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Inpatient Thromboprophylaxis in Pregnancy and Postpartum

Obstetric Consensus Conference

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INTRODUCTION AND BACKGROUND

Venous thromboembolic events (VTE) are among the top three causes of maternal death in developed countries and prevention with thromboprophylaxis has been identified as the most readily implementable means of reducing maternal mortality from VTE. The frequency of VTE in pregnancy is approximately 1 in 1200 deliveries, with the incidence of deep venous thrombosis (DVT) being 3-fold more common than pulmonary embolus[1-3]. The highest risk time for thrombotic events is postpartum, when the risk of VTE is five times higher than during pregnancy. In 2006-2010, thrombotic pulmonary embolism accounted for 9.3% of pregnancy-related deaths in the United States[3]. Despite increasing mechanical prophylaxis after cesarean delivery, obstetric VTE in the United States increased 72% during hospitalizations for childbirth between 1998-2009[4]. There is evidence that broader treatment with pharmacologic thromboprophylaxis may decrease maternal mortality from VTE[5].

This consensus strives to generate practice guidelines for hospital antepartum and postpartum services, reviewing indications for inpatient pharmacologic prophylaxis against thromboembolism.

This review will focus on patients typically considered low or moderate risk for peripartum VTE. This is the group of patients for whom guidelines vary significantly amongst national and international societies and organizations. This review does not focus on thromboprophylaxis in high risk patients who meet clear qualifications for antepartum or postpartum pharmacologic thromboprophylaxis or therapy based on current guidelines from the American College of Obstetricians and Gynecologists[6] (i.e., those with a personal history of VTE, those with diagnosed thrombophilias, or those already on long-term anticoagulation). This consensus document also will not discuss outpatient thromboprophylaxis during pregnancy.

Important publications regarding the risk of VTE in pregnancy and the postpartum period include the 2012 Chest Guidelines from the American College of Chest Physicians (ACCP)[7], the 2018 American College of Obstetricians and Gynecologists (ACOG) Practice Bulletin on “Thromboembolism in Pregnancy,”[8] and the 2015 Royal College of Obstetricians and Gynecologists (RCOG) guidelines[5]. All three publications emphasize the importance of identifying and treating those patients at risk for VTE. However, recommendations from these societies regarding which patients to treat, and how to treat them, differ substantially and are generally nonspecific, thus leading to a lack of consensus. These society recommendations have been synthesized by several entities including: the National Partnership for Maternal Safety (NPMS)[9] and the California Maternal Quality Care Collaborative (CMQCC)[10]. Acknowledging the significant variation in United States and international obstetric VTE prevention guidelines, this consensus summary strives to follow the ACOG recommendation for “each facility to review the risk assessment protocols available and adopt and implement one of them in a systematic way to reduce the incidence of VTE in pregnancy and the postpartum period. In the absence of clear, randomized, controlled trial evidence, practitioners can rely on consensus-derived clinical practice guidelines.” [8]

INPATIENT ANTEPARTUM RECOMMENDATIONS

IDENTIFICATION OF VTE RISK FACTORS

Identification of patients who are at increased risk for VTE is the initial step for prevention of an event. Numerous maternal medical conditions increase the risk for antepartum VTE. Table 1 provides a list of risk factors for VTE in pregnancy as determined from multiple case-control or cross-section studies[11].

Table 1: Antepartum Clinical Risk Factors for VTE[11]

Risk Factor	Adjusted OR (95% CI)
Maternal cardiac disease	7.1 (6.2-8.3)
Systemic Lupus Erythematosus	8.7 (5.8-13.0)
Sickle cell disease	6.7 (4.4-10.0)
Anemia	2.6 (2.2-2.9)
Diabetes	2.0 (1.4-2.7)
Hypertension	1.8 (1.4-2.3)
Obesity (pre-pregnancy BMI >30 kg/m^2)	5.3 (2.1-13.5)
Immobility (strict bedrest ≥1 week in the antepartum period) with pre-pregnancy ≥BMI 25 kg/m^2	62.3 (11.5-337.0)
Immobility (strict bedrest ≥1 week in the antepartum period) with pre-pregnancy <BMI 25 kg/m^2	7.7 (3.2-19.0)
Multiple gestation	4.2 (1.8-9.7)
Smoking (10-30 cigarettes/day prior to or during pregnancy)	2.1 (1.3-2.4)
Poor weight gain <7 kg	1.7 (1.1-2.6)
Increased weight gain >21 kg (vs. 7-21 kg)	1.6 (1.1-2.6)
Assisted reproductive techniques	1.8 (1.4-2.3)
Antepartum hemorrhage	2.3 (1.8-2.8)

When considering the VTE risk factors listed above in Table 1, several societies have utilized point-based risk stratification models to identify individuals who should receive VTE prophylaxis. The Padua score (Table 2) is supported by the ACCP, while the NPMS VTE Safety Bundle proposes the use of a modified Padua risk assessment model for pregnancy. In the Padua model, a score of ≥ 4 is considered high risk and warrants pharmacologic thromboprophylaxis for hospitalized patients. Importantly, *inpatient hospitalization for ≥ 3 days in a pregnant patient alone results in a score of 4,* thus recommending pharmacologic prophylaxis for any antepartum patient admitted for at least 72 hours. Alternatively, the RCOG uses a more complex scoring system with 27 individual criteria to assess antenatal VTE risk factors, which leads to a much higher rate of pharmacologic thromboprophylaxis than traditionally used in the United States.

Table 2. Modified Padua Risk Assessment Model for Pregnancy**

Previous venous thromboembolism	3
Reduced mobility (≥ 3 days inpatient)	3
Thrombophilia*	3
Acute infection / Rheumatologic disorder	1
Overweight or obese (BMI >25)	1
Pregnancy	1

* Antithrombin deficiency, Protein C or S deficiency, factor V Leiden, G20210A prothrombin gene mutation, antiphospholipid antibody syndrome.

**Source: Steven L. Clark, NPMS VTE bundle; modified to include conditions commonly encountered in obstetric patients.

ACOG does not directly address antepartum inpatient pharmacologic thromboprophylaxis for patients without a known thrombophilia or prior VTE. The recent 2018 ACOG Practice Bulletin 196 discusses the RCOG risk stratification strategy, the ACCP 2012 guidelines, as well as the NRMP recommendations which predominantly merge RCOG and ACCP recommendations. ACOG generally states that "no widely accepted scoring system has been prospectively validated in the obstetric population, [thus] thromboprophylaxis should be individualized according to patient risk factors." ACOG does not elaborate further regarding specific recommendations.

CMQCC highlights two recent large cohort studies evaluating VTE risk among hospitalized antepartum patients[12,13]. These studies found that VTE risk was highest for patients hospitalized > 3 days, resulting in a 12-18-fold increased risk of VTE. Antepartum admission for 1-3 days was associated with a 4-fold increase in antepartum VTE risk. Both the CMQCC as well as the NPMS VTE Safety Bundle recommend pharmacologic thromboprophylaxis for all antepartum patients hospitalized > 72 hours.

All society recommendations, as well as NMPS and CMQCC, support ambulation for antepartum hospitalized patients. Multiple studies have demonstrated no advantage for strict bedrest for many common obstetric complications resulting in antepartum hospital admission[14-16]. Additionally mechanical prophylaxis with sequential compression devices is well supported across societies.

Balancing the recommendations of ACOG, ACCP, RCOG, the NPMS VTE Safety Bundle and the CMQCC VTE Toolkit, **we recommend pharmacologic prophylaxis for ALL antepartum patients who are hospitalized for > 72 hours. Patients who qualify for immediate pharmacologic thromboprophylaxis upon admission include: all obese patients with a BMI ≥ 40kg/m^2, and patients with significant underlying maternal prothrombotic medical issues** (ex. lupus, sickle cell, heart disease). Significant maternal medical comorbidities should be co-managed with a Maternal Fetal Medicine specialist. In compliance with The Joint Commission[17], an initial decision about thromboprophylaxis should be made within the first 24 hours of admission.

Table 3. Candidates for Antepartum VTE Pharmacologic Thromboprophylaxis

All antepartum patients hospitalized for >72 hours
Obesity with BMI ≥ 40kg/m^2
Significant underlying maternal prothrombotic medical issues*

* Significant maternal medical comorbidities should be managed in coordination with a Maternal Fetal Medicine specialist

At UW Medicine, the average antepartum total length of stay for patients admitted and discharged undelivered is 4.8 days (admissions from July 2017 – June 2019).

High risk patients with inherited thombophilias or prior VTE should be managed according to ACOG Practice Bulletins 196 and 197[6,8].

Mechanical prophylaxis with sequential compression devices should be initiated on admission for all antepartum hospitalized patients not on pharmacologic thromboprophylaxis. When making a decision about initiating pharmacologic thromboprophylaxis, clinical judgement should always be used on an individual case-by-case basis. **For patients at risk for imminent delivery, or patients at high risk for bleeding (ex. bleeding previa, abruption, invasive placentation), pharmacologic thromboprophylaxis should be held.** Providers may reassess risk of delivery or bleeding for those patients who remain hospitalized to determine using their best clinical judgement when pharmacologic thromboprophylaxis can be initiated.

ANTEPARTUM MEDICATION CHOICE AND DOSING: ANESTHESIA CONSIDERATIONS

An important consideration for all antepartum patients is the risk of delivery and need for neuraxial anesthesia with spinal and/or epidural anesthesia. The University of Washington Department of Anesthesia has institutional guidelines regarding management of antithrombotic therapy for neuraxial procedures. While low molecular weight heparins (LMWH), such as enoxaparin and dalteparin, and unfractionated heparin (UFH) are safe in pregnancy and do not cross the placenta[8], the risk of delivery and potential need for neuraxial anesthesia for any obstetric patient alters pharmacologic thromboprophylaxis options that are typically available for the non-pregnant population. UFH has a short half-life of 1.2 hours and is reversible with protamine. Enoxaparin has a longer half-life of 5-7 hours, and is non-reversible. UW Medicine anesthesia guidelines place no time restriction on placement or removal of neuraxial anesthesia for patients receiving **UFH 5,000 units subcutaneously every 8-12 hours**, making this the treatment of choice for antepartum patients who may require neuraxial anesthesia or surgical delivery (Table 4). NPMS guidelines suggest UFH 5,000 units every 12 hours for VTE prophylaxis in patients who qualify for pharmacologic thromboprophylaxis antepartum. At this dose, NMPS provides similar anesthesia guidelines with no contraindication to timing of last UFH dose and neuraxial anesthesia for doses of ≤ 10,000 units/day. Of note, UW Medicine institutional guidelines and NMPS guidelines on timing of neuraxial anesthesia differ slightly from the Society of Obstetric Anesthesia and Perinatology (SOAP) guidelines[18] which recommend a delay in neuraxial anesthesia until 4-6 hours after the last 5,000 unit UFH dose or until normal coagulation studies if within 4-6 hours from last UFH dose. Therefore institutions whose anesthesia practice patterns differ from UW Medicine may need to address these differences when applying recommendations for antepartum pharmacologic thromboprophylaxis.

Table 4. UW Medicine Regional Anesthesia and Timing of Antithrombotic Prophylaxis

Medication	Minimum time between last dose and neuraxial injection or catheter placement
UFH 5,000u SQ q8h or q12h	**No restriction**
UFH 7,500 SQ q8h	12 hours
Enoxaparin 40mg SQ daily Enoxaparin 30-40mg SQ q12h Dalteparin 5,000u SQ daily	12 hours if CrCl ≥30mL/min* 24 hours if CrCl <30mL/min*

* *An exception* to this would be normal aPTT or undetectable anti-Xa
Source: http://depts.washington.edu/anticoag/home/sites/default/files/Management%20of%20Antithrombotic%20Therapy%20for%20Neuraxial%20and%20Peripheral%20Nerve%20Procedures.pdf

We do not recommend an increased dose for obese women given the risk of delivery and potential need for neuraxial anesthesia in all antepartum patients. Planning is fundamental in assessing patients who are eligible for antepartum pharmacologic thromboprophylaxis, and we recommend that all patients are evaluated by anesthesia. Further, in concordance with NPMS recommendations, **patients on UFH for >4 days should have a complete blood count (CBC) drawn to exclude heparin induced thrombocytopenia (HIT)[9]**. Patient education materials may be beneficial to assist patients in understanding the recommendation for subcutaneous injections 2-3 times per day.

For hospitals that use standardized order sets, placement of the VTE screening and action plan into the antepartum admission order set can improve compliance with pharmacologic thromboprophylaxis administration, as well as CBC collection after 4 days of heparin administration.

INPATIENT POSTPARTUM RECOMMENDATIONS

IDENTIFICATION OF VTE RISK FACTORS

The risk of VTE is greatest in the weeks immediately after delivery[8]. It is during this critical time period that all patients should be reassessed for VTE thromboprophylaxis. Some patients who may not qualify for pharmacologic thromboprophylaxis before delivery may meet criteria for postpartum prophylaxis. As in the antepartum period, numerous risk factors have been identified with increased odds of VTE during the postpartum period. These are listed in Table 5. Given the additive effect of surgery on VTE risk, we will address postpartum recommendations after vaginal and cesarean delivery separately, followed by medication choice and dosing.

Table 5. Postpartum Clinical Risk factors for VTE[11]

Risk factor	Adjusted OR (95%CI)
Postpartum infection following vaginal delivery (clinical signs/symptoms with fever and elevated white blood cell count)	20.2 (6.4-63.5)
Postpartum infection following cesarean section (clinical signs/symptoms with fever and elevated white blood cell count)	6.2 (2.4-16.2)
Postpartum hemorrhage ≥ 1000 mL with surgery (curettage, evacuation of hematoma, or re-operation after cesarean section)	12.0 (3.9-36.9)
Postpartum hemorrhage > 1000 mL with no surgery	4.1 (2.3–7.3)
Immobility with pre-pregnancy BMI ≥ 25 kg/m2 (strict bedrest for ≥ 1 week in the antepartum period)	40.1 (8.0-201.5)
Immobility with pre-pregnancy BMI < 25 kg/m2 (strict bedrest for ≥ 1 week in the antepartum period)	10.8 (4.0-28.8)
Obesity (pre-pregnancy BMI >30 kg/m^2)	5.3 (2.1-13.5)
Blood transfusion	7.6 (6.2-9.4)
Pre-eclampsia	3.1 (1.8-5.3)
Pre-eclampsia with fetal growth restriction	5.8 (2.1-16.0)
Fetal growth restriction (gestational age + sex-adjusted birth weight <2.5th percentile)	3.8 (1.4-10.2)
Smoking (5-9 cigarettes/day prior to or during pregnancy)	2.0 (1.1-3.7)
Smoking (10-30 cigarettes/day prior to or during pregnancy)	3.4 (2.0-4.4)
Hyperemesis	2.5 (2.0-3.2)
Maternal cardiac disease	7.1 (6.2-8.3)
Systemic Lupus Erythematosus	8.7 (5.8-13.0)
Sickle cell disease	6.7 (4.4-10.0)
Anemia	2.6 (2.2-2.9)
Diabetes	2.0 (1.4-2.7)
Multiple gestation	4.2 (1.8-9.7)

AFTER VAGINAL DELIVERY

We recommend continuing inpatient anticoagulation in all women who were receiving it antepartum, as these women are at the highest risk for VTE, with further elevation in VTE risk postpartum.

As above in antepartum recommendations, the risk of VTE is significantly elevated after 72 hours of hospital admission so as to warrant antepartum pharmacologic thromboprophylaxis for all patients with extended hospitalization beyond 3 days. Thus, **we similarly recommend universal VTE pharmacologic thromboprophylaxis for ALL postpartum patients who have a prolonged postpartum stay lasting > 72 hours.** If there is elevated risk of bleeding postpartum at the 72-hour time, clinical judgement should be used regarding initiation of VTE thromboprophylaxis, with frequent re-assessment regarding when safe administration can occur.

Patients who fall into the above 2 categories represent a small proportion of overall deliveries on Labor and Delivery units. The majority of patients who experience a vaginal delivery are individuals who were not hospitalized antepartum, nor on antepartum pharmacologic thromboprophylaxis, and have a postpartum stay of <72 hours. As an example, for admissions resulting in delivery at UW Medical Center, the average postpartum length of stay after vaginal delivery was 1.4 days for the time period August 2017 – July 2019. Average antepartum stay prior to vaginal delivery was 1.0 days, making average total length of stay for vaginal delivery patients 2.4 days. For this group of patients, we again turn to ACCP risk factors in Table 5, as well as CMQCC and NRMP recommendations to guide management. NPMS recommends using the Padua score for patients postpartum after vaginal delivery; recommending enoxaparin or UFH for any women with a Padua score ≥ 4. CMQCC recommends pharmacologic thromboprophylaxis for patients postpartum after vaginal delivery with a BMI ≥ 40kg/m^2 plus an additional VTE risk factor, such as a thrombophilia. ACOG does not directly address inpatient pharmacologic thromboprophylaxis after vaginal deliveries for patients without a known thrombophilia.

Combining ACCP, NPMS and CMQCC guidelines, **we recommend the following for post-vaginal delivery patients who were not previously on antepartum prophylaxis and with postpartum hospital stay < 72 hours: obesity defined as BMI ≥ 40kg/m^2 + at least 1 additional major VTE risk factor (Table 6)**.

Table 6: Candidates for VTE Pharmacologic Thromboprophylaxis after Vaginal Delivery**

All patients receiving antepartum VTE pharmacologic thromboprophylaxis
All patients hospitalized for >72 hours postpartum
Patients with obesity (BMI ≥40kg/m^2) + at least 1 additional major VTE risk factor: Postpartum hemorrhage >1000cc Blood transfusion Postpartum infection Preeclampsia with severe features Multiple gestation Maternal prothrombotic medical comorbidities (ex. lupus, sickle cell, heart disease)*

* Significant maternal medical comorbidities should be managed in coordination with a Maternal Fetal Medicine specialist
** A postpartum CBC is not required prior to starting pharmacologic thromboprophylaxis. The decision to obtain a CBC in the setting of a postpartum hemorrhage is at the discretion of the provider.

The above major VTE risk factors were determined from multiple case-control or cross-section studies listed in Table 5, with an OR of >4 for postpartum VTE. High risk patients with inherited thombophilias or prior VTE should be managed according to ACOG Practice Bulletins 196 and 197[6,8].

For hospitals that use standardized order sets, placement of the VTE screening and action plan into the postpartum order set can improve compliance with pharmacologic thromboprophylaxis administration.

AFTER CESAREAN DELIVERY

Cesarean delivery approximately quadruples with risk of VTE when compared to vaginal delivery[8]. Given this increased surgical risk, ACOG recommends placement of pneumatic sequential compression devices (SCDs) before delivery, which should continue postpartum until the patient is ambulatory. Early ambulation post-cesarean is recommended. Beyond SCDs, ACOG does not provide specific recommendations for post-cesarean pharmacologic thromboprophylaxis in patients without a known thrombophilia or prior VTE.

CMQCC uses the ACCP VTE risk factors and odds ratios listed in Table 5 to define major and minor postpartum VTE risk factors. They recommend SCDs for all post-cesarean patients, with addition of pharmacologic thromboprophylaxis for patients with 1 major or 2 minor risk factors. While this strategy uses evidence-based odds ratios to risk stratify patients into low, medium and high risks groups, the long list of minor and major postpartum risk factors which providers would need to reference may present a barrier to implementing these guidelines.

NPMS acknowledges the challenges of appropriately risk stratifying patients, as well as lack of compliance with mechanical compression with SCDs. Literature has demonstrated that compliance with mechanical prophylaxis is low once patients are out of recovery, with only 52% of post-cesarean patients wearing SCDs as prescribed[19]. NPMS states that "given the challenges in consistently identifying women with risk factors and issues related to poor compliance with mechanical devices, hospitals may choose a strategy in which all women undergoing cesarean birth receive postoperative [pharmacologic] thromboprophylaxis with unfractionated or low-molecular-weight heparin unless there is a specific contraindication. This approach is consistent with the RCOG recommendations."

Given the acuity of our Labor and Delivery unit at UW Medicine with many patients having identified risk factors for postpartum VTE, as well as taking into account the NPMS and RCOG guidelines for post-cesarean patients, **we recommend universal inpatient pharmacologic thromboprophylaxis after cesarean delivery for all patients without clinical contraindications to anticoagulation.** Clinical judgement should always be used on an individual case-by-case basis. For patients with ongoing risk of bleeding postpartum, providers may hold postpartum VTE pharmacologic thromboprophylaxis and reassess using their best clinical judgement when pharmacologic thromboprophylaxis can be safely initiated. High risk patients with inherited thombophilias or prior VTE should be managed according to ACOG Practice Bulletins 196 and 197[6,8].

All patients undergoing cesarean delivery should have SCDs placed at the time of surgery, prior to induction of anesthesia. SCDs should remain in place postoperatively until patient is ambulatory.

For admissions resulting in delivery at UW Medical Center, the average postpartum length of stay after cesarean delivery was 2.7 days for the time period August 2017 – July 2019. Average antepartum stay prior to cesarean delivery was 2.4 days, making average total length of stay for cesarean delivery patients 5.1 days.

For hospitals that use standardized order sets, placement of the VTE screening and action plan into the postpartum cesarean delivery order set can improve compliance with pharmacologic thromboprophylaxis administration.

POSTPARTUM MEDICATION CHOICE, DOSING AND TIMING

All 5 organizations used in this consensus review support the use of LWMH or UFH for postpartum pharmacologic thromboprophylaxis medication choice.

Our preferred medication choice for postpartum pharmacologic VTE prophylaxis is LMWH due to ease of administration, with once daily dosing for patients with a BMI of < 40 kg/m^2 compared to UFH dosing 3 times daily. While UFH is preferred antepartum due to risk of delivery and neuraxial anesthesia, the postpartum period allows for broader use of irreversible LMWH. UW Medicine Anticoagulation Services provides the following guidelines on LMWH and UFH dosing in Table 7. For obese patients with a BMI >40kg/m^2, postpartum LMWH dosing should be increased to twice daily. The choice regarding use of enoxaparin, dalteparin, or UFH depends on institutional pharmacy formulary and clinical judgement of the provider regarding ongoing bleeding risk postpartum.

Table 7. Postpartum Heparin Dosing Recommendations

	Enoxaparin	Dalteparin	Unfractionated Heparin
BMI < 40 kg/m^2	40mg q24 hours*	5,000 units daily	5,000 units q8 hours
BMI ≥ 40 kg/m^2	40mg q12 hours*	Not recommended	5,000 units q8 hours

* Severe renal impairment with creatinine clearance < 30 = Enoxaparin 30mg daily

Source:http://depts.washington.edu/anticoag/home/sites/default/files/LMWH_Dosing_Recommendations_March_2013.pdf
http://depts.washington.edu/anticoag/home/sites/default/files/VTE%20Prophylaxis%20Guidelines%20by%20Clinical%20Group.pdf

Based on UW Medicine anesthesia guidelines, **we recommend that postpartum LMWH be started at least 4 hours following spinal injection / removal of epidural, but within 12 hours after delivery.**

If an epidural catheter is not removed immediately after delivery to augment postoperative pain control, pharmacologic thromboprophylaxis with UFH is preferred, in order to reduce the likelihood of errors in timing of catheter removal while on irreversible LMWH.

A post-operative CBC is *not* required prior to starting pharmacologic thromboprophylaxis.

Table 8. UW Postpartum Regional Anesthetic Contraindications to Timing of Pharmacologic Prophylaxis

Medication	While neuraxial catheter is IN PLACE or prior to catheter removal	After neuraxial procedure (Minimum time between neuraxial injection or catheter removal and anticoagulant dose)
UFH 5,000u SQ q8h or q12h	**No time restriction**	**No time restriction**
Enoxaparin 30-40mg SQ daily	May be given BUT: •Must wait 8 hours after catheter PLACEMENT before giving dose •Must wait 12 hours after last dose before REMOVING catheter	4 hours
Enoxaparin 40mg SQ q12 hours	**CONTRAINDICATED**	4 hours
Dalteparin 5,000u SQ daily	May be given BUT: •Must wait 8 hours after catheter PLACEMENT before giving dose •Must wait 12 hours after last dose before REMOVING catheter	4 hours

*Source:*http://depts.washington.edu/anticoag/home/sites/default/files/Management%20of%20Antithrombotic%20Therapy%20for%20Neuraxial%20and%20Peripheral%20Nerve%20Procedures.pdf

POSTPARTUM READMISSION

All patients who are admitted postpartum should have VTE risk specifically addressed in admission documentation and pharmacologic thromboprophylaxis utilized based on patient risk factors and mode of delivery.

SUMMARY OF RECOMMENDATIONS

Antepartum:

1) All patients should be encouraged to use SCDs while in bed if not meeting criteria for pharmacologic thromboprophylaxis.
2) In compliance with The Joint Commission[17], a decision about implementation of VTE thromboprophylaxis should be made within the first 24 hours of admission.
3) See Table 3. Patients with the following comorbidities should receive antepartum pharmacologic VTE thromboprophylaxis

Table 3. Candidates for Antepartum VTE Pharmacologic Thromboprophylaxis

All antepartum patients hospitalized for > 72 hours
Obesity with BMI ≥ 40kg/m^2
Significant underlying maternal prothrombotic medical issues*

* Significant maternal medical comorbidities should be managed in coordination with a Maternal Fetal Medicine specialist

4) High risk patients with inherited thombophilias or prior VTE should be managed according to ACOG Practice Bulletins 196 and 197[6,8.]
5) Recommended antepartum regimen: UFH 5,000u SQ q8-12 hours
    a. No weight-based increase for obese patients due to the risk of delivery and need for neuraxial anesthesia in all antepartum patients
    b. Based on UW Medicine anesthesia guidelines, there is no limitation on timing of neuraxial anesthesia for UFH 5,000u SQ q8-12 hours
6) If a patient is at risk for imminent delivery, or a patient is admitted with high risk for bleeding (ex vaginal bleeding, abruption, invasive placentation) pharmacologic thromboprophylaxis should be held, and the decision regarding timing of initiation is at the clinical discretion of the provider.
7) Patients on UFH > 4 days should have a CBC to exclude heparin induced thrombocytopenia

Postpartum after Vaginal Delivery:

1) See Table 6. Patients with the following comorbidities should receive pharmacologic thromboprophylaxis after vaginal delivery.
2) These guidelines do not replace clinical judgment of the providers; for patients at risk of ongoing postpartum bleeding, providers may hold postpartum pharmacologic thromboprophylaxis and reassess using their best clinical judgement when thromboprophylaxis can be safely initiated.
3) High risk patients with inherited thombophilias or prior VTE should be managed according to ACOG Practice Bulletins 196 and 197[6,8].
4) A postpartum CBC is not required prior to starting pharmacologic thromboprophylaxis. The decision to obtain a CBC in the setting of postpartum hemorrhage is at the discretion of the provider.

Table 6. Candidates for VTE Pharmacologic Thromboprophylaxis after Vaginal Delivery

All patients receiving antepartum pharmacologic thromboprophylaxis
All patients hospitalized for > 72 hours postpartum
Patients with obesity (BMI ≥ 40kg/m^2) + at least 1 additional major VTE risk factor: Postpartum hemorrhage > 1000cc Blood transfusion Postpartum infection Preeclampsia with severe features Multiple gestation Maternal prothrombotic medical comorbidities (lupus, sickle cell, heart disease)*

* Significant maternal medical comorbidities should be managed in coordination with a Maternal Fetal Medicine specialist

Postpartum after Cesarean Delivery:

1) All patients undergoing cesarean delivery should have SCDs placed at the time of surgery which should remain in place postoperatively until patient is ambulatory.
2) We recommend universal pharmacologic thromboprophylaxis for all post-cesarean patients.
3) These guidelines do not replace clinical judgment of the providers; for patients at risk of ongoing postoperative bleeding, providers may hold postpartum pharmacologic thromboprophylaxis and reassess using their best clinical judgement when thromboprophylaxis can be safely initiated.
4) High risk patients with inherited thombophilias or prior VTE should be managed according to ACOG Practice Bulletins 196 and 197[6,8].

Postpartum Medication Choice, Dosing and Timing:

1) The preferred medication choice for postpartum pharmacologic thromboprophylaxis is LMWH.
2) The choice regarding use of enoxaparin, dalteparin or UFH depends on institutional pharmacy formulary and clinical judgement of the provider regarding ongoing bleeding risk postpartum.
3) See Table 7 for weight-based dosing.

Table 7. Postpartum Heparin Dosing Recommendations

	Enoxaparin	**Dalteparin**	**Unfractionated Heparin**
BMI < 40 kg/m^2	40mg q24 hours*	5,000 units daily	5,000 units q8 hours
BMI ≥ 40 kg/m^2	40mg q12 hours*	Not recommended	5,000 units q8 hours

* Severe renal impairment with creatinine clearance < 30 = Enoxaparin 30mg daily

4) Postpartum LMWH should be started at least 4 hours following spinal injection / removal of epidural, but within 12 hours after delivery.
5) If an epidural catheter is not removed immediately after delivery in order to augment postoperative pain control, prophylactic anticoagulation with UFH is preferred, in order to reduce the likelihood of errors in timing of catheter removal while on irreversible LMWH.
6) A post-operative CBC is *not* required prior to starting anticoagulation.

DISCLAIMER

This consensus document is to be used as a guideline for practice management and does not replace provider clinical judgement. It is generated by expert review from the Department of Obstetrics and Gynecology, Division of Obstetric Anesthesia and Labor and Delivery Nursing.

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