Anticoagulation Kahoot

Brenda Shinar, MD, FACP

Question #1

A patient presents to the ED directly from the airport after a 12 hour flight from Australia to Phoenix. She is 39 years old and previously healthy. She developed chest pain and shortness of breath immediately after leaving the plane and paramedics were called.

She is afebrile, her blood pressure is 110/70, HR 101, RR 20, and 02 sat is 93% on 3 liter NC. Her BMI is 33, and she is in mild respiratory distress. Her lungs are CTA, heart is tachycardic and regular. Her legs are are symmetric and there is no edema.

You appropriately calculate a pre-test probability with a Modified Well's score.

What is the score?

A. 4 points; Low probability

B. 4.5 points; Intermediate probability

C. 6 points; High probability

D. 6 points; PE likely

Modified Well's Score Pre-Test Probability for PE

Modified Wells Score (3 tier)

- < 2 points: low risk
- 2-6 points: intermediate risk
- > 6 points: high risk

Simplified Score (2 tier)

- < 4 points: PE unlikely
- > 4 points: PE likely

Clinical signs and symptoms of DVT	**No 0**	Yes +3
PE is #1 diagnosis OR equally likely	No 0	**Yes +3**
Heart rate > 100	No 0	**Yes +1.5**
Immobilization at least 3 days OR surgery in the previous 4 weeks	**No 0**	Yes +1.5
Previous, objectively diagnosed PE or DVT	**No 0**	Yes +1.5
Hemoptysis	**No 0**	Yes +1
Malignancy w/ treatment within 6 months or palliative	**No 0**	Yes +1

4.5 points

Moderate risk group: 16.2% chance of PE in an ED population.

Another study assigned scores ≤ 4 as "PE Unlikely" and had a 3% incidence of PE.

Another study assigned scores > 4 as "PE Likely" and had a 28% incidence of PE.

Question #2

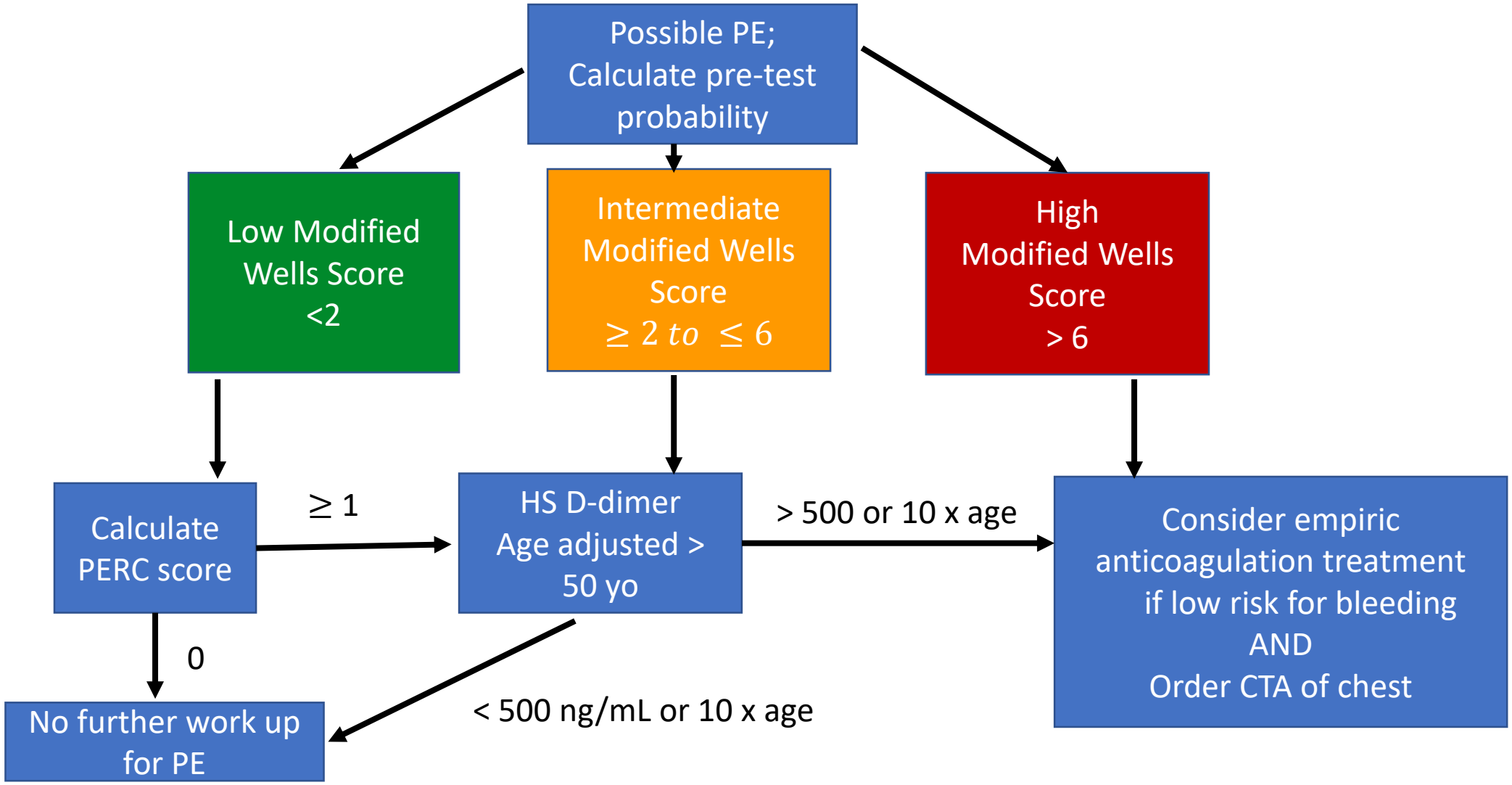
You determine your patient's Modified Well's score, which is 4.5 points.

Your medical student asks you what the most appropriate next step is for the patient's evaluation.

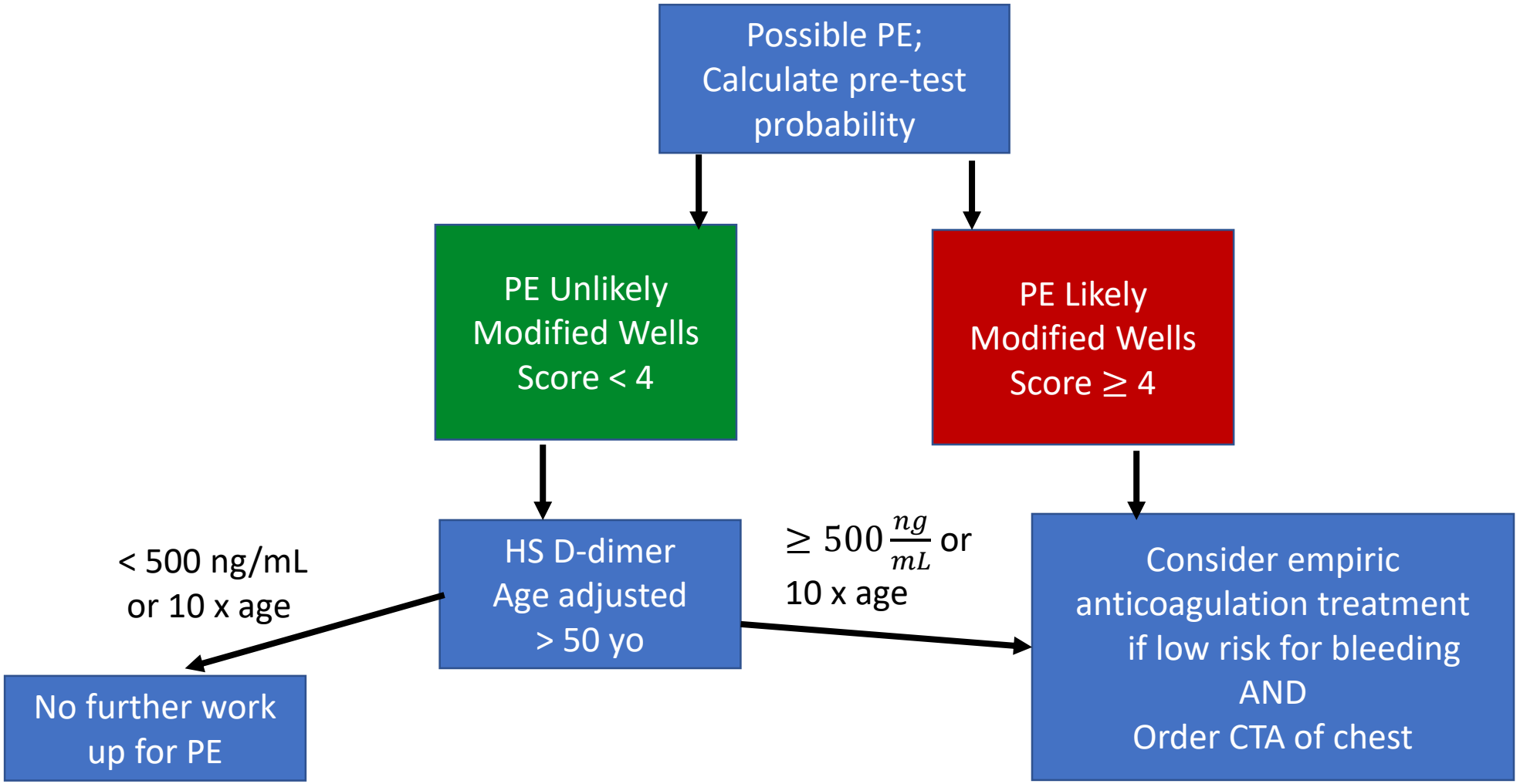
This is most appropriate next step for this patient.

A. Calculate a PERC score
B. Order a high sensitivity d-dimer
C. Order a CT angiogram of the chest
D. Order an age-adjusted d-dimer

Three Tier Decision for PE



Two Tier Decision for PE*



Question #3

A 54 year-old man undergoes follow up for DVT after a left hip replacement 2 months ago. He is feeling well, swelling is improved, and he has no pain. His only medication is rivaroxaban.

On physical exam, vital signs are normal. The PE is unremarkable.

Which of the following is the most appropriate management?

A. Completion of 3-month course of anticoagulation

B. D-dimer measurement

C. Extended anticoagulation

D. Thrombophilia evaluation

Duration of Anticoagulation Therapy

- All provoked VTE events should be treated with anticoagulation for 3 months.
- ANY further anticoagulation that is given *after* 3 months is done to prevent recurrent clot.
- All Extended Therapy AC should be assessed annually for risk/benefit ratio for bleeding

Chest Guidelines, February 2016; 149#2

Question #4

Your medical student is very bright and is able to tell you many of the risk factors for VTE, according to Virchow's triad of stasis, hypercoagulability, and endothelial disruption.

You explain to him that most provoked VTEs do not require extended anticoagulation even though they vary in their risk for recurrence.

Which of the following risk factors for an initial VTE has the LOWEST risk of recurrent VTE following cessation of anticoagulation?

A. Surgery
B. A long airplane flight (> 8 hr)
C. Estrogen therapy
D. Cancer

Risk of VTE Recurrence in the 5 years After Anticoagulation Cessation

- Surgery: < 3%
- NON- surgical risk: 15%
  - Estrogen
  - Pregnancy
  - Long travel
- Idiopathic (Unprovoked): 30%
- Cancer: 15% ***per year***

Question #5

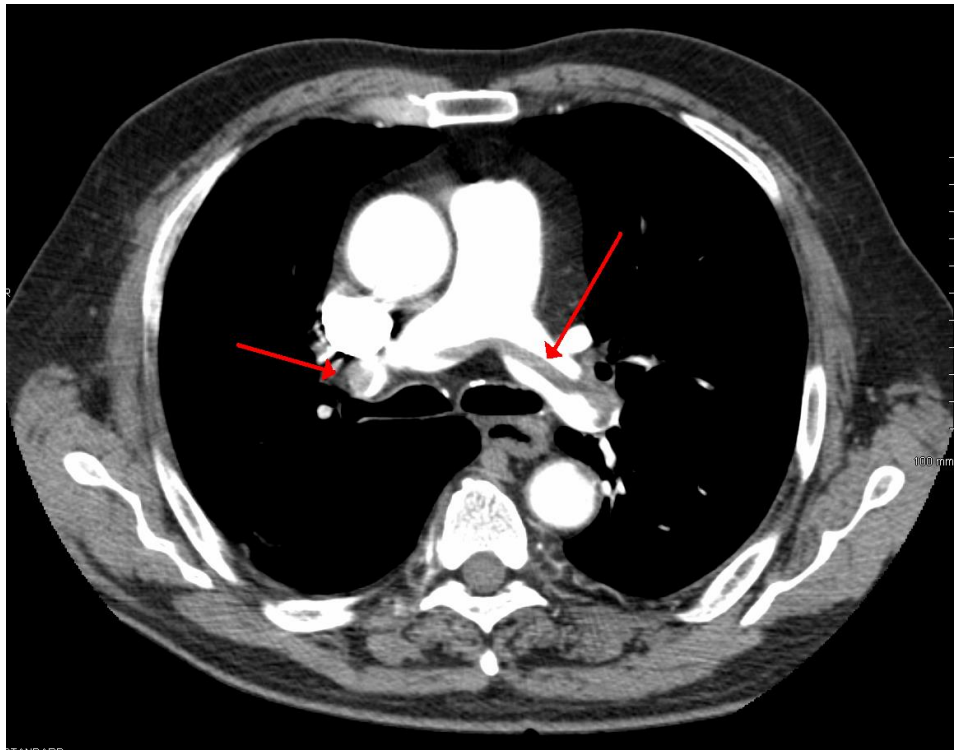
You are admitting a patient from the ED who was diagnosed with a pulmonary embolism. Although the patient requires supplemental oxygen at 2 liters, she is not experiencing any hemodynamic consequences of hypotension or right ventricular strain.

The patient is 75 years old and was recently diagnosed with rectal cancer and has started chemotherapy and radiation. She is 75 kg and her creatinine is at baseline at 1.2 mg/dL.(estimated GFR 44 mL/min) She has no liver dysfunction and appears well nourished.

Which of the following agents do you choose to start for her treatment of pulmonary embolism?

A. SQ Enoxaparin
B. PO Dabigatran
C. P0 Rivaroxaban
D. IV Heparin

Cancer Related VTE



- 20-30% of first time VTEs are associated with malignancy
- VTE is the second cause of death after the malignancy itself
- LMWH is treatment of choice for VTE in cancer patients for initial and long term treatment
- NCCN Guidelines recommends edoxaban for CAT (Level 1) (2018)
- International Society on Thrombosis and Hemostasis suggests edoxaban or rivaroxaban for acute VTE in cancer patients (June 2018)

Direct Oral Anticoagulant Drugs: On the Treatment of Cancer-Related Venous Thromboembolism and their Potential Anti-Neoplastic Effect: Cancers (Basel), 2019 Jan: 11(1) 46

Considerations for AC in Cancer Patients

- Oral agents difficult in patients with nausea and vomiting
- Drug interactions with P glycoprotein and cytochrome P450 3A4
- Beware of extremes of body weight and creatinine clearance
- Edoxaban and Rivaroxaban only DOACs studied in cancer patients compared to LMWH

Question # 6

A 55 year old woman was admitted to the hospital with the diagnosis of a brain mass with imaging features of a glioblastoma. Twenty-four hours after brain biopsy, the patient developed chest pain and dyspnea and an acute pulmonary embolism was diagnosed.

Blood pressure is 110/60 mm Hg, pulse is 100/min, respirations are 18/min, and oxygen saturation is 93% on 2 liters NC.

Serum creatinine is 1.7 mg/dL. (eGFR 29).

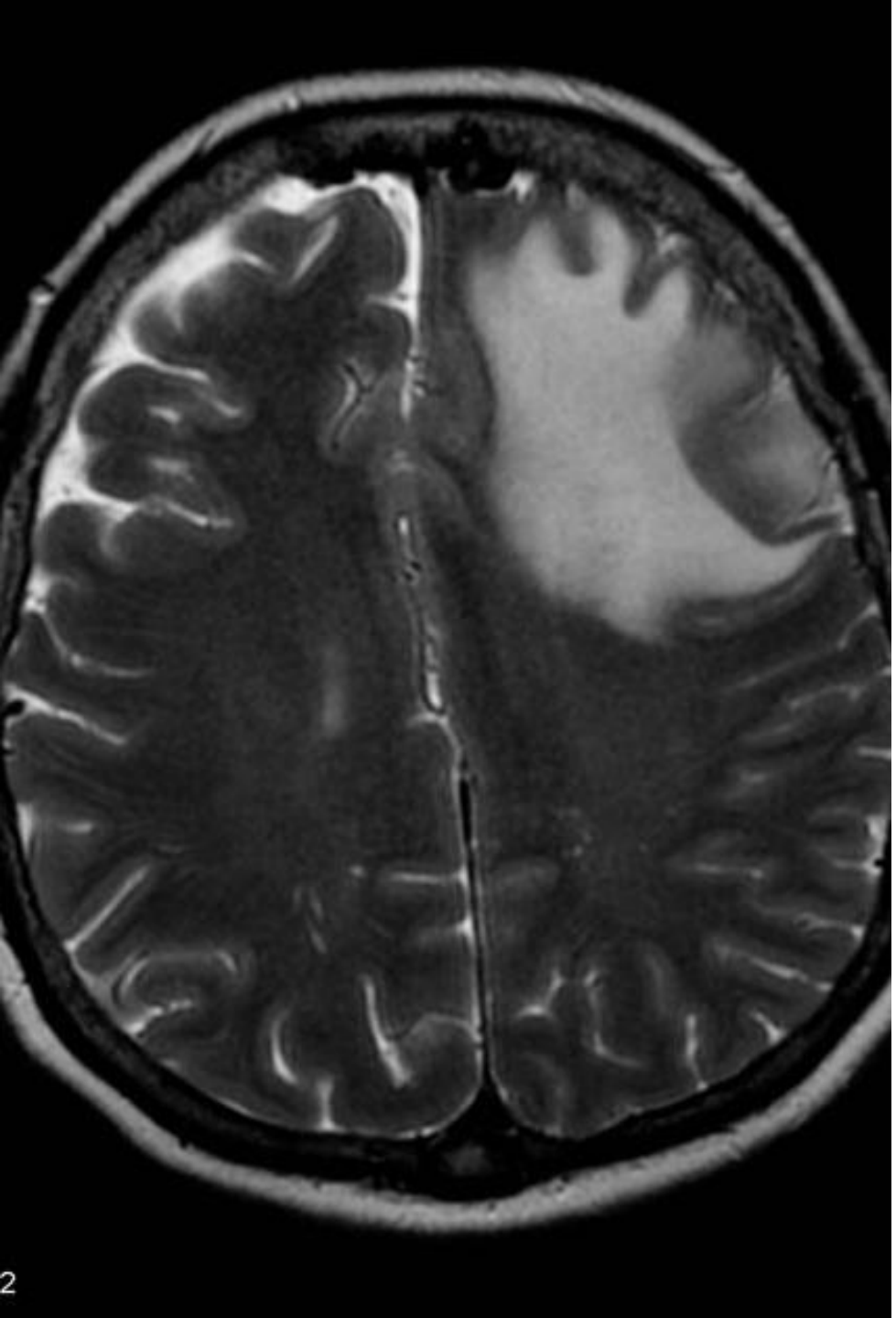
Which of the following is the most appropriate treatment?

A. Apixaban

B. Inferior vena cava placement

C. Intravenous alteplase

D. Intravenous heparin



Risk factors for VTE in patients with central nervous system tumors

- Age > 75
- Prolonged mobility or leg weakness
- Indwelling vascular catheter
- Prior VTE
- Glioblastoma multiforme
- Glioma > 5 cm
- Chemotherapy, hormonal or antiangiogenic agents
- Recurrent tumor
- Incomplete resection
- Immediate post resection period
- PHARMACOLOGIC + MECHANICAL PROPHYLAXIS INDICATED INPATIENT AS SOON AS POSSIBLE AFTER SURGERY

Question # 7

A 26-year-old man undergoes follow-up evaluation for a deep venous thrombosis diagnosed last week. He reports no travel, surgery, or immobilization. He has a sister who was diagnosed with an unprovoked DVT 1 year ago at age 35. Medical history is unremarkable. His only medication is rivaroxaban.

On physical examination, vital signs are normal. The examination is otherwise unremarkable.

The possibility of an inherited thrombophilia is discussed with the patient. After reviewing the risks and benefits of additional testing, he would like to be evaluated for a possible thrombophilia.

Which of the following is the ideal testing strategy?

A. Test now

B. Test in 2 months

C. Test a saved blood sample obtained during hospitalization but before anticoagulation

D. Temporarily stop rivaroxaban in 1 year and test 2 weeks later

Indications for a Hypercoagulable Workup

WHO

- Unprovoked VTE age≤ 45
- Thrombosis at unusual site
- Recurrent unprovoked VTE
- VTE with + family history
- Warfarin skin necrosis

WHAT

- Functional APC Resistance Assay
- Factor V Leiden
- Prothrombin G20210a mutation
- Protein C deficiency
- Protein S deficiency
- Antithrombin deficiency
- Antiphospholipid antibody (consider)
- JAK2 (consider)

Indications for a Hypercoagulable Workup

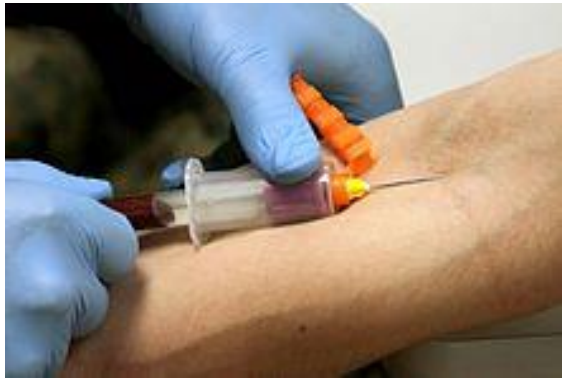
WHEN

- Testing should occur 2 weeks after discontinuation of anticoagulation

- Aspirin should be given to patients when extended duration anticoagulation is stopped

HOW LONG

- Duration of therapy for FIRST ***unprovoked*** clot
  - Low risk of bleed; extended therapy
  - High risk of bleed; 3 months therapy



Question #8

A 64-year-old man is evaluated in your clinic. He has hypertension and CAD and had a left circumflex stent placed 4 years ago. He is physically active and denies symptoms with exercise. His medication includes atorvastatin, lisinopril, metoprolol succinate, and aspirin.

On physical exam, BP is 120/75 mmHg, pulse is 72 and irregular. Respiratory rate is 16/min, and BMI is 22. The precordial cadence is irregularly irregular. The remainder of the exam is normal.

An ECG shows atrial fibrillation.

Which of the following is the most appropriate treatment?

A. No change in therapy

B. Add oral anticoagulation

C. Discontinue aspirin and begin clopidogrel and oral anticoagulation

D. Discontinue aspirin and begin oral anticoagulation

Atrial fibrillation with coexisting stable CAD

CHA(2)DS(2)-VASc Score

- Congestive Heart Failure (+1)
- Hypertension (+1)
- Age 65-74 (+1)
- Diabetes mellitus (+1)
- Stroke or TIA (+2)
- Vascular disease (MI, aortic, PAD) (+1)
- Age > 75 (+2)
- Sex Female (+1)

Recommendation for OAC

- Non-valvular afib
  - No moderate/severe mitral stenosis
  - No mechanical heart valve
- 2019 ACC/AHA guidelines
  - $\geq 2\ men\ or\ \geq 3\ women$
- ACCP guidelines
  - $\geq 1\ men\ or\ \geq 2\ women$

Atrial fibrillation coexisting CAD

- HAS-BLED SCORE $\geq$ 3 IS HIGH
  - Hypertension > 160
  - Renal disease Cr > 2.26
  - Liver disease
  - Stroke history
  - Prior major bleeding
  - Labile INR
  - Age > 65
  - Other medications with risk of bleeding

- Calculate risk/benefit ratio to anticoagulation when initiated and at least yearly thereafter
- Patients with co-existing CAD that is stable (> 12 months) can come off of antiplatelet agent and remain on OAC alone
- Patients with ACS who also need OAC can often be given “double therapy” rather than “triple therapy” to reduce risk of bleeding

Question #10

A 66-year-old man has just received an aortic valve replacement with a mechanical prosthesis. He is otherwise healthy and takes no medications.

On physical exam, vital signs are normal. There is a regular rhythm with a normal S1, a mechanical S2, and no murmurs. The remainder of the exam is normal.

Which of the following is the most appropriate antithrombotic therapy?

A. Apixaban
B. Dabigatran
C. Warfarin
D. Warfarin and aspirin
E. No anticoagulation required

11.2.2. Medical Therapy: Recommendations

Recommendations for Antithrombotic Therapy for Patients with Prosthetic Heart Valves

COR	LOE	Recommendations	Comment/Rationale
I	A	Anticoagulation with a VKA and INR monitoring is recommended in patients with a mechanical prosthetic valve.[178–183]	2014 recommendation remains current.
I	B	Anticoagulation with a VKA to achieve an INR of 2.5 is recommended for patients with a mechanical bileaflet or current-generation single-tilting disc AVR and no risk factors for thromboembolism.[178,184–186]	2014 recommendation remains current.
I	B	Anticoagulation with a VKA is indicated to achieve an INR of 3.0 in patients with a mechanical AVR and additional risk factors for thromboembolic events (AF, previous thromboembolism, LV dysfunction, or hypercoagulable conditions) or an older-generation mechanical AVR (such as ball-in-cage).[178]	2014 recommendation remains current.
I	B	Anticoagulation with a VKA is indicated to achieve an INR of 3.0 in patients with a mechanical MVR.[178,187,188]	2014 recommendation remains current.
I	A	Aspirin 75 mg to 100 mg daily is recommended in addition to anticoagulation with a VKA in patients with a mechanical valve prosthesis.[178,189,190]	2014 recommendation remains current.
IIa	B	Aspirin 75 mg to 100 mg per day is reasonable in all patients with a bioprosthetic aortic or mitral valve.[178,191–194]	2014 recommendation remains current.
IIa	B-NR	Anticoagulation with a VKA to achieve an INR of 2.5 is reasonable for at least 3 months and for as long as 6 months after surgical bioprosthetic MVR or AVR in patients at low risk of bleeding.[195–197]	**MODIFIED: LOE updated from C to B-NR.** Anticoagulation for all surgical tissue prostheses was combined into 1 recommendation, with extension of the duration of anticoagulation up to 6 months. Stroke risk and mortality rate are lower in patients who receive anticoagulation for up to 6 months after implantation of a tissue prosthesis than in those who have do not have anticoagulation. Anticoagulation for a tissue prosthesis is also supported by reports of valve thrombosis for patients undergoing bioprosthetic surgical AVR or MVR, a phenomenon that may be warfarin responsive.
See Online Data Supplement 6.			

ACC/AHA 2017 Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease

Question #9

A 55 year-old woman is evaluated before partial colectomy for recurrent episodes of diverticulitis. She has atrial fibrillation and hypertension. Medications are apixaban, hydrochlorothiazide, and metoprolol.

On PE, vitals are normal. BMI is 25. Cardiac exam is irregularly irregular and pulmonary exam is normal.

Labs reveal a creatinine of 1.0 mg/dL, an estimated GFR of 60 mL/min, and a hemoglobin of 13 g/dL.

When should this patient's anticoagulation therapy be discontinued prior to surgery?

A. 1 Day
B. 3 Days
C. 5 Days
D. 7 Days

Discontinuation of OAC for Elective Surgery

5 Questions to Ask

1. What is thrombotic risk of stopping anticoagulation?
2. What is bleeding risk of the procedure?
3. Can the anticoagulant be continued?
4. If not, what is the timing required due to pharmacokinetic drug properties?
5. Is bridging required?

Perioperative thrombotic risk

Risk stratum	Indication for anticoagulant therapy		
	Mechanical heart valve	**Atrial fibrillation**	**VTE**
Very high thrombotic risk*	Any mitral valve prosthesis Any caged-ball or tilting disc aortic valve prosthesis Recent (within six months) stroke or transient ischemic attack	CHA_2DS_2-VASc score of ≥6 (or $CHADS_2$ score of 5-6) Recent (within three months) stroke or transient ischemic attack Rheumatic valvular heart disease	Recent (within three months) VTE Severe thrombophilia (eg, deficiency of protein C, protein S, or antithrombin; antiphospholipid antibodies; multiple abnormalities)
High thrombotic risk	Bileaflet aortic valve prosthesis and one or more of the of following risk factors: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age >75 years	CHA_2DS_2-VASc score of 4-5 or $CHADS_2$ score of 3-4	VTE within the past 3 to 12 months Nonsevere thrombophilia (eg, heterozygous factor V Leiden or prothrombin gene mutation) Recurrent VTE Active cancer (treated within six months or palliative)
Moderate thrombotic risk	Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke	CHA_2DS_2-VASc score of 2-3 or $CHADS_2$ score of 0-2 (assuming no prior stroke or transient ischemic attack)	VTE >12 months previous and no other risk factors

Refer to UpToDate topics on perioperative anticoagulation management for details.

VTE: venous thromboembolism; $CHADS_2$: congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, and stroke or transient ischemic attack; CHA_2DS_2-VASc: congestive heart failure, hypertension, age ≥75 years (2 points), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (2 points), vascular disease (peripheral artery disease, myocardial infarction, or aortic plaque), age 65-74 years, sex category female.

* Very high-risk patients may also include those with a prior stroke or transient ischemic attack occurring >3 months before the planned surgery and a CHA_2DS_2-VASc score <6 (or $CHADS_2$ score <5), those with prior thromboembolism during temporary interruption of anticoagulation, or those undergoing certain types of surgery associated with an increased risk for stroke or other thromboembolism (eg, cardiac valve replacement, carotid endarterectomy, major vascular surgery).

Procedure Bleeding Risk

High Risk (2-4% major bleed in 48 hours)

- Any major operation > 45 minutes
- AAA repair / CABG/ Heart valve replacement
- Endoscopically guided FNA
- Kidney biopsy
- Foot/hand/shoulder surgery
- Hip /Knee Replacement
- Laminectomy
- Transurethral prostate resection
- Polypectomy, variceal treatment, biliary sphincterotomy, pneumatic dilatation
- Neurosurgical, Head and Neck, Abdomen, Breast Cancer Surgery
- Vascular and General Surgery

Low Risk (0-2% risk of major bleed in 48 hours)

- Abdominal hernia repair
- Abdominal hysterectomy
- Arthroscopic surgery < 45 minutes
- Axillary node dissection
- Bronchoscopy with or without biopsy
- Carpal tunnel surgery
- Cataract or Non-cataract eye surgery
- Central venous catheter removal
- Cholecystectomy
- Dilation and Curettage
- Hemorrhoid surgery
- Pacemaker and Cardiac defibrillator
- Tooth extractions

Perioperative management of oral direct thrombin inhibitors and factor Xa inhibitors

Anticoagulant	Renal function and dose	Interval between last dose and procedure NOTE: No anticoagulant is administered the day of the procedure		Resumption after procedure	
		High bleeding risk	Low bleeding risk	High bleeding risk	Low bleeding risk
Dabigatran	CrCl >50 mL/minute Dose 150 mg twice daily	Give last dose three days before procedure (ie, skip four doses on the two days before the procedure)	Give last dose two days before procedure (ie, skip two doses on the day before the procedure)	Resume 48 to 72 hours after surgery (ie, postoperative day 2 to 3)	Resume 24 hours after surgery (ie, postoperative day 1)
	CrCl 30 to 50 mL/minute Dose 150 mg twice daily	Give last dose five days before procedure (ie, skip eight doses on the four days before the procedure)	Give last dose three days before procedure (ie, skip four doses on the two days before the procedure)		
Rivaroxaban	CrCl >50 mL/minute Dose 20 mg once daily	Give last dose three days before procedure (ie, skip two doses on the two days before the procedure)	Give last dose two days before procedure (ie, skip one dose on the day before the procedure)		
	CrCl 30 to 50 mL/minute Dose 15 mg once daily				
Apixaban	CrCl >50 mL/minute Dose 5 mg twice daily	Give last dose three days before procedure (ie, skip four doses on the two days before the procedure)	Give last dose two days before procedure (ie, skip two doses on the day before the procedure)		
	CrCl ≤50 mL/minute Dose 2.5 mg twice daily				
Edoxaban	CrCl 51 to 95 mL/minute Dose 60 mg once daily	Give the last dose three days before the procedure (ie, skip two doses on the two days before the procedure)	Give the last dose two days before the procedure (ie, skip one dose on the day before the procedure)		
	CrCl ≤50 mL/minute* Dose 30 mg once daily				

Bleeding risk is determined primarily by the type of surgery; patient comorbidities may also play a role. In patients undergoing neuraxial anesthesia or a very high bleeding risk

Question #10

A 58-year-old man is seen for preoperative evaluation for an elective hernia repair in 1 week. He has never had a stroke or TIA. PMH is significant for an aortic valve replacement with bileaflet mechanical valve performed 3 years ago for bicuspid valve with aortic stenosis. Medications are warfarin and low dose aspirin.

On PE, vital signs are normal. A mechanical S2 is heard on cardiac exam and the rest of the exam is normal.

Labs reveal a normal serum creatinine. An EKG is normal and echo shows normal EF and normal function of the prosthetic valve.

In addition to continuing aspirin and stopping the warfarin 5 days before surgery, which of the following is the most appropriate anticoagulation bridging?

A. IV unfractionated heparin

B. Prophylactic dose sub Q enoxaparin

C. Therapeutic dosed sub Q enoxaparin

D. No bridging anticoagulation

Perioperative thrombotic risk

Risk stratum	Indication for anticoagulant therapy		
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High thrombotic risk	Bileaflet aortic valve prosthesis and one or more of the of following risk factors: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age >75 years	CHA_2DS_2-VASc score of 4-5 or $CHADS_2$ score of 3-4	VTE within the past 3 to 12 months Nonsevere thrombophilia (eg, heterozygous factor V Leiden or prothrombin gene mutation) Recurrent VTE Active cancer (treated within six months or palliative)
Moderate thrombotic risk	Bileaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke	CHA_2DS_2-VASc score of 2-3 or $CHADS_2$ score of 0-2 (assuming no prior stroke or transient ischemic attack)	VTE >12 months previous and no other risk factors

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Anticoagulation Bridging for Mechanical Heart Valves

	Low bleeding risk (minor procedure or BleedMAP ≤1)		Moderate to high bleeding risk (major procedure or BleedMAP ≥2)	
	Preoperative	**Postoperative**	**Preoperative**	**Postoperative**
Low TE risk				
• Mechanical bileaflet aortic valve in normal sinus rhythm	• No interruption of warfarin or lower target INR (2 instead of 2.5, 2.5 instead of 3)	• Continue or resume standard-dose warfarin	• Hold warfarin 4 d before with target INR <1.5 • No bridging heparin or LMWH	• Resume warfarin once tolerating oral diet • No bridging heparin or LMWH unless unable to administer warfarin • Appropriate mechanical and pharmacologic VTE prophylaxis
Moderate to high TE risk				
• Mechanical mitral valve or mechanical aortic valve with additional risk factors — Hypercoagulable state — Atrial fibrillation — Previous TE event — LVEF <35%	• No interruption of warfarin or lower target INR (2 instead of 2.5, 2.5 instead of 3)	• Continue or resume standard-dose warfarin	• Hold warfarin 4 d before with target INR <1.5 • Bridge with LMWH* • If CKD stage IV or V, bridge with heparin	• Resume warfarin once able to tolerate oral diet • Bridging heparin or LMWH on postoperative day 2 • Appropriate mechanical and pharmacologic VTE prophylaxis

TE, Thromboembolic; *INR*, international normalized ratio; *LMWH*, low–molecular weight heparin; *VTE*, venous thromboembolism; *LVEF*, left ventricular ejection fraction; *CKD*, chronic kidney disease. *Initiate bridging once international normalized ratio is below therapeutic range *or* 2 days after warfarin has been held.

Question #11

A 26 year-old woman seeks preconception counseling. She has a history of mitral stenosis and underwent mitral valve replacement with a tilting-disc mechanical prosthesis 5 years ago. She is asymptomatic. Medications are warfarin 4 mg/day, and low-dose aspirin.

On PE, a normal mechanical S1 and normal S2 are appreciated. The rest of the exam is unremarkable.

Laboratory reveals an INR of 3.0. An ECG demonstrates normal sinus rhythm.

In addition to continuing the low-dose aspirin, which of the following is the most appropriate anticoagulation regimen for this patient during the first trimester?

A. Continue INR-adjusted warfarin

B. Stop warfarin and start apixaban

C. Stop warfarin and start unfractionated heparin, 5000 units SQ twice daily

D. Stop warfarin and start weight-based low molecular weight heparin

Anticoagulation for Mechanical Valves in Pregnancy

Mechanical Valve Prosthesis	
Weeks 6-12	Warfarin dose ≤5 mg for therapeutic INR Continue warfarin (class IIa recommendation) UFH: IV; aPTT 2 × control (class IIb recommendation) Anti–factor Xa adjusted LMWH (class IIb recommendation) Warfarin dose >5 mg for therapeutic INR UFH: IV; aPTT 2 × control (class IIa recommendation) Anti–factor Xa adjusted LMWH (class IIa recommendation)
Weeks 13-37	Warfarin (therapeutic INR)
Weeks 37 to term	UFH (IV; aPTT 2 × control)

aPTT = activated partial thromboplastin time; IV = intravenous; LMWH = low-molecular-weight heparin; SQ = subcutaneous; UFH = unfractionated heparin.

Question #12

Based on a retrospective review at Banner University and Banner Baywood hospitals, which patient population on anticoagulation was most inappropriately managed?

A. Patients with major bleeding
B. Patients with minor bleeding
C. Patients requiring reversal for a procedure
D. Patients with an elevated INR with no bleeding

Retrospective Review of Warfarin Reversal at BUMCP

- 360 patients received vitamin K for an elevated INR
- There was no bleeding and no procedure done
- After 48 hours, only 20% had a therapeutic INR
- 53% of INRs were subtherapeutic

Question #13

A 72-year- old woman with ESRD on hemodialysis is admitted to the hospital for sepsis. She is on warfarin for atrial fibrillation with a CHADS-Vasc score of 5, and has an INR of 6.0 on admission. There is no sign of bleeding.

In addition to giving broad spectrum antibiotics and resuscitation, this is the appropriate management of her elevated INR at this time.

A. Give 1 mg po vitamin K
B. Give 2.5 mg po vitamin K
C. Give 5 mg IV vitamin K
D. Hold warfarin and check the INR daily to ensure it does not rise

Management of Supratherapeutic INR Without Bleeding

Guideline recommendations for management of warfarin-associated bleeding and/or high INR

Clinical setting	2018 ASH guideline	2012 ACCP guideline
▪ Serious or life-threatening bleeding ▪ Any INR	▪ 4-factor PCC ▪ Vitamin K (intravenous) ▪ Hold warfarin	▪ 4-factor PCC* ▪ Vitamin K (intravenous) ▪ Hold warfarin
▪ No bleeding ▪ INR >10	(No recommendations given)	▪ Vitamin K (oral) ▪ Hold warfarin
▪ No bleeding ▪ INR 4.5 to 10	▪ Hold warfarin ▪ No vitamin K	▪ Hold warfarin ▪ Vitamin K (low dose, oral) is optional

Clinical judgment is required to assess the severity of bleeding, urgency of warfarin reversal, and need for other interventions. Refer to UpToDate for details.

INR: international normalized ratio; ASH: American Society of Hematology; ACCP: American College of Chest Physicians; PCC: prothrombin complex concentrate; FFP: fresh frozen plasma.
* A plasma product such as thawed plasma or FFP (approximately 10 mL/kg, depending on INR) can be used as an alternative if PCC is not available.

References:

1. *Witt DM, Nieuwlaat R, Clark NP, et al. American Society of Hematology 2018 guidelines for management of venous thromboembolism: Optimal management of anticoagulation therapy. Blood Adv 2018; 2:3257.*
2. *Holbrook A, Schulman S, Witt DM, et al. Evidence-based management of anticoagulant therapy: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. Chest 2012; 141:e152S.*

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