

A hand is shown tipping a domino in a line of falling dominoes. The dominoes are light-colored wood and are arranged in a line on a light-colored surface. The background is a solid light blue color. The hand is positioned at the top right of the frame, with the index finger pointing down at the top of a domino. The dominoes to the left of the hand are falling, while the domino being touched is still upright. The dominoes to the right of the hand are still upright.

# Interrupting Anticoagulation: The variables that make the difference

Dr. Kristi Parmiter PharmD  
Clinical Pharmacy Specialist - NLHS

# Speaker Disclosure

- I have the following relationships with commercial interests

Funding (Grants/Honoraria) : Sanofi Canada

# NLHS Anticoagulation Management Service

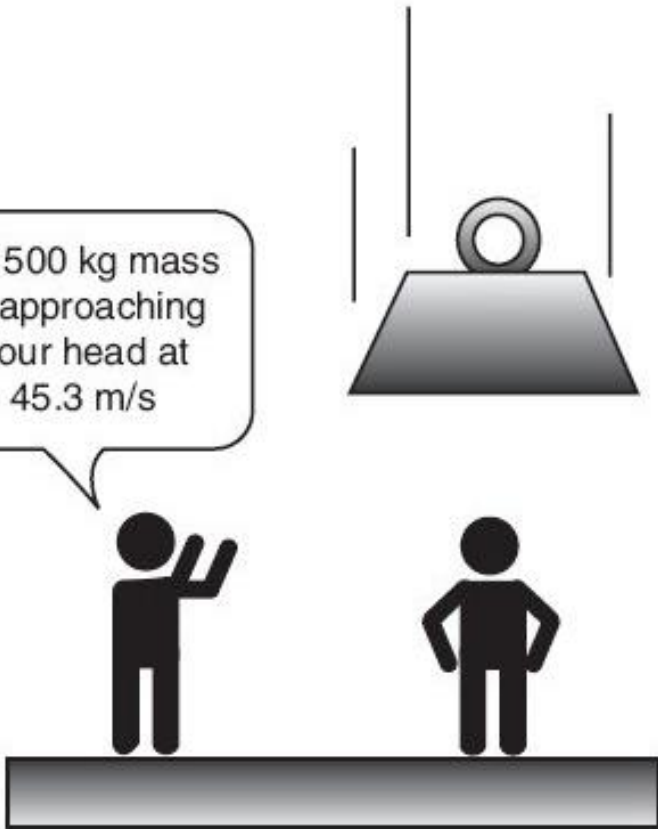


# Learning Objectives

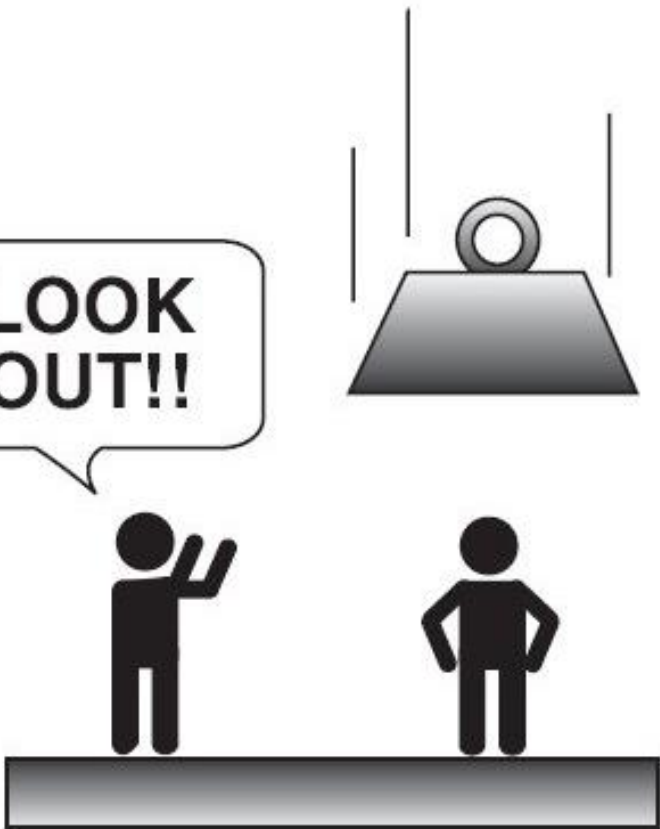
**Upon completion of this educational activity, learners should be able to:**

1. Discuss the impact of perioperative anticoagulation management on stakeholders.
2. Identify tools and guidelines for perioperative anticoagulation management.
3. Evaluate the bleeding risk and thrombotic risk of a patient undergoing a surgery or procedure.
4. Construct a perioperative anticoagulation management plan for a patient.
5. Describe the four components of an effective perioperative anticoagulation management plan.

A 1500 kg mass  
is approaching  
your head at  
45.3 m/s



**LOOK  
OUT!!**



# Interruption of Anticoagulation

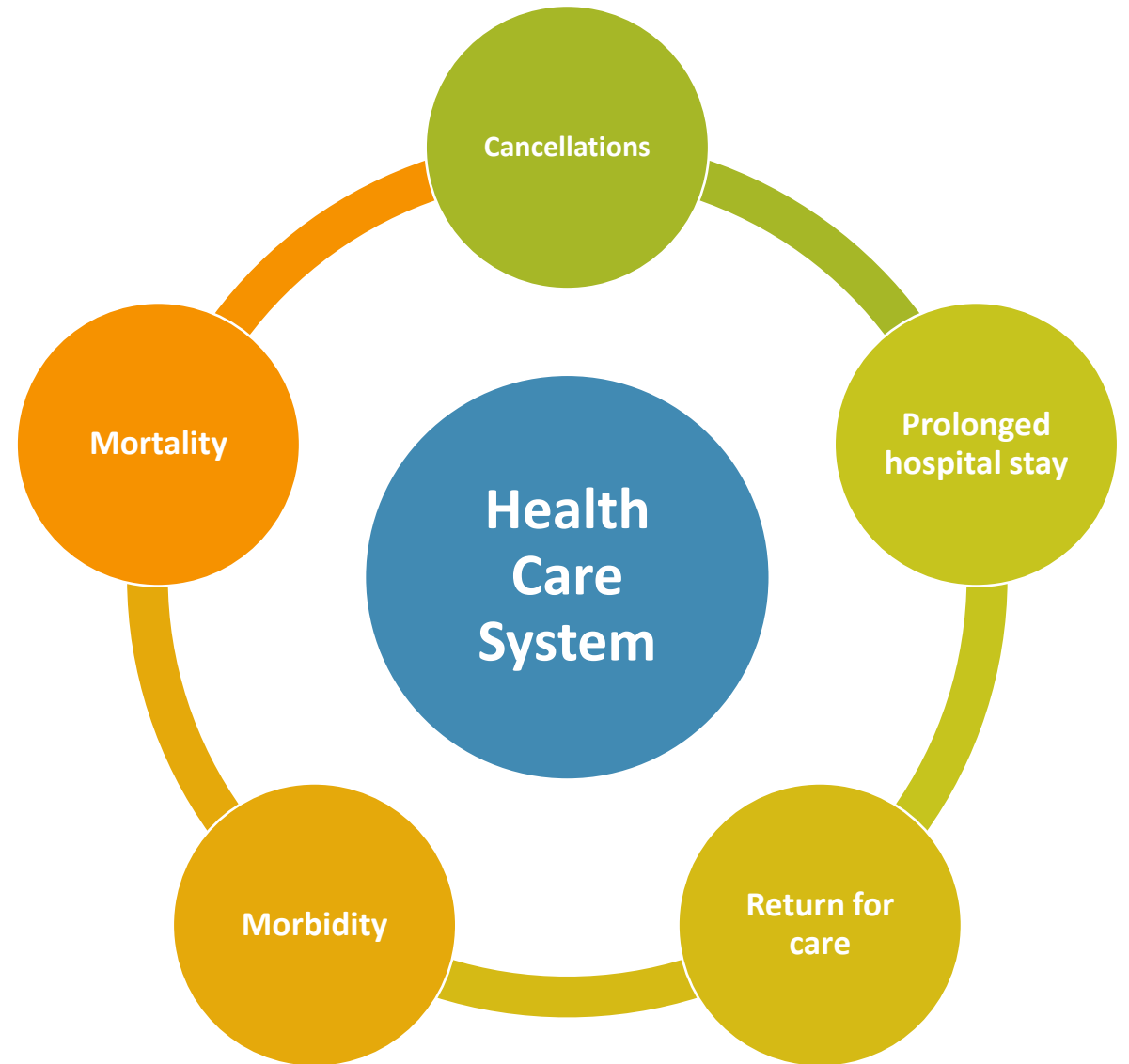
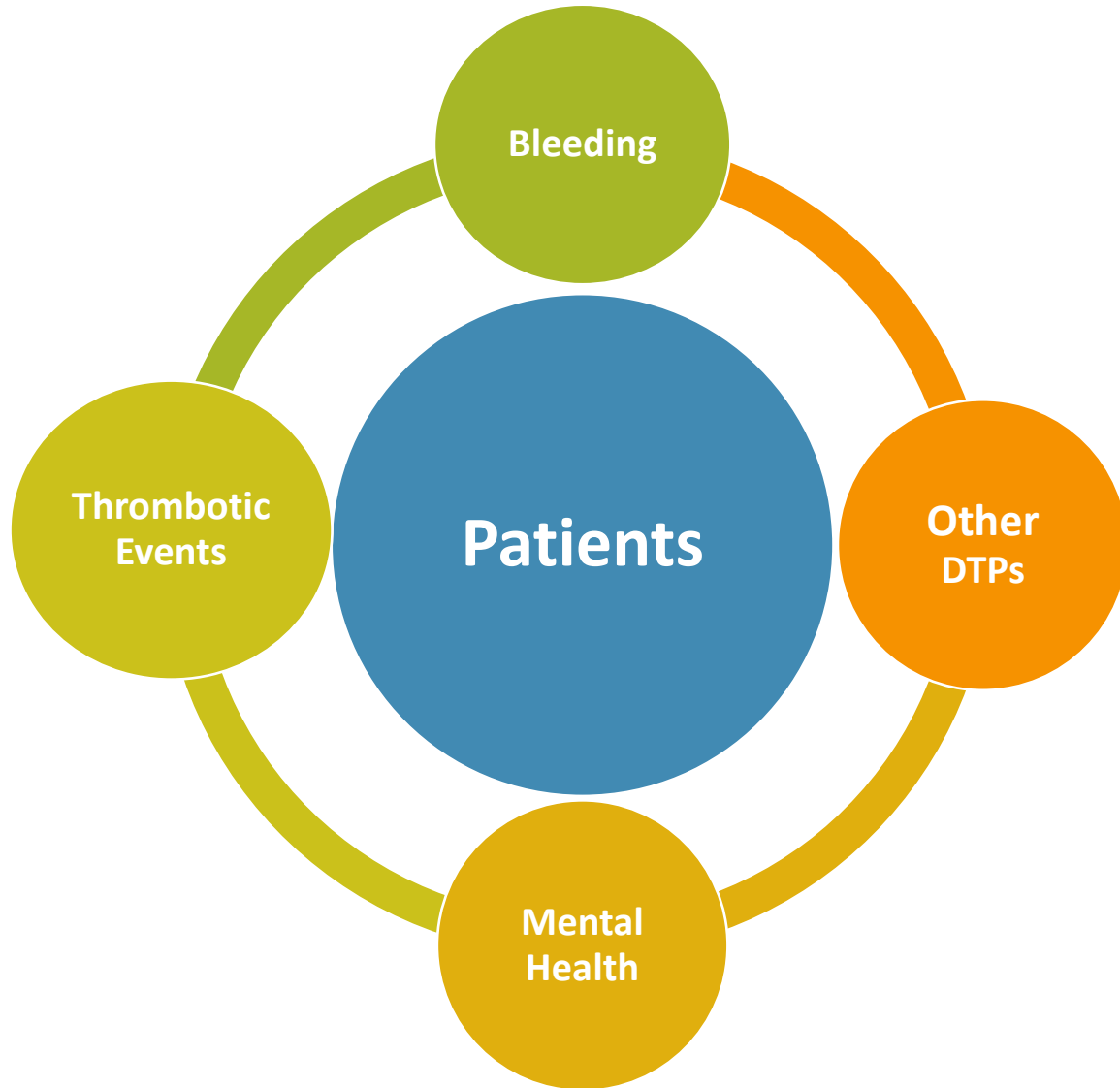
- Oral anticoagulants at therapeutic dose
- Perioperative or Periprocedural
- Elective/non-urgent
- Goals
  - Individualized patient centered care
  - Minimize the risk of thromboembolism
  - Facilitate hemostasis and avoid intra- and postoperative bleeding

# Risk vs Benefit of Anticoagulation Interruption

**MON-FRI**



# Stakeholders



# Tools for Anticoagulation Management



## General Guidelines

ACCP Chest 2022  
ASH 2018



## Specialty Specific Guidelines

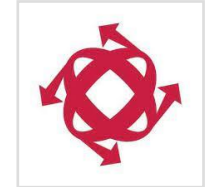
2024  
AHA/ACC/ACS/ASNC/HRS/SCA/  
SCCT/SCMR/SVM Guideline for  
Perioperative Cardiovascular  
Management for Noncardiac  
Surgery

Regional anesthesia in the patient  
receiving antithrombotic or  
thrombolytic therapy: American  
Society of Regional Anesthesia and  
Pain Medicine Evidence-Based  
Guidelines 2025



## Thrombosis Canada

Clinical Guides  
Clinical Tools  
Webinars



## Anticoagulation Forum

Rapid Resource:  
Periprocedural  
Anticoagulation Management  
  
Webinars

# Tools for Anticoagulation Management

## RxFiles Drug Comparison Charts

- PERIOPERATIVE ANTITHROMBOTIC MANAGEMENT
  - July 2023
  - M Jin PharmD, L Kosar BPS
- Free access to MB, NB, NL, NS, ON, and PEI Branch Members



# Tools for Anticoagulation Management



## Practice Changing Trials

### BRIDGE

Douketis JD, Spyropoulos AC, Kaatz S, et al. Perioperative bridging anticoagulation in patients with atrial fibrillation. *N Engl J Med* 2015;373:823-833.

### PAUSE

Douketis JD, Spyropoulos AC, Duncan J, et al. Perioperative management of patients with atrial fibrillation receiving a direct oral anticoagulant. *JAMA Intern Med*. 2019;179:1469–1478.

### PERIOP2

Kovacs MJ, Wells PS, Anderson DR, et al. Postoperative low molecular weight heparin bridging treatment for patients at high risk of arterial thromboembolism (PERIOP2): double blind randomized controlled trial. *BMJ* 2021;373

# Variables to Consider



## **Bleeding Risk**

Patient

Surgery/Procedure



## **Anticoagulant**



## **Thrombotic risk**

Patient

Surgery



## **Anesthesia**



# Bleeding Risk of Procedure

Variable #1

# Bleeding Risk of Procedure



**Time to Hemostasis after a procedure/surgery**

Invasiveness

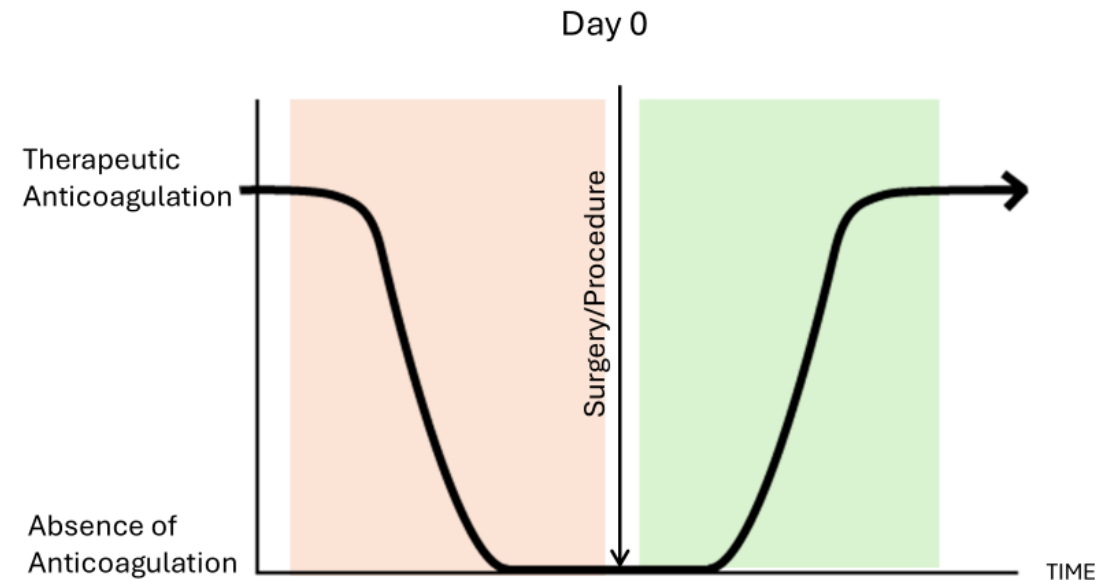
Vascularity



**Bleeding from procedure  
vs. Consequences of bleeding**

# Bleeding Risk of Procedure

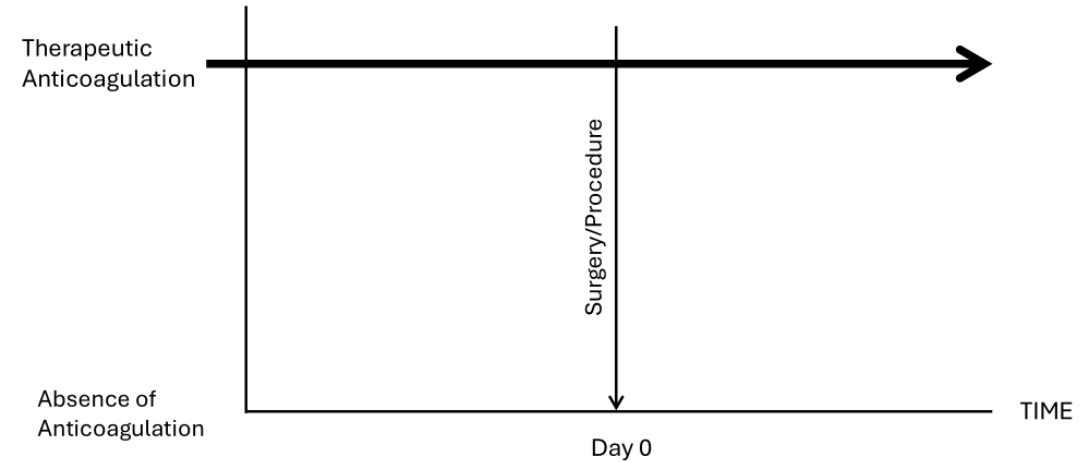
1. When to hold AC prior to procedure
  - Determines how much AC is onboard at time of procedure
  - Influences intra/post operative bleeding
2. When can AC be restarted
  - Determines when it is safe to be on therapeutic AC postoperatively
  - Influences post operative bleeding



# Bleeding Risk of Procedure

## Minimal Bleeding Risk

- Does AC need to be interrupted?
  - Without any or minimal (day of) interruption



**Minimal-bleed-risk surgery/procedure**  
(30-day risk of major bleed ~0%)

Minor dermatologic procedures (excision of basal and squamous cell skin cancers, actinic keratoses, and premalignant or cancerous skin nevi)  
Ophthalmological (cataract) procedures  
Minor dental procedures (dental extractions, restorations, prosthetics, endodontics), dental cleanings, fillings  
Pacemaker or cardioverter-defibrillator device implantation  
Coronary angiography by radial artery approach  
Selected patients requiring screening gastrointestinal endoscopy and colonoscopy ± biopsy

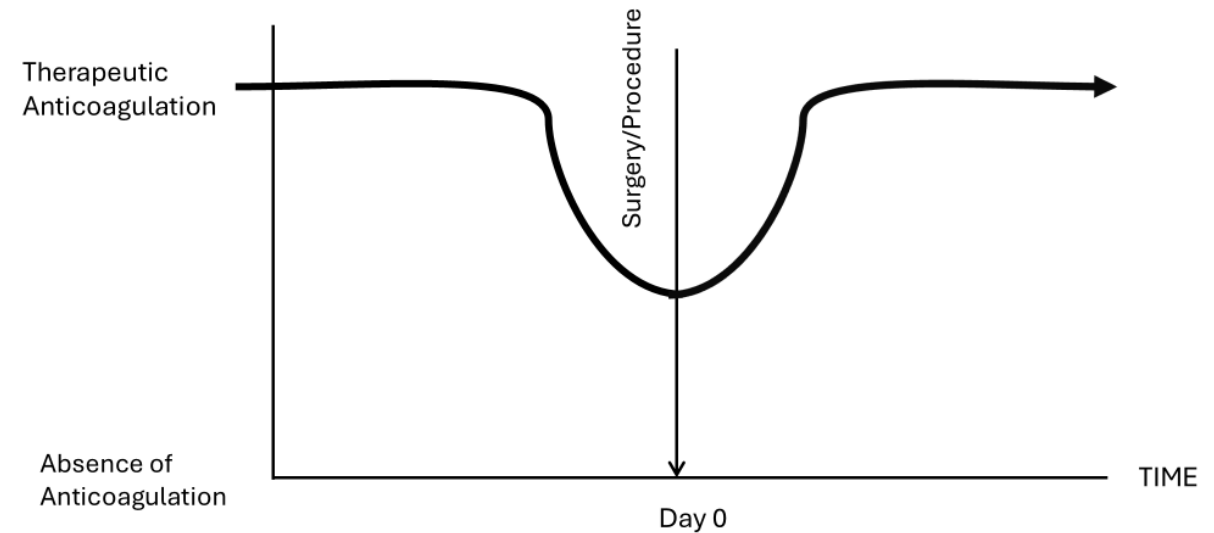
# Bleeding Risk of Procedure

Low/moderate bleeding Risk

- some AC effect present at time of surgery

Low/moderate-bleed-risk surgery/procedure:  
(30-day risk of major bleed 0%–2%)

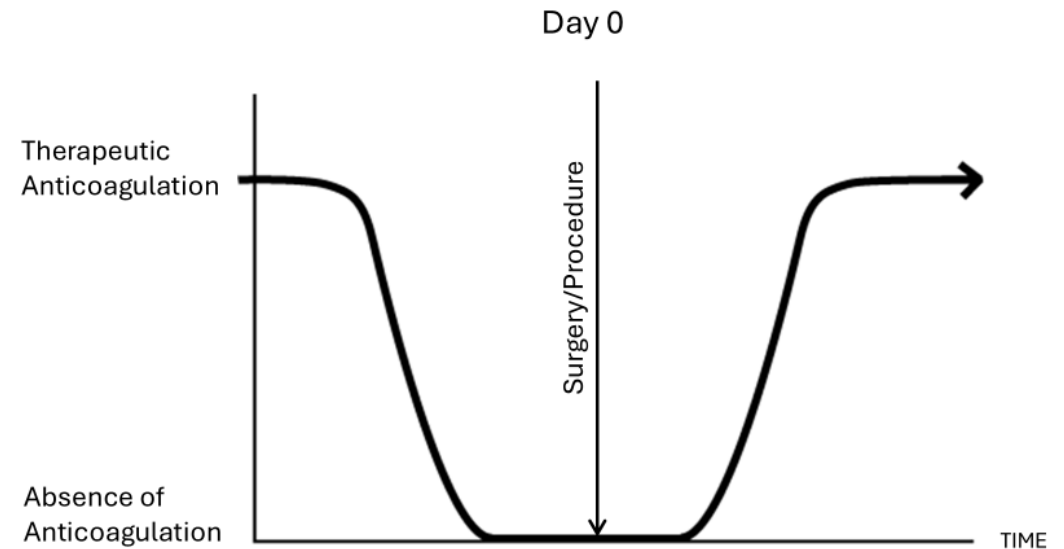
Arthroscopy  
Cutaneous/lymph node biopsies  
Foot/hand surgery  
Coronary angiography by femoral artery approach  
Gastrointestinal endoscopy ± biopsy  
Colonoscopy ± biopsy  
Abdominal hysterectomy  
Laparoscopic cholecystectomy  
Abdominal hernia repair  
Hemorrhoidal surgery  
Bronchoscopy ± biopsy



# Bleeding Risk of Procedure

## High bleeding risk

- minimal to no residual AC effect at time of surgery



### High-bleed-risk surgery/procedure† (30-day risk of major bleed $\geq 2\%$ )

Major surgery with extensive tissue injury  
Cancer surgery, especially solid tumor resection (lung, esophagus, gastric, colon, hepatobiliary, pancreatic)  
Major orthopedic surgery, including shoulder replacement surgery  
Reconstructive plastic surgery  
Major thoracic surgery  
Urologic or gastrointestinal surgery, especially anastomosis surgery  
Transurethral prostate resection, bladder resection, or tumor ablation  
Nephrectomy, kidney biopsy  
Colonic polyp resection  
Bowel resection  
Percutaneous endoscopic gastrostomy placement, endoscopic retrograde cholangiopancreatography  
Surgery in highly vascular organs (kidneys, liver, spleen)  
Cardiac, intracranial, or spinal surgery  
Any major operation (procedure duration  $>45$  minutes)  
Neuraxial anaesthesia¶  
Epidural injections

# Bleeding Risk of Procedure

## Other resources

### Specialty Guidelines

- Patel IJ, Rahim S, Davidson JC, et al. [Society of Interventional Radiology consensus guidelines for the periprocedural management of thrombotic and bleeding risk in patients undergoing percutaneous image-guided interventions-part II: recommendations](#): endorsed by the Canadian Association for Interventional Radiology and the Cardiovascular and Interventional Radiological Society of Europe. *J Vasc Interv Radiol* 2019; 30:1168–1184.e1.

Contact the provider!

# Baseline Patient Case

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Follow-up colonoscopy with polypectomy

## Anticoagulant

- Apixaban 5 mg twice daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

Direct Oral Anticoagulant	Procedure Bleeding Risk	Pre-Procedure DOAC Interruption						Surgery/Procedure (Day 0)	Post-Procedure Resumption*			
		Day -6	Day -5	Day -4	Day -3	Day -2	Day -1		Day +1	Day +2	Day +3	Day +4
Apixaban	High	[Yellow box]						Surgery/Procedure (Day 0)	[Yellow box]			
	Low/Mod	[Yellow box]							[Yellow box]			
Dabigatran (CrCl ≥ 50 ml/min)	High	[Yellow box]							[Yellow box]			
	Low/Mod	[Yellow box]							[Yellow box]			
Dabigatran (CrCl < 50 ml/min)	High	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]		[Yellow box]			
	Low/Mod	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]		[Yellow box]			
Edoxaban	High	[Yellow box]							[Yellow box]			
	Low/Mod	[Yellow box]							[Yellow box]			
Rivaroxaban	High	[Yellow box]						[Yellow box]				
	Low/Mod	[Yellow box]						[Yellow box]				

[Yellow box] No DOAC administered that day

\*DOAC can be resumed ~24 hours after low/moderate-bleed-risk procedures, and 48-72 hours after high-bleed-risk procedures. In selected patients at high risk for VTE, low-dose anticoagulants (i.e., enoxaparin, 40 mg daily or dalteparin, 5,000 IU daily) can be given for the first 48-72 hours post-procedure.

- Apixaban
- High Bleeding Risk Procedure
- CrCl 48 ml/min

# Baseline PAM Protocol

Indication for Apixaban: Atrial Fibrillation

Procedure: Colonoscopy with Polypectomy

Weight: 60 kg   Serum Creatinine: 100 µmol/L   Creatinine Clearance: 48 mL/min

Day	Action: Apixaban
-4	Apixaban 5 mg twice daily
-3	Apixaban 5 mg twice daily
-2	No Apixaban
-1	No Apixaban
DAY OF PROCEDURE	
0	No Apixaban
1	No Apixaban
2	No Apixaban
3	Apixaban 5 mg twice daily
4	Apixaban 5 mg twice daily

Thrombotic Risk of Patient: Low  
Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low  
**Bleeding Risk of Procedure: High**

Overall Thrombotic Risk: Low  
**Overall Bleeding Risk: High**

# Patient Case –Change Procedure

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Knee arthroscopy

## Anticoagulant

- Apixaban 5 mg twice daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

Direct Oral Anticoagulant	Procedure Bleeding Risk	Pre-Procedure DOAC Interruption						Surgery/Procedure (Day 0)	Post-Procedure Resumption*			
		Day -6	Day -5	Day -4	Day -3	Day -2	Day -1		Day +1	Day +2	Day +3	Day +4
Apixaban	High	→							█		→	
	Low/Mod	→							→			
Dabigatran (CrCl ≥ 50 ml/min)	High	→							█		→	
	Low/Mod	→							→			
Dabigatran (CrCl < 50 ml/min)	High			█					█		→	
	Low/Mod	→							→			
Edoxaban	High	→							█		→	
	Low/Mod	→							→			
Rivaroxaban	High	→							█		→	
	Low/Mod	→							→			

█ No DOAC administered that day

\*DOAC can be resumed ~24 hours after low/moderate-bleed-risk procedures, and 48-72 hours after high-bleed-risk procedures. In selected patients at high risk for VTE, low-dose anticoagulants (i.e., enoxaparin, 40 mg daily or dalteparin, 5,000 IU daily) can be given for the first 48-72 hours post-procedure.

- Apixaban
- Low/Moderate Bleeding Risk Procedure
- CrCl 48 ml/min

# PAM Protocol – Change Procedure Bleeding Risk

Indication for Apixaban: Atrial Fibrillation

Procedure: Knee arthroscopy      Bleeding Risk: Low/Moderate

Weight: 60 kg    Serum Creatinine: 100 µmol/L    Creatinine Clearance: 48 mL/min

Day	Action: Apixaban
-4	Apixaban 5 mg twice daily
-3	Apixaban 5 mg twice daily
-2	Apixaban 5 mg twice daily
-1	No Apixaban
DAY OF PROCEDURE 0	No Apixaban
1	Apixaban 5 mg at 8 PM
2	Apixaban 5 mg twice daily
3	Apixaban 5 mg twice daily
4	Apixaban 5 mg twice daily

Thrombotic Risk of Patient: Low

Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low

Bleeding Risk of Procedure: Low/Moderate

Overall Thrombotic Risk: Low

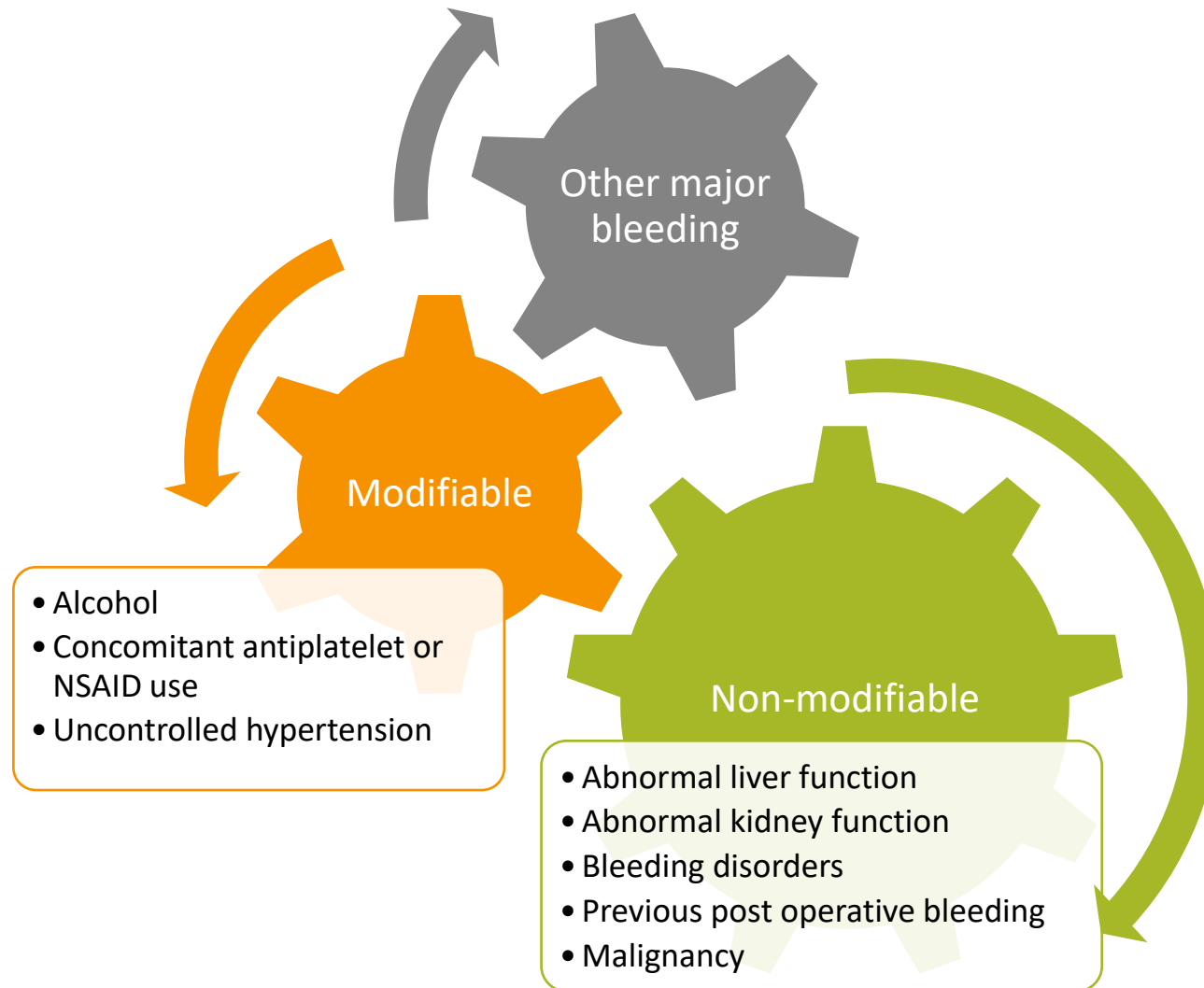
Overall Bleeding Risk: Low/Moderate



# Bleeding Risk of Patient

Variable #2

# Patient Bleeding Risk





# Anticoagulant

Variable #3

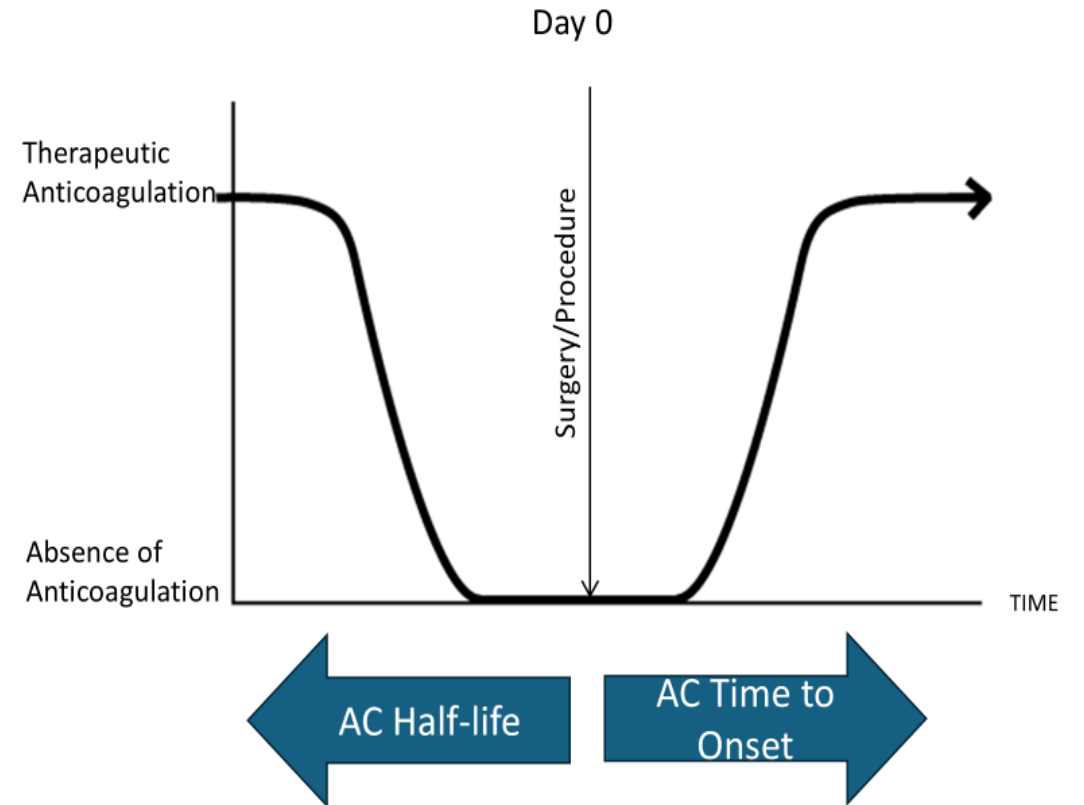
# Anticoagulant

## Elimination half-life

- How long to hold AC prior to procedure
- 4-5 half-lives for a medication to be cleared from the body
- Longer in renal dysfunction for renally-cleared drugs

## Time to onset of action

- How soon after a procedure AC can be restarted



# Anticoagulant - DOACs

- Elimination Half life
  - Short half life = short time off AC prior = no “bridging”
- Time to onset
  - 1-3 hrs
  - Cannot restart until risk of bleeding is decreased

Half Life	Dabigatran	Rivaroxaban	Apixaban	Edoxaban
Normal to mild (CrCl $\geq$ 50 mL/min)	7-17 hrs	7-11 hrs	8-12 hrs	10-14 hrs
Moderate (30-60 mL/min)	17-20 hrs	7-11 hrs	8-12 hrs	
Severe (<30 mL/min)	21-35 hrs	11-15 hrs	12-17 hrs	

# Baseline Patient Case

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Follow-up colonoscopy with polypectomy


## Anticoagulant

- Apixaban 5 mg twice daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

Direct Oral Anticoagulant	Procedure Bleeding Risk	Pre-Procedure DOAC Interruption						Surgery/Procedure (Day 0)	Post-Procedure Resumption*			
		Day -6	Day -5	Day -4	Day -3	Day -2	Day -1		Day +1	Day +2	Day +3	Day +4
Apixaban	High	[Yellow box] →						Surgery/Procedure (Day 0)	[Yellow box] [Red bar] →			
	Low/Mod	[Yellow box] →							[Yellow box] →			
Dabigatran (CrCl ≥ 50 ml/min)	High	[Yellow box] →							[Yellow box] [Blue bar] →			
	Low/Mod	[Yellow box] →							[Yellow box] →			
Dabigatran (CrCl < 50 ml/min)	High	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]		[Yellow box] [Grey bar] →			
	Low/Mod	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]	[Yellow box]		[Yellow box] →			
Edoxaban	High	[Yellow box] →							[Yellow box] [Orange bar] →			
	Low/Mod	[Yellow box] →							[Yellow box] →			
Rivaroxaban	High	[Yellow box] →							[Yellow box] [Light Blue bar] →			
	Low/Mod	[Yellow box] →							[Yellow box] →			

 No DOAC administered that day

\*DOAC can be resumed ~24 hours after low/moderate-bleed-risk procedures, and 48-72 hours after high-bleed-risk procedures. In selected patients at high risk for VTE, low-dose anticoagulants (i.e., enoxaparin, 40 mg daily or dalteparin, 5,000 IU daily) can be given for the first 48-72 hours post-procedure.

- Apixaban
- High Bleeding Risk Procedure
- CrCl 48 ml/min

# Patient Case – Change DOAC

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Follow-up colonoscopy with polypectomy


## Anticoagulant

- Dabigatran 150 mg twice daily for atrial fibrillation

## CHADS<sub>2</sub> Features

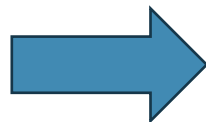
- Hypertension

Direct Oral Anticoagulant	Procedure Bleeding Risk	Pre-Procedure DOAC Interruption						Surgery/Procedure (Day 0)	Post-Procedure Resumption*			
		Day -6	Day -5	Day -4	Day -3	Day -2	Day -1		Day +1	Day +2	Day +3	Day +4
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Edoxaban	High	[Yellow box] →							[Yellow box] [Orange bar] →			
	Low/Mod	[Yellow box] →							[Yellow box] →			
Rivaroxaban	High	[Yellow box] →						[Yellow box] [Light Blue bar] →				
	Low/Mod	[Yellow box] →						[Yellow box] →				

 No DOAC administered that day

\*DOAC can be resumed ~24 hours after low/moderate-bleed-risk procedures, and 48-72 hours after high-bleed-risk procedures. In selected patients at high risk for VTE, low-dose anticoagulants (i.e., enoxaparin, 40 mg daily or dalteparin, 5,000 IU daily) can be given for the first 48-72 hours post-procedure.

- Apixaban
- High bleeding risk procedure
- CrCl 48 ml/min



- Dabigatran
- High bleeding risk procedure
- CrCl 48 ml/min

# PAM Protocol – Change DOAC

Indication for **Dabigatran**: Atrial Fibrillation

Procedure: Colonoscopy with Polypectomy

Overall Bleeding Risk: High

Weight: 60 kg Serum Creatinine: 100 µmol/L

**Creatinine Clearance: 48 mL/min**

Day	Action: Dabigatran
-5	Dabigatran 150 mg twice daily
-4	No Dabigatran
-3	No Dabigatran
-2	No Dabigatran
-1	No Dabigatran
DAY OF PROCEDURE 0	No Dabigatran
1	No Dabigatran
2	No Dabigatran
3	Dabigatran 150 mg twice daily
4	Dabigatran 150 mg twice daily

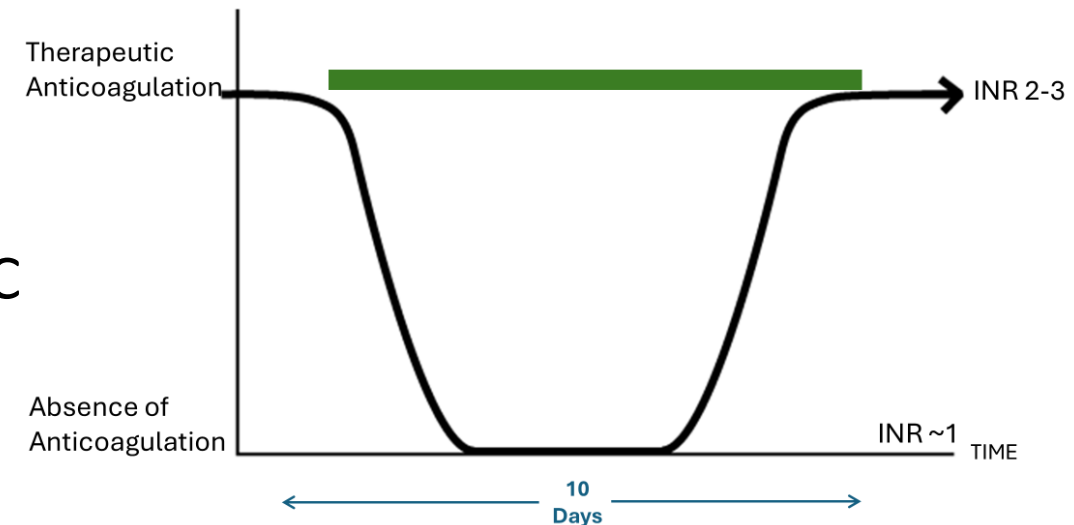
Thrombotic Risk of Patient: Low  
Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low  
Bleeding Risk of Procedure: High

Overall Thrombotic Risk: Low  
Overall Bleeding Risk: High

# Anticoagulant - Warfarin

- Elimination half life 36-42hrs
  - Not affected by renal function
  - Hold for 5 days – 90% of pts have normal ( $<1.3$ ) or near normal (1.3-1.4) INR
- Time to onset
  - 3-5 days (or longer)
- Long half life + long time to onset = long time off AC
  - Assess for Bridging Requirement
  - Based on Thrombotic Risk of Patient



# Patient Case – Change to Warfarin

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Follow-up colonoscopy with polypectomy

## Anticoagulant

- Warfarin 5 mg once daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

# PAM Protocol – Change to Warfarin

Original Indication for Warfarin: Atrial Fibrillation

Procedure: Colonoscopy with Polypectomy  
Weight: 60 kg Serum Creatinine: 100 µmol/L

Overall Bleeding Risk: High  
Creatinine Clearance: 48 mL/min

Day	Action: Warfarin
-6	Warfarin at usual dose
-5	No Warfarin
-4	No Warfarin
-3	No Warfarin
-2	No Warfarin
-1	No Warfarin
DAY OF PROCEDURE 0	Warfarin at usual dose
1	Warfarin at usual dose
2	Warfarin at usual dose
3	Warfarin at usual dose
	Check INR
4	Warfarin at usual dose

Thrombotic Risk of Patient: Low  
Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low  
Bleeding Risk of Procedure: High

Overall Bleeding Risk: High  
Overall Thrombotic Risk: Low



# Thrombotic Risk of Patient

Variable #4

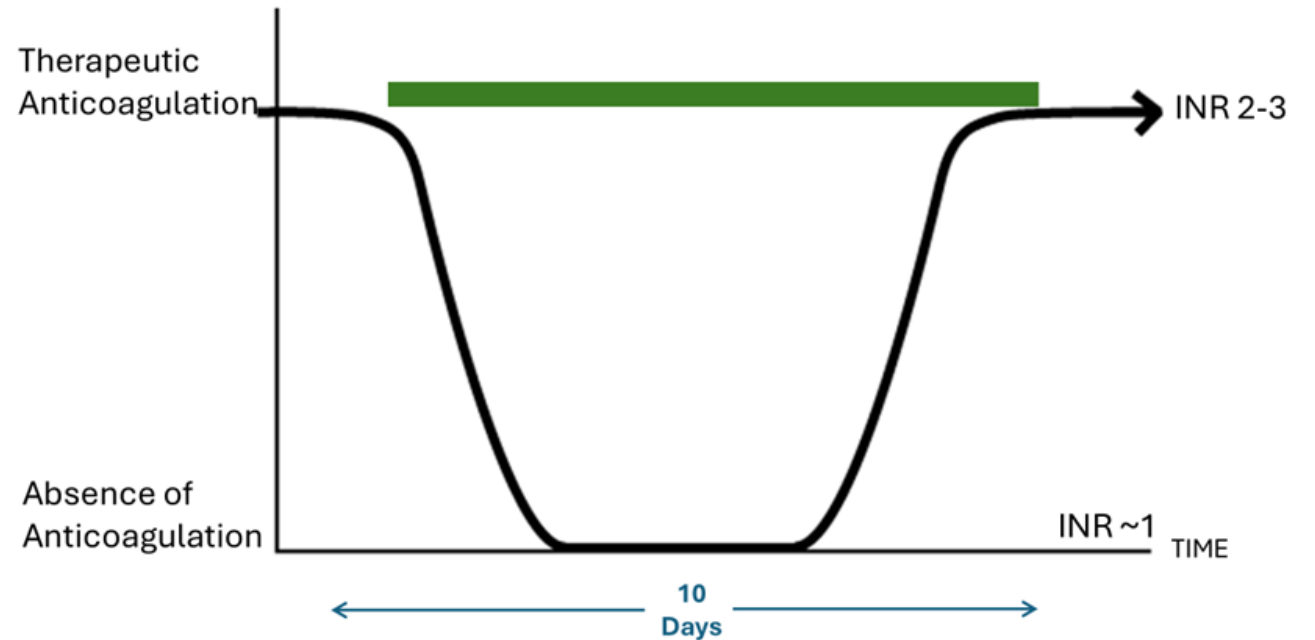
# Thrombotic Risk of Patient

#1 Does the thrombotic risk outweigh need for surgery?

- Recent TE event consider delaying non urgent surgery/procedure

#2 Is “bridging” required for warfarin?

- For high-risk thrombotic patients
- LMWH while INR is subtherapeutic
  - LMWH must also be adjusted around the day of procedure



# Thrombotic Risk of Patient

Table 2. Risk Classification for Thromboembolism.*			
Risk Category	Mechanical Heart Valve	Atrial Fibrillation	Venous Thromboembolism
<b>High</b> (>10%/year risk of ATE or >10%/month risk of VTE)	Mechanical mitral valve <i>with</i> risk factors for stroke† Caged ball or tilting disc valve in mitral/aortic position Recent (<3 month) stroke or TIA	CHA <sub>2</sub> DS <sub>2</sub> VASc score of ≥7 CHADS <sub>2</sub> score of 5 or 6 Recent (<3 month) stroke or TIA Rheumatic valvular heart disease	Recent (<3 months and especially 1 month) VTE Severe thrombophilia (deficiency of protein C, protein S or antithrombin; homozygous factor V Leiden or prothrombin gene mutation or double-heterozygous for each mutation, multiple thrombophilias) Antiphospholipid syndrome Active cancer associated with high VTE risk‡
<b>Moderate</b> (4%–10%/year risk of ATE or 4%–10%/month risk of VTE)	Bileaflet AVR <i>with</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 5 or 6 CHADS <sub>2</sub> score of 3 or 4	VTE within the past 3–12 months Recurrent VTE Nonsevere thrombophilia (heterozygous factor V Leiden or prothrombin gene mutation) Active cancer or recent history of cancer§
<b>Low</b> (<4%/year risk of ATE or <2%/month risk of VTE)	Bileaflet AVR <i>without</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 1–4 CHADS <sub>2</sub> score of 0–2 (and no prior stroke or TIA)	VTE more than 12 months ago

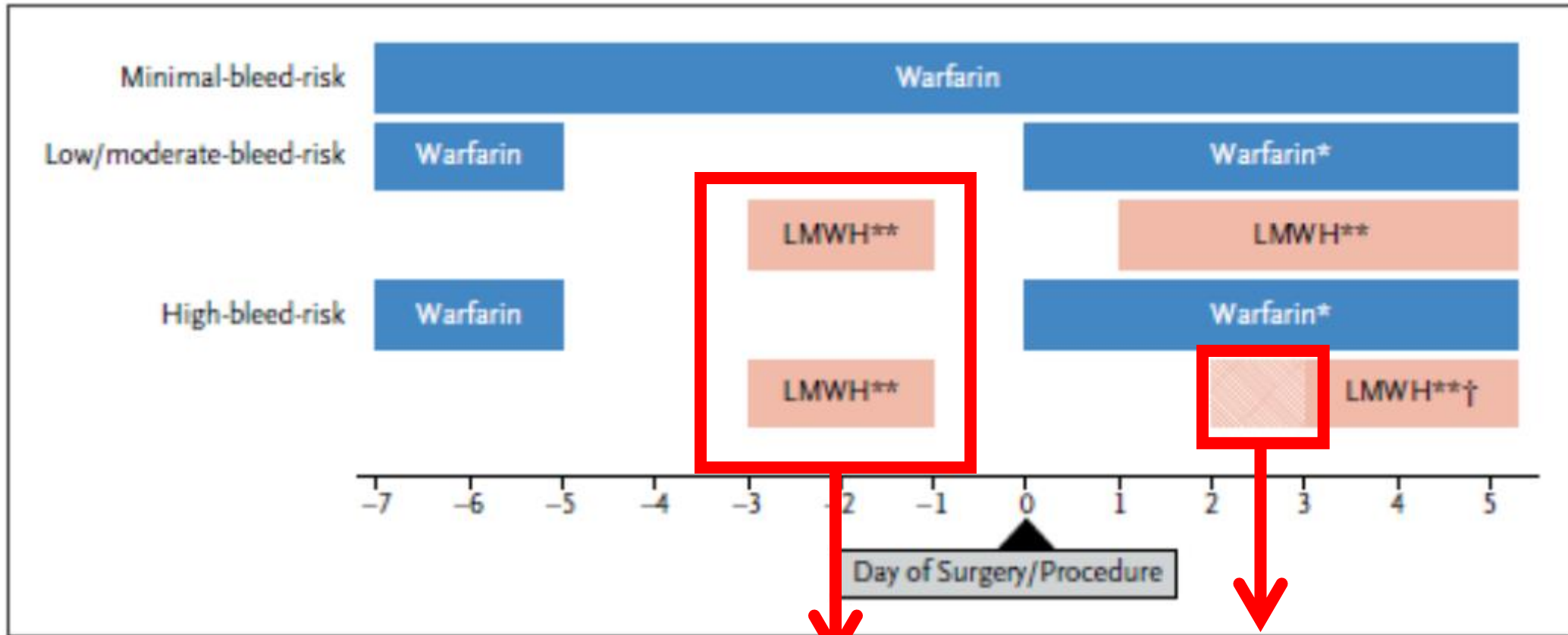
\* Adapted from 2022 CHEST Guidelines. ATE denotes arterial thromboembolism; AVR, aortic valve replacement; TIA, transient ischemic attack; and VTE, venous thromboembolism.

† Includes atrial fibrillation, prior stroke or transient ischemic attack (including during perioperative period), prior valve thrombosis, rheumatic valvular heart disease, hypertension, diabetes, congestive heart failure, age >75 years.

‡ Includes pancreatic cancer, myeloproliferative disorders, primary brain cancer, gastric cancer, and esophageal cancer.

§ Within 5 years if history of cancer, excluding nonmelanoma skin cancer.

# High Thrombotic Risk Patient



Day -3 and -2 – Therapeutic dose  
Day -1 half dose at 9 am

Prophylactic dose

# Patient Case – Warfarin

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Follow-up colonoscopy with polypectomy

## Anticoagulant

- Warfarin 5 mg once daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

# Thrombotic Risk of Patient

Table 2. Risk Classification for Thromboembolism.*			
Risk Category	Mechanical Heart Valve	Atrial Fibrillation	Venous Thromboembolism
<b>High</b> (>10%/year risk of ATE or >10%/month risk of VTE)	Mechanical mitral valve <i>with</i> risk factors for stroke† Caged ball or tilting disc valve in mitral/aortic position Recent (<3 month) stroke or TIA	CHA <sub>2</sub> DS <sub>2</sub> VASc score of ≥7 CHADS <sub>2</sub> score of 5 or 6 Recent (<3 month) stroke or TIA Rheumatic valvular heart disease	Recent (<3 months and especially 1 month) VTE Severe thrombophilia (deficiency of protein C, protein S or antithrombin; homozygous factor V Leiden or prothrombin gene mutation or double-heterozygous for each mutation, multiple thrombophilias) Antiphospholipid syndrome Active cancer associated with high VTE risk‡
<b>Moderate</b> (4%–10%/year risk of ATE or 4%–10%/month risk of VTE)	Bileaflet AVR <i>with</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 5 or 6 CHADS <sub>2</sub> score of 3 or 4	VTE within the past 3–12 months Recurrent VTE Nonsevere thrombophilia (heterozygous factor V Leiden or prothrombin gene mutation) Active cancer or recent history of cancer§
<b>Low</b> (<4%/year risk of ATE or <2%/month risk of VTE)	Bileaflet AVR <i>without</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 1–4 CHADS <sub>2</sub> score of 0–2 (and no prior stroke or TIA)	VTE more than 12 months ago

\* Adapted from 2022 CHEST Guidelines. ATE denotes arterial thromboembolism; AVR, aortic valve replacement; TIA, transient ischemic attack; and VTE, venous thromboembolism.

† Includes atrial fibrillation, prior stroke or transient ischemic attack (including during perioperative period), prior valve thrombosis, rheumatic valvular heart disease, hypertension, diabetes, congestive heart failure, age >75 years.

‡ Includes pancreatic cancer, myeloproliferative disorders, primary brain cancer, gastric cancer, and esophageal cancer.

§ Within 5 years if history of cancer, excluding nonmelanoma skin cancer.

# PAM Protocol

Original Indication for Warfarin: Atrial Fibrillation

Procedure: Colonoscopy with Polypectomy  
Weight: 60 kg Serum Creatinine: 100 µmol/L

Overall Bleeding Risk: High  
Creatinine Clearance: 48 mL/min

Day	Action: Warfarin
-6	Warfarin at usual dose
-5	No Warfarin
-4	No Warfarin
-3	No Warfarin
-2	No Warfarin
-1	No Warfarin
DAY OF PROCEDURE 0	Warfarin at usual dose
1	Warfarin at usual dose
2	Warfarin at usual dose
3	Warfarin at usual dose
	Check INR
4	Warfarin at usual dose

**Thrombotic Risk of Patient: Low**  
Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low  
Bleeding Risk of Procedure: High

Overall Bleeding Risk: High  
**Overall Thrombotic Risk: Low**

# Patient Case - Change Patient Thrombotic Risk

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- Previous stroke post knee replacement surgery 2020

## Procedure

- Follow-up colonoscopy with polypectomy

## Anticoagulant

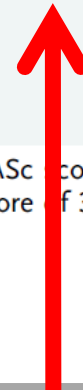
- Warfarin for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

# Thrombotic Risk of Patient

Table 2. Risk Classification for Thromboembolism.*			
Risk Category	Mechanical Heart Valve	Atrial Fibrillation	Venous Thromboembolism
<b>High</b> (>10%/year risk of ATE or >10%/month risk of VTE)	Mechanical mitral valve <i>with</i> risk factors for stroke† Caged ball or tilting disc valve in mitral/aortic position Recent (<3 month) stroke or TIA	CHA <sub>2</sub> DS <sub>2</sub> VASc score of ≥7 CHADS <sub>2</sub> score of 5 or 6 Recent (<3 month) stroke or TIA Rheumatic valvular heart disease	Recent (<3 months and especially 1 month) VTE Severe thrombophilia (deficiency of protein C, protein S or antithrombin; homozygous factor V Leiden or prothrombin gene mutation or double-heterozygous for each mutation, multiple thrombophilias) Antiphospholipid syndrome Active cancer associated with high VTE risk‡
<b>Moderate</b> (4%–10%/year risk of ATE or 4%–10%/month risk of VTE)	Bileaflet AVR <i>with</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 5 or 6 CHADS <sub>2</sub> score of 3 or 4	VTE within the past 3–12 months Recurrent VTE Nonsevere thrombophilia (heterozygous factor V Leiden or prothrombin gene mutation) Active cancer or recent history of cancer§
<b>Low</b> (<4%/year risk of ATE or <2%/month risk of VTE)	Bileaflet AVR <i>without</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 1–4 CHADS <sub>2</sub> score of 0–2 (and no prior stroke or TIA)	VTE more than 12 months ago



\* Adapted from 2022 CHEST Guidelines. ATE denotes arterial thromboembolism; AVR, aortic valve replacement; TIA, transient ischemic attack; and VTE, venous thromboembolism.

† Includes atrial fibrillation, prior stroke or transient ischemic attack (including during perioperative period), prior valve thrombosis, rheumatic valvular heart disease, hypertension, diabetes, congestive heart failure, age >75 years.

‡ Includes pancreatic cancer, myeloproliferative disorders, primary brain cancer, gastric cancer, and esophageal cancer.

§ Within 5 years if history of cancer, excluding nonmelanoma skin cancer.

# PAM Protocol – Change Patient Thrombotic Risk

Indication for Warfarin: Atrial Fibrillation

Procedure: Colonoscopy with Polypectomy

Weight: 60 kg    Serum Creatinine: 100 µmol/L    Creatinine Clearance: 48 mL/min

Day	Action: Warfarin	Action: Enoxaparin
-6	Warfarin at usual dose	-
-5	No Warfarin	-
-4	No Warfarin	-
-3	No Warfarin	Enoxaparin 100 mg sc daily
-2	No Warfarin	Enoxaparin 100 mg sc daily
-1	No Warfarin	Enoxaparin 60 mg sc daily
DAY OF PROCEDURE 0	Warfarin at usual dose	No Enoxaparin
1	Warfarin at usual dose	Enoxaparin 40 mg sc daily
2	Warfarin at usual dose	Enoxaparin 40 mg sc daily
3	Warfarin at usual dose	Enoxaparin 100 mg sc daily
Check INR		

**Thrombotic Risk of Patient: High – Previous post op stroke**

Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low

Bleeding Risk of Procedure: High

**Overall Thrombotic Risk: High**

**Overall Bleeding Risk: High**

# Patient Case - Change Patient Thrombotic Risk

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx: **Mechanical aortic valve (2023)**, Hypertension, Moderate renal impairment
- No history of prior stroke

## Procedure

- Follow-up colonoscopy with polypectomy

## Anticoagulant

- **Warfarin for Mechanical AVR**

## CHADS<sub>2</sub> Features

- Hypertension

# Thrombotic Risk of Patient

Table 2. Risk Classification for Thromboembolism.*			
Risk Category	Mechanical Heart Valve	Atrial Fibrillation	Venous Thromboembolism
<b>High</b> (>10%/year risk of ATE or >10%/month risk of VTE)	Mechanical mitral valve <i>with</i> risk factors for stroke† Caged ball or tilting disc valve in mitral/aortic position Recent (<3 month) stroke or TIA	CHA <sub>2</sub> DS <sub>2</sub> VASc score of ≥7 CHADS <sub>2</sub> score of 5 or 6 Recent (<3 month) stroke or TIA Rheumatic valvular heart disease	Recent (<3 months and especially 1 month) VTE Severe thrombophilia (deficiency of protein C, protein S or antithrombin; homozygous factor V Leiden or prothrombin gene mutation or double-heterozygous for each mutation, multiple thrombophilias) Antiphospholipid syndrome Active cancer associated with high VTE risk‡
<b>Moderate</b> (4%–10%/year risk of ATE or 4%–10%/month risk of VTE)	<b>Bileaflet AVR <i>with</i> major risk factors for stroke†</b>	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 5 or 6 CHADS <sub>2</sub> score of 3 or 4	VTE within the past 3–12 months Recurrent VTE Nonsevere thrombophilia (heterozygous factor V Leiden or prothrombin gene mutation) Active cancer or recent history of cancer§
<b>Low</b> (<4%/year risk of ATE or <2%/month risk of VTE)	Bileaflet AVR <i>without</i> major risk factors for stroke†	CHA <sub>2</sub> DS <sub>2</sub> VASc score of 1–4 CHADS <sub>2</sub> score of 0–2 (and no prior stroke or TIA)	VTE more than 12 months ago

\* Adapted from 2022 CHEST Guidelines. ATE denotes arterial thromboembolism; AVR, aortic valve replacement; TIA, transient ischemic attack; and VTE, venous thromboembolism.

† Includes atrial fibrillation, prior stroke or transient ischemic attack (including during perioperative period), prior valve thrombosis, rheumatic valvular heart disease, hypertension, diabetes, congestive heart failure, age >75 years.

‡ Includes pancreatic cancer, myeloproliferative disorders, primary brain cancer, gastric cancer, and esophageal cancer.

§ Within 5 years if history of cancer, excluding nonmelanoma skin cancer.

# PAM Protocol - Change Patient Thrombotic Risk

Original Indication for Warfarin: **Mechanical Aortic Valve**

Procedure: Colonoscopy with Polypectomy  
Weight: 60 kg Serum Creatinine: 100 µmol/L

Overall Bleeding Risk: High  
Creatinine Clearance: 48 mL/min

Day	Action: Warfarin
-6	Warfarin at usual dose
-5	No Warfarin
-4	No Warfarin
-3	No Warfarin
-2	No Warfarin
-1	No Warfarin
DAY OF PROCEDURE 0	Warfarin at usual dose
1	Warfarin at usual dose
2	Warfarin at usual dose
3	Warfarin at usual dose
	Check INR
4	Warfarin at usual dose

**Thrombotic Risk of Patient: Moderate**

Thrombotic Risk of Procedure: Low

Bleeding Risk of Patient: Low

Bleeding Risk of Procedure: High

**Overall Thrombotic Risk: Moderate**

Overall Bleeding Risk: High



# Thrombotic Risk of Procedure

Variable #5

# Thrombotic Risk of Procedure

## High risk for post operative VTE

- Patients who would normally receive pharmacological thromboprophylaxis post procedure
- Examples: abdominopelvic cancer surgery or hip or knee replacement surgery
- Patients on prophylactic AC prior to resuming therapeutic AC
- Low-dose LMWH
  - Start 12-24 hours post surgery
  - Continue until INR therapeutic OR therapeutic DOAC restarted

# Patient Case with Procedure Change

## Patient

- KP 65-year-old cisgender female
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Bilateral mastectomy for breast cancer

## Anticoagulant

- Apixaban 5 mg twice daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

# PAM Protocol – Thrombotic Risk of Procedure Change

Original Indication for Apixaban: Atrial Fibrillation

Procedure: **Bilateral mastectomy for breast cancer**

Weight: 60 kg    Serum Creatinine: 100 µmol/L    Creatinine Clearance: 48 mL/min

Day	Action: Apixaban	Action: Enoxaparin
-4	Apixaban 5 mg twice daily	-
-3	Apixaban 5 mg twice daily	-
-2	No Apixaban	-
-1	No Apixaban	-
DAY OF PROCEDURE 0	No Apixaban	No Enoxaparin
1		<b>Enoxaparin 40 mg sc once daily</b>
2		<b>Enoxaparin 40 mg sc once daily</b>
3	Apixaban 5 mg twice daily	-
4	Apixaban 5 mg twice daily	-

Thrombotic Risk of Patient: Low  
**Thrombotic Risk of Procedure: High**

Bleeding Risk of Patient: Low  
 Bleeding Risk of Procedure: High

Overall Bleeding Risk: High  
**Overall Thrombotic Risk: High**

# Patient Case with Procedure Change

## Patient

- KP 65-year-old cisgender female
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Bilateral mastectomy for breast cancer

## Anticoagulant

- Warfarin for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

# PAM Protocol - Thrombotic Risk of Procedure Change

Indication for **Warfarin**: Atrial Fibrillation

Procedure: : **Bilateral mastectomy for breast cancer**

Weight: 60 kg    Serum Creatinine: 100 µmol/L    Creatinine Clearance: 48 mL/min

Day	Action: Warfarin	Action: Enoxaparin
-6	Warfarin at usual dose	-
-5	No Warfarin	-
-4	No Warfarin	-
-3	No Warfarin	
-2	No Warfarin	
-1	No Warfarin	
DAY OF PROCEDURE 0	Warfarin at usual dose	No Enoxaparin
1	Warfarin at usual dose	<b>Enoxaparin 40 mg sc daily</b>
2	Warfarin at usual dose	<b>Enoxaparin 40 mg sc daily</b>
3	Warfarin at usual dose	<b>Enoxaparin 40 mg sc daily</b>
Check INR		

Thrombotic Risk of Patient: Low  
**Thrombotic Risk of Procedure: High**

Bleeding Risk of Patient: Low  
Bleeding Risk of Procedure: High

Overall Bleeding Risk: High  
**Overall Thrombotic Risk: High**



# Anesthesia

Variable #6

# Anesthesia



Neuraxial anesthesia



Risk of epidural hematoma  
lower limb paralysis



Bleeding from the procedure vs Consequences of bleeding



Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines



Increases drug free interval prior to surgery

# ASRA Guidelines -5<sup>th</sup> ed

## MANAGEMENT OF NEURAXIAL BLOCK OR DEEP PLEXUS/PERIPHERAL BLOCK IN THE PATIENT RECEIVING A HIGH DOSE OF APIXABAN

We suggest that a high dose of apixaban be discontinued at least 72 hours prior to neuraxial block or deep plexus/peripheral block. Consider checking apixaban or aXa plasma level if <72 hours (grade IIC)

We suggest that a residual apixaban plasma level <30 ng/mL or a residual aXa activity plasma level ≤0.1 IU/mL is acceptable prior to neuraxial block or deep plexus/peripheral block (grade IIC)

We suggest that needle placement/catheter removal occurs at least 24 hours prior to the first postoperative dose (grade IIC)

With the unanticipated administration of high dose of apixaban with a neuraxial catheter in situ, we suggest that apixaban dosing be withheld for at least 72 hours, or a residual apixaban plasma level <30 ng/mL or a residual aXa activity plasma level ≤0.1 IU/mL before the catheter is removed (grade IIC)

## MANAGEMENT OF NEURAXIAL BLOCK OR DEEP PLEXUS/PERIPHERAL BLOCK IN THE PATIENT RECEIVING A LOW DOSE OF APIXABAN

We suggest that a low dose of apixaban be discontinued for at least 36 hours prior to neuraxial block or deep plexus/peripheral block. Consider checking apixaban or aXa plasma level if <36 hours (grade IIC)

We suggest that a residual apixaban plasma level <30 ng/mL or a residual aXa activity plasma level ≤0.1 IU/mL is acceptable prior to neuraxial block or deep plexus/peripheral block (grade IIC)

We suggest that needle placement/catheter removal occurs at least 6 hours prior to the first postoperative dose (grade IIC)

With the unanticipated administration of low dose of apixaban with a neuraxial catheter in situ, we suggest that apixaban dosing be withheld for at least 36 hours, or a residual apixaban plasma level <30 ng/mL or a residual aXa activity plasma level ≤0.1 IU/mL before the catheter is removed (grade IIC)

# Patient Case with Procedure Change

## Patient

- KP 65-year-old cisgender female
- History of colonic polyps
- PMHx Atrial fibrillation, Hypertension, Moderate renal impairment
- No history of stroke or TIA

## Procedure

- Bowel resection for colorectal cancer

## Anticoagulant

- Apixaban 5 mg twice daily for atrial fibrillation

## CHADS<sub>2</sub> Features

- Hypertension

# PAM Protocol with Neuraxial Anesthesia

Original Indication for Apixaban: Atrial Fibrillation

Procedure: **Bowel resection**

Weight: 60 kg    Serum Creatinine: 100 µmol/L    Creatinine Clearance: 48 mL/min

Day	Action: Apixaban	Action: Enoxaparin
-4	Apixaban 5 mg twice daily	-
-3	Apixaban 5 mg twice daily	-
-2	<b>Apixaban 5 mg at 7 AM ONLY</b>	-
-1	No Apixaban	-
DAY OF PROCEDURE 0	No Apixaban	No Enoxaparin
1		<b>Enoxaparin 40 mg sc once daily</b>
2		<b>Enoxaparin 40 mg sc once daily</b>
3	Apixaban 5 mg twice daily	-
4	Apixaban 5 mg twice daily	-

Thrombotic Risk of Patient: Low  
Thrombotic Risk of Procedure: High

Bleeding Risk of Patient: Low  
**Bleeding Risk of Procedure: High –  
Neuraxial anesthesia**

**Overall Bleeding Risk: High**  
Overall Thrombotic Risk: High

# Components of a Successful PAM Appt



## **Protocol**

Clear

Concise



## **Education**

Protocol

Medication  
administration (LMWH)



## **Access**

Special authorization



## **Communication**

Patient

Referring practitioner

Primary care provider

Community pharmacy

# Summary

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Mismanagement of anticoagulation during an interruption for surgery or procedures can impact patients and the healthcare system.

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It is an individualized patient decision making process balancing risk of bleeding and thromboembolic complications.

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Patient and procedure specific variables can influence the periprocedural plan.

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Route of anesthesia needs to be considered in bleeding risk.

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After a plan is developed, communication and education are key components for the plan to be safely executed.

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# Editorial Board

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Questions

