Evaluating Risk Factors to Develop Guidelines for Prophylactic Anticoagulation in Admitted Pregnant Patients

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Introduction

- The United States has the highest maternal mortality rate among developed nations, with cardiovascular events among the leading causes.
- Pregnancy increases the risk of venous thromboembolism (VTE) due to physiologic changes including hypercoagulability, venous stasis, vascular compression, and reduced mobility.
- VTE, defined as deep vein thrombosis (DVT; 75–80%) and pulmonary embolism (PE; 20–25%), remains a major cause of non-obstetric maternal morbidity and mortality.
- Prophylactic anticoagulation is used in high-risk patients, though no standardized antepartum protocol exists.
- Low molecular weight heparin (LMWH) is preferred because it does not cross the placenta, has predictable pharmacokinetics, fewer bleeding complications, and is easier to administer compared to unfractionated heparin.
- Prior studies support prophylactic LMWH in patients with risk factors such as prior VTE, thrombophilia, family history, or smoking. However, standardized VTE risk assessment is lacking.

Aims and Objectives

Aim I: Review charts of a subset of individuals who have experienced VTE in pregnancy or the antepartum period; looking for commonalities between these patients.

Aim II: Assess commonalities for markers that can serve as indications to risk stratify individuals that would benefit from using LMWH prophylactically in the antepartum period.

Objective:
Identify risk factors associated with antepartum venous thromboembolism (VTE) in admitted patients without a personal history of VTE and inform criteria for prophylactic anticoagulation in pregnancy.

Methods

A retrospective chart review was conducted of pregnant inpatients who developed VTE during hospitalization at Corewell Health William Beaumont University Hospital from 2016-2019. Data included demographics, obstetric history, and relevant comorbidities. Risk factors were evaluated independently and compared to age and BMI matched controls from all deliveries during the same timeframe using t-tests, Wilcoxon rank-sum, and Fischer's Exact tests.

Results

Among 38,512 pregnant patients, 39 (0.001%) developed VTE during inpatient admission. Analysis revealed patients with VTE had a higher BMI (33 vs 30.8, $p < 0.05$), history of thrombophilia (22% vs 0%, $p < 0.01$), sickle cell disease (7.9% vs 0.7%, $p < 0.01$), multiple gestation (7.7% vs 0.2%, $p < 0.01$), and hyperemesis gravidarum (15.8% vs 0.1%, $p < 0.01$). (Table 1)
In a 2:1 matched analysis by age and BMI, thrombophilia (22.9% vs 0%, $p < 0.01$), sickle cell disease (8.3% vs 0%, $p < 0.05$), and hyperemesis gravidarum (13.9% vs 0%, $p < 0.01$) remained significant. VTE patients were also more likely to be African American (42.9% vs 16.9%, $p < 0.01$) or non-Caucasian and non-Asian (other) (17.1% vs 4.2%, $p < 0.01$). (Table 2)

Table 1: Comparison of All Inpatient Antepartum Patients

	Non-VTE N= 38473 (99.9%)	VTE N=38 (0.001%)	P value
Age Mean (±SD)	29.9 (5.38)	31.3 (5.31)	0.12
BMI Mean (IQR)	30.9 (27.5-35.4)	33.0 (29.1-43.1)	0.02
Race, N (%)			
American Indian or Alaskan Native	101 (0.3%)	0 (0.0%)	
Asian	2142 (5.6%)	0 (0.0%)	
Black or African American	6168 (16.1%)	16 (42.1%)	
Multi Racial	12 (0.0%)	0 (0.0%)	
Native Hawaiian/Pacific Islander	38 (0.1%)	0 (0.0%)	
Other	3005 (7.9%)	6 (15.8%)	
White or Caucasian	26811 (70.0%)	16 (42.1%)	
Hyperemesis, N (%)	48 (0.1%)	6 (15.8%)	< 0.01
Thrombophilia, N (%)	3 (0.0%)	8 (21.6%)	< 0.01
Sickle Cell Disease, N (%)	255 (0.7%)	3 (7.9%)	< 0.01
Multiple Gestation, N (%)	72 (0.2%)	3 (7.7%)	< 0.01

Table 2: Age and BMI Matched Data of Inpatient Antepartum VTE Events

	Non-VTE N=72	VTE N=36	P value
Race, N (%)			
Asian	7 (9.9%)	0	< 0.01
Black or African American	12 (16.9%)	15 (42.9%)	< 0.01
Other	3 (4.2%)	6 (17.1%)	< 0.01
White or Caucasian	49 (69.0%)	14 (40.0%)	< 0.01
Hyperemesis, N (%)	0	5 (13.9%)	< 0.01
Thrombophilia, N (%)	0	8 (22.9%)	< 0.01
Sickle Cell Disease, N (%)	0	3 (8.3%)	< 0.05
Multiple Gestation, N (%)	1 (1.4%)	3 (8.3%)	0.11

Conclusions

Thrombophilia, sickle cell disease, hyperemesis gravidarum, elevated BMI, and non-Caucasian and non-Asian race are potential risk factors for antepartum VTE during hospital admission. These findings support consideration of routine prophylactic anticoagulation in hospitalized pregnant patients without personal VTE history who exhibit these risk factors.
Larger prospective studies are needed to validate these associations and develop guidelines for antepartum inpatient thromboprophylaxis.

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