, Hamilton, ON, Canada*

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Abstract

Context: Pharmacological thromboprophylaxis involves a trade-off between a reduction in venous thromboembolism (VTE) and increased bleeding. No guidance specific for procedure and patient factors exists in urology.
Objective: To inform estimates of absolute risk of symptomatic VTE and bleeding requiring reoperation in urological non-cancer surgery.
Evidence acquisition: We searched for contemporary observational studies and estimated the risk of symptomatic VTE or bleeding requiring reoperation in the 4 wk after urological surgery. We used the GRADE approach to assess the quality of the evidence.
Evidence synthesis: The 37 eligible studies reported on 11 urological non-cancer procedures. The duration of prophylaxis varied widely both within and between procedures; for example, the median was 12.3 d (interquartile range [IQR] 3.1–55) for open recipient nephrectomy (kidney transplantation) studies and 1 d (IQR 0–1.3) for percutaneous nephrolithotomy, open prolapse surgery, and reconstructive pelvic surgery studies. Studies of open recipient nephrectomy reported the highest risks of VTE and bleeding (1.8–7.4% depending on patient characteristics and 2.4% for bleeding). The risk of VTE was low for 8/11 procedures (0.2–0.7% for patients with low/medium risk; 0.8–1.4% for high risk) and the risk of bleeding was low for 6/7 procedures ($\leq$0.5%; no bleeding estimates for 4 procedures). The quality of the evidence supporting these estimates was low or very low.
Conclusions: Although inferences are limited owing to low-quality evidence, our results suggest that extended prophylaxis is warranted for some procedures (eg, kidney transplantation procedures in high-risk patients) but not others (transurethral resection of the prostate and reconstructive female pelvic surgery in low-risk patients).

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* Corresponding author. Department of Urology, University of Helsinki and Helsinki University Hospital, Haartmaninkatu 4, Helsinki 00029, Finland. Tel. +358 50 5393222.
E-mail address: kari.tikkinen@gmail.com (Kari A.O. Tikkinen).

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Patient summary: The best evidence suggests that the benefits of blood-thinning drugs to prevent clots after surgery outweigh the risks of bleeding in some procedures (such as kidney transplantation procedures in patients at high risk of clots) but not others (such as prostate surgery in patients at low risk of clots).

1. Introduction

The volume of urological non-cancer surgery worldwide is large. In the UK alone, urologists plan more than 200 000 urological operations yearly [1]. Almost all patients undergoing such surgical procedures are at risk of deep vein thrombosis (DVT) and pulmonary embolism (PE)—together referred to as venous thromboembolism (VTE)—and major bleeding.

Whether to use thromboprophylaxis depends on the trade-off between a reduction in VTE and an increase in bleeding [2]. The benefits and harms of thromboprophylaxis critically depend on the risk of VTE and bleeding in those not receiving thromboprophylaxis, which we refer to as *baseline risk*. Prophylaxis is warranted when the baseline risk of VTE is high and the risk of bleeding is low, but not in those with low VTE risk and high bleeding risk.

Although the baseline risks of VTE and bleeding in the absence of prophylaxis vary widely between urological procedures [3,4], their specific magnitude has not been established. This uncertainty is, at least in part [4,5], responsible for substantial practice variation in the use of thromboprophylaxis in urology, both within and between countries [6–9]. In an accompanying paper, we provide baseline risk estimates of VTE and bleeding for surgery in malignant diseases of the urinary tract and male genital system [7]. Here, we summarize the evidence regarding risks of VTE and bleeding in urological non-cancer surgery.

2. Evidence acquisition

Our study protocol, which was prospectively registered (PROSPERO: CRD42014010342) and previously published [2], followed PRISMA guidance [10]. Our methods follow those presented in detail previously [2,7]; here, we summarize in brief.

2.1. Eligibility

We included observational studies published in English in which investigators enrolled at least 50 adult patients undergoing procedures for non-malignant diseases of the urinary tract or male genital system. Eligible studies reported absolute estimates of risk for one or more of the outcomes of interest: fatal PE, symptomatic PE, symptomatic DVT, symptomatic VTE, fatal bleeding, and bleeding requiring reoperation.

2.2. Data sources and searches

For the baseline risk of VTE and bleeding [2], we conducted a comprehensive systematic search, developed together with experienced research librarians (N.B. and L.B.), of MEDLINE from January 1, 2000 to January 1, 2016 (Supplementary material, pages 58–63). We performed additional searches: (1) for patient-related risk factors for VTE and bleeding after surgery; (2) for cohort studies addressing timing of VTE and bleeding after surgery to inform modeling of outcomes for studies with varying follow-up; and (3) for randomized trials addressing the effects of pharmacological and mechanical thromboprophylaxis on VTE and bleeding risk after surgery to calculate baseline risks in patients not receiving prophylaxis (Supplementary material, pages 64–68).

2.3. Study selection and data abstraction

We used standard methods for systematic reviews for independent duplicate screening and data extraction [2,7]. To confirm the accuracy of the data extracted, and if necessary to clarify missing or unclear information, we contacted the authors of all the original articles.

2.4. Risk of bias

Through iterative discussion and consensus-building, and informed by the prior literature [11,12], we developed a novel instrument to categorize studies as either at low or high risk of bias (RoB) in their estimates of VTE or bleeding risk [2,7]. Items included the representativeness of the patient population, thromboprophylaxis documentation, data sources, whether a majority of patient recruitment years were earlier or later than 2000, clear specification of the duration of follow-up, and study type (Supplementary material, page 17).

2.5. Analysis

2.5.1. Outcomes

Outcomes included the absolute risks of symptomatic VTE and bleeding requiring reoperation (including exploration and angioembolization) at 4 wk, as well as fatal PE and fatal bleeding. We analyzed all outcomes separately for each type of procedure.

2.5.2. Calculating the risk of VTE and bleeding for individual studies

In calculating VTE and bleeding risk, we adjusted analyses for the extent of thromboprophylaxis use (Supplementary material, pages 27–28, 30, 34–57), as described in an accompanying paper. For studies that did not report on use of thromboprophylaxis, we estimated thromboprophylaxis use (Supplementary material, page 29).

2.5.3. Choosing the best estimates

We used the median value of estimates from eligible studies to estimate baseline risk of VTE and bleeding requiring reoperation [2].

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