BSTH

Belgian Society on Thrombosis and Haemostasis

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BSTH protocol on peri-operative antithrombotic management for elective non-cardiac surgery

In collaboration with experts from AZ Sint-Jan Brugge, CHR Citadelle Liège, CHU Charleroi-Chimay, CHU Liège, CHU UCL Namur, GHDC Charleroi, OLVZ Aalst, Hôpital Erasme ULB Bruxelles, ULiège, UZ Brussel, UZ Gent, UZ Leuven, ZAS Antwerpen

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TABLE 1

Procedure-associated bleeding risk*

*Attention: individual patient characteristics and bleeding phenotype and history should also be taken into account and might increase the procedure-associated bleeding risk

	Minor	Moderate	High
Ophtalmology	Cataract or glaucoma procedure	Non-cataract ophtalmic surgery	Posterior/vitreoretinal eye surgery (Attention: very high bleeding risk)
Dentistry	Simple dental procedures (e.g extraction of 1-3 teeth, periodontal surgery, implant positioning, endodontic (root canal) procedures, subgingivial scaling/cleaning)	Complex dental procedures (multiple tooth extractions)	
Gastroenterology & gastric surgery	Endoscopy without sampling or interventional therapy	Endoscopy with simple biopsy sampling	Endoscopy with interventional therapy (e.g. ERCP with sphincterectomy, EMR/ ESD, dilatation of strictures, varices, PEG, EUS guided interventions, colon polypectomy)
	Diagnostic punction (e.g. ascites)		Procedures with liver biopsy
		Non-major gastrointestinal surgery (e.g. (laparscopic) cholecystectomy, hernia repair, hemorrhoidal surgery)	Major gastrointestinal surgery (e.g. anastomosis surgery, bowel resection)
			Extensive cancer surgery (e.g. pancreas, liver)
Gynaecology		Abdominal hysterectomy	
Cardiology, vascular surgery & interventional radiology	Coronarography via radial artery, ablation	Coronarography via femoral artery	
	Insertion of implantable cardiac device	Retraction of implantable cardiac device	
	Diagnostic punction (e.g. pericard)		
		Angiography	Vascular surgery (e.g. AAA repair, vascular bypass, endovascular aneurysm repair, flebology)

	Minor	Moderate	High
Pneumology & thoracic surgery		Bronchoscopy with simple biopsy sampling	
	Diagnostic punction (e.g. pleura)		
		Non-major thoracic surgery, (e.g. breast surgery)	Major thoracic surgery (e.g. lung resection)
Nefrology & urology			Procedures with kidney or prostate biopsy
			Extracorporeal shockwave lithotripsy
			Major urologic surgery (e.g. transurethral prostate resection, bladder resection, nephrectomy)
Orthopedics	Diagnostic punction (e.g. articulation)		
		Arthroscopy	
		Non-major orthopaedic surgery (foot/hand)	Major orthopedic surgery (e.g. shoulder replacement)
Neurology & neurosurgery			Lumbar punction
			Neurosurgery (intracranial, spinal) (Attention: very high bleeding risk)
Anesthesiology			Neuraxial (spinal or epidural) anaesthesia (Attention: very high bleeding risk)
Plastic surgery	Superficial surgery (e.g. small skin excisions)		Reconstructive plastic surgery
Otorhinolaryngology		Amygdalectomy	
Other	Superficial surgery (e.g. abscess incision, small skin excisions/biopsy)	Large-bore needles procedures (e.g. bone marrow/lymph node biopsy)	

TABLE 2

Thrombotic risk

	Low	Intermediate	High
Atrial fibrilliation	CHA2DS2-VASc **<4**	CHA2DS2-VASc **4-6**	CHA2DS2-VASc **>6**
			post CVA/TIA
			with mitral stenosis
Prosthetic heart valve	Biological valve **>3m**	Biological valve **<3m**	
		Mechanical aortic valve **WITHOUT** any thromboembolic risk factor: • atrial fibrillation • previous thromboembolism/stroke/TIA • severe left ventricular dysfunction • hypercoagulable state	Mechanical aortic valve **AND** any thromboembolic risk factor: • atrial fibrillation • previous thromboembolism/stroke/TIA • severe left ventricular dysfunction • hypercoagulable state
			Mechanical mitral or tricuspid valve
			Multiple valve replacement
Venous thrombo-embolism	DVT and/or PE **>12m**	DVT and/or PE **3-12m**	DVT and/or PE **<3m***
		Mild thrombophilia: • Prot C or S deficiency • heterozygous FV Leiden/prothrombin mutation	Severe thrombophilia: • AT deficiency • homozygous FV Leiden/prothrombin mutation • Antiphospholipid syndrome • multiple thrombophilia risk factors, • recurrent VTE
CVA/TIA	CVA/TIA without AF **>12m**	CVA/TIA without AF **3-12m**	CVA/TIA without AF **<3m***
			CVA/TIA with AF
Other	All other	Active cancer	Left ventricular apex thrombus
		Venous graft in peripheral vascular disease >3m	Venous graft in peripheral vascular disease <3m

*defer procedure if possible

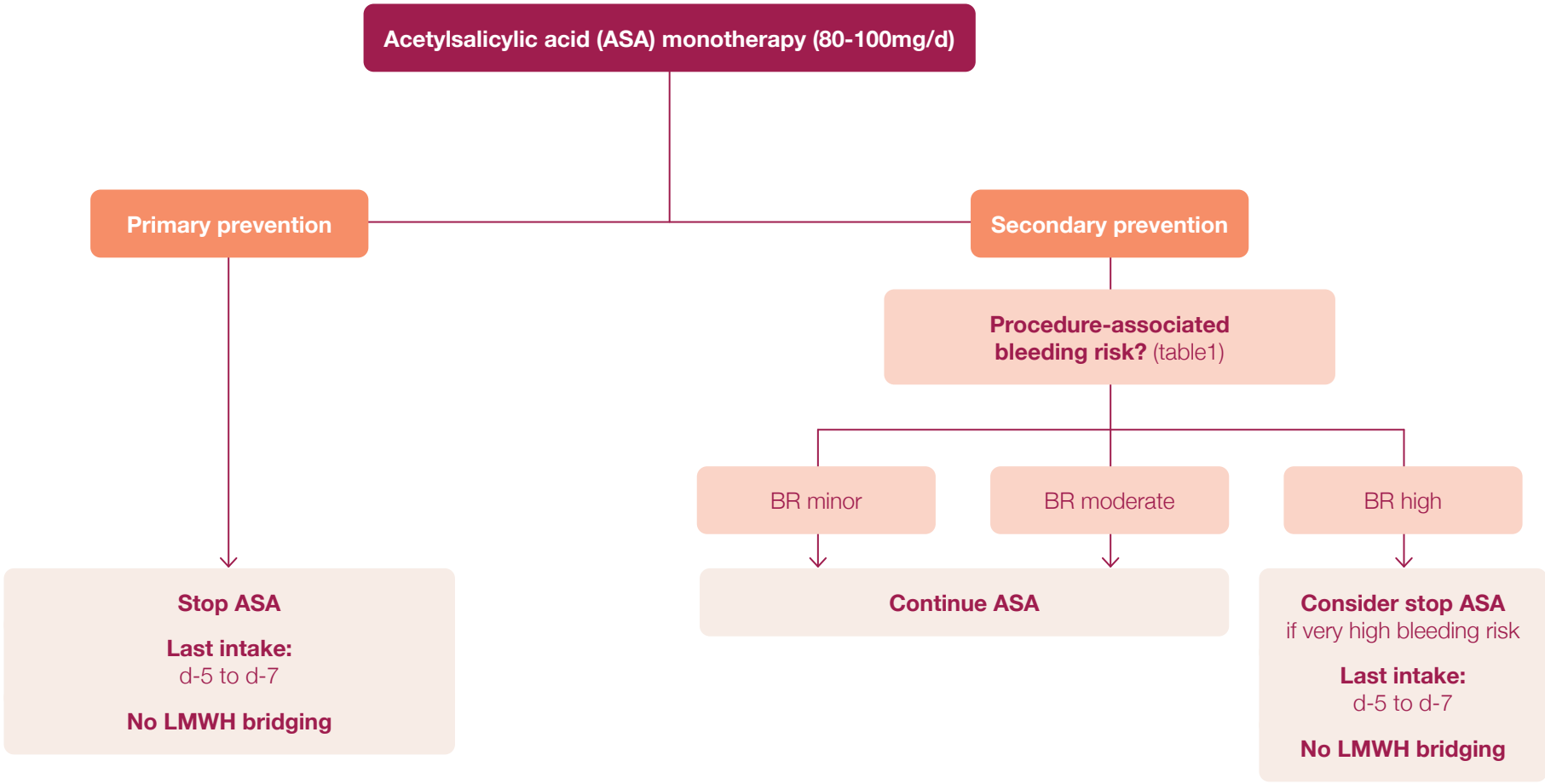
GRAPH 1

Acetylsalicylic acid (ASA) monotherapy*

*Aspirine®, ASA Apotex®, Asa EG®, Asaflow®, Cardioaspirine®, Acetylsalicylic Acid Krka® **(80-100mg/d)**

PRE-OPERATIVE

day of surgery = d 0



POST-OPERATIVE

In consultation with surgeon/anesthetist

Start ASA 24h post-op:

- Only if no bleeding (risk)(check platelet count)
- If no risk of re-intervention
- At maintenance dose

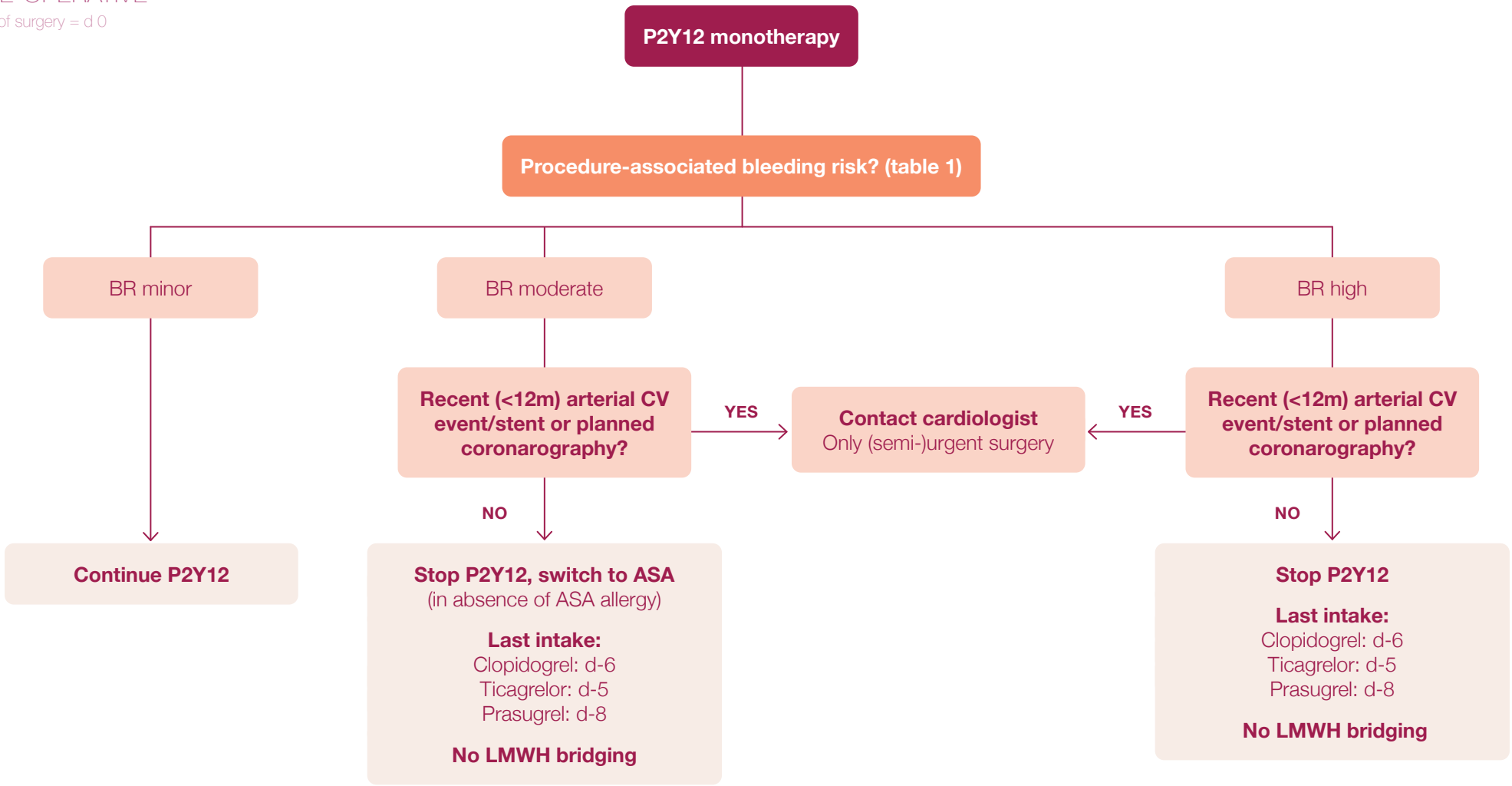
GRAPH 2

P2Y12 monotherapy*

*Clopidogrel (Plavix®), Ticagrelor (Brilique®), Prasugrel (Efient®)

PRE-OPERATIVE

day of surgery = d 0



POST-OPERATIVE

In consultation with surgeon/anesthetist

Start P2Y12 24h post-op:

- Only if no bleeding (risk)(check platelet count)
- If no risk of re-intervention
- At maintenance dose

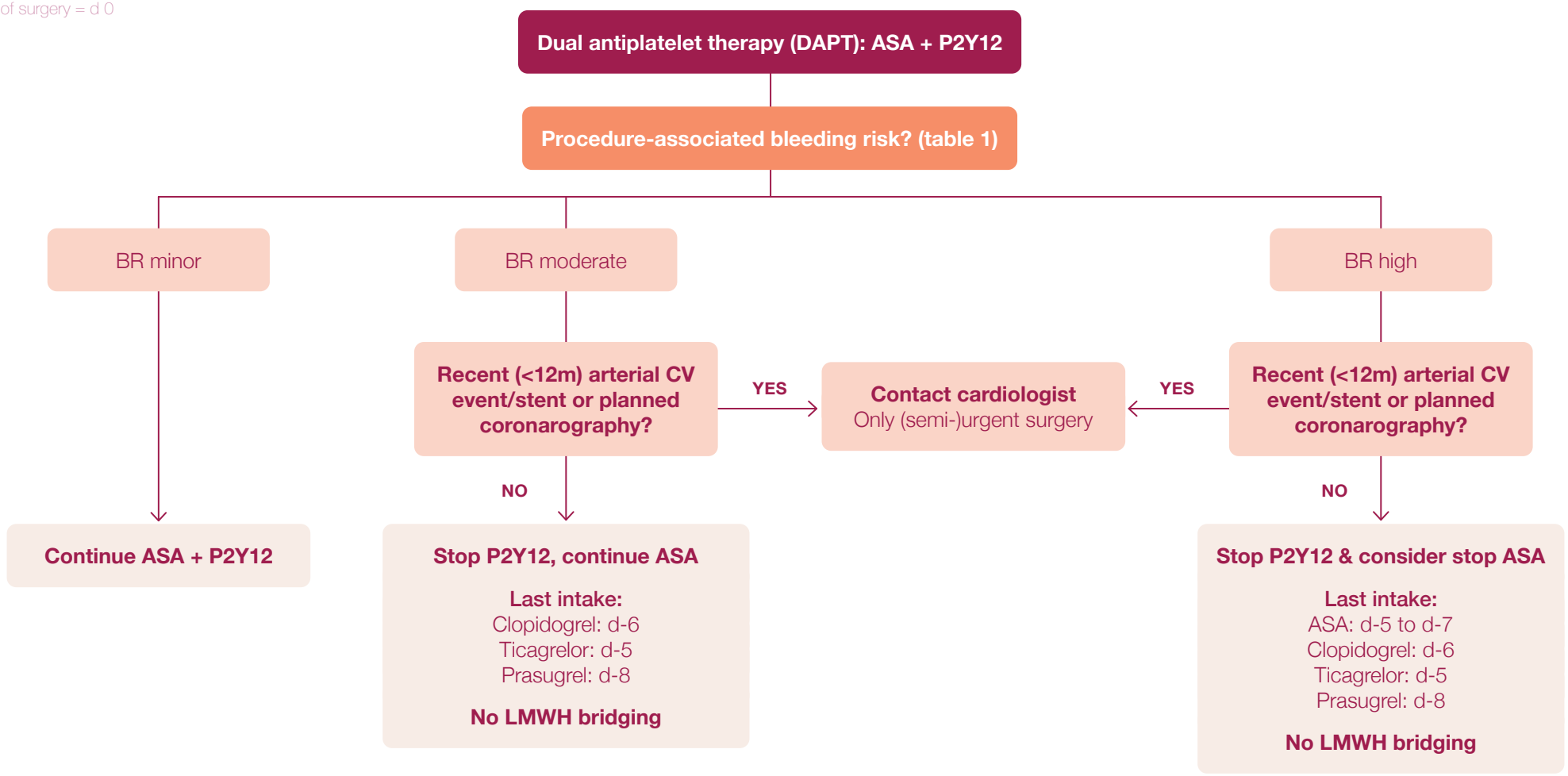
GRAPH 3

Dual antiplatelet therapy (DAPT)

ASA + P2Y12

PRE-OPERATIVE

day of surgery = d 0



POST-OPERATIVE

In consultation with surgeon/anesthetist

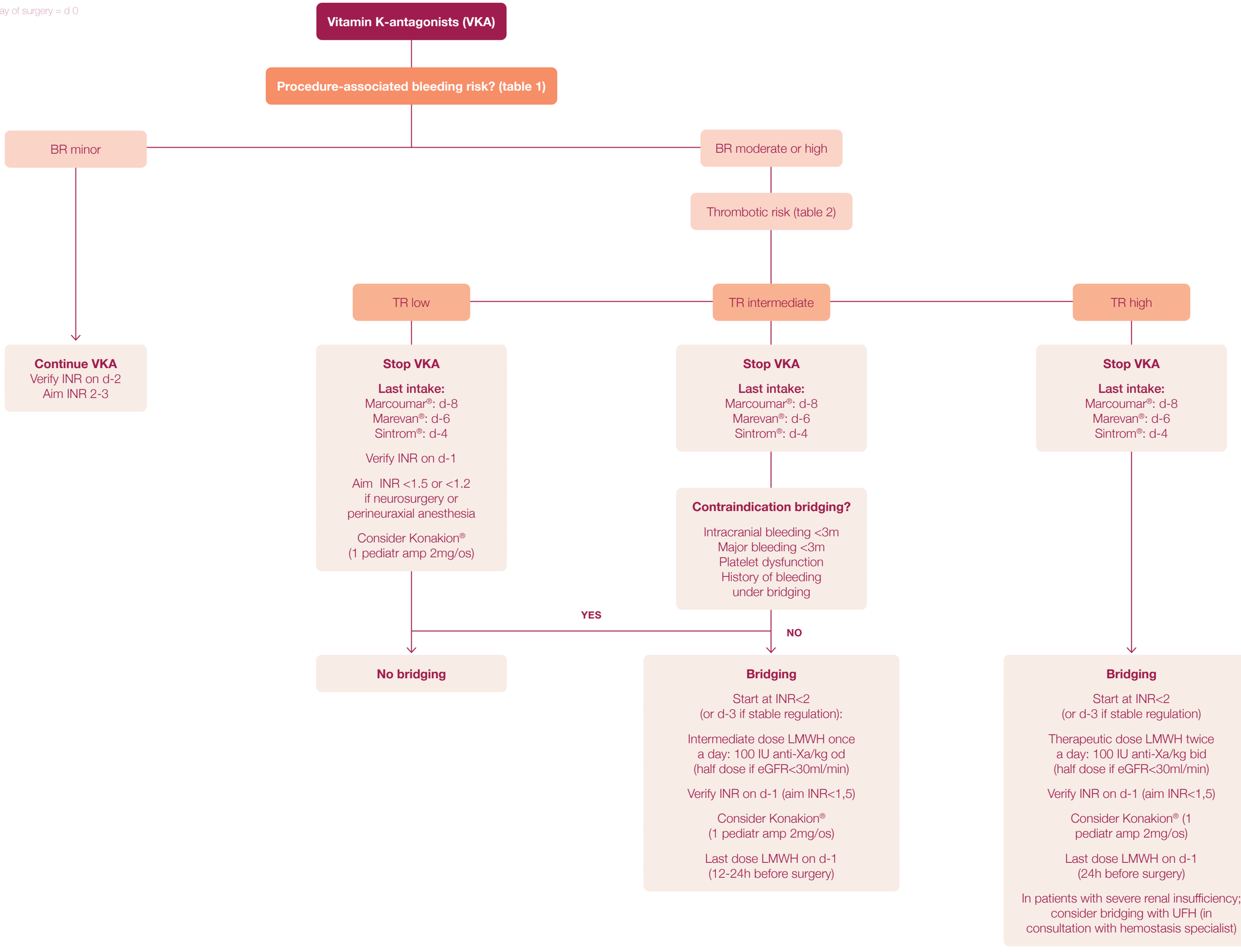
Start ASA + P2Y12 24h post-op:

- Only if no bleeding (risk)(check platelet count)
- If no risk of re-intervention
- At maintenance dose

GRAPH 4

Vitamin K-antagonists (VKA)

Marcoumar®, Marevan®, Sintrom®


Vitamin K-antagonists (VKA)
Procedure-associated bleeding risk? (table 1)
BR minor
BR moderate or high
Thrombotic risk (table 2)
TR low
TR intermediate
TR high
Continue VKA
Verify INR on d-2
Aim INR 2-3
Stop VKA
Last intake:
Marcoumar®: d-8
Marevan®: d-6
Sintrom®: d-4
Verify INR on d-1
Aim INR <1.5 or <1.2
if neurosurgery or
perineuraxial anesthesia
Consider Konakion®
(1 pediatr amp 2mg/os)
Stop VKA
Last intake:
Marcoumar®: d-8
Marevan®: d-6
Sintrom®: d-4
Contraindication bridging?
Intracranial bleeding <3m
Major bleeding <3m
Platelet dysfunction
History of bleeding
under bridging
YES
NO
Stop VKA
Last intake:
Marcoumar®: d-8
Marevan®: d-6
Sintrom®: d-4
No bridging
Bridging
Start at INR<2
(or d-3 if stable regulation):
Intermediate dose LMWH once
a day: 100 IU anti-Xa/kg od
(half dose if eGFR<30ml/min)
Verify INR on d-1 (aim INR<1,5)
Consider Konakion®
(1 pediatr amp 2mg/os)
Last dose LMWH on d-1
(12-24h before surgery)
Bridging
Start at INR<2
(or d-3 if stable regulation)
Therapeutic dose LMWH twice
a day: 100 IU anti-Xa/kg bid
(half dose if eGFR<30ml/min)
Verify INR on d-1 (aim INR<1,5)
Consider Konakion® (1
pediatr amp 2mg/os)
Last dose LMWH on d-1
(24h before surgery)
In patients with severe renal insufficiency;
consider bridging with UFH (in
consultation with hemostasis specialist)

In consultation with surgeon/anesthetist

Post-op LMWH if VKA have been interrupted:

- Only if no bleeding (risk)(check platelet count)
- Timing and dosing according to table 3

Table 3: Post-Operative LMWH

	TR Low	TR Intermediate	TR High
≥8h post-op	prophylactic	prophylactic	prophylactic
≥24h post-op*	prophylactic	intermediate	intermediate
≥48-72h post-op*	prophylactic	intermediate	therapeutic

*** Do not increase dose in case of spinal/epidural catheter or in case of risk of re-intervention**

- Intermediate dose LMWH once a day: 100 IU anti-Xa/kg od (half dose if eGFR<30ml/min)
- Therapeutic dose LMWH twice a day: 100 IU anti-Xa/kg bid (half dose if eGFR<30ml/min)

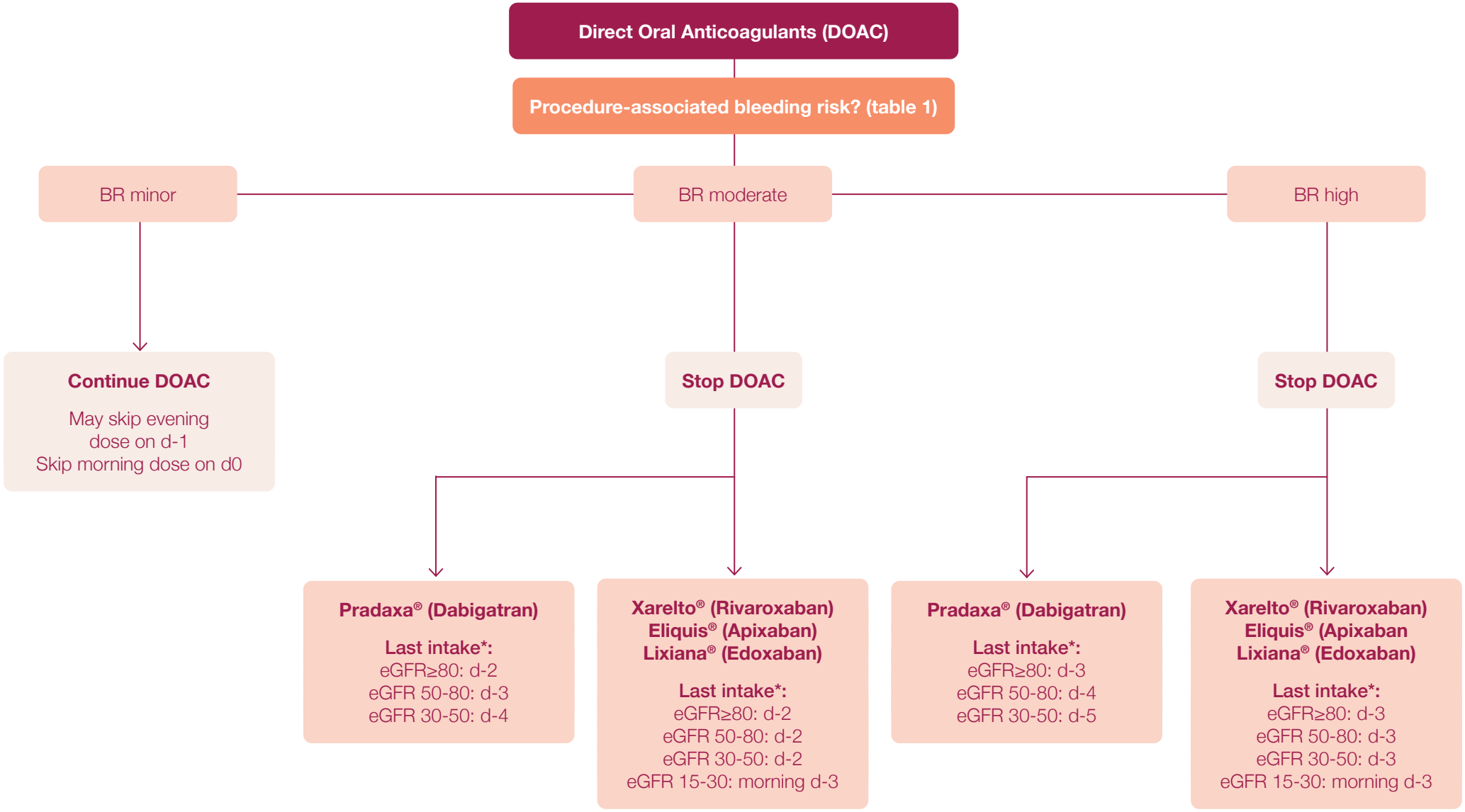
Start VKA:

- 12-24h post-op (in function of type of surgery)
- At maintenance dose only if:
  - No bleeding (risk)(check platelet count)
  - No risk of re-intervention
  - Good gastro-intestinal transit

GRAPH 5

Direct oral anticoagulants (DOAC)

Pradaxa® (Dabigatran), Xarelto® (Rivaroxaban), Eliquis® (Apixaban), Lixiana® (Edoxaban)



***Attention:** in patients/situations with risk of DOAC accumulation (renal insufficiency, older age, concomitant medication etc.) or procedures with very high bleeding risk (spinal or epidural anaesthesia, neurosurgery,posterior eye surgery) pausing the DOAC 12-24 hours earlier may be considered.

In selected cases where DOAC accumulation is suspected (e.g. combination of factors predisposing to DOAC accumalation), consider plasma level measurements.

In consultation with surgeon/anesthetist

Start DOAC:

- Surgery with low and high bleeding risk (table 1): d+1 post-op
- Surgery with very high bleeding risk (table 1): d+2 post-op
- Only if:
  - No bleeding (risk)(check platelet count)
  - No risk of re-intervention
  - Good gastro-intestinal transit
- Check kidney function and adjust dose if necessary

Consider temporary switch to LMWH (prophylactic dose) if:

- No bleeding (risk)(check platelet count)
- Risk of re-intervention
- No good gastro-intestinal transit

Consider step-up of LMWH to intermediate dose in case of high thrombotic risk (table 2) AND prolonged DOAC interruption UNLESS:

- Intracranial bleeding <3m
- Major bleeding <3m
- Platelet dysfunction
- History of bleeding under LMWH

GRAPH 7

LMWH

Including bridging

PRE-OPERATIVE

day of surgery = d 0

LMWH (includiging bridging)

↓

Last intake:
Morning of d-1

POST-OPERATIVE

In consultation with surgeon/anesthetist

- Only if no bleeding (risk)(check platelet count)
- Timing and dosing according to table 4 (build-up until the pre-op dose):

Table 4: Post-Operative LMWH

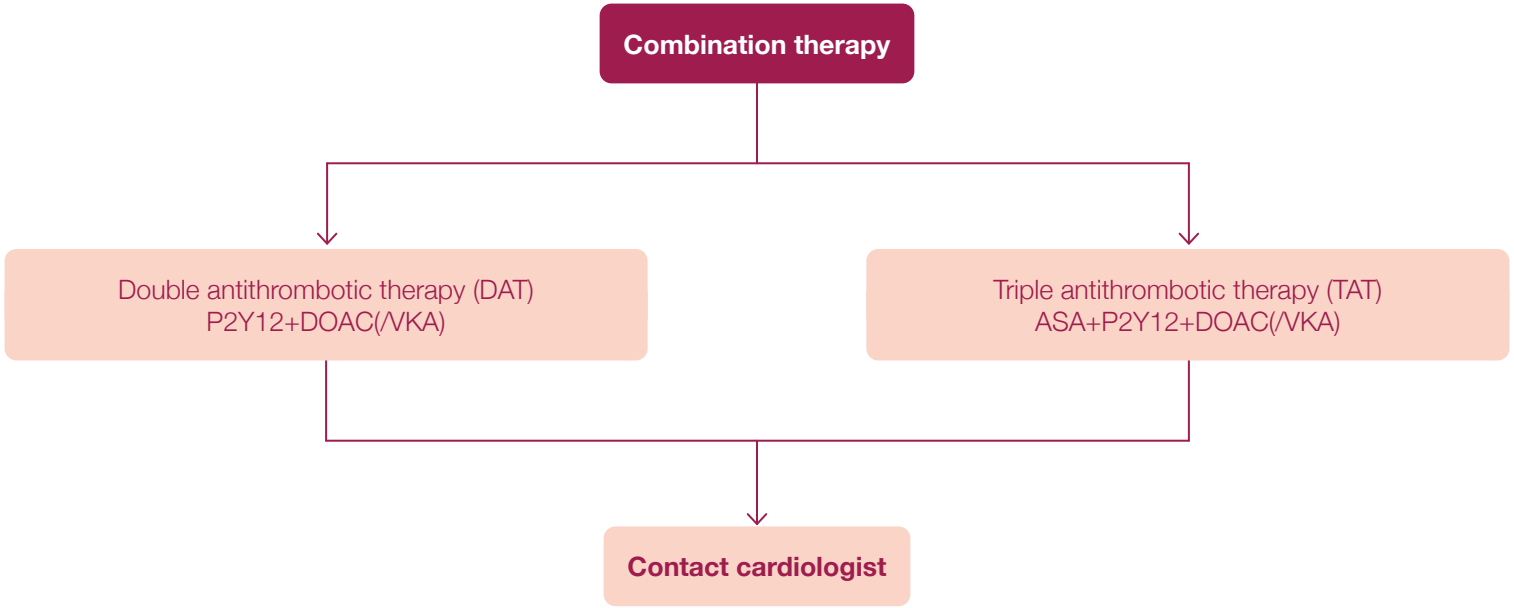
≥8h post-op	prophylactic
≥24h post-op*	intermediate
≥48-72h post-op*	therapeutic

*** Do not increase dose in case of spinal/epidural catheter or in case of risk of re-intervention**

- Intermediate dose LMWH once a day: 100 IU anti-Xa/kg od (half dose if eGFR<30ml/min)
- Therapeutic dose LMWH twice a day: 100 IU anti-Xa/kg bid (half dose if eGFR<30ml/min)

GRAPH 6

Combination therapy


Combination therapy
Double antithrombotic therapy (DAT)
P2Y12+DOAC(/VKA)
Triple antithrombotic therapy (TAT)
ASA+P2Y12+DOAC(/VKA)
Contact cardiologist

Abbreviations

AAA	abdominal aortic aneurysm
AF	atrial fibrillation
amp	ampoule
ASA	acetylsalicylic acid
bid	bis in die/twice a day
BR	bleeding risk
CV	cardiovascular
d	day
DOAC	direct oral anticoagulant
DVT	deep vein thrombosis
eGFR	estimated glomerular filtration rate
ERCP	endoscopic retrograde cholangio-pancreaticopgraphy
EMR/ESD	endoscopic mucosal resection/ endoscopic submucosal dissection
h	hour
IU	international units
INR	international normalized ratio
LMWH	low molecular weight heparin
m	month
mg	milligram
od	once daily
PE	pulmonary embolism
TIA	transient ischemic attack
TR	thrombotic risk
UFH	unfractionated heparin
VKA	vitamin K antagonist

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design by **Sarah Sepelie**

sarahsepelie@gmail.com