Intermittent pneumatic compression can reduce the burden of venous thromboembolism in India

Abstract

• Introduction: In contrast to earlier studies, recent work has shown that rates of venous thromboembolism (VTE) in India are considerably lower than in Western settings. Orthopaedic procedures increase the risk of VTE. In this study, a computer model was used to estimate the health and economic impact of options for VTE prophylaxis, including heparin, Intermittent Pneumatic Compression (IPC) and no prophylaxis.

• Methods: A published model for VTE prophylaxis was adapted using India-specific incidence and prevalence rates for VTE and bleeding events in the orthopaedic population. Risk factors for VTE were age, gender, smoking status, surgery duration, and body mass index. Results are for 100,000 patients, 35% having total hip and 65% total knee arthroplasty. In 2016, clinical survey determined the cost of prophylaxis and adverse events in Indian Rupees (INR).

• Results: VTE and bleeding events are estimated to cost healthcare providers INR 2.9 billion per 100,000 surgeries. Switching 1% of patients from low molecular weight heparin (LMWH) to IPC saved INR 7.7 million for the 1,000 switched patients. For a switch from no prophylaxis to IPC this saving is INR 18.7 million. Savings were driven by improved patient safety, with fewer anticipated deep vein thromboses and pulmonary embolisms (-11% and -59%, respectively) compared to no prophylaxis, and fewer minor and major (-55%) bleeds relative to LMWH.

• Conclusions: VTE prophylaxis following arthroplasty in India is likely to be cost saving compared with no prophylaxis. IPC compared to LMWH reduces bleeding events leading to lower costs of care.

References:
3) Saunders R, et al., Value in Health 2016; 19:A244

Introduction

The choice of device or treatment method to use for venous thromboembolism (VTE) prophylaxis in orthopaedic patients can have a large impact on patient safety and overall costs. Previous studies in the Indian setting had suggested rates of VTE were much lower than in Western populations2, thus arguing against prophylaxis, but recent work has shown that rates are comparable in the two settings with appropriate monitoring2. Prophylaxis is therefore indicated for the prevention of VTE after orthopaedic procedures2.

Objective

To estimate the potential impact on outcomes after total hip or total knee arthroplasty (THA and TKA, respectively) by increasing the proportion of patients receiving intermittent pneumatic compression (IPC).

Methods

• A semi-Markov model for VTE and adverse events was previously developed in the US setting3 and adapted for the Indian setting.

• Values were derived from published literature for incidence and prevalence rates for bleeding events in the orthopaedic patient population.

• Model includes risk factors for VTE:
  • Age, Gender, Smoking status, Length of surgery, Body Mass Index (BMI) etc.
  • Baseline population profile2: 45.7% male, mean age 57.4, BMI 27.9 kg/m²
  • Costs were included from clinician and hospital survey in 2016 (Indian Rupees, ₹)

• Sensitivity analyses were performed (1,000 model runs) varying inputs within uncertainty range (95% confidence intervals) and the results recalculated.

• The base case scenario investigates the budget and safety impact of switching 1% of these 100,000 patients from no prophylaxis to IPC and from LMWH to IPC.

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3) Saunders R, et al., Value in Health 2016; 19:A244

Results

• Switching 1% of patients in the test population impacts adverse event rates and costs due to adverse events

• Changing from no prophylaxis or LMWH to IPC results in cost savings (Figure 3)

Figure 3: Impact on prophylaxis and adverse event costs after increasing usage of IPC

From LMWH to no prophylaxis

Difference in number of adverse events per 1,000 surgeries with increase IPC usage

No VTE prophylaxis

DVT

PE

Major bleeds

Minor bleeds

0

20

40

60

80

-20

-40

-60

-80

From no prophylaxis to IPC

Difference in number of adverse events per 1,000 surgeries with increase IPC usage

Figure 4: Impact on adverse events after THA/TKA

From LMWH to IPC

Sensitivity analysis results show the range (95% credibility interval) of cost savings achieved per 1,000 surgeries changing 1% of patients from LMWH or from no prophylaxis to IPC.

• IPC results in fewer VTE events compared to no prophylaxis while decreasing the number of bleeding events relative to LMWH (Figure 4).

Conclusions

• Patient safety in the Indian setting is improved by fewer VTE events with IPC after surgery

• Increased usage of intermittent pneumatic compression may yield considerable savings by reducing rates of costly adverse events relative to no prophylaxis or LMWH

What is the impact of changing thromboprophylaxis strategy after orthopaedic surgery?

1. In a budget impact model, cost of care for VTE related to orthopaedic surgery is considerable.

2. Fewer bleeding events switching from low molecular weight heparin to intermittent pneumatic compression.

3. Reduced costs due to venous thromboembolism-related adverse events switching from no prophylaxis to intermittent pneumatic compression.

Intermittent pneumatic compression is a safe, potentially cost-saving method of prophylaxis.

Model setup

• The risk factors for VTE development in the Indian setting4 (Figure 1) suggest the risk in the patient population developing VTE is considerable.

• A starting market share of treatment patterns (Figure 2) is established from clinician and hospital survey.

• A hypothetical population consisting of 100,000 patients (35,000 total hip, 65,000 total knee arthroplasty) was considered.

Figure 1: Risk factors associated with VTE in the Indian setting

BMI > 30 kg/m²

Surgery > 2h

Age > 60 years

Female

Smoker

Relative risk (ratio)

1.00

2.00

4.00

8.00

Relative risk of development of VTE for various factors are shown.

Figure 2: Market share of orthopaedic surgery thromboprophylaxis strategy

No VTE prophylaxis (62%)

LMWH (45%)

NFAC (1%)

IPC (2%)

Warfarin (5%)

UFH (25%)

Prophylaxis patterns (including "none") for VTE prevention in patients undergoing orthopaedic procedures. IPC, intermittent pneumatic compression; NFAC, novel oral anticoagulants (rivaroxaban, apixaban); UFH, unfractionated heparin.