Ente Ospedaliero Cantonale

IOSI

Bridging nell'anticoagulazione

WORKSHOP

23°corso di aggiornamento GMF

15.10.2025

Eugenia Biguzzi

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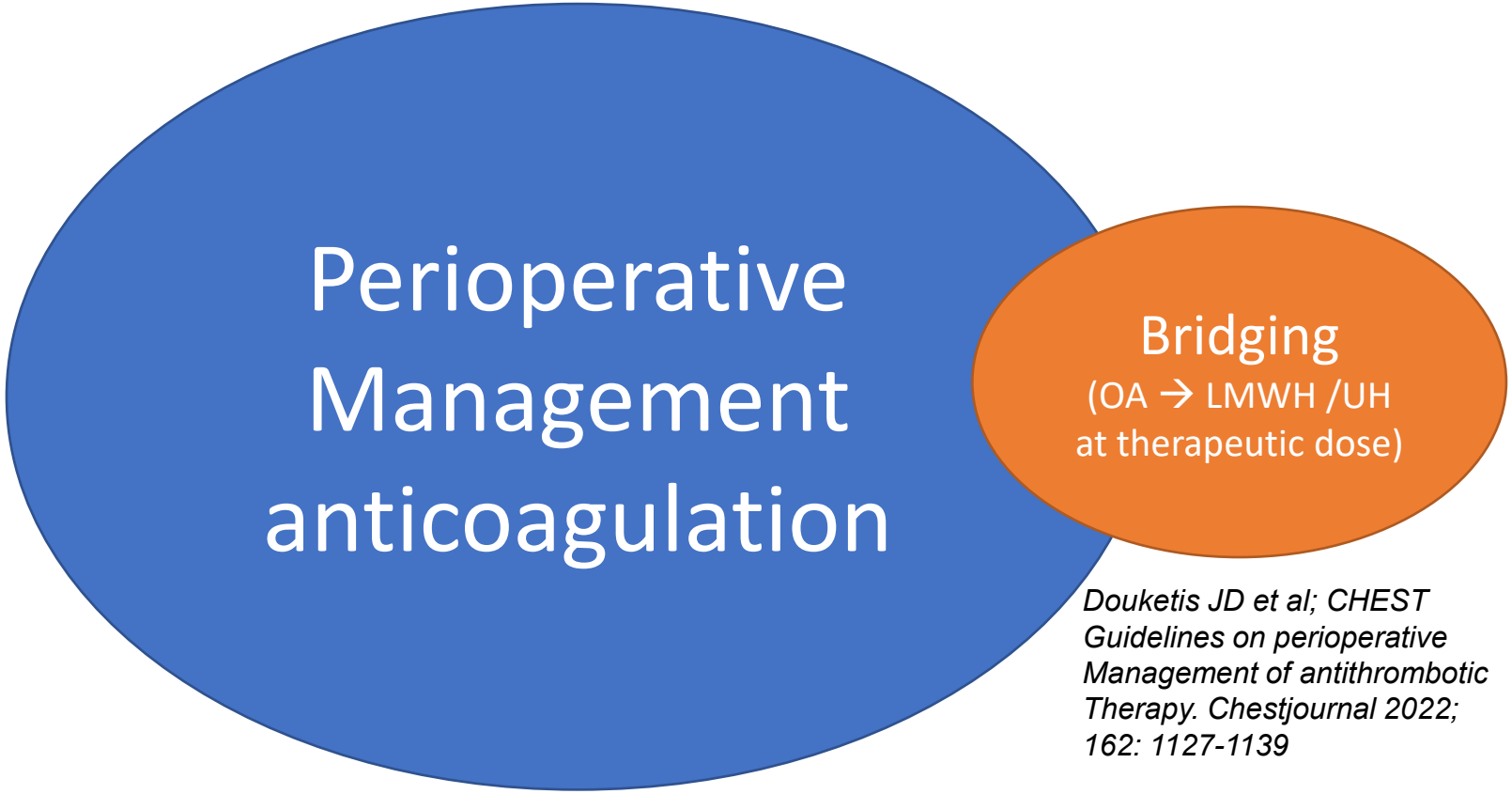
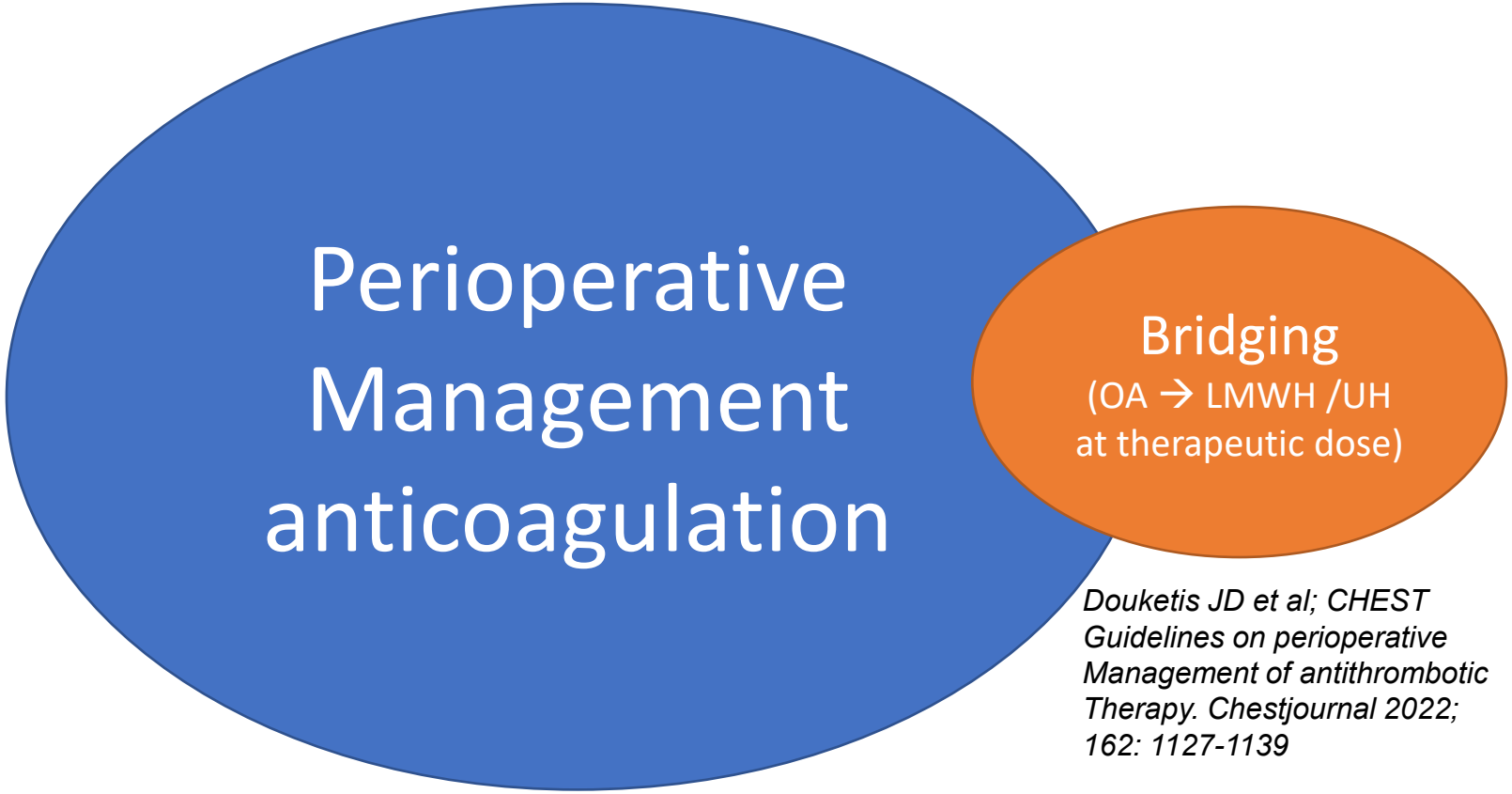


Douketis JD et al; CHEST Guidelines on perioperative Management of antithrombotic Therapy. Chestjournal 2022; 162: 1127-1139

Who is in charge of the decision?



Douketis JD et al; CHEST Guidelines on perioperative Management of antithrombotic Therapy. Chestjournal 2022; 162: 1127-1139

GP → surgeon/specialist → indication to surgery/procedures → date of surgery/procedure

Apps & tools

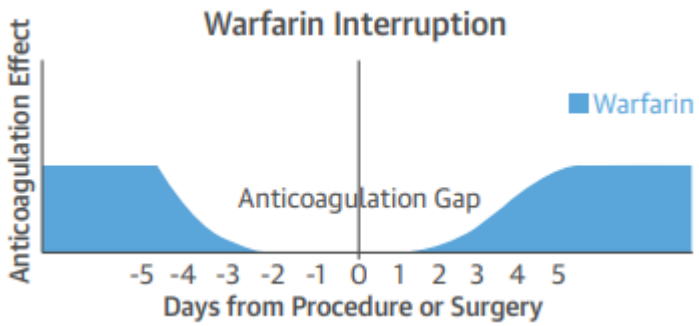
https://mappp.ipro.org/

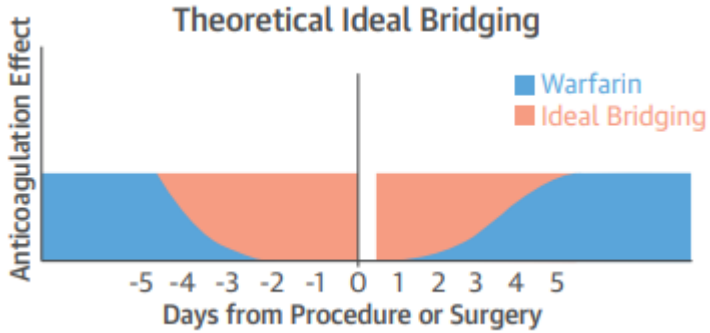
Thrombosis Canada
Thrombose Canada

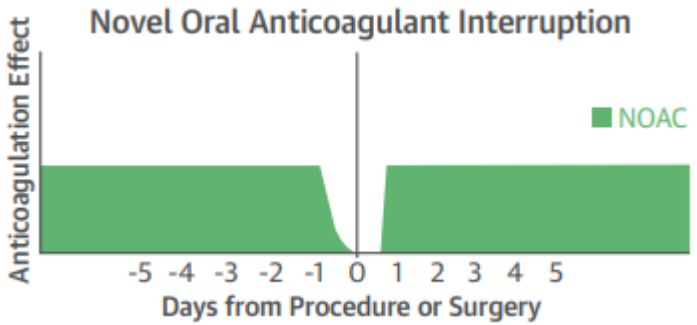
https://thrombosiscanada.ca/hcp/practice/clinical_tools?calc=perioperativeAnticoagulantAlgorithm

CoaguSafe - anticoagulanti
Girard Development GmbH
Progettata per iPad
#13 in Medicina
★★★★★ 4,9 • 158 valutazioni
CHF 3.00

The ideal scenario

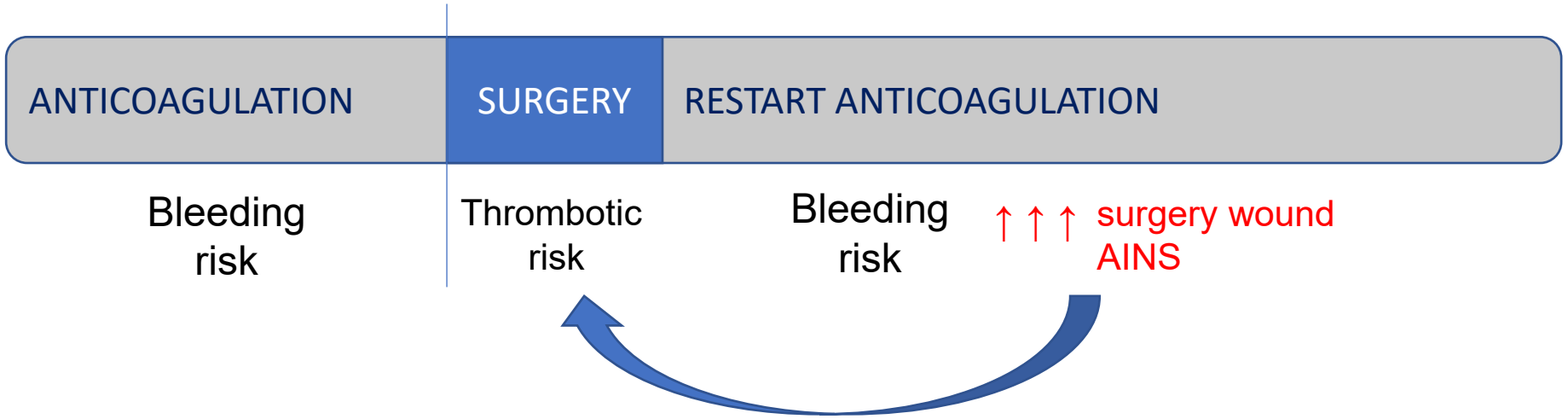






Rechenmacher and Fang; JACC 2015; 66: 1392-1403

Scilla and Cariddi: thrombosis and bleeding



Guidelines, websites and app

GUIDELINES

- Douketis JD et al; CHEST **Guidelines on perioperative management of antithrombotic therapy.** Chestjournal 2022;162: 1127-1139
- Douketis JD, Spyropoulos AC. **Perioperative Management of Patients Taking Direct Oral Anticoagulants: A Review**. JAMA. 2024 Sep 10;332(10):825-834
- Thompson A et al. 2024 AHA/ACC/ACS/ASNC/HRS/SCA/SCCT/SCMR/SVM Guideline for **Perioperative Cardiovascular Management for Noncardiac Surgery**: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2024 Nov 5;150(19):e351-e442
- **ORBV_I-ANES-189** Estratto delle raccomandazioni sulla gestione perioperatoria della terapia antiaggregante/anticoagulante per procedure endoscopiche digestive

WEB SITES

https://mappp.ipro.org/
https://thrombosiscanada.ca/hcp/practice/clinical_tools?calc=perioperativeAnticoagulantAlgorithm

APP

CoaguSafe - anticoagulanti
Girard Development GmbH
Progettata per iPad
#13 in Medicina
★★★★★ 4,9 • 158 valutazioni
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Can the procedure be done WITHOUT stopping the anticoagulation?


Assess the bleeding risk
Procedure
Patient

Less is more (AVK)

(Bajkin BV et al; Am Ass Oral Maxillof Surg 2009; 67: 990-995)

- 214 patients on oral anticoagulation, simple dental extractions
- randomization
  - 109 patients continue oral anticoagulation INR ≤4.0 → bleeding in 7.3%
  - 105 patients bridging with LMWH (mean INR 1.26 ± 0.11) → bleeding in 4.8%

No need for bridging

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→ No need for bridging

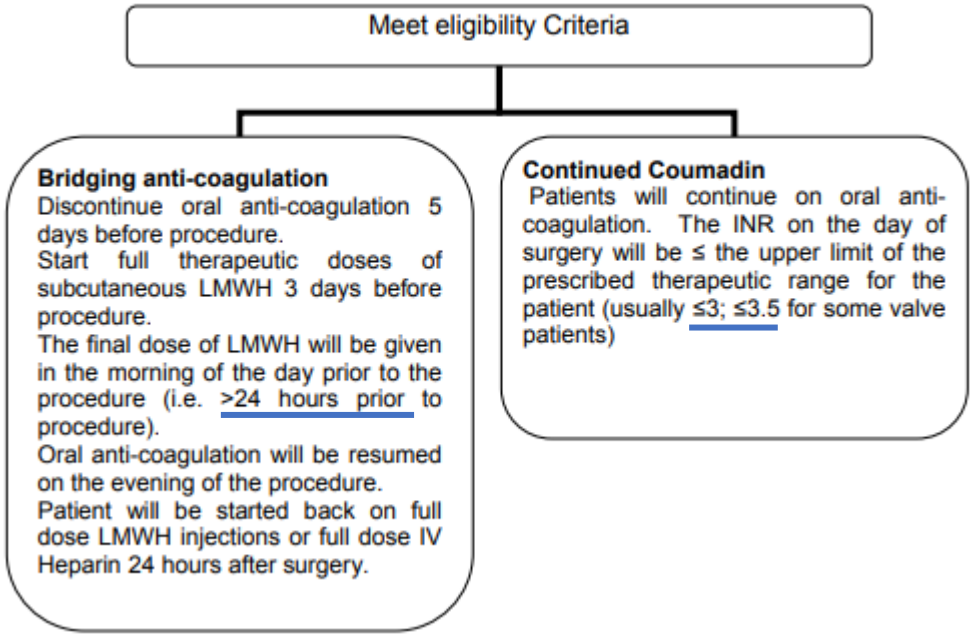
Some suggestions:

- Check INR the day of the procedure
- Accurate surgical hemostasis
- No AINS
- Soft diet + avoid hot beverages/foods for 5-7 days
- Oral rinses with tranexamic acid

Less is more (AVK)

*(Birnie et al, **BRUISE** control investigators; NEJM 2013; 368: 2084-2093)*

Pacemaker or Defibrillator Surgery without Interruption of Anticoagulation BRUISE TRIAL (AVK)



- 681 randomized patients, no blinding (one team implanting the device, one team blind of the randomizazion assessing possible bleeding complications)
- no restrictions regarding renal function
- Early termination of the trial after the second prespecified interim analysis
- Clinically significant device-pocket hematoma 12/ 343 (3.5%) warfarin vs 54/ 338 (16.0%) bridging
- **Relative risk 0.19 (95% 0.10 - 0.36)**

Less is more (AVK)

(Clark NP et al; Am Heart J; 2018: 195: 108-114)

BRIDGE randomized double-blind placebo controlled trial:

- 1813 patients on warfarin for AF
- Randomization
  - 895 patients stop warfarin, placebo
  - 895 patients stop warfarin, bridging with LMWH (dalteparin 100mg/kg twice daily)
- Major bleeding events n=41
- Risk factors for major bleeding
  - **Bridge therapy** **OR 2.4 (95% CI 1.2-4.8)**
  - History of renal disease OR 2.9 (95% CI 1.4-6.0)
  - Perioperative ASA use OR 3.6 (95% CI 1.1-11.9)
  - Post-procedure INR >3.0 OR 2.1 (95% CI 1.5-5.1)

Less is more (AVK)

(Clark NP et al; Am Heart J; 2018: 195: 108-114)

BRIDGE randomized double-blind placebo controlled trial:

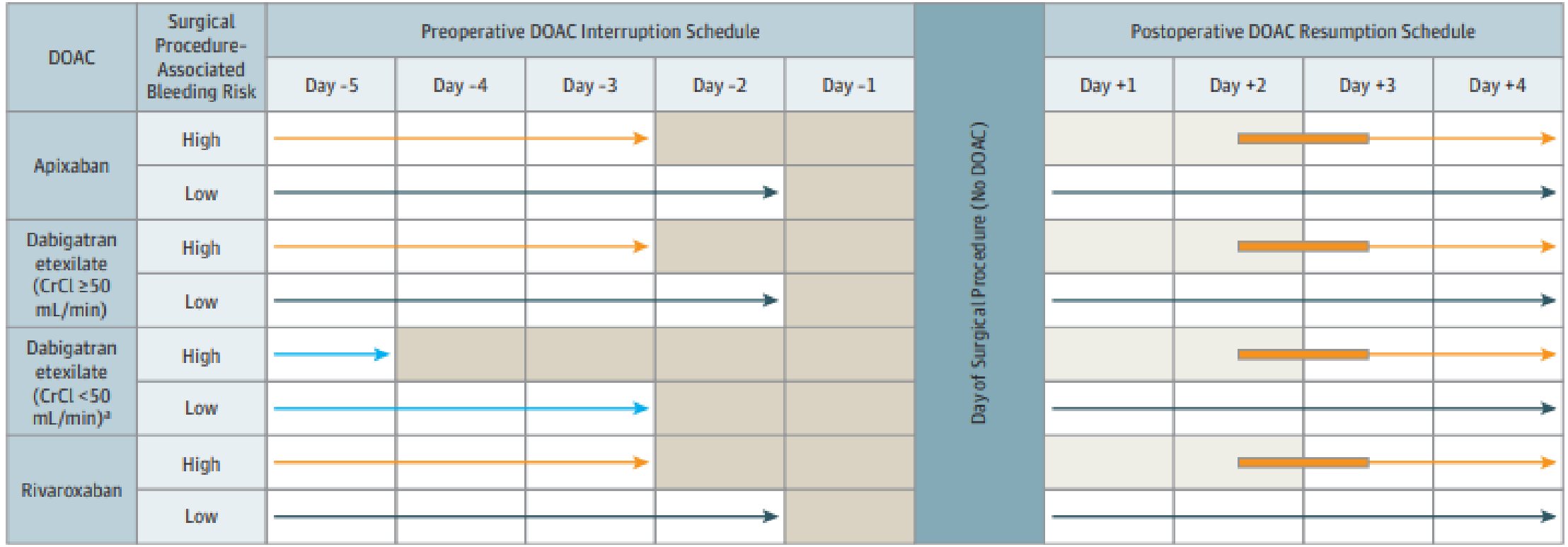
- 1813 patients on warfarin for AF (only 3% with $CHADS_2$ score of 5-6)
- Randomization
  - 895 patients stop warfarin, placebo
  - 895 patients stop warfarin, bridging with LMWH (dalteparin 100mg/kg twice daily)
- Major bleeding events n=41 (only 11% major surgery/procedure)
- Risk factors for major bleeding
  - **Bridge therapy** **OR 2.4 (95% CI 1.2-4.8)**
  - History of renal disease OR 2.9 (95% CI 1.4-6.0)
  - Perioperative ASA use OR 3.6 (95% CI 1.1-11.9)
  - Post-procedure INR >3.0 OR 2.1 (95% CI 1.5-5.1)

Less is more, also with DOAC

(Douketis JD et al; JAMA Intern Med; 2019: 179: 1469-1478)

PAUSE trial:

3007 patients on DOAC (apixaban/dabigatran/rivaroxaban) for AF, elective procedure



N=1257

N=668

N=1082

Less is more, also with DOAC

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PAUSE trial:

3007 patients on DOAC (apixaban/dabigatran/rivaroxaban) for AF, elective procedure

	Apixaban	Dabigatran	Rivaroxaban
N	**1257**	**668**	**1082**
Major bleeding, n (%)	17 (1.35%)	6 (0.90%)	20 (1.85%)
Procedures with high bleeding risk, n	406	228	373
Major bleeding rate at 30-days, % (95% CI)	2.96 (0-4.7)	0.88 (0-2.6)	2.95 (0.4.76)
Preoperative DOAC levels <50ng/ml, %	90.5%	96.8%	82.6%
Arterial thromboembolism, n (%)	2 (0.16%)	4 (0.60%)	4 (0.37%)

Assess the bleeding risk

PROCEDURES THAT DO NOT REQUIRE TO STOP THE ANTICOAGULATION

Surgical and nonsurgical procedures associated with minimal bleeding risk

- Cardiac device implantation (eg, pacemaker or cardioverter-defibrillator device)
- Coronary angiography using radial artery access
- Minor dermatologic procedures (eg, excision of basal and squamous cell skin cancers, actinic keratoses, or premalignant or cancerous skin nevi)
- Phacoemulsification (cataract) procedures
- Minor dental procedures (eg, dental extractions, restorations, cleanings, or fillings)

(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

- EGD with/without biopsy
- Colonscopy without biopsy
- Diagnostic ERCP

(ORBV_I-ANES-189, rev 24.02.2025)

Assess the bleeding risk

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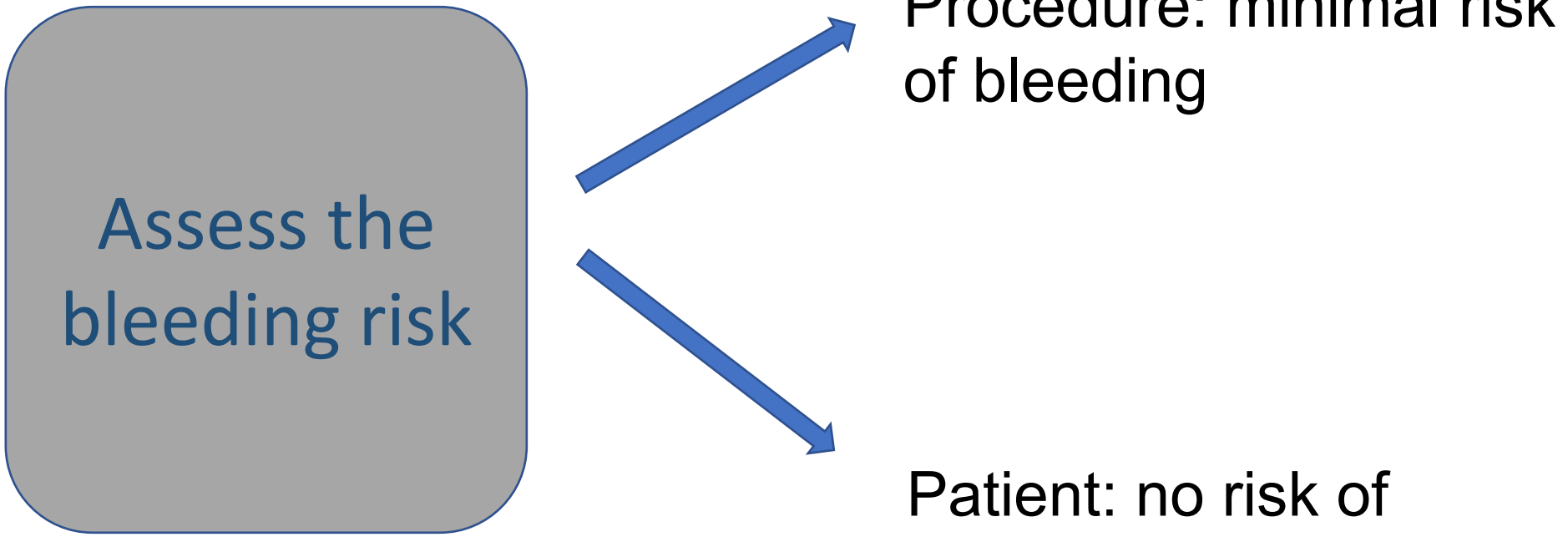
(ORBV_I-ANES-189, rev 24.02.2025)

PATIENT

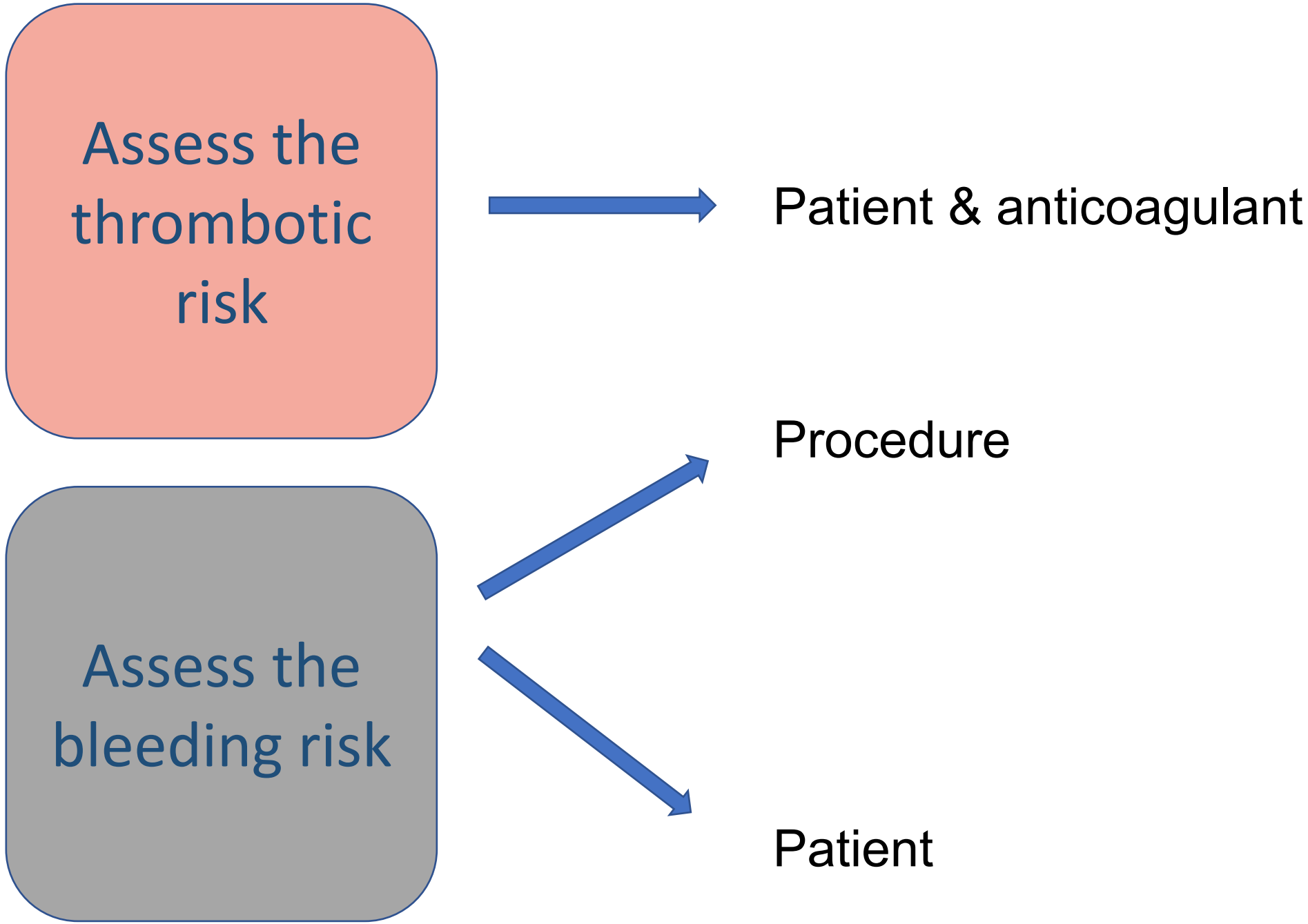
- Phytotherapics and over the counter drugs (gingko biloba, ginseng, ginger, omega 3, coenzyme Q10… → antiaggregant effect)
- No AINS before and after the procedure
- Uremic patients



Avoid drug peak interval !

- **Rivaroxaban, edoxaban, acenocoumarol, phenoprocoumon** → DELAY the morning dose to the evening post-procedure (or avoid dose)
- **Apixaban** → AVOID morning dose

And the other procedures?


Assess the thrombotic risk
Patient & anticoagulant
Assess the bleeding risk
Procedure
Patient

Assess the bleeding risk

Procedures associated with low or moderate bleeding risk

- Laparoscopic cholecystectomy
- Abdominal hernia repair
- Abdominal hysterectomy
- Lymph node biopsy
- Foot or hand surgery
- Coronary angiography using femoral artery access
- Gastrointestinal endoscopy with or without biopsy
- Colonoscopy with or without biopsy
- Hemorrhoidal surgery
- Bronchoscopy with or without biopsy

(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

Procedures associated with high bleeding risk

- Any surgery with spinal or epidural anesthesia
- Major cancer surgery (eg, lung, esophagus, gastric, colon, kidney, or hepatobiliary)
- Major orthopedic surgery (eg, hip or knee replacement)
- Major reconstructive plastic surgery (eg, cancer resection)
- Noncancer major thoracoabdominal surgery (eg, colectomy)
- Transurethral prostate or bladder resection
- Selected biopsies (eg, kidney)
- Selected gastrointestinal procedures (eg, endoscopic retrograde cholangiopancreatography)
- Surgery involving highly vascular organs (eg, kidneys)
- Surgery involving closed space areas (eg, cardiac)
- Deep nerve block procedures

- Colonscopy with biopsy/polipectomy
- ERCP with sphincterotomy
- Ultrasound endoscopy with biopsy
- GAVE and varices treatment
- PEG

(ORBV_I-ANES-189, rev 24.02.2025)

Assess the bleeding risk

Very detailed list of surgeries /procedures to get an idea

http://jaccjacc.acc.org/Clinical_Document/PMAC_Online_Appendix.pdf

Discuss with the surgeon/specialist !

Assess the thrombotic risk

(Thompson A et al; 2024 AHA/ACC/ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery Circulation; 2024: 150: e351-e442)

Table 14. Thromboembolic Risk for Common Oral Anticoagulant Indications

Risk Category	Venous Thromboembolism	Atrial Fibrillation	Mechanical Valve	Other Anticoagulation Indications
Low	VTE >12 mo	CHA_2DS_2-VASc 1-4 (without prior history of stroke)	Bileaflet mechanical AVR without major risk factors for stroke*	
Moderate	VTE ≤3-12 mo Recurrent VTE	CHA_2DS_2-VASc 5-6	Bileaflet mechanical AVR with major risk factors for stroke*	Nonsevere coagulopathy (heterozygous factor V Leiden or prothrombin gene G20210A mutation) Active cancer
High	Recent VTE (<1 mo or <3 mo)	CHA_2DS_2-VASc ≥7 (or 5-6 with recent stroke or TIA) AF with rheumatic valvular heart disease	Mechanical mitral valve * Caged ball or tilting-disk valve Mechanical heart valve in any position with recent stroke or TIA (<3 mo)	Recent cardioembolic stroke (<3 mo)† Active cancer associated with high VTE risk LV thrombus (within past 3 mo) Severe thrombophilia† Antiphospholipid antibodies

Adapted from Douketis et al.[15] Copyright 2022 Elsevier, with permission from Elsevier.

*Major risk factors for stroke include AF, multiple prior strokes/TIAs (≥3 months), prior perioperative stroke, or prior valve thrombosis.

†Deficiency of protein C, protein S, or antithrombin; homozygous factor V Leiden or prothrombin gene G20210A mutation or double heterozygous for each mutation, multiple thrombophilias.

AF indicated atrial fibrillation; AVR, aortic valve replacement; CHA_2DS_2-VASc, congestive heart failure, hypertension, age ≥75 (doubled), diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism (doubled), vascular disease, age 65 to 74 years, sex category; LV, left ventricular; OAC, oral anticoagulant; TIA, transient ischemic attack; and VTE, venous thromboembolism.

Assess the thrombotic risk

(Thompson A et al; 2024 AHA/ACC(ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery Circulation; 2024: 150: e351-e442)

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Can we delay the surgery/procedure?

Assess the thrombotic risk

(Thompson A et al; 2024 AHA/ACC(ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery Circulation; 2024: 150: e351-e442)

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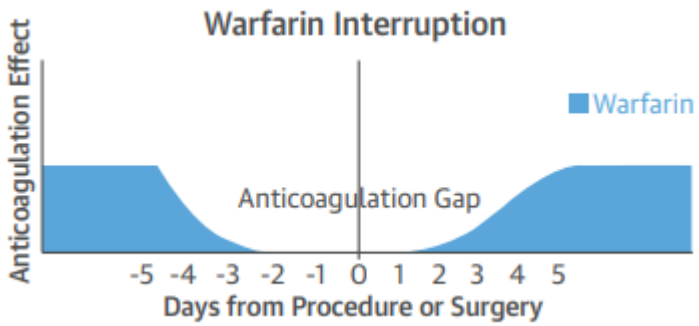
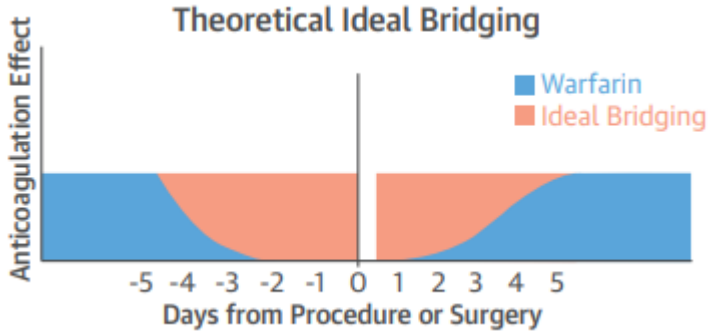
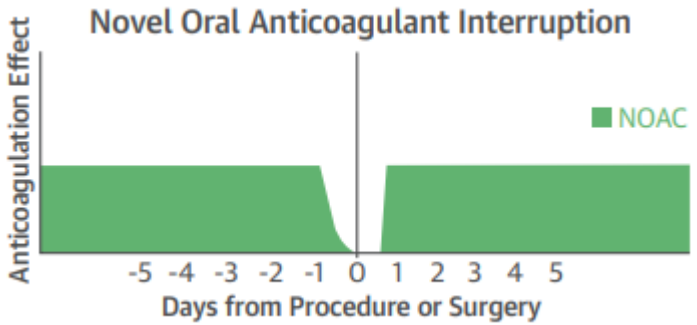
DOAC

The ideal scenario







Rechenmacher and Fang; JACC 2015; 66: 1392-1403

Perioperative management: DOAC

Procedures associated with low or moderate bleeding risk

- Laparoscopic cholecystectomy
- Abdominal hernia repair
- Abdominal hysterectomy
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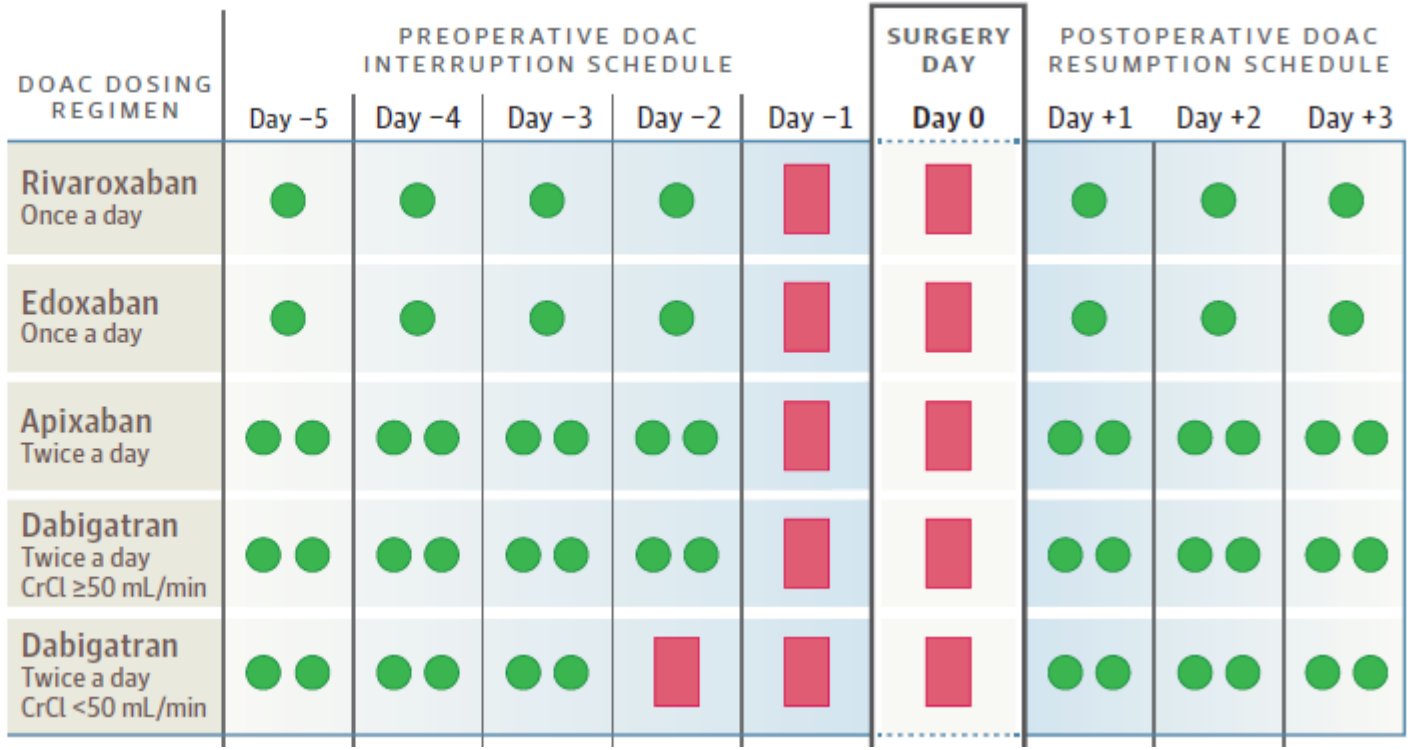
- Coronary angiography using femoral artery access
- Gastrointestinal endoscopy with or without biopsy
- Colonoscopy with or without biopsy
- Hemorrhoidal surgery
- Bronchoscopy with or without biopsy



(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

Variable risk definition for EGD and colonoscopy
No evaluation of Creatinine clearance for apixaban

Perioperative management: DOAC

Procedures associated with high bleeding risk

- Any surgery with spinal or epidural anesthesia
- Major cancer surgery (eg, lung, esophagus, gastric, colon, kidney, or hepatobiliary)
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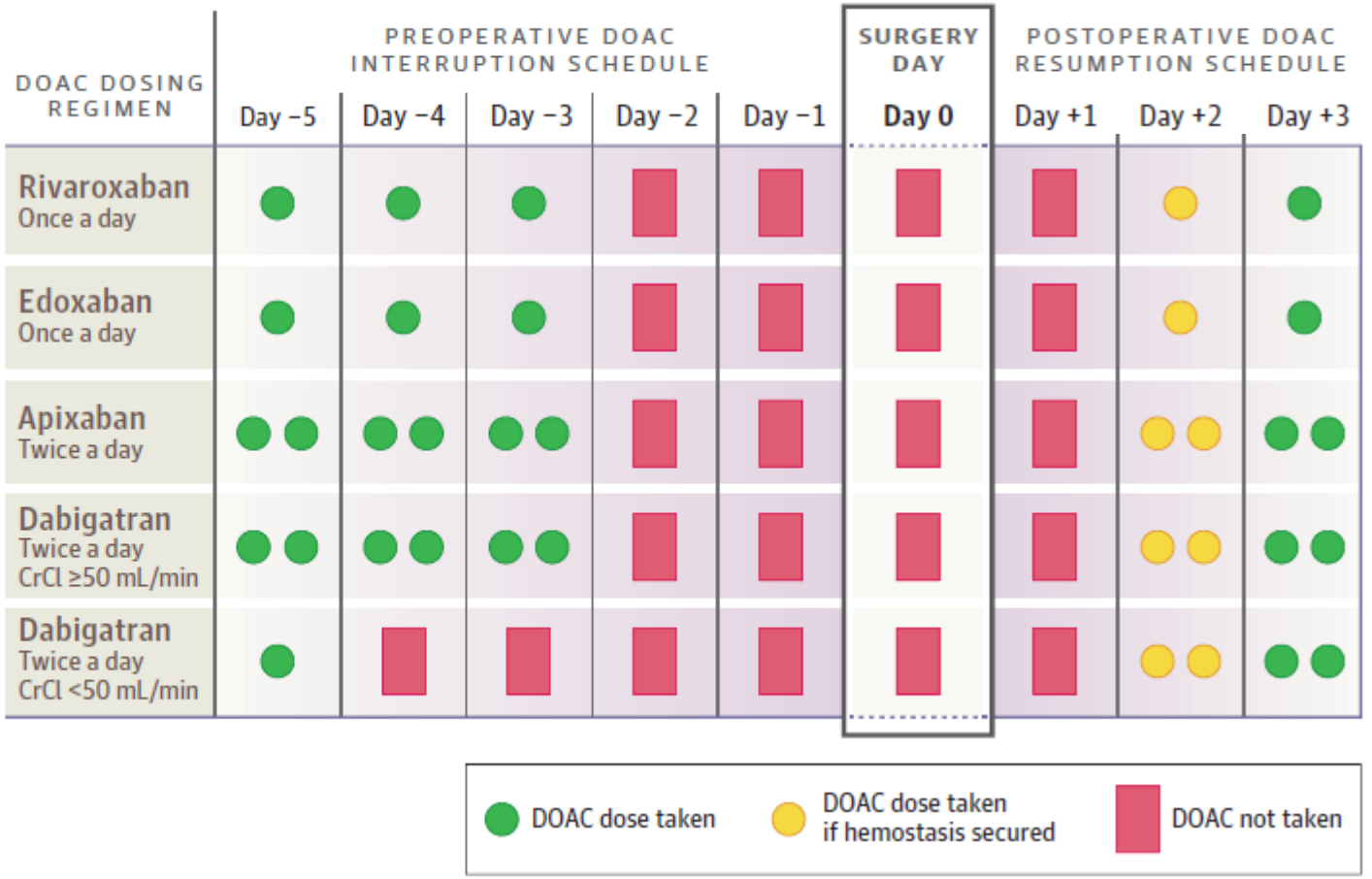
- Deep nerve block procedures



(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

Perioperative management: DOAC

Preoperative DOAC Schedule												
		Preoperative Interruption						Surgery/ Procedure	Postoperative Resumption			
	Procedure Bleeding Risk	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 0	Day +1	Day +2	Day +3	Day +4
Apixaban, edoxaban, rivaroxaban	High	•	•	•	•	†	†	†	†	†	•	•
	Low/Moderate	•	•	•	•	•	†	†	•	•	•	•
	Minimal	•	•	•	•	•	•	•	•	•	•	•
Apixaban, edoxaban, rivaroxaban with renal impairment (CrCl <30 mL/min)	High	•	•	•	†	†	†	†	†	†	•	•
	Low/Moderate	•	•	•	•	†	†	†	•	•	•	•
	Minimal	•	•	•	•	•	•	•	•	•	•	•
Dabigatran CrCl ≥50 mL/min	High	•	•	•	•	†	†	†	†	†	•	•
	Low/Moderate	•	•	•	•	•	†	†	•	•	•	•
	Minimal	•	•	•	•	•	•	•	•	•	•	•
Dabigatran CrCl <50 mL/min	High	•	•	†	†	†	†	†	†	†	•	•
	Low/Moderate	•	•	•	•	†	†	†	•	•	•	•
	Minimal	•	•	•	•	•	•	•	•	•	•	•

(Thompson A et al; 2024 AHA/ACC/ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery Circulation; 2024: 150: e351-e442)

Perioperative management: DOAC

Schema di sospensione AOD

	Dabigatran (Pradaxa®)		Apixaban (Eliquis®) Rdoxaban (Lixiana®) Rivaroxaban (Xarelto®)	
(CrCl calcolata sec. Cockcroft Gault)	Endoscopia NON operativa (Low risk of bleeding)	Endoscopia operativa (High risk of bleeding)	Endoscopia NON operativa (Low risk of bleeding)	Endoscopia operativa (High risk of bleeding)
CrCl ≥ 80 ml/min.	≥24 ore	≥48 ore	≥24 ore	≥48 ore
CrCl 50-79 ml/min.	≥36 ore	≥72 ore	≥24 ore	≥48 ore
CrCl 30-49 ml/min.	≥48 ore	≥96 ore	≥24 ore	≥48 ore
CrCl 15-29 ml/min.	Non indicato l'uso		≥36 ore	≥48 ore
CrCl < 15 ml/min.	Non indicato l'uso			
Non è necessario fare bridging con EBPM o ENF				

(ORBV_I-ANES-189 Estratto delle raccomandazioni sulla gestione perioperatoria della terapia antiaggregante/anticoagulante per procedure endoscopiche digestive)

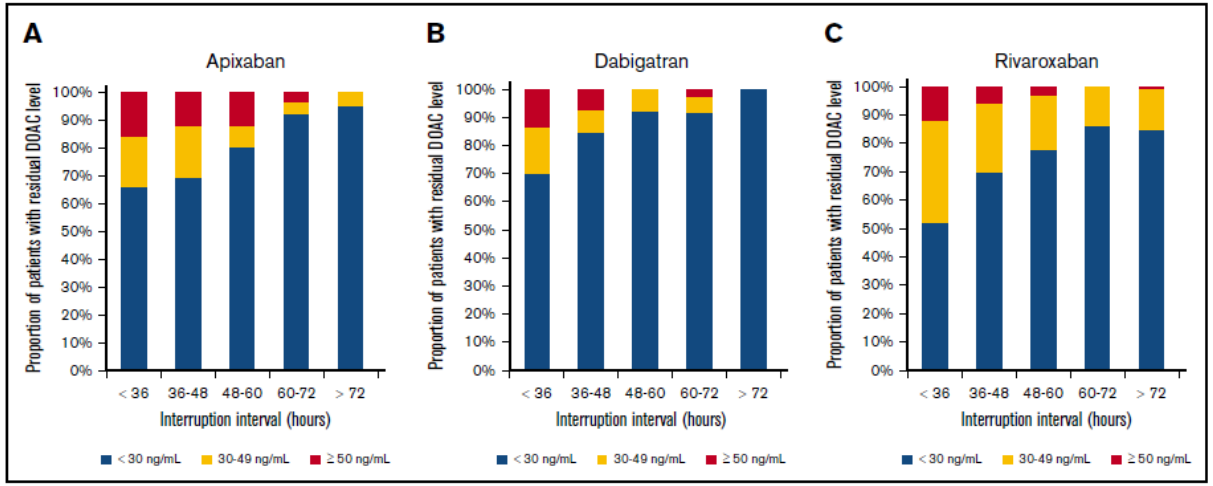
Predictors of preprocedural DOAC levels before elective surgery

(Shaw JR et al, Blood adv; 2020: 4: 3520-3527)

- **PAUSE study:** 2541 pts on DOAC, undergoing elective surgery
- Low bleeding risk surgery → no DOAC day -1

  (dabigatran CrCl <50ml/min → no DOAC day -1-2)
- High bleeding risk surgery→ no DOAC day -1-2

  (dabigatran CrCl <50ml/min → no DOAC day -1-3)
- **Risk factors for levels >50ng/ml before surgery:**
  - **Age ≥75 years**
  - **Female sex**
  - **CrCl <50ml/min**
- Apixaban and rivaroxaban were more likely than dabigatran to be associated with residual preprocedural levels using the PAUSE protocol.



Do we need to evaluate DOAC levels before surgery?

(Camilleri E et al; DALI study, OC at the ISTH congress 2025)

- **DALI study**
- 2019-2024: 257 pts on DOAC (100 apixaban, 100 rivaroxaban, 57 dabigatran)
- DOAC stopping according to Creatinine clearance
- **DOAC levels ≥ 30ng/ml in 7.6%** (95% CI 4.9-11.6)
- 12 major bleeding (all in patients with DOAC levels < 30ng/ml, 4.7% 95%CI 2.7-8.0)
- No association between DOAC levels and surgical blood loss

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- 12 major bleeding (all in patients with DOAC levels < 30ng/ml, 4.7% 95%CI 2.7-8.0)
- No association between DOAC levels and surgical blood loss

Kopp SL et al, ASRAPM guidelines, BMJ 2025: 0:1-29 → neuraxial block
Consider DOAC dosing if shorter discontinuation
Acceptable levels: DOAC <30ng/ml or anti-Xa ≤0.1 IU/ml

Assess the thrombotic risk

(Thompson A et al; 2024 AHA/ACC(ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery Circulation; 2024: 150: e351-e442)

Table 14. Thromboembolic Risk for Common Oral Anticoagulant Indications

Risk Category	Venous Thromboembolism	Atrial Fibrillation	Mechanical Valve	Other Anticoagulation Indications
Low	VTE >12 mo	CHA_2DS_2-VASc 1-4 (without prior history of stroke)	Bileaflet mechanical AVR without major risk factors for stroke*	
Moderate	VTE ≤3-12 mo Recurrent VTE	CHA_2DS_2-VASc 5-6	Bileaflet mechanical AVR with major risk factors for stroke*	Nonsevere coagulopathy (heterozygous factor V Leiden or prothrombin gene G20210A mutation) Active cancer
High	Recent VTE (<1 mo or <3 mo)	CHA_2DS_2-VASc ≥7 (or 5-6 with recent stroke or TIA) AF with rheumatic valvular heart disease	Mechanical mitral valve * Caged ball or tilting-disk valve Mechanical heart valve in any position with recent stroke or TIA (<3 mo)	Recent cardioembolic stroke (<3 mo)† Active cancer associated with high VTE risk LV thrombus (within past 3 mo) Severe thrombophilia† Antiphospholipid antibodies

AVK

Perioperative management: AVK

VKA Schedule											
		Preoperative Interruption						Surgery/ Procedure	Postoperative Resumption		
	Procedure Bleeding Risk	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 0	Day +1	Day +2	Day +3	Day +4
Warfarin in low/moderate thrombotic risk	High	*	†	†	†	†	†	†	*	*	*	*
	Low/ Moderate	*	†	†	†	†	†	†	*	*	*	*
	Minimal	*	*	*	*	*	*	*	*	*	*	*
Warfarin in high thrombotic risk	High	*	†	†	‡	‡	‡	†	*	*	*#	*#
	Low/ Moderate	*	†	†	‡	‡	‡	†	*	*#	*#	*#
	Minimal	*	*	*	*	*	*	*	*	*	*	*

(Thompson A et al; 2024 AHA/ACC/ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery. Circulation; 2024: 150: e351-e442)

Bridging with LMWH in very high thrombotic risk

Post-op prophy or full dose LMWH to be discussed

Perioperative management: AVK

VKA Schedule											
		Preoperative Interruption						Surgery/ Procedure	Postoperative Resumption		
	Procedure Bleeding Risk	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 0	Day +1	Day +2	Day +3	Day +4
Warfarin in low/moderate thrombotic risk	High	*	†	†	†	†	†	†	*	*	*	*
	Low/ Moderate	*	†	†	†	†	†	†	*	*	*	*
	Minimal	*	*	*	*	*	*	*	*	*	*	*
Warfarin in high thrombotic risk	High	*	†	†	‡	‡	‡	†	*	*	*#	*#
	Low/ Moderate	*	†	†	‡	‡	‡	†	*	*#	*#	*#
	Minimal	*	*	*	*	*	*	*	*	*	*	*

(Thompson A et al; 2024 AHA/ACC/ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for the perioperative cardiovascular management for noncardiac surgery. Circulation; 2024: 150: e351-e442)

Bridging with LMWH in high thrombotic risk

Post-op prophy or full dose LMWH to be discussed

Douketis JD et al (2022 Chest guidelines):

- **Bridging** suggested for high thrombotic risk populations with full-dose: subcutaneous LMWH (e.g., enoxaparin, 1 mg/kg bid), with the last dose given the AM of the day prior to the procedure (i.e., D-1) at half the total daily dose.
- **Post-op** low-dose LMWH (e.g., enoxaparin, 40 mg daily or dalteparin 5,000 IU daily) can be used for VTE prophylaxis for first 24-72 hours post-procedure, with full dose LMWH resumed 2-3 days post-procedure.

and Phenprocoumon (Marcoumar) ?

(https://sggssg.ch/fileadmin/user_upload/broschueren/Antikoagulation/Phenprocoucon.pdf)

Discontinuation of vitamin K antagonist anticoagulants (VKA)
Part 1: Phenprocoumon

Discontinuation without bridging (procedure = day 0)

Day -7 to -5	Stop Phenprocoumon; consider INR testing before
Day -2	INR testing; if INR >1.5 administer vitamin K 1-2.5 mg po
Day 0 to +1	Resume phenprocoumon (evening after procedure)

Discontinuation with bridging (procedure = day 0)

Day -7 to -5	Stop Phenprocoumon
Day -4 to -2	INR testing; if INR <2.0 start LMWH (2 sc doses/day);
Day -1	INR testing; if INR >1.5 administer vit. K 1-2.5 mg po; last LMWH dose >24 h before procedure, consider anti-factor Xa testing before procedure in renal insufficiency
Day 0	If adequate hemostasis, LMWH at prophylactic or therapeutic (2 sc doses/day) level according to bleeding risk ≥ 6 h after procedure; resume phenprocoumon, stop LMWH when INR is within target range

The effect of stopping phenprocoumon 5 days preoperatively

(Knol S et al, RPTH 2019; 3:85-88)

- Observational study, 118 patients undergoing an elective procedure
- Phenprocoumon discontinued 5 days before surgery
- **PT-INR ≥ 1.8 in 36%**
- Risk factors: male sex and ASA score 3-4 (5-6 not included)
- **Conclusions**: stop phenprocoumon **7 days before surgery** or customize discontinuation

The effect of stopping phenprocoumon 5 days preoperatively

(van Geest-Daalderop JHH et al, TH 2007; 98:747-755)

Observational study, 111 pts on phenprocoumon undergoing an elective procedure

55 pts, day -2
Vitamin K 2-10mg single dose
Stop phenprocoumon

56 pts, day -2
Vitamin K 2-10mg single dose

The effect of stopping phenprocoumon 5 days preoperatively

(van Geest-Daalderop JHH et al, TH 2007; 98:747-755)

Observational study, 111 pts on phenprocoumon undergoing an elective procedure

55 pts, day -2
Vitamin K 2-10mg single dose
Stop phenprocoumon

PT-INR, mean 1.5 (SD 0.2)

56 pts, day -2
Vitamin K 2-10mg single dose

PT-INR, mean 1.6 (SD 0.3)

Conclusions: administrazion of vitamin K before an intervention results in an acceptable INR during the intervention, regardless whether phenprocoumon is interrupted or not

Vitamin K dose: 4mg (INR <2.5); 7mg (INR 2.5-3.5); 10mg (INR >3.5)

Perioperative anticoagulant management: guidelines and adherence

(Moesker MJ et al, BMJ open 2019, 9: e29879)

- Multicenter retrospective patient record review, 184 elective surgeries in pts on AVK

Table 1 Perioperative anticoagulant management (PAM) steps with evaluation criteria and source

Preoperative					
		Evaluation criteria		Applicable population	Source
No	PAM step	Compliant	Non-compliant		
1	Timing of patient assessment	► Assessment Performed ≥ 7 days preoperative	► Assessment Performed < 7 days preoperative	Elective	ACCP, 2012
2	VKA interruption interval	► Acenocoumarol interruption = 3 days ► Phenprocoumon interruption = 5 days	► Acenocoumarol interruption ≠ 3 days ► Phenprocoumon interruption ≠ 5 days	Elective	CBO, 2008
3	INR testing	► INR is tested on day of surgery	► INR is not tested on day of surgery	Elective	ACCP, 2012
4	Bridging anticoagulation use	Based on thromboembolic risk: ► Low/intermediate risk: no bridging used ► Intermediate/high risk: bridging used	Based on thromboembolic risk: ► Low risk: bridging used ► High risk: no bridging used	Elective	ACCP, 2012
Postoperative					
5	Bridging anticoagulation use	Based on thromboembolic risk: ► Low/intermediate risk: no bridging used ► Intermediate/high risk: bridging used	Based on thromboembolic risk: ► Low risk: bridging used ► High risk: no bridging used	Elective Non-elective	ACCP, 2012
6	Restart time for bridging anticoagulation	► Bridging restart day = 1st day after surgery In case high thromboembolic risk: ► Bridging restart day = day of surgery or 1st day after surgery	► Bridging restart day ≠ 1st day after surgery In case high thromboembolic risk: ► Bridging restart day ≠ day of surgery or 1st day after surgery	Elective Non-elective	CBO, 2008
7	Restart time for VKA	► VKA restart day = 1st day after surgery	► VKA restart day ≠ 1st day after surgery	Elective Non-elective	CBO, 2008

ACCP, American College of Chest Physicians; CBO, Dutch Quality Institute for Healthcare; INR, international normalised ratio; VKA, vitamin-K antagonist.

Perioperative anticoagulant management: guidelines and adherence

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Postoperative					
5	Bridging anticoagulation use	Based on thromboembolic risk: ► Low/intermediate risk: no bridging used ► Intermediate/high risk: bridging used	Based on thromboembolic risk: ► Low risk: bridging used ► High risk: no bridging used	Elective Non-elective	ACCP, 2012
6	Restart time for bridging anticoagulation	► Bridging restart day = 1st day after surgery In case high thromboembolic risk: ► Bridging restart day = day of surgery or 1st day after surgery	► Bridging restart day ≠ 1st day after surgery In case high thromboembolic risk: ► Bridging restart day ≠ day of surgery or 1st day after surgery	Elective Non-elective	CBO, 2008
7	Restart time for VKA	► VKA restart day = 1st day after surgery	► VKA restart day ≠ 1st day after surgery	Elective Non-elective	CBO, 2008

ACCP, American College of Chest Physicians; CBO, Dutch Quality Institute for Healthcare; INR, international normalised ratio; VKA, vitamin-K antagonist.

Valid records	Compliance, %	95% CI
182	81	75-87
119	59	50-68
184	61	54-68
157	80	73-87
181	74	67-81
63	61	48-73
136	42	34-50

Clinical cases

Clinical Case 1, AVK

- Man, 60 years old
- Mechanical mitral valve, since 2020
- On Phenprocoumon with good PT-INR control (time in range >80%)
- Normal weight (75kg), normal creatinine (62 µmol/L)

Melanocytic nevus excision (3mm, left forearm)

Clinical Case 1, AVK

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- Mechanical mitral valve, since 2020
- On Phenprocoumon with good PT-INR control (time in range >80%)
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Melanocytic nevus excision (3mm, left forearm)

Surgical and nonsurgical procedures associated with minimal bleeding risk

- Cardiac device implantation (eg, pacemaker or cardioverter-defibrillator device)
- Coronary angiography using radial artery access
- Minor dermatologic procedures (eg, excision of basal and squamous cell skin cancers, actinic keratoses, or premalignant or cancerous skin nevi)
- Phacoemulsification (cataract) procedures
- Minor dental procedures (eg, dental extractions, restorations, cleanings, or fillings)

(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

WEB SITES

https://mappp.ipro.org/

https://thrombosiscanada.ca/hcp/practice/clinical_tools?calc=perioperativeAnticoagulantAlgorithm

Clinical Case 1, AVK

- Man, 60 years old
- Mechanical mitral valve, since 2020
- On Phenprocoumon with good PT-INR control (time in range >80%)
- Normal weight (75kg), normal creatinine (62 µmol/L)

Melanocytic nevus excision (3mm, left forearm)

WEB SITES

https://mappp.ipro.org/

Anticoagulant type	→ Warfarin (phenprocoumon is not a possible option)
Procedure bleeding risk	→ minimal (minor dermatologic procedures)
Thrombotic risk	→ moderate (mechanical mitral valve WITHOUT major risk factors for stroke)
RESULTS	**→ DO NOT INTERRUPT ANTICOAGULANTS**

https://thrombosiscanada.ca/hcp/practice/clinical_tools?calc=perioperativeAnticoagulantAlgorithm

Type of surgery	→ elective
Procedural bleeding risk	→ low (minor non-dental procedure, dermatologic procedures)
Anticoagulant type	→ Warfarin (phenprocoumon is not a possible option)
RESULTS	**→ Continue anticoagulant up to and including day of procedure and use local hemostatic techniques to control bleeding**

Clinical Case 1, AVK

- Man, 60 years old
- Mechanical mitral valve, since 2020
- On Phenprocoumon with good PT-INR control (time in range >80%)
- Normal weight (75kg), normal creatinine (62 µmol/L)

Melanocytic nevus excision (3mm, left forearm)

Tips

- PT-INR (day of procedure, postpone procedure if necessary)
- Konakion corrects INR after at least 4 hours, not useful
- Accurate surgical hemostasis (suture if needed, compressive medication, possible use of local tranexamic acid)

Clinical Case 2, DOAC

- Man, 63 years old
- 11.2023 Pulmonary embolism, no evident transient risk factors, obesity (BMI 33.3)
- Cancer history: prostatic cancer, kidney cancer, urothelial cancer (urological evaluation 01.2024: not active cancer)
- Negative family history of VTE, anticardiolipin IgM positive (276 U/ml, negative rheumatoid factor)
- On Apixaban 5mg BID
- Weight (90kg), increased creatinine (130 µmol/L), GFR CKD-EPI 53ml/min, C/G 66ml/min

Colonscopy (occult neoplasia), 07.2024

Clinical Case 2, DOAC

- Man, 63 years old
- 11.2023 Pulmonary embolism, no evident transient risk factors, obesity (BMI 33.3)
- Cancer history: prostatic cancer, kidney cancer, urothelial cancer (urological evaluation 01.2024: not active cancer)
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- On Apixaban 5mg BID
- Weight (90kg), increased creatinine (130 µmol/L), GFR CKD-EPI 53ml/min, C/G 66ml/min

Colonscopy (occult neoplasia), 07.2024

Schema di sospensione AOD

	Dabigatran (Pradaxa®)		Apixaban (Eliquis®) Rdoxaban (Lixiana®) Rivaroxaban (Xarelto®)	
(CrCl calcolata sec. Cockcroft Gault)	Endoscopia NON operativa (Low risk of bleeding)	Endoscopia operativa (High risk of bleeding)	Endoscopia NON operativa (Low risk of bleeding)	Endoscopia operativa (High risk of bleeding)
CrCl ≥ 80 ml/min.	≥24 ore	≥48 ore	≥24 ore	≥48 ore
CrCl 50-79 ml/min.	≥36 ore	≥72 ore	≥24 ore	≥48 ore
CrCl 30-49 ml/min.	≥48 ore	≥96 ore	≥24 ore	≥48 ore
CrCl 15-29 ml/min.	Non indicato l'uso		≥36 ore	≥48 ore
CrCl < 15 ml/min.	Non indicato l'uso			
Non è necessario fare bridging con EBPM o ENF				

(ORBV_I-ANES-189 Estratto delle raccomandazioni sulla gestione perioperatoria della terapia antiaggregante/anticoagulante per procedure endoscopiche digestive)

Clinical Case 2, DOAC

- Man, 63 years old
- 11.2023 Pulmonary embolism, no evident transient risk factors, obesity (BMI 33.3)
- Cancer history: prostatic cancer, kidney cancer, urothelial cancer (urological evaluation 01.2024: not active cancer)
- Negative family history of VTE, anticardiolipin IgM positive (276 U/ml, negative rheumatoid factor)
- On Apixaban 5mg BID
- Weight (90kg), increased creatinine (130 µmol/L), GFR CKD-EPI 53ml/min, C/G 66ml/min

Colonscopy (occult neoplasia), 07.2024

Schema di sospensione AOD

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CrCl 15-29 ml/min.	Non indicato l'uso		≥36 ore	≥48 ore
CrCl < 15 ml/min.	Non indicato l'uso			
Non è necessario fare bridging con EBPM o ENF				

(ORBV_I-ANES-189 Estratto delle raccomandazioni sulla gestione perioperatoria della terapiaantiaggregante/anticoagulante per procedure endoscopiche digestive)

No Apixaban day -1 & day -2

When should he restart apixaban? polipectomy no → same day

polipectomy yes → specialist, wait 48-72h

Clinical Case 3, DOAC

- Man, 53 years old
- 17.10.2024 Emergency department: worsening asthenia, dyspnea on exertion, melena
  - haemorrhagic shock associated with gastric ulcer, HP negative (Hb 57 g/L) → transfusion of 3 units RBC
  - CT scan → bilateral pulmonary embolism
  - Risk factors: obesity (BMI 53.1, occult neoplasia?); thrombophilia (FVL hetero + FII G20210A hetero)
  - **Caval vein filter (unsuccessfull retrieval)**
- Comorbidities: metabolic syndrome (arterial hypertension, diabetes, obesity), metabolic liver disease (no information available)
- On Apixaban 5mg BID
- Weight (122 kg), normal creatinine (86 µmol/L), GFR CKD-EPI 92ml/min, C/G not applicable

Eco-endoscopy with biopsy, 09.2025

Clinical Case 3, DOAC

- Man, 53 years old
- 17.10.2024 Emergency department: worsening asthenia, dyspnea on exertion, melena
  - haemorrhagic shock associated with gastric ulcer, HP negative (Hb 57 g/L) → transfusion of 3 units RBC
  - CT scan → bilateral pulmonary embolism
  - Risk factors: obesity (BMI 53.1, occult neoplasia?); thrombophilia (FVL hetero + FII G20210A hetero)
  - **Caval vein filter (unsuccessfull retrieval)**
- Comorbidities: metabolic syndrome (arterial hypertension, diabetes, obesity), metabolic liver disease (no information available)
- On Apixaban 5mg BID
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Eco-endoscopy with biopsy, 09.2025

Schema di sospensione AOD

	Dabigatran (Pradaxa®)		Apixaban (Eliquis®) Rdoxaban (Lixiana®) Rivaroxaban (Xarelto®)	
(CrCl calcolata sec. Cockcroft Gault)	Endoscopia NON operativa (Low risk of bleeding)	Endoscopia operativa (High risk of bleeding)	Endoscopia NON operativa (Low risk of bleeding)	Endoscopia operativa (High risk of bleeding)
CrCl ≥ 80 ml/min.	≥24 ore	≥48 ore	≥24 ore	≥48 ore
CrCl 50-79 ml/min.	≥36 ore	≥72 ore	≥24 ore	≥48 ore
CrCl 30-49 ml/min.	≥48 ore	≥96 ore	≥24 ore	≥48 ore
CrCl 15-29 ml/min.	Non indicato l'uso		≥36 ore	≥48 ore
CrCl < 15 ml/min.	Non indicato l'uso			
Non è necessario fare bridging con EBPM o ENF				

(ORBV_I-ANES-189 Estratto delle raccomandazioni sulla gestione perioperatoria della terapiaantiaggregante/anticoagulante per procedure endoscopiche digestive)

Clinical Case 4, DOAC

- Woman, 80 years old
- Non valvular Atrial Fibrillation
- On rivaroxaban 20mg/day
- Normal weight (52.5kg), creatinine (85 µmol/L, CrCl C/G 39ml/min)
- Comorbidities: arthrosis, arterial hypertension

Tooth avulsion (2 elements)

Surgical and nonsurgical procedures associated with minimal bleeding risk

- Cardiac device implantation (eg, pacemaker or cardioverter-defibrillator device)
- Coronary angiography using radial artery access
- Minor dermatologic procedures (eg, excision of basal and squamous cell skin cancers, actinic keratoses, or premalignant or cancerous skin nevi)
- Phacoemulsification (cataract) procedures
- Minor dental procedures (eg, dental extractions, restorations, cleanings, or fillings)

(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

Clinical Case 4, DOAC

- Woman, 80 years old
- Non valvular Atrial Fibrillation
- On rivaroxaban 20mg/day
- Normal weight (52.5kg), creatinine (85 µmol/L, CrCl C/G 39ml/min)
- Comorbidities: arthrosis, arterial hypertension

Tooth avulsion (2 elements)

Surgical and nonsurgical procedures associated with minimal bleeding risk

- Cardiac device implantation (eg, pacemaker or cardioverter-defibrillator device)
- Coronary angiography using radial artery access
- Minor dermatologic procedures (eg, excision of basal and squamous cell skin cancers, actinic keratoses, or premalignant or cancerous skin nevi)
- Phacoemulsification (cataract) procedures
- Minor dental procedures (eg, dental extractions, restorations, cleanings, or fillings)

(Douketis & Spyropoulos, JAMA 2024; 332: 825-834)

Tips

- Warm (not hot!) diet
- Possible use of tranexamic acid rinses
- Think about possible switch to apixaban, reduced dose (2.5mg BID) for age ≥80y + weight <60kg (2.5mg BID)

Clinical Case 5, DOAC

- Woman, 37 years old
- Currently on treatment for breast cancer, BRCA2 mutated, triple negative for hormonal receptors (diagnosis 03.2025)
  - 4 cycles of chemotherapy (neoadjuvant), port-a-cath
  - Oncology program: bilateral mastectomy + ovariectomy (09.2025)
- Comorbidity:
  - Ulcerative rectocolitis (diagnosis 2006, non-responder to immunosuppression, surgery 2012)
  - Obesity (BMI 40.5 kg/m2, 101kg x 158cm)
- 09.09.2025 Incidental finding (CT-PET staging): thrombus in right atrium (CVC related)
  - CT scan for dispnea: segmental pulmunary embolism
  - Lower limbs duplex: negative for deep vein thrombosis (12.09.2025)
  - On anticoagulant (apixaban 5mg BID), creatinine 58 µmol/L, GFR CKD-EPI 116ml/min, C/G 187 ml/min

Bilateral mastectomy + ovariectomy 10.2025

Clinical Case 5, DOAC

- Woman, 37 years old
- Currently on treatment for **breast cancer**, BRCA2 mutated, triple negative for hormonal receptors (diagnosis 03.2025)
  - 4 cycles of chemotherapy (neoadjuvant), **port-a-cath**
  - Oncology program: bilateral mastectomy + ovariectomy (09.2025)
- Comorbidity:
  - **Ulcerative rectocolitis** (diagnosis 2006, non-responder to immunosuppression, surgery 2012)
  - **Obesity** (BMI 40.5 kg/m2, 101kg x 158cm)
- 09.09.2025 Incidental finding (CT-PET staging): thrombus in right atrium (CVC related)
  - CT scan for dispnea: segmental pulmunary embolism
  - Lower limbs duplex: negative for deep vein thrombosis (12.09.2025)
  - On anticoagulant (apixaban 5mg BID), creatinine 58 µmol/L, GFR CKD-EPI 116ml/min, C/G 187 ml/min

Bilateral mastectomy + ovariectomy 10.2025

No Apixaban day -1 & day -2 (GFR CKD-EPI crea (2021) 112 ml/min, C/G 172ml/min
Clinical evaluation pre-op → correct anemia if any deficiency is present
Bridging **pre-op** → enoxaparin 100mg BID (1 dose, day -1 in the morning)
post-op → same day enoxaparin 40mg, daily clinical evaluation to increase dose (40mg BID day+1 and +2, 60mg BID day +3 and +4, 80mg BID from day 5 or restart apixaban 5mg BID)

Clinical Case 6, AVK

- Woman, 48 years old
- On anticoagulant treatment for ischemic strokes associated with antiphospholipid antibodies (triple positivity) (diagnosis **12.2020, start Phenoprocoumon**)
- Uveitis (2020), **renal insufficiency**, livedo reticularis → **Sneddon syndrome (diagnosis 2023)**
- On treatment for **breast cancer**, BRCA2 mutated, triple positive for hormonal receptors (diagnosis 2020)
  - adjuvant therapy (trastuzumab, pertuzumab, paclitaxel)

Left mastectomy (skin reducing) + SLNB + expander 21.04.2021
Right reductive mastectomy

Clinical Case 6, AVK

- Woman, 48 years old
- On anticoagulant treatment for ischemic strokes associated with antiphospholipid antibodies (triple positivity) (diagnosis **12.2020, start Phenprocoumon**)
- Uveitis (2020), **renal insufficiency**, livedo reticularis → **Sneddon syndrome (diagnosis 2023)**
- On treatment for **breast cancer**, BRCA2 mutated, triple positive for hormonal receptors (diagnosis 2020)
  - adjuvant therapy (trastuzumab, pertuzumab, paclitaxel)

Left mastectomy (skin reducing) + SLNB + expander 21.04.2021
Right reductive mastectomy

Pre-admission evaluation (20.04.2021)
Body weight 78kg (BMI 27.5), creatinine 141 µmol/L (GFR CKD-EPI 38ml/min, C/G 53ml/min)
Hb 105g/L, PLT 417 G/L, GB 10.5 G/L
Stop Phenprocoumon: last dose 13.04.2021; PT-INR 1.3, **APTT 76 sec**
Bridging (high thrombotic risk for APS) enoxaparing 60mg BID (last dose 20.04.2021, morning)
No AINS in the post-op; ongoing escitalopram 20mg/day

Clinical Case 6, AVK

Recommendation

Interrupt warfarin with LMWH bridging suggested based on clinician judgment and most current evidence*

*Atrial fibrillation: Bridging NOT recommended based on Level 1 evidence, but evidence in few high risk CHADS2 patients (score 5 and 6); MHV and VTE: Retrospective studies suggest bridging increases bleeding risk without reducing thrombosis.

Warfarin Interruption and Bridging Suggestions *(show/hide)*

Day	Warfarin Dose	Bridging with Low Molecular Weight Heparin (LMWH)††	International Normalized Ratio (INR) Monitoring
-7 to -10	Maintenance dose	Assess for perioperative bridging anticoagulation; classify patients as undergoing high or low bleeding risk procedures	Check baseline labs (hemoglobin, platelet count, serum creatinine, INR)
-6 or -5	Begin to hold warfarin day -5 or day -6	No LMWH	None
-4	No Warfarin	No LMWH	None
-3	No Warfarin	Start LMWH at therapeutic or intermediate dose†	None
-2	No Warfarin	LMWH at therapeutic or intermediate dose†	None
-1	No Warfarin	Last preprocedural dose of LMWH administered no less than 24h before start of surgery at half the total daily dose	Assess INR before the procedure; proceed with surgery if INR <1.5; If INR > 1.5 and <1.8, consider low-dose oral vitamin K reversal (1-2.5 mg)
0 or +1	Provided that adequate hemostasis is achieved, resume maintenance dose of warfarin on evening of or morning after procedure	None	None
+ 1	Maintenance dose	No LMWH administration	Per clinician judgment
+2 or +3	Maintenance dose	Restart LMWH at previous dose	Per clinician judgment
+4	Maintenance dose	INR testing (discontinue LMWH if INR > 1.9)	INR
+7 to +10	Maintenance dose		INR

† Either twice daily LMWH regimens (i.e. enoxaparin 1mg/kg subcutaneous, dalteparin 100 IU/kg subcutaneous) or once-daily LMWH regimens have been used (i.e. enoxaparin 1.5 mg/kg subcutaneous, dalteparin 200 IU/kg subcutaneous). Intermediate-dose LMWH has been less studied in this setting.

Clinical Case 6, AVK

Thrombosis Canada
Thrombose Canada

Perioperative Anticoagulant Management Algorithm

Summary

Bleeding Risk: **Moderate (2-day risk of major bleed 0-2%)**
Anticoagulant: **Warfarin**
Creatinine Clearance: **53.1 mL/min**
Indication For Antithrombotic: **Mechanical valve**
Thromboembolic Risk: **Moderate**

Breast surgery

Phenprocoumon not available

Antiphospholipid sd not available

Preoperative Recommendations

No bridging may be acceptable for selected patients but bridging anticoagulation should be considered. Stop warfarin 5-6 days before surgery. Provide therapeutic doses of LMWH (e.g., dalteparin 100 IU/kg SC BID, enoxaparin 1.5 mg/kg SC daily) on preoperative days 3 and 2, and on the day before surgery administer half of the therapeutic dose (e.g., dalteparin 100 IU/kg morning dose only). The last dose of LMWH should be given 24h before surgery. No anticoagulant to be administered the evening before or on the morning of surgery.

Postoperative Recommendations

Postoperative bridging anticoagulation should be considered. Resume warfarin as soon as patient drinking fluids and if further operative intervention is not anticipated. Resume therapeutic dose for LMWH 48-72 hrs after surgery. Consider prophylactic dosing of LMWH (e.g., enoxaparin 40 mg SC daily) until therapeutic dose of LMWH is initiated. Discontinue LMWH once INR in therapeutic range

Click here for a sample of a perioperative bridging protocol.

Clinical Case 6, AVK

Thrombosis Canada
Thrombose Canada

Sample Bridging Protocol

Day	Warfarin	LMWH
-6	✓	✗
-5	✗	✗
-4	✗	✗
-3	✗	✓
-2	✗	✓
-1	✗	✓*
Surgery	✗	✗
+1	✓	✓**
+2	✓	✓**
+3	✓	✓***

* Use half daily dose administered 24h prior to procedure

** If high bleeding risk, hold, or use prophylactic dose LMWH

*** Continue LMWH until INR in therapeutic range

Clinical Case 6, AVK

- Woman, 48 years old
- On anticoagulant treatment for ischemic strokes associated with antiphospholipid antibodies (triple positivity) (diagnosis **12.2020, start Phenprocoumon**)
- Uveitis (2020), renal insufficiency, livedo reticularis → **Sneddon syndrome (diagnosis 2023)**
- On treatment for **breast cancer**, BRCA2 mutated, triple positive for hormonal receptors (diagnosis 2020)
  - adjuvant therapy (trastuzumab, pertuzumab, paclitaxel)

Left mastectomy (skin reducing) + SLNB + expander 21.04.2021
Right reductive mastectomy

Pre-admission evaluation (20.04.2021)
Body weight 78kg (BMI 27.5), creatinine 141 µmol/L (GFR CKD-EPI 38ml/min, C/G 53ml/min)
Hb 105g/L, PLT 417 G/L, GB 10.5 G/L
Stop Phenprocoumon: last dose 13.04.2021; PT-INR 1.3, **APTT 76 sec**
Bridging enoxaparing 60mg BID (last dose 20.04.2021, morning)
No AINS in the post-op; ongoing escitalopram 20mg/day
Day +0: surgery, no complications, program: enoxaparin 60mg BID from day +1
Day +1: Redon (left side) 110ml hematic, redon (right side) 10ml hematic; Hb 78g/L, local pain, local bruise → hematological consultation (UH 10.000U/die, APTT not informative, anti-Xa evaluation)

Clinical Case 6, AVK

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From day +3 → Enoxaparin 60mg BID, discharge on day +4; Phenprocoumon from day +5
Day +16 → Hematoma drainage (500ml, serum-hematic, mainly hematic) (PT-INR 1.7, Hb 64g/L), RBC transfusion + INR reversal (Beriplex)
Day +19 → **surgery** hematoma evacuation + expander change → UH 10.000 UI, day 0-2, enoxaparin 60mg BID until day +8, switch to Phenprocoumon by GP

Clinical Case 7, AVK

- Woman, 90 years old
- 1996 mechanical aortic valve (**SJM Master: bileaflet**) → Phenprocoumon
- **07.05.2024** Post-traumatic left femur fracture → surgery, hip prothesis (planned **10.05.2024**)
- PT-INR 5.4, creatinine 130 µmol/L, GFR epi 34 ml/min; weight 63kg, Hb 125 g/L
- Comorbidities: renal insufficiency

Hip prothesis

Hematological consultation (08.05.2024, PT-INR 6.8, Hb 112 g/L)

Evaluation: moderate thrombotic risk, high bleeding risk

- Konakion 10mg e.v.
- When PT-INR <2 → bridging with prophylactic UH 10.000/day (stop 3 hours before surgery)
- Post-op: prophylactic UH and switch to Phenprocoumon when possible (surgical evaluation)
- Daily evaluation of PT-INR

Clinical Case 7, AVK

- Woman, 90 years old
- 1996 mechanical aortic valve (**SJM Master: bileaflet**) → Phenprocoumon
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- PT-INR 5.4, creatinine 130 µmol/L, GFR epi 34 ml/min; weight 63kg, Hb 125 g/L
- Comorbidities: renal insufficiency

Hip prothesis

Hematological consultation (08.05.2024, PT-INR 6.8, Hb 112 g/L)

Evaluation: moderate thrombotic risk, high bleeding risk

- Konakion 10mg e.v.
- When PT-INR <2 → bridging with prophilactic UH 10.000/day (stop 3 hours before surgery)
- Post-op: prophylactic UH and switch to Phenprocoumon when possible (surgical evaluation)
- Daily evaluation of PT-INR → **WHY ?**

Clinical Case 7, AVK

- Woman, 90 years old
- 1996 mechanical aortic valve (**SJM Master: bileaflet**) → Phenprocoumon
- **07.05.2024** Post-traumatic left femur fracture → surgery, hip prothesis (planned **10.05.2024**)
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Hematological consultation (08.05.2024, PT-INR 6.8, Hb 112 g/L)

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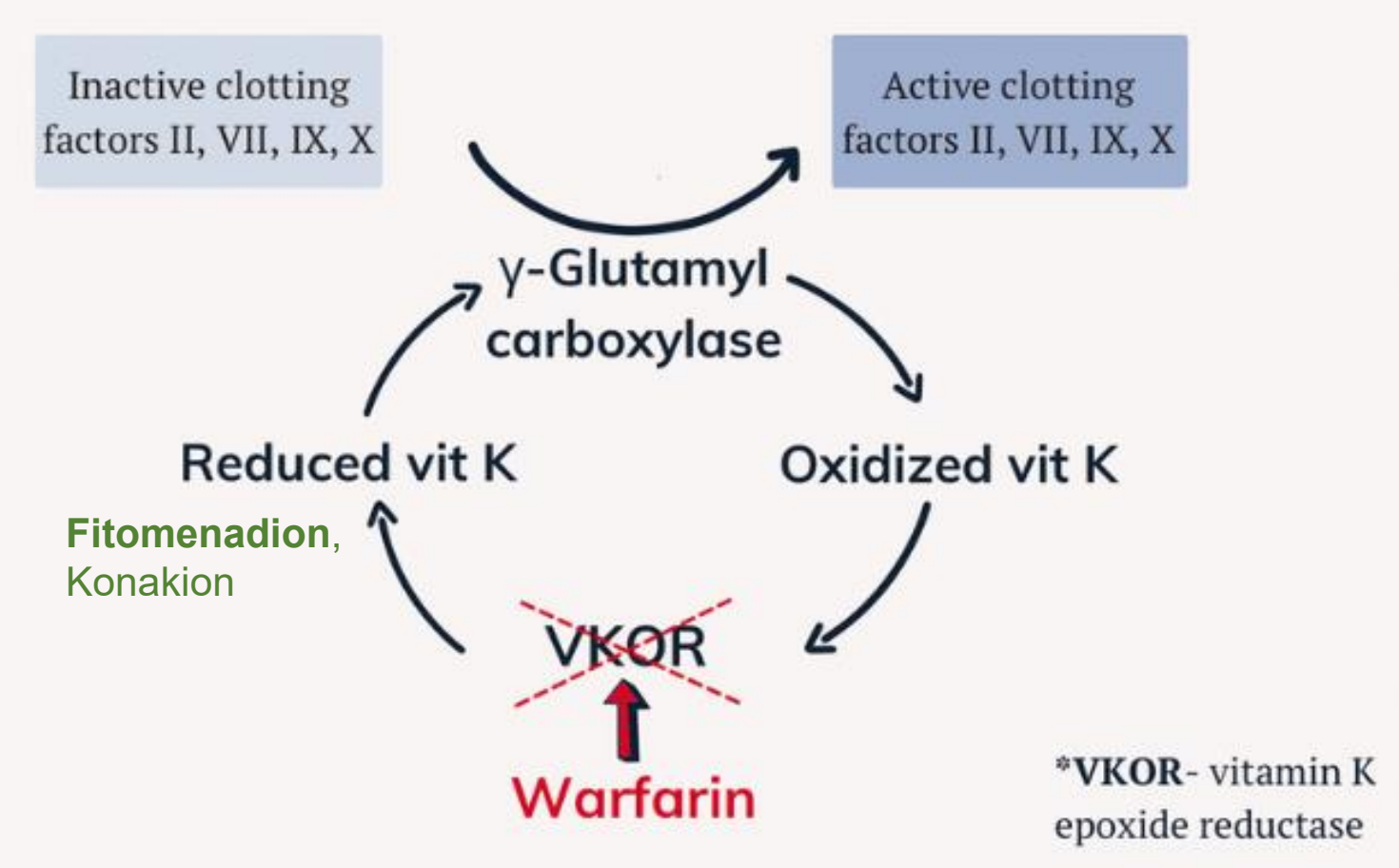
- Konakion 10mg e.v.
- When PT-INR <2 → bridging with prophilactic UH 10.000/day (stop 3 hours before surgery)
- Post-op: prophylactic UH and switch to Phenprocoumon when possible (surgical evaluation)
- Daily evaluation of PT-INR because of possible rebound

Clinical Case 7, AVK



(Mostbauer A et al, J Int Med Res 2022; 50:3000605221103959)

Clinical Case 7, AVK

	07.05	08.05	09.05	10.05
PT-INR	4.3-5.4	6.8	1.3	2.0
APTT, sec	-	-	29	33
Hb, g/L	125		112	
Phenprocoumon		-		
UH			→	
Konakion		10mg		5mg
Consulto ematologia		x		x
Surgery				0
RBC transfusion				

Clinical Case 7, AVK

	07.05	08.05	09.05	10.05	11.05	12.05	13.05	14.05	15.05
PT-INR	4.3-5.4	6.8	1.3	2.0	1.2	1.3	-	-	-
APTT, sec	-	-	29	33	25	29	109	52	54
Hb, g/L	125		112		87	68			
Phenprocoumon		-						1,5	2
UH			→		→	→	→	→	→
Konakion		10mg		5mg					
Consulto ematologia		x		x					
Surgery				0	+1	+2	+3	+4	+5
RBC transfusion						1 unit			

Clinical Case 7, AVK

	07.05	08.05	09.05	10.05	11.05	12.05	13.05	14.05	15.05	16.05	17.05	18.05	19.05	20.05
PT-INR	4.3-5.4	6.8	1.3	2.0	1.2	1.3	-	-	-	5.6	8.2-2.5	2.3		6.8
APTT, sec	-	-	29	33	25	29	109	52	54	71	52	-		
Hb, g/L	125		112		87	68								
Phenprocoumon		-						1,5	2	stop	stop	1	1	
UH			→		→	→	→	→	→	stop	stop			
Konakion		10mg		5mg						2mg	5mg			4mg
Consulto ematologia		x		x						x	x			
Surgery				0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
RBC transfusion						1 unit								

Clinical Case 7, AVK

	07.05	08.05	09.05	10.05	11.05	12.05	13.05	14.05	15.05	16.05	17.05	18.05	19.05	20.05	21.05
PT-INR	4.3-5.4	6.8	1.3	2.0	1.2	1.3	-	-	-	5.6	8.2-2.5	2.3		6.8	3.1
APTT, sec	-	-	29	33	25	29	109	52	54	71	52	-			
Hb, g/L	125		112		87	68									
Phenprocoumon		-						1,5	2	stop	stop	1	1		0.25
UH			→		→	→	→	→	→	stop	stop				
Konakion		10mg		5mg						2mg	5mg			4mg	
Consulto ematologia		x		x						x	x				
Surgery				0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11
RBC transfusion						1 unit									

Phenprocoumon maintenance dose 0.25 tablet/day (not 1 tablet/day) !!!

Take home messages

- **Less is more** → reserve bridging therapy ONLY for selected cases
- **Old information are important**
  - type of mechanical valve
  - previous medical history
- **Recent info are equally important**
  - weight, renal function, bleeding events
- **Discuss with surgeons/specialist type of maneuvre**

Thank you

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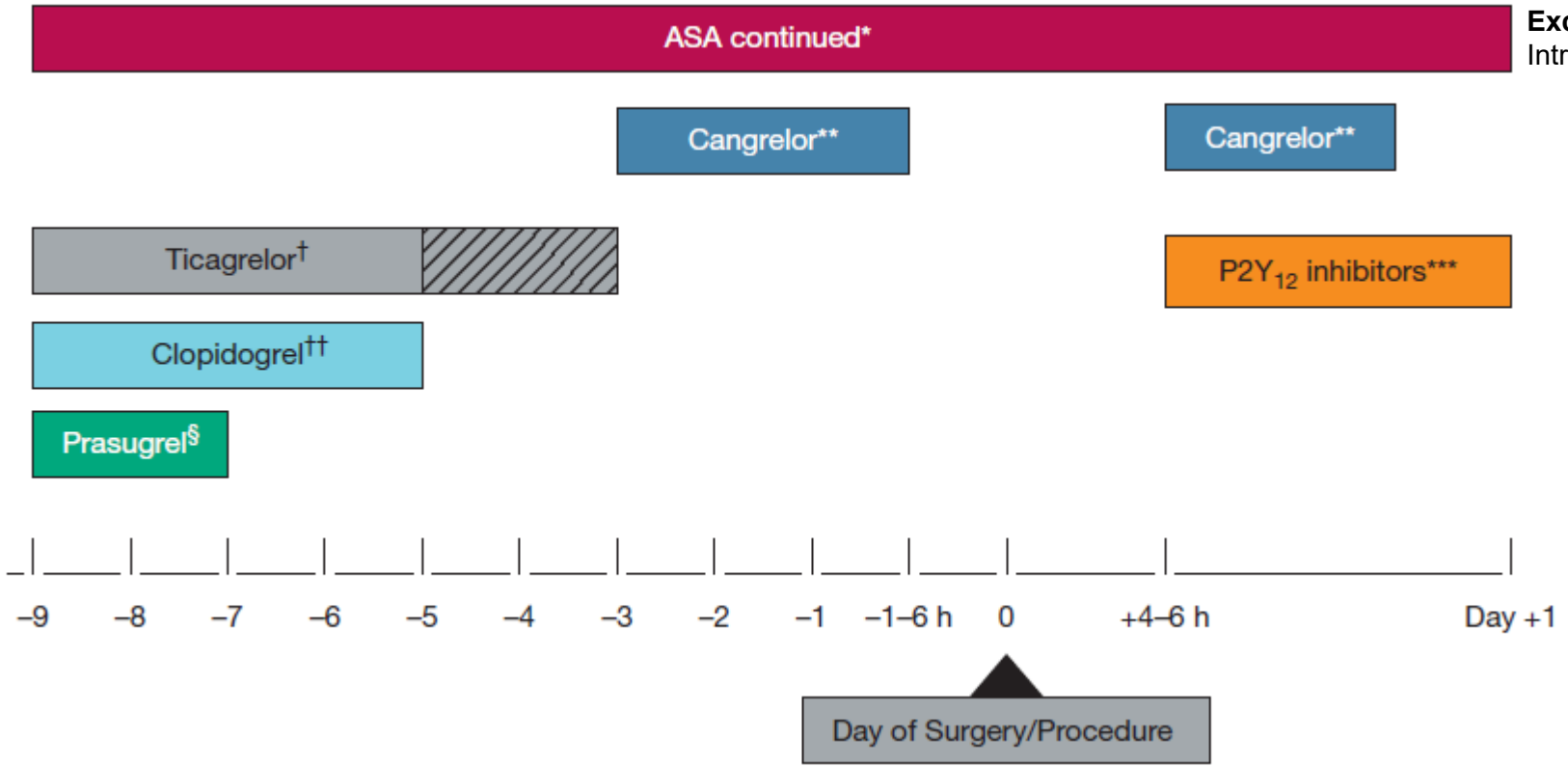
Antiplatelet drugs

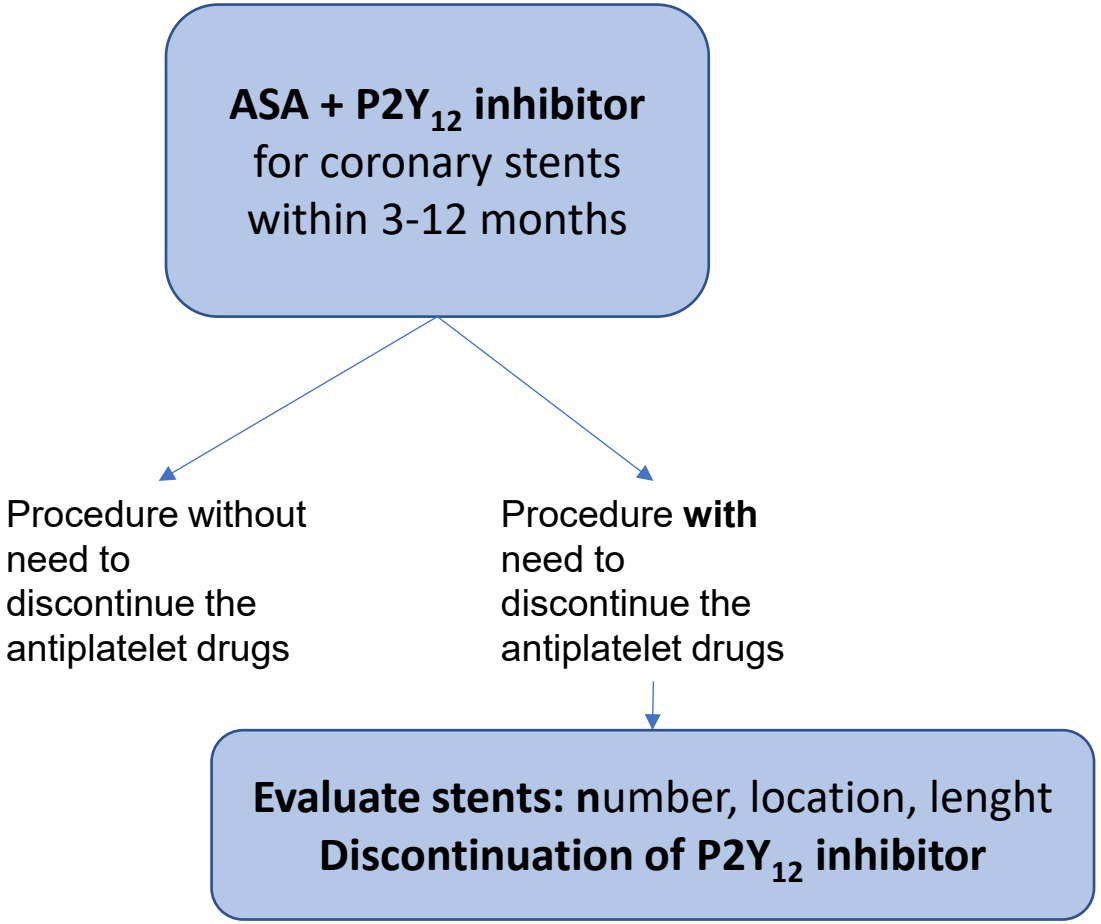


Exception (5-7 days interruption):
Intracranial, spinal

*Based on surgery/procedure bleed risk assessment.
**Routine use not suggested. If used, initiate within 72 hours from $P2Y_{12}$ inhibitor discontinuation at dose of 0.75 mg/kg/min; resume within 6 hours post-procedure for minimum of 48 hours and maximum of 7 days total. Very low quality data for antiplatelet bridging with glycoprotein IIb/IIIa inhibitors (e.g., eptifibatide, tirofiban).
***$P2Y_{12}$ inhibitors can be resumed within 24 hours post-procedure at a maintenance dose.

†For ticagrelor, 3-5 day interruption
††For clopidogrel, 5 day interruption
§For prasugrel, 7-10 day interruption.

Antiplatelet drugs



Antiplatelet drugs

ASA + $P2Y_{12}$ inhibitor
for coronary stents
within 3-12 months

Procedure without need to discontinue the antiplatelet drugs

Procedure **with** need to discontinue the antiplatelet drugs

Evaluate stents: number, location, lenght
Discontinuation of $P2Y_{12}$ inhibitor

ASA + $P2Y_{12}$ inhibitor
for coronary stents
within 6-12 weeks

Procedure without need to discontinue the antiplatelet drugs

Procedure **with** need to discontinue the antiplatelet drugs

Evaluate stents: number, location, lenght
Evaluate timing procedure: delay?
Discuss bridging with cangrelor

Clinical Case 8, DAPD

- Man, 75 years old
- **04.04.2024 Myocardial infarction** → stent (2.5x18mm common trunk of the left coronary → ASA + clopidogrel
- 07.04.2024 diagnosis of Hepatocellular Carcinoma (metabolic liver disease) → Selective Internal Radioactive therapy (urgent)

Selective Internal Radioactive therapy (03.06.2024)

Discussion with cardiologist → **indication to bridging with cangrelor** (P2Y12 inhibitor, intravenous administration, short half-life)

Day -5 → stop clopidogrel

Day -3 → start cangrelor 0.75 mcg/kg/min (continous infusion)

Day 0 → stop cangrelor 1 hour before procedure; restart after 6 hours (clinical evaluation of no bleeding)

Day +1 (24h after procedure) → stop cangrelor, restart clopidogrel