# Retrospective Review of Venous Thromboembolism Incidence and Prophylaxis at The Ottawa Hospital Bariatric Center Of Excellence

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**Key message:** Review of current literature supports extended VTE prophylaxis post discharge for intermediate to high-risk bariatric surgery patients. Our study identified a small number of patients that experienced a thrombotic complication while receiving prophylaxis during hospitalization only. Selected patients required referral for evaluation of extended VTE prophylaxis. A transition to extended thromboprophylaxis for all, needs further study to evaluate benefits and harms.

## Introduction

Venous thromboembolism (VTE) is among the most common causes of death after bariatric surgery. Rates of VTE post bariatric surgery are approximately 0.2-3.5% with PE rates as high as 1.2%[1-4]. More than 80% of VTE events occur within one month from the primary procedure[2-4]. The average time to diagnosis has been found to be 11.6 days with the risk of VTE increasing in patients who had experienced other complications[4], raising the question of need for VTE prophylaxis beyond hospital discharge[5-6]. Both the American College of Chest Physicians and the American Society for Metabolic Bariatric Surgery have recommended that pharmacoprophylaxis be administered to all bariatric surgery patients (in the absence of contraindications) [7]. The ideal pharmacoprophylaxis is uncertain given that the efficacy of medications varies with increasing BMI[8]. Weight-based dosing of LMWH is complex in this population given the risk of excessive dosing if actual weight rather than lean body weight is used[9-11]. Despite this, a survey assessing the practice patterns in high-risk bariatric VTE prophylaxis revealed that only half of surgeons routinely screened patients pre-operatively and thus used more aggressive VTE prophylaxis[12]. Adherence to the recommended peri-operative VTE prophylaxis in this patient group and rates of post-operative VTE and bleeding events are not currently known for The Ottawa Hospital (TOH) bariatric surgery population.

## Objectives

1) Assess rates of administration, timing and dosing of VTE prophylaxis for elective bariatric surgeries.
2) Determine incidence of VTE and bleeding complications in patients undergoing elective bariatric surgery

## Methods

The Ottawa Hospital Data Warehouse (OHDW) was used to identify all patients who underwent elective bariatric surgery at TOH from 2011 to 2018. Charts were reviewed to determine baseline demographics, pre-operative BMI, comorbidities including history of VTE, dose/timing of peri-operative VTE prophylaxis, incidence of post-operative thrombotic complications and bleeding events. Major bleeding was defined using the ISTH criteria as requiring 2 units of pRBC or greater, bleeding requiring return to the operating room, and/or bleeding resulting in death[13]. Minor bleeding was any clinically relevant bleeding that did not meet criteria for major bleeding.

## Table 1.

| Demographics[1] | Total Patients (n=3093) | VTE Events (n=9, 0.29%) | Major Bleeding[2] Events (n=57, 1.8%) | Minor Bleeding Events (n=55, 1.8%) |
|---|---|---|---|---|
| Female | 2528 (82%) | 6 (67%) | 40 (70%) | 41 (75%) |
| Age (min-max) | 45 (18-71) | 45 (27-54) | 45 (27-65) | 48 (27-65) |
| BMI (min-max) | 48 (19-87) | 48 (36-63) | 47 (35-74) | 48 (33-71) |
| **Comorbidities** | | | | |
| Prior DVT/PE | 97 (3%) | 3 (33%) | - | - |
| MI/Stroke | 58 (2%) | - | 1 (2%) | 1 (2%) |
| Smoking History | 1177 (38%) | 4 (44%) | 19 (33%) | 19 (35%) |
| Hormonal Therapy | 295 (10%) | 3 (33%) | 3 (5%) | 5 (9%) |
| Dyspnea at Rest | 16 (1%) | - | - | 2 (4%) |
| HTN | 1331 (43%) | 1 (11%) | 37 (65%) | 32 (58%) |
| Mobility Limitations | 178 (6%) | - | 6 (11%) | 6 (11%) |
| OSA | 1557 (50%) | 6 (67%) | 28 (49%) | 37 (67%) |
| **Operative Characteristics** | | | | |
| Roux-en Y Gastric Bypass | 2768 (89%) | 6 (67%) | 50 (88%) | 50 (92%) |
| Sleeve Gastrectomy | 325 (11%) | 3 (33%) | 7 (12%) | 5 (9%) |
| Duration of Operation (min-max) | 1h38m (25m - 5h56m) | 1h50m (1h 6m - 3h 52m) | 1h 44m (40m - 5h 32m) | 1h 52m (59m - 4h 42m) |
| Intra-Operative Heparin | 2673 (86%) | 7 (78%) | 50 (88%) | 45 (82%) |
| **Post-Operative Care** | | | | |
| LOS | 1.9 (0-94) | 2.3 (1-7) | 8.2 (1-89) | 4.5 (1-94) |
| Post-Op VTE PPX | 3035 (98%) | 9 (100%) | 47 (82%) | 51 (93%) |
| VTE Risk Score[3] | 9.8 (5-19) | 11.9 (7-19) | 9.8 (6-14) | 10 (6-17) |
| Discharged with VTE PPX | 58 (2%) | 3 (33%) | 4 (7%) | - |
| **Follow-up** | | | | |
| 90d. ED Visit | 733 (24%) | 100% | 22 (39%) | 42 (40%) |
| 90d. Follow-up | 2776 (90%) | 100% | 45 (79%) | 53 (79%) |

[1]Variable distributions are reported as n (%) unless otherwise specified
[2]**Major bleeding event** was defined using the ISTH Bleeding Score as requiring 2 units of pRBC or greater, bleeding requiring return to the operating room, and/or bleeding resulting in death.
[3]**VTE Risk Score**, Risk of Post-discharge Venous Thromboembolism after Bariatric Surgery, Cleveland Clinic[3]
Abbreviations: VTE = Venous Thromboembolism, DVT = Deep Vein Thrombosis, PE = Pulmonary Embolism, MI = Myocardial Infarction, HTN = Hypertension, OSA = Obstructive Sleep Apnea, LRYGB = Laparoscopic Roux-en Y Gastric Bypass, LSG = Laparoscopic Sleeve Gastrectomy, LOS = Length of Stay, PPX = Prophylaxis, ED = Emergency Department

## Results

**1)** Post-Operative VTE Prophylaxis Dosing:
- Prior to July 2016: 90% of patients received at least one dose of Enoxaparin 40mg SC q24h prior to discharge home.
- A pre-printed order set was introduced in July 2016 increasing the dose to q12h based on their BMI (40mg SC BID if BMI < 60 and 60mg SC BID if BMI >60).
- Subsequent to July 2016: 97% of patients were receiving BID dosing of enoxaparin.

There was no increase in bleeding complications nor a decrease in VTE rates following this dosing regimen change. LOS decreased from 2.3d to 1.4d. More patients were discharged with VTE prophylaxis prior to the standardized order sheet (3.2% vs 0.5% post July 2016).

**2a)** 9 patients (0.29%) experienced a VTE within the 90-days following their operation, with a median time to diagnosis of 21 days (3-40): 6 pulmonary embolisms, 2 portal vein thrombosis and 1 SMV thrombus

**2b)** Bleeding complications occurred in 112 patients (3.6%) with the median day to diagnosis being 2 days (0-39) – 51% of all bleeding events captured were classified as major bleeding events. Fifteen patients (0.48%) required re-operation for bleeding. Major bleeding complications resulted in a marked increase in hospital stay.

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