Hospital Episode Statistics data analysis of postoperative venous thromboembolus in patients undergoing urological surgery: a review of 126,891 cases

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ABSTRACT
INTRODUCTION Current guidelines on venous thromboembolism (VTE) prevention do not reflect the potential varying risk for patients undergoing different urological procedures. Our study aimed to establish the procedure specific rate of postoperative VTE in patients undergoing urological surgery.

METHODS Hospital Episode Statistics were obtained for all patients undergoing common urological procedures between April 2009 and April 2010. This cohort was followed up to identify all patients reattending with either deep vein thrombosis (DVT) or pulmonary embolism (PE) within 12 months.

RESULTS A total of 126,891 individuals underwent urological surgery during the study period. This included 89,628 men (70.6%) and 37,236 women (29.3%) with a mean age of 65.2 years. At the 12-month follow-up, 839 patients (0.66%) were readmitted with VTE. Of these, 373 (0.29%) were admitted with DVT and 466 (0.37%) with PE. The procedure-specific rate of VTE varied significantly between 2.86% following cystectomy and 0.23% following urethral dilatation. Procedures performed in the lithotomy position carried a significantly lower risk of VTE than those performed in the supine position (0.60% vs 1.28%, p<0.0001). Furthermore, of all procedures performed in the lithotomy position, those performed on benign conditions carried a significantly lower risk than those performed on malignant disease (0.52% vs 0.79%, p<0.0001).

CONCLUSIONS Procedure specific rates of postoperative VTE vary widely among patients undergoing urological procedures. These findings suggest the potential benefit of prolonging the use of thromboprophylaxis in high-risk patients but also exploring the apparent lack of need for routine thromboprophylaxis in patients undergoing low-risk procedures.

KEYWORDS
Urology – Venous thromboembolism – Pulmonary embolism – Deep vein thrombosis

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The House of Commons Health Committee 2005 report on venous thromboembolism (VTE) documents the significant problems associated with hospital-acquired VTE.1 It estimates the annual incidence of fatal hospital-acquired pulmonary embolism (PE) at 25,000 annually and highlights the substantial morbidity associated with deep vein thrombosis (DVT). Consequently, in 2010 the National Institute for Health and Clinical Excellence (NICE) published guidance for the care of hospitalised patients at risk of developing VTE.2 These guidelines detail the suggested mechanical, medical and surgical measures that should be employed in hospitalised patients suffering with medical illness and undergoing a range of surgical procedures.

Clearly, both the risk of VTE and the consequence of postoperative bleeding differ between different surgical procedures. This is reflected in the NICE guidance with different recommendations for surgery in different specialties (orthopaedic, ophthalmology, gastrointestinal etc).2 There is, however, no procedure-specific variation in guidance for patients undergoing urological surgery. This is particularly important in urological surgery as there is wide variation in surgical techniques (open, endoscopic and laparoscopic), in patient positioning (supine, prone and lithotomy) and in diseases (benign and malignant). Furthermore, much of the data on which conclusions for current guidelines are based date from the 1970s and 1980s.2,7 By interrogating the National Health Service (NHS) Hospital Episode Statistics (HES) database, our study aimed to elucidate the rate of procedure-specific postoperative VTE in patients undergoing a range of urological surgery.
Methods

HES data were obtained for all patients undergoing common urological procedures in NHS trusts throughout England between April 2009 and April 2010. The codes and groupings are given in Table 1. This dataset was employed as it was the most recently available complete dataset that permitted a minimum follow-up period of 12 months. The cohort was followed to identify those patients reattending with either DVT or PE within 12 months of their surgery. Patients were stratified according to sex, procedure and operative position. Statistical significance was determined using a chi-squared test. In order to preserve patient confidentiality, data were not included in subsequent analysis if the output from HES was fewer than six in any given category.

Table 1  Hospital Episode Statistics codes for commonly performed urological procedures

| Procedure | Code | Description |
|-----------|------|-------------|
| Nephrectomy | M02.1 | Nephrectomy and excision of perirenal tissue |
| | M02.2 | Nephroureterectomy NEC |
| | M02.3 | Bilateral nephrectomy |
| | M02.4 | Excision of half of horseshoe kidney |
| | M02.5 | Nephrectomy NEC |
| | M02.6 | Excision of rejected transplanted kidney |
| | M02.8 | Other specified total excision of kidney |
| | M02.9 | Unspecified total excision of kidney |
| Endoscopic ureteric or renal calculus procedures | M09.1 | Endoscopic ultrasonography fragmentation of calculus of kidney |
| | M09.2 | Endoscopic electrohydraulic shock wave fragmentation of calculus of kidney |
| | M09.3 | Endoscopic laser fragmentation of calculus of kidney |
| | M09.4 | Endoscopic extraction of calculus of kidney NEC |
| | M09.8 | Other specified therapeutic endoscopic operations on calculus of kidney |
| | M09.9 | Unspecified therapeutic endoscopic operations on calculus of kidney |
| | M11.3 | Diagnostic endoscopic retrograde examination of kidney NEC |
| | M27.1 | Ureteroscopic laser fragmentation of calculus of ureter |
| | M27.2 | Ureteroscopic fragmentation of calculus of ureter NEC |
| | M27.3 | Ureteroscopic extraction of calculus of ureter |
| | M27.4 | Ureteroscopic insertion of ureteric stent |
| | M27.5 | Ureteroscopic removal of ureteric stent |
| | M28.1 | Endoscopic laser fragmentation of calculus of ureter NEC |
| | M28.2 | Endoscopic fragmentation of calculus of ureter NEC |
| | M28.3 | Endoscopic extraction of calculus of ureter NEC |
| | M28.4 | Endoscopic catheter drainage of calculus of ureter |
| | M28.5 | Endoscopic drainage of calculus of ureter by dilation of ureter |
| | M28.8 | Other endoscopic removal of calculus from ureter, other specified |
| | M28.9 | Unspecified other endoscopic removal of calculus from ureter |
| | M29.2 | Endoscopic insertion of tubal prosthesis into ureter NEC |
| | M29.5 | Endoscopic renewal of tubal prosthesis into ureter |
| | M30.1 | Endoscopic retrograde pyelography |
| | M30.9 | Unspecified diagnostic endoscopic examination of ureter |
| Cystectomy | M34.1 | Cystoprostatectomy |
| | M34.2 | Cystourethrectomy |
| | M34.3 | Cystectomy NEC |
| | M34.4 | Simple cystectomy |
| | M34.8 | Other specified total excision of bladder |
| | M34.9 | Unspecified total excision of bladder |
| Prostatectomy | M61.1 | Total excision of prostate and capsule of prostate |
| TURBT/cystoscopic bladder procedures (malignant) | M42.1 | Endoscopic resection of lesion of bladder |
| | M42.2 | Endoscopic cauterisation of lesion of bladder |
| | M42.3 | Endoscopic destruction of lesion of bladder NEC |
| | M42.8 | Other specified endoscopic extirpation of lesion of bladder |
| | M42.9 | Unspecified endoscopic extirpation of lesion of bladder |
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HOSPITAL EPISODE STATISTICS DATA ANALYSIS OF POSTOPERATIVE VENOUS THROMBOEMBOLUS IN PATIENTS UNDERGOING UROLOGICAL SURGERY: A REVIEW OF 126,891 CASES

Cystoscopic bladder procedures (benign)
- M43.2 Endoscopic hydrostatic distension of bladder
- M44.1 Endoscopic lithotripsy
- M44.2 Endoscopic extraction of calculus of bladder NEC
- M44.3 Endoscopic removal of foreign body from bladder
- M44.4 Endoscopic removal of blood clot from bladder
- M44.8 Other therapeutic endoscopic operations on bladder; other specified
- M44.9 Unspecified other therapeutic endoscopic operations on bladder
- M45.3 Diagnostic endoscopic examination of bladder and biopsy of lesion of prostate using rigid cystoscope
- M45.4 Diagnostic endoscopic examination of bladder and biopsy of lesion of prostate using rigid cystoscope
- M45.5 Diagnostic endoscopic examination of bladder using rigid cystoscope

TURP/bladder outflow surgery
- M65.1 Endoscopic resection of prostate using electrotome
- M65.3 Endoscopic resection of prostate NEC
- M65.4 Endoscopic resection of prostate using laser
- M66.2 Endoscopic incision of outlet of male bladder NEC

Urethral procedures
- M76.4 Endoscopic dilation of urethra
- M79.2 Dilation of urethra NEC

NEC = not elsewhere classified; TURBT = transurethral resection of bladder tumour; TURP = transurethral resection of prostate

Figure 1  Procedure-specific variation in postoperative venous thromboembolism (VTE) including representations of community-based incidence of VTE taken from White9

TURBT = transurethral resection of bladder tumour; TURP = transurethral resection of prostate; PCNL = percutaneous nephrolithotomy
Results
A total of 126,891 individuals were identified as having undergone urological surgery during the study period. This included 89,628 men (70.6%), 37,236 women (29.3%) and 27 patients with sex unknown (0.02%). The mean patient age was 65.2 years. At the 12-month follow-up, 839 patients (0.66%) were readmitted with VTE. Of these, 373 (0.29%) had been admitted with DVT and 466 (0.37%) with PE. There was no significant difference between the incidence of VTE between men and women (0.67% vs 0.63%, \( p = 0.413 \)).

Procedure-specific VTE rates varied considerably (Fig 1, Table 2) with major open and laparoscopic surgery carrying the highest risk of VTE. Of this group, cystectomy carried the highest risk with an incidence of 2.86%. Benign cystoscopic procedures and urethral dilatation carried the lowest risk of postoperative VTE with 0.48% and 0.25% respectively. Procedures performed in the lithotomy position were associated with approximately half the risk of developing VTE than those performed in the supine position (0.60% vs 1.28%, \( p < 0.0001 \)) (Table 3). Furthermore, there was a reduction in VTE risk when comparing cystoscopic surgery on benign and malignant conditions (0.52% vs 0.79%, \( p < 0.0001 \)) (Table 4).

Discussion
As expected, procedure-specific rates of symptomatic VTE varied greatly among patients undergoing urological surgery. Cystectomy appears to carry the highest risk of VTE, which is greater than the published incidence for known high-risk procedures such as total hip arthroplasty (2.4%), partial hip arthroplasty (2.0%) and embolectomy of lower limb artery (2.8%).

Current guidelines for major urological, gastrointestinal and gynaecological pelvic cancer surgery suggest continuing medical thromboprophylaxis following discharge for 28 days. Although the assumption from our findings would be to support a prolonged duration of postoperative thromboprophylaxis, it is necessary to reiterate that our study indicates annual incidence of VTE rather than the incidence in a different specific time period. There is a need for further clarification on the VTE risk for such patients, particularly in terms of the time to development of symptomatic VTE. Such knowledge will aid the development of recommendations for patients undergoing a cystectomy with regard to method, duration and dosage of thromboprophylaxis. Conversely, our study showed that urethral dilatation and cystoscopic procedures performed in the lithotomy position for

| Procedure | Total procedures | VTE | DVT | PE | Mean age of onset of VTE |
|-----------|------------------|-----|-----|----|-------------------------|
| Cystectomy | 1,641 | 47 | 2.86% | 21 | 1.28% | 26 | 1.58% | 66.1 years |
| Prostatectomy | 3,213 | 32 | 1.00% | 15 | 0.47% | 17 | 0.53% | 72.5 years |
| Nephrectomy | 6,230 | 63 | 1.01% | 16 | 0.26% | 47 | 0.75% | 62.2 years |
| TURBT | 35,765 | 281 | 0.79% | 118 | 0.33% | 163 | 0.46% | 55.2 years |
| Ureteric/kidney stone removal | 27,133 | 166 | 0.61% | 91 | 0.34% | 75 | 0.28% | 70.5 years |
| TURP | 25,691 | 150 | 0.58% | 72 | 0.28% | 78 | 0.30% | 52.7 years |
| PCNL | 1,637 | 9* | 0.55% | 60.6 years |
| Benign cystoscopic procedures | 12,681 | 61 | 0.48% | 26 | 0.21% | 35 | 0.28% | 52.3 years |
| Urethral dilatation procedures | 12,900 | 30 | 0.23% | 8 | 0.06% | 22 | 0.17% | 57.7 years |
| Total | 126,891 | 839 | 0.66% | 373 | 0.29% | 466 | 0.37% | 65.2 years |

VTE = venous thromboembolism; DVT = deep vein thrombosis; PE = pulmonary embolism; TURBT = transurethral resection of bladder tumour; TURP = transurethral resection of prostate; PCNL = percutaneous nephrolithotomy

*absolute values not disclosed to preserve confidentiality

| Position | Total | VTE | Incidence |
|----------|-------|-----|-----------|
| Lithotomy | 114,170 | 688 | 0.60 |
| Supine | 11,084 | 142 | 1.28* |

*chi-squared test \( p < 0.05 \)

| Disease category | Total | VTE | Incidence |
|------------------|-------|-----|-----------|
| Benign | 78,405 | 407 | 0.52 |
| Malignant | 35,765 | 281 | 0.79* |

*chi-squared test \( p < 0.05 \)
benign conditions (e.g., removal of bladder clot, cystolithotomy, removal of foreign body, and cystostentosion) carry a very low risk of VTE (0.25–0.48%).

A systematic review of community-based epidemiological studies estimated the annual incidence of VTE to be around 0.1%.10 However, beyond the age of 40, there seems to be an exponential increase in VTE incidence, rising to 0.3–0.5% annually in patients aged between 70 and 79 years. Unfortunately, there are inherent problems in using HES for the purposes of this study. It is not possible to control for the use of thromboprophylaxis, pre-existing VTE risk factors, and procedures performed under general or regional anaesthesia. Despite laparoscopic surgery being established as the gold standard for a variety of procedures, HES do not account for different surgical techniques (open, laparoscopic or robotic). Furthermore, there is reliance on accurate clinical coding and a greater number of codes for urological procedures performed with differing techniques, which would increase the usefulness of analogous analysis and is a recommendation of our study.

Nevertheless, HES have been shown to be increasingly accurate and an effective tool in comparative audit.10–11 HES will no doubt continue to be used as a research tool in the future. The introduction of a greater number of codes for urological procedures with differing techniques will likely increase the usefulness of analogous analysis and is a recommendation of our study.

Despite its limitations, this study is the first large multi-centre study of postoperative VTE across a range of urological procedures. Comparing VTE incidence in our study with community-based control studies reveals a group of procedures that carry a VTE risk similar to and often less than the community-based control studies. The combination of dated evidence and apparently low VTE incidence in our study suggests value in conducting further randomised controlled trials to delineate the health benefit and economical implications of routine thromboprophylaxis, particularly for patients undergoing low-risk surgery.

Conclusions

It would appear that there is scope for improvement and streamlining of care with regard to VTE prevention for patients undergoing both high-risk and low-risk urological surgery. Given the limitations of our study, alterations in local practice should await further investigation.

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