UROLOGYPRACTICE

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Cost-Effectiveness of Extended Duration Venous Thromboembolism Prophylaxis in High Risk Urological Oncology Surgical Patients

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Abstract

Introduction: Major urological oncology surgery carries a significant risk of postoperative venous thromboembolism events, resulting in major morbidity, possible mortality and substantial costs. We determined the incremental cost-effectiveness for in-hospital and low molecular weight heparin extended duration prophylaxis for venous thromboembolism prevention in patients at high risk following major urological oncology surgery.

Methods: A decision analytical model was developed to compare inpatient hospital costs, venous thromboembolism incidence within 365 days and outcomes associated with extended duration prophylaxis for 4 prophylaxis strategies. The 4 strategies grouped by protocol adherence were 1) per protocol in-hospital prophylaxis with extended duration prophylaxis in 88 cases, 2) per protocol in-hospital prophylaxis without extended duration prophylaxis in 42, 3) not per protocol in-hospital prophylaxis with extended duration prophylaxis in 80 and 4) not per protocol in-hospital prophylaxis without extended duration prophylaxis in 99. Between June 2011 and March 2014, 707 patients underwent major urological oncology surgery. Using the Caprini risk score 309 patients were at high risk.

Results: The group 1 strategy was the dominant (most effective) strategy when the probability of preventing venous thromboembolism with extended duration prophylaxis was greater than 80%. Effectiveness for preventing venous thromboembolism was most influenced by the group 2 venous thromboembolism incidence rate. Costs in group 1 vs group 2 were calculated at $1,531 vs $1,563. Using the incremental cost-effectiveness ratio to compare groups 1 and 2, which were the 2 groups with the closest costs and effectiveness, an overall cost savings of $1,390 per patient was seen.

Conclusions: Compared with competing strategies in-hospital and extended duration prophylaxis for venous thromboembolism prevention in patients at high risk undergoing major urological oncology surgery is effective to prevent venous thromboembolism and it is cost saving.

Key Words: urology, venous thrombosis, pulmonary embolism, cost-benefit analysis, prevention & control

Abbreviations and Acronyms

ACCP = American College of Chest Physicians

ASCO = American Society of Clinical Oncology

DVT = deep vein thrombosis

EDP = extended duration prophylaxis

ICER = incremental cost-effectiveness ratio

LMWH = low molecular weight heparin

NCCN = National Comprehensive Cancer Network®

PE = pulmonary embolus

QALY = quality adjusted life-years

VTE = venous thromboembolism

Submitted for publication May 23, 2015.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

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2352-0779/16/34-1/0
UROLOGY PRACTICE
http://dx.doi.org/10.1016/j.urpr.2015.08.004
Vol. 3, 1-8, July 2016
Published by Elsevier

Major urological oncology surgery is associated with an increased risk of VTE,[1] a generic term encompassing DVT and PE. It is estimated that before the initiation of heparin prophylaxis to prevent VTEs after pelvic surgery the DVT incidence is between 10% and 30%, and the PE incidence is between 1% and 10%.[1,2]

Several authoritative bodies have published guidelines recommending VTE prophylaxis with LMWH for 4 weeks after major abdominal and pelvic surgery in patients at high risk. LMWH, which is used for VTE prophylaxis, has more predictable absorption than unfractionated heparin and provides once daily dosing for most patients. VTEs are often counted as preventable events. These guidelines come from ACCP, a group of pulmonary physicians who publish evidence based guidelines about preventing VTE in all surgical and nonsurgical patients; NCCN, another organization of oncologists that makes evidence based recommendations for cancer care, including the prevention of VTE in oncology patients; and ASCO, an organization of oncologists who make evidence based recommendations for preventing VTE in oncology patients.[3–5] Following the ACCP, NCCN and ASCO guidelines of prescribing extended duration VTE prophylaxis in high risk cancer surgery cases decreases the incidence of VTE between 7% and 14%.[6–8] EDP consists of 28 days of low molecular weight heparin given once daily in prophylactic doses, for example enoxaparin 40 mg or dalteparin 5,000 mg, with the dose adjusted for renal function and patient weight.

Despite this the current clinical prescriptive patterns for 28 days of LMWH in postoperative patients at high risk is not well recognized as standard practice. VTEs are often counted as preventable events. VTE reduction could help achieve health care cost containment as it is estimated that the estimated economic burden of total hospital acquired preventable VTEs in the United States is between $11.9 and $39.3 billion annually.[9,10]

A recent clinical study demonstrated the effectiveness of EDP in urological oncology patients but a cost comparison was not included.[7] The purpose of the current study was to extend effectiveness findings and compare the costs of the 4 alternative VTE prevention options using EDP for VTE prophylaxis in urological oncology patients at high risk undergoing major surgery.

Methods

After receiving approval from the research studies review board VTE quality improvement measures were implemented in July 2012. For standardized administration of prophylaxis a protocol was developed to provide pharmacological prevention in accordance with the guidelines recommended by ACCP, NCCN and ASCO.[3–5] Further details of the protocol can be found in previously published data from the clinical outcomes study of EDP for major urological oncology surgery.[7]

Figure 1 shows groupings based on protocol adherence.[7] [F1] Briefly, the records of patients who underwent major urological surgery for malignancy were consecutively reviewed retrospectively from June 2011 to July 2012 and prospectively from July 2012 to March 2014. Of the 707 patients undergoing major urological oncology surgery 309 qualified as being at high risk as determined by the Caprini risk assessment score.[7,11,12] Patients were followed for 365 days. The VTE incidence was obtained by telephone or office interviews at 30, 90 and 365 days to ascertain the development of VTE.

Clinical data were modeled based on study data on the prevention of VTEs in patients at high risk after major urological oncology surgery.[7] Patients were divided into 4 groups according to protocol adherence and violation in the clinical study (fig. 1),[8] including group 1—per protocol prophylaxis in the hospital with EDP, group 2—per protocol prophylaxis in the hospital with no EDP, group 3—not per protocol prophylaxis in the hospital with EDP and group 4—not per protocol prophylaxis in the hospital without EDP.[7] During hospitalization patients in all 4 groups wore

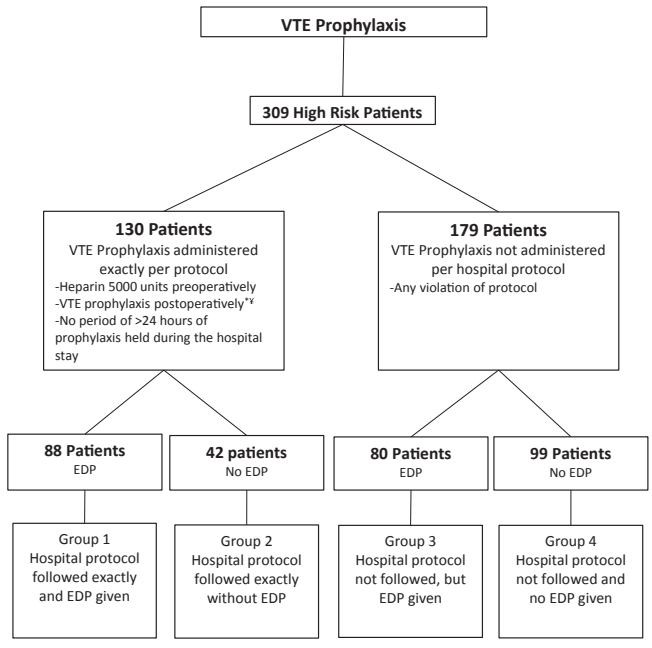

Figure 1. VTE prophylaxis prevention protocol of how clinical groups were divided by prophylaxis adherence. All patients had intermittent pneumatic compression devices. Asterisk indicates enoxaparin, dalteparin or heparin adjusted to FDA (Food and Drug Administration) approved dose for weight and renal function. Yen sign indicates within 8 hours of wound closure according to manufacturer recommendations.