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Guidelines

Guideline of guidelines: thromboprophylaxis for urological surgery

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Decisions regarding thromboprophylaxis in urologic surgery involve a trade-off between decreased risk of venous thromboembolism (VTE) and increased risk of bleeding. Both patient- and procedure-specific factors are critical in making an informed decision on the use of thromboprophylaxis. Our systematic review of the literature revealed that existing guidelines in urology are limited. Recommendations from national and international guidelines often conflict and are largely based on indirect as opposed to procedure-specific evidence. These issues have likely contributed to large variation in the use of VTE prophylaxis within and between countries. The majority of existing guidelines typically suggest prolonged thromboprophylaxis for high-risk abdominal or pelvic surgery, without clear clarification of what these procedures are, for up to 4 weeks post-discharge. Existing guidance may result in the under-treatment of procedures with low risk of bleeding and the over-treatment of oncological procedures with low risk of VTE. Guidance for patients who are already anticoagulated are not specific to urological procedures but generally involve evaluating patient and surgical risks when deciding on bridging therapy. The European Association of Urology Guidelines Office has commissioned an ad hoc guideline panel that will present a formal thromboprophylaxis guideline for specific urological procedures and patient risk factors.

Keywords

anticoagulation, bleeding, deep vein thrombosis, prophylaxis, pulmonary embolism, venous thromboembolism

Introduction

The risks and benefits of thromboprophylaxis for urological surgery depend on both patient-specific and procedure-specific factors [1,2]. Clinicians and patients must trade off a reduction in venous thromboembolism (VTE) against a potential increase in bleeding. Although investigators have not addressed the issue specifically for urological procedures, high-quality evidence from randomized trials has shown that pharmacological prophylaxis, with, for example, low-molecular-weight heparins (LMWH), decreases the risk of VTE in patients undergoing abdominal or pelvic surgery by ~50% [1]. Best estimates for LMWH also suggest, however, an increase in the risk of postoperative major bleeding of ~50% [1]. Although these relative risks are likely to be consistent across patients and procedures, the balance of benefits and harms varies with the absolute risk of VTE and bleeding. In patients with a high risk of VTE and a low risk of major bleeding, a 50% reduction in VTE represents a substantial benefit (for instance, from a baseline risk of 12 to 6%) and a 50% increase in bleeding represents a minimal increase in harm (for instance, from 0.2 to 0.3%). Patients whose risk of VTE without anticoagulation is low and whose bleeding risk is high face the opposite situation.

Because evidence regarding procedure- and patient-specific baseline risks of thrombosis and bleeding in the absence of prophylaxis remains very limited, decisions regarding the use of VTE prophylaxis currently involve large uncertainty [1,3]. The existence of substantial practice variation in the use of thromboprophylaxis in urology, both within and among countries, is therefore not surprising [4–6]. In this context we have summarized, taking a global perspective, the available guidelines addressing the use of thromboprophylaxis in urology.

Methodology

We performed a Medline search of the period from 1 January 2000 until 31 December 2015 and, in addition, manually searched the websites of international and national urological

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societies and their associated journals to identify guidelines addressing thromboprophylaxis in urological procedures. Society websites included the AUA, European Association of Urology (EAU), Société Internationale d'Urologie, Endourological Society, BAUS, Canadian Urological Association, Japanese Urological Association, Urological Society of India, Urological Society of Australia and New Zealand, Urological Association of Asia, Arab Association of Urology, Association Francaise de l'Urologie and the German Society of Urology. In the absence of a specific guideline on VTE prophylaxis, we collected all formal guidelines pertaining to urological operations from society websites and searched these manually for procedure-specific recommendations.

General Results of Search

Neither the primary search strategy, nor subsequent searches of society websites, identified any formal guidance on thromboprophylaxis specific to urology; therefore, we retrieved and reviewed individual society guidelines pertaining to urological topics. Eight of 13 urological societies searched provided 163 guideline documents either on their websites or in their affiliated journals. Review of this body of literature identified a single guidance document, the AUA Best Practice Statement, that made specific recommendations; this, however, was not a formal guideline. Other procedure- or condition-specific guidance documents did not make specific thromboprophylaxis recommendations.

In the absence of urology-specific guidelines, we reviewed guidelines pertaining to urological surgery from the UK National Institute for Health and Care Excellence (NICE), the German Association of Scientific Medical Societies (AWMF), the American College of Chest Physicians (ACCP), the National Comprehensive Cancer Network (NCCN), and the Australian National Health and Medical Research Council.

American Urological Association

In 2008, the AUA Practice Guideline Committee found insufficient data to support a formal evidence-based guideline on the prevention of VTE. As a result, the Committee developed and, in 2011, reviewed [7] a Best Practice Statement for patients undergoing urological surgery. The Best Practice Statement suggested stratifying patients into one of four risk categories (low, moderate, high and very high) based on age, presence of risk factors (as defined by Geerts et al. [8]) and whether they considered the procedure to be 'minor surgery' (characterized as having a short operating time and rapid ambulatory recovery) or 'major surgery' (defined as all surgery not considered minor) [8].

Using this schema, the guideline panel made recommendations for the use of thromboprophylaxis based primarily on patient risk stratification (Table 1). Factors they considered to increase VTE risk included: major lower extremity trauma; immobility; malignancy; non-surgical therapy for cancer; previous deep vein thrombosis; increasing age; pregnancy; oestrogen-containing contraception and hormone replacement therapy; acute medical illness; heart or respiratory failure; inflammatory bowel disease; nephrotic syndrome; myeloproliferative disorders; paroxysmal nocturnal haemoglobinuria; obesity; smoking; varicose veins; central venous catheterization; and inherited or acquired thrombophilia.

The Best Practice Statement did not explicitly present a recommendation for the duration of prophylaxis, but implied the general use of in-hospital prophylaxis only, as the document suggested post-discharge enoxaparin or warfarin only for selected very-high-risk patients. The guidance considered prophylaxis with unfractionated heparin or LMWH, as well as the use of pneumatic compression stockings, to be equivalent. The panel recommended increasing the unfractionated heparin dose from 5000U twice per day to three times per day for high- or very-high-risk patients.

The AUA guidance differed according to the surgical approach used (transurethral, anti-incontinence, pelvic reconstructive, laparoscopic or robotic and open). The panel suggested that the majority of transurethral procedures do not require pharmacological or mechanical prophylaxis. Because rates of VTE and bleeding may vary considerably across patients, the statement further suggested that any decision regarding thromboprophylaxis after TURP be individualized. The document also suggested that anti-incontinence and pelvic reconstructive surgeries are associated

Table 1 Summary of recommendations from the AUA Best Practice Statement.

Risk of VTE	AUA recommendation
Low risk (minor surgery, <40 years, no risk factors*)	No prophylaxis
Moderate risk (40–60 years, or minor surgery with risk factors)	Pharmacological or pneumatic mechanical prophylaxis
High risk (>60 years, or 40–60 years with risk factors)	Pharmacological or pneumatic mechanical prophylaxis
Very high risk (presence of multiple risk factors†)	Pharmacological and pneumatic mechanical prophylaxis

*VTE, venous thromboembolism. *Risk factors cited in the AUA document included: surgery; trauma (major or lower extremity); immobility; paresis; malignancy; cancer therapy (hormonal, chemotherapy or radiotherapy); previous VTE; increasing age; pregnancy and the postpartum period; oestrogen-containing oral contraception or hormone replacement therapy; selective oestrogen receptor modulators; acute medical illness; heart or respiratory failure; inflammatory bowel disease; nephrotic syndrome; myeloproliferative disorders; paroxysmal nocturnal haemoglobinuria; obesity; smoking; varicose veins; central venous catheterization; and inherited or acquired thrombophilia. These were adapted from Geerts et al. [8]. †In selected very-high-risk patients, clinicians should consider post-discharge enoxaparin or warfarin.*

with variable VTE and bleeding risk. The Best Practice Statement suggested that peri-urethral bulking, slings and cystoscopic procedures do not require prophylaxis other than early ambulation. By contrast, the panel considered vaginal and paravaginal repairs, vault suspension, sacrospinous ligament fixation, and abdominal sacrocolpopexy to be high risk for VTE, and here recommended prophylaxis.

The panel addressed laparoscopic and robotic surgeries only for nephrectomy and prostatectomy. In this setting, the AUA statement recommended intermittent pneumatic compression devices, with the addition of pharmacological therapy for high-risk patients, including those aged >60 years, or 40–60 years with risk factors as described in Table 1. For other open procedures, particularly open radical prostatectomy and radical cystectomy, the panel suggested mechanical prophylaxis with consideration of additional pharmacological therapy. For the majority of procedures, the statement document did not provide a review of bleeding risk.

European Association of Urology

The EAU does not provide a thromboprophylaxis guideline; an *ad hoc* committee will, however, present a formal guideline in 2016. These guidelines will be based on a series of systematic reviews that evaluate the baseline risk of thrombosis and bleeding in urological surgery (ROTBUS) [3]. Such assessments are challenging to perform but will result in the best available estimates of VTE and bleeding risk, from which informed decisions about prophylaxis can be made.

National Institute for Health and Care Excellence

In the UK, NICE updated their guidance for prevention of VTE for hospitalized patients in 2010 [9,10]. The guidance provides both general strategies for risk reduction for all inpatients, as well as advice for surgical patients in general, and urological patients in particular. The advice is based on evaluation of risks of bleeding and thrombosis, both on admission to hospital, and after 24 h.

NICE considers that surgical patients may be at increased risk of VTE as a result of either patient or procedural factors. They suggest the following procedural risk factors: a total anaesthetic and surgical time of >90 min, or 60 min if the surgery involves the pelvis or lower limb; any acute surgical admission with inflammatory or intra-abdominal condition; or any procedure with an expected significant reduction in mobility.

NICE provides an extensive list of patient-specific risk factors, including: active cancer or cancer treatment; age >60 years; critical care admission; dehydration; known thrombophilias; obesity (body mass index [BMI] >30 kg/m^2); one or more significant medical comorbidities; personal history or first-degree relative with a history of VTE; use of hormone replacement therapy, or use of oestrogen-containing contraceptive therapy; varicose veins with phlebitis; and current pregnancy or within 6 weeks postpartum.

NICE also suggests risk factors for bleeding, or adverse effects of bleeding, including: acquired bleeding disorders (such as acute liver failure); use of anticoagulants, such as warfarin; requirement for lumbar puncture/epidural/spinal anaesthesia (within the previous 4 h, or expected in the next 12 h); acute stroke; thrombocytopenia; uncontrolled hypertension (≥230/120 mmHg); and untreated inherited bleeding disorders.

The guidance recommends risk reduction measures for all surgical patients who, based on the risk factors above, are at sufficiently high risk, including advice to consider stopping oestrogen-containing oral contraceptives or hormone replacement therapy 4 weeks before elective surgery and suggests a risk benefit assessment for discontinuation of antiplatelet therapy 1 week before surgery. The guidance recommends regional anaesthesia for individual patients where possible, and careful consideration of the timing of prophylaxis in relation to risk of epidural haematoma. Finally, NICE specifically recommends against either pharmacological or mechanical VTE prophylaxis for patients having surgical procedures under local anaesthesia (by local infiltration), with no limitation of mobility.

Consistent with the general recommendations, for urological procedures NICE recommends offering VTE prophylaxis to all patients who are, considering the risk factors they have identified, at increased risk of VTE. They suggest that mechanical VTE prophylaxis, including anti-embolism stockings, foot impulse devices or intermittent pneumatic compression devices, should begin at admission, and can continue until the patient no longer has significantly reduced mobility.

The NICE guidance recommends that pharmacological VTE prophylaxis be considered for patients who have a low risk of major bleeding if sufficient individual patient risk factors are present. They suggest LMWH or, for patients with significant renal impairment or established renal failure, unfractionated heparin. Regarding mechanical thromboprophylaxis, the NICE guidelines recommend continuing pharmacological VTE prophylaxis until the patient no longer has significantly reduced mobility (generally 5–7 days). The guidelines suggest extending pharmacological VTE prophylaxis to 28 days postoperatively for patients who have had major cancer surgery in the abdomen or pelvis, a recommendation relevant for all urological oncology.

American College of Chest Physicians

The ACCP has developed a thromboprophylaxis guideline for non-orthopedic surgical patients undergoing abdominal or pelvic surgery [1]. This guideline provides recommendations for surgical procedures including general surgery as well as

Table 2 Summary of recommendations based on American College of Chest Physicians Guideline.

Risk of VTE	Risk of major bleeding*	ACCP recommendation
Very low risk†	Any risk	No pharmacologic or mechanical prophylaxis recommended
Low risk‡	Any risk	Mechanical prophylaxis
Moderate risk§	Not high risk	Pharmacological or mechanical prophylaxis
Moderate risk§	High risk	Mechanical prophylaxis
High risk¶	Not high risk	Pharmacological and mechanical prophylaxis
High risk¶	Not high risk and surgery for cancer	4 weeks LMWH
High risk¶	High risk	Mechanical prophylaxis until risk of bleeding diminishes then add pharmacological prophylaxis
High risk¶	Contraindication to pharmacological prophylaxis	Low-dose aspirin, fondaparinux or mechanical prophylaxis
Any risk	Any risk	Inferior vena cava filter should not be used for primary VTE prophylaxis
Any risk	Any risk	Periodic surveillance with venous compression ultrasonography should not be performed

*ACCP, American College of Chest Physicians; LMWH, low-molecular-weight heparins; VTE, venous thromboembolism. *Major bleeding defined as fatal bleeding, bleeding requiring re-operation and definitions included in studies identified in evidence review. †Very low risk defined as <0.5%; Rogers score, <7; Caprini score, 0. ‡Low risk defined as 1.5% Rogers score, 7–10; Caprini score, 1–2. §Moderate risk defined as 3.0%; Rogers score, >10; Caprini score, 3–4. ¶High risk defined as 6.0%; Caprini score, ≥5.*

gastro-intestinal, urological, gynaecological, bariatric, vascular, plastic and reconstructive surgery. Specific recommendations for prophylaxis are stratified by risk of VTE as very low, low and moderate risk, by Rogers score (<7, 7–10 or >10), or as very low, low, moderate and high risk, by Caprini score (0, 1–2, 3–4 or ≥5) and bleeding (high or low risk). Table 2 summarizes the ACCP recommendations.

From a urology viewpoint, a key limitation of these guidelines, as for those of the NICE, is that they do not provide procedure-specific risk stratification. The ACCP guideline suggests that TURP has a relatively low VTE risk, and rates pelvic surgeries for cancer at highest risk; these risk estimates are not, however, based on specific data for these procedures.

German Association of Scientific Medical Societies

The AWMF issued S3-guidelines (representative group of experts following a structured consensus process based on critically appraised empirical evidence from a systematic literature search) addressing VTE prophylaxis in 2009 [11]. The guidelines include a section with specific recommendations for urological patients. They categorize VTE risk as low, intermediate, and high, based on exposure and risk factors (without providing specific references).

They suggest clinicians prescribe the type and duration of VTE prophylaxis according to these three categories taking into account contraindications. Suggested risk factors include: previous VTE/pulmonary embolism (high importance); thrombophilias (low to high importance); malignancies (intermediate to high importance); age ≥60 years (intermediate importance); history of VTE in immediate family members (intermediate importance); heart failure (intermediate importance); obesity (BMI >30 kg/m^2; intermediate importance); acute infectious or inflammatory diseases with immobilization (intermediate importance); hormone therapies (low to high importance); pregnancy and postnatal period (low importance); nephrotic syndrome (low importance); and substantial venous varicosities (low importance). In contrast to both the ACCP and NICE guidelines, the AWMF guideline group did not consider the duration of surgery as a risk factor, citing a lack of empirical studies.

Although the AWMF guidelines did not explicitly describe how to classify different risk categories in practice, they issued the following urology-specific recommendations.

1 Patients with low VTE risk undergoing minor urological surgery (including transurethral procedures) and no or minimal risk factors should not receive heparin or LMWH prophylaxis. General measures, such as early mobilization and physical exercises, should be applied. Where additional risk factors are present, unfractionated heparin or LMWH should be given.
2 Patients with intermediate VTE risk undergoing minor or intermediate urological surgery and with multiple risk factors should receive heparins (not further specified in guideline) for VTE prophylaxis. In addition, these patients could receive mechanical prophylaxis.
3 Patients with high VTE risk undergoing major or intermediate urological surgery and with multiple risk factors should receive mechanical prophylaxis and pharmacological prophylaxis with LMWH.
4 Patients undergoing live-donor nephrectomy for kidney transplantation should receive heparins as VTE prophylaxis.
5 For patients undergoing urological surgery, prophylaxis recommendations remain the same regardless of surgical approach (laparoscopic, robotic or open). The recommended duration of pharmacological prophylaxis is 5–7 days, independent of whether the patient is in hospital or ambulant care. In case of prolonged immobilization or infectious complications, prophylaxis should be continued until resolution. Oncological patients undergoing surgery should receive prolonged prophylaxis for 4–5 weeks.

Australian National Health and Medical Research Council

In 2009 the Australian National Health and Medical Research Council published a clinical practice guideline for the prevention of VTE in patients admitted to hospital

[12]. The authors critically assessed the urological literature regarding thromboprophylaxis and offered the following conclusions.

1 Regarding the use of unfractionated heparin: in patients undergoing urological surgery, unfractionated heparin significantly reduced the incidence of deep vein thrombosis compared with no treatment; however, unfractionated heparin also resulted in significantly more non-fatal bleeding compared with no treatment.
2 Regarding LMWH, compression stocking and low-dose warfarin: there were a number of randomized controlled trials that compared a range of mechanical methods of prophylaxis with other mechanical methods or pharmacological methods. All of these randomized controlled trials were inconclusive.

Much of the evidence reviewed included a heterogeneous group of patients who underwent a spectrum of urological procedures. The authors concluded that, because benefits and harms for specific procedures were not known, it was not possible to make specific recommendations for prophylaxis after urological surgery. A very general recommendation the authors made was to consider thromboprophylaxis for patients admitted to hospital for urological surgery based on patient's risk of VTE and bleeding.

National Comprehensive Cancer Network

The NCCN (in the USA) has published the most recent guideline addressing cancer-associated venous thromboembolic disease [13]. The NCCN guidelines are intended to address a broad spectrum of patients with a cancer diagnosis who are at risk of VTE and do not offer urology-specific guidance. Broadly, the authors recommend medical VTE prophylaxis for all patients who do not have a specific contraindication (absolute contraindications: recent CNS bleed, intracranial or spinal lesion at high risk of bleeding, major active bleeding defined as > 2 units transfused over 24 h).

Guidance for all abdominal/pelvic surgery includes consideration of preoperative unfractionated heparin or LMWH and continuation of VTE prophylaxis up to 4 weeks after surgery, especially among high-risk individuals. The authors recommend mechanical prophylaxis only for patients in whom pharmacological prophylaxis is contraindicated, or in addition to anticoagulant therapy for high-risk surgical patients. Features that identify patients as being at higher risk include previous VTE, anaesthesia for >2 h, advanced disease, bed rest for ≥4 days, or age ≥60 years; however, the relative weights of these factors and threshold to be considered higher risk remains undefined and may not be applicable for specific urological surgeries.

Peri-operative Management of Anticoagulated Patients

Managing peri-operative thromboprophylaxis for patients who already receive anticoagulants remains a challenge. The best available evidence synthesis comes from the International Consultation on Urological Disease/AUA Review Paper [14], which systematically reviewed the English-language literature up to 1 August 2012. They identified a lack of adequate randomized controlled trials, but reviewed numerous observational studies quantifying the risks for these patients of both bleeding and thrombotic events. The authors made 17 specific recommendations based on the limited available evidence. They suggest that aspirin or clopidogrel be continued throughout the peri-operative period where it is being used for stroke prevention. They recommend that management of patients on new oral anticoagulants for atrial fibrillation have peri-operative care individualized based on patients' and procedure-specific risks, with the possibility of continuing new oral anticoagulants for procedures with low bleeding risk, and the possibility of bridging therapy for high-risk procedures. The recommendation for peri-operative warfarin, suggests warfarin be stopped 3–5 days before and restarted 12–24 h after surgery. They also reviewed the recommended bridging therapies from the American College of Clinical Pharmacy, for patients at high risk of thrombosis, despite a lack of urology-specific evidence.

NICE additionally provide suggestions for the management of patients already anticoagulated before surgery [10]. They recommend balancing the risks of bleeding and VTE in the choice between mechanical and pharmacological prophylaxis. For patients in the therapeutic range for warfarin they recommend against additional pharmacological therapy or mechanical prophylaxis. Bridging with therapeutic dose fondaparinux or heparins may be warranted depending on patient-specific risk factors.

The ACCP guidance for bridging therapies for anticoagulated patients again specifically recommends to consider the risk of VTE to determine the need and type of bridging [15]. For low-risk patients they suggest either omitting any bridging therapy, or bridging with prophylactic-dose LMWH. For patients at moderate risk they favour bridging with therapeutic-dose LMWH, but also suggest prophylactic-dose LMWH or unfractionated heparin as alternatives. Finally, for patients at high risk, such as those with mechanical valves, or a recent VTE, they recommend bridging with therapeutic-dose LMWH in preference to unfractionated heparin.

Randomized trial evidence published since these summaries has shown that, in patients anticoagulated for atrial fibrillation, foregoing bridging increases bleeding without decreasing thrombosis [16]. This trial has an indirect bearing

on patients receiving anticoagulation for venous thrombosis, and suggests withholding bridging for most patients is probably advisable.

Variations in the Use of Venous Thromboembolism Prophylaxis in Urology Among Countries

Given the variation in guideline recommendations and the absence of guidelines specific to different urological surgeries, it is not surprising that there exists considerable variation in thromboprophylaxis use in urology. A recent national survey conducted in the UK among 64 pelvic cancer centres reported that, after radical cystectomy, all centres routinely use LMWH in the peri-operative period and 67% do so after discharge [6]. Similarly, for radical prostatectomy, 98% used peri-operative prophylaxis while 61% also used it after discharge. In contrast, a US study that evaluated 94 709 men from 500 centres who underwent radical prostatectomy identified that 52% of these men received mechanical prophylaxis only, 7% pharmacological only and 11% both, and the remaining 30% did not receive prophylaxis [17].

A second survey that polled practising AUA members also showed low rates of thromboprophylaxis use for major pelvic urological surgery [5]. Of the respondents to this survey, only 71% would frequently or always prescribe prophylaxis, while 19% would never or infrequently prescribe prophylaxis for patients undergoing cystectomy who were at high risk of VTE; the percentages for prescribing prophylaxis decreased to 61 and 28%, respectively, for a low-risk patient. Authors reported similar findings for radical prostatectomy, regardless of surgical approach. This observed variation underscores the need for a formal urology procedure-specific guideline that accounts for patient VTE risk factors. The expected EAU Guideline is intended to close this gap by providing evidence-based guidance that can inform clinicians and patients and help standardize practice globally.

Trade-off of Bleeding and Venous Thromboembolism Risk for Patients Undergoing Radical Prostatectomy

Evaluation of the trade-off between decreased VTE vs increased bleeding risk for patients undergoing radical prostatectomy requires consideration of several factors. The risk of VTE and bleeding will be influenced by the impact of thromboprophylaxis, patient-specific factors and surgery-specific factors. When comparing the thromboprophylaxis

Table 3 Guideline recommendations applied to a 65-year-old man, with a body mass index of 35 kg/m^2 and a first-degree relative with a history of venous thromboembolism.

Guideline	VTE risk factors	Bleeding risk factors	Patient risk category	Mechanical prophylaxis recommendation	Pharmacological prophylaxis recommendation	Discharge prophylaxis
AUA	Obesity Age >60 years Malignancy Major procedure	Not considered	Very-high-risk VTE	Until discharge	Until discharge	No
NICE	First-degree relative with VTE Obesity Age >60 years Malignancy Surgical time >90min Pelvic surgery	Not elevated	High-risk VTE	Until ambulating	4 weeks postoperative	Yes
ACCP	Family history of VTE Age 61–74 years BMI >25 kg/m^2 Malignancy Surgical time >45 min Major surgery*	Male, malignancy, abdominal surgery†	High-risk VTE High-risk bleeding	Mechanical only until risk of bleeding diminishes	4 weeks postoperative (started once bleeding risk diminishes)	Yes
AWMF	VTE in relative Age >60 years Malignancy	Not considered	High-risk VTE	Until ambulating	4–5 weeks postoperative	Yes
ANH-MRC	Marked obesity Age Malignancy Pelvic surgery	Not elevated	High-risk VTE	No recommendation	No recommendation	No recommendation
NCCN	Age >60 years Anaesthesia >2 h	Not considered	High-risk VTE	No recommendation	4 weeks postoperatively	Yes

*ACCP, American College of Chest Physicians; ANH-MHC, Australian National Health and Medical Research Council; AWMF, German Association of Scientific Medical Societies; BMI, body mass index; NCCN, National Comprehensive Cancer Network; NICE, National Institute for Health and Care Excellence; VTE, venous thromboembolism. *Defined by Caprini score.† When radical prostatectomy is considered as 'abdominal surgery'.*

guidelines a spectrum of recommendations appear (Table 3). This divergence of recommendations contributes significantly to the heterogeneity of practice among urologists [4–6].

To illustrate, we consider a scenario in which a 65-year-old patient has a BMI of 35 kg/m^2 and a first-degree relative with VTE but has minimal comorbidities otherwise, and is undergoing radical prostatectomy. Table 3 summarizes the key considerations and recommendations from each guideline. One significant limitation across guidelines is that many risk factors are ambiguously defined and how to apply these to risk stratification is not prescriptive. Additionally, the majority of guidelines do not weigh the risk of bleeding in their recommendations. With these limitations in mind, our interpretation is that the majority of guidelines would identify our patient as high risk and recommend pharmacological thromboprophylaxis at discharge; however, all guidelines rely on extrapolation from abdominal or pelvic surgery and do not rely on procedure-specific data, including whether or not pelvic lymph nodes were dissected. For procedures other than prostatectomy, it was even more difficult to compare recommendations between guidelines.

In conclusion, we found only a single document offering recommendations specific to urological surgery, the AUA Best Practice statement. This statement has a number of limitations: optimum dosing regimens and treatment duration are not well defined, and the document deals mainly with in-hospital prophylaxis only. Because the majority of thromboembolic events occur after discharge, in-hospital prophylaxis will have limited impact in reducing VTE risk [3,18–20]. Similarly, the estimated risks of VTE and bleeding reported in the AUA Best Practice statement may be misleading, first because guidance was not informed by evidence-based knowledge synthesis, and secondly because they may not reflect current practice because of advances in surgical technique and care [21–23].

Guidance regarding surgical prophylaxis in general from a variety of organizations is more specific regarding dosing regimens and duration, deals with post-hospital prophylaxis, and is more evidence-based. Its application to urological procedures is, however, limited. This is particularly the case because, crucially, the thromboprophylaxis decision depends on risk of thrombosis and bleeding in the absence of treatment (baseline risk), and the large variety of urological surgeries is likely to each be associated with their own unique baseline risk. Moreover, patient-specific risk factors, which are also likely to be crucial in decision-making, remain poorly defined.

Specific guidance that takes into account baseline risk of the various urological procedures is urgently needed. The EAU will produce the first urological procedure-specific formal guideline addressing thromboprophylaxis. This guidance will help fill the gap in knowledge and promote standardization of care.

Key points

- Decisions regarding thromboprophylaxis in urologic surgery involve a trade-off between decreased risk of venous thromboembolism (VTE) and increased risk of bleeding.
- Both patient- and procedure-specific factors are critical in making an informed decision on the use of thromboprophylaxis.
- Recommendations from national and international guidelines often conflict and are largely based on indirect as opposed to procedure-specific evidence.
- The majority of existing guidelines typically suggest prolonged thromboprophylaxis for high-risk abdominal or pelvic surgery, without clear clarification of what these procedures are, for up to 4 weeks post-discharge.
- Existing guidance may result in the under-treatment of procedures with low risk of bleeding and the over-treatment of oncological procedures with low risk of VTE.
- Guidance for patients who are already anticoagulated are not specific to urological procedures but generally involve evaluating patient and surgical risks when deciding on bridging therapy.
- The European Association of Urology Guidelines Office has commissioned an ad hoc guideline panel that will present a formal thromboprophylaxis guideline for specific urological procedures and patient risk factors.

Conflict of Interest

Dr Violette declares honoraria from Astellas, Janssen and Pfizer. Other authors declare no financial conflicts of interest. Dr Tikkinen is chairman and Drs Violette, Cartwright and Guyatt are panel members of the EAU *ad hoc* Guideline Panel on Thromboprophylaxis.

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Abbreviations: ACCP, American College of Chest Physicians; ANH-MHC, Australian National Health and Medical Research Council; AUA, American Urological Association; AWMF, German Association of Scientific Medical Societies; BMI, body mass index; EAU, European Association of Urology; LMWH, low-molecular-weight heparin; NCCN, National Comprehensive Cancer Network; NICE, National Institute for Health and Care Excellence; VTE, venous thromboembolism.