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

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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
Ophthalmology	Cataract or glaucoma procedure	Non-cataract ophthalmic 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, subgingival 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 puncture (e.g. ascites)		Procedures with liver biopsy
		Non-major gastrointestinal surgery (e.g. (laparoscopic) 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 puncture (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 puncture (e.g. pleura)		
Nefrology & urology		Non-major thoracic surgery, (e.g. breast surgery)	Major thoracic surgery (e.g. lung resection)
			Procedures with kidney or prostate biopsy
			Extracorporeal shockwave lithotripsy
Orthopedics			Major urologic surgery (e.g. transurethral prostate resection, bladder resection, nephrectomy)
	Diagnostic puncture (e.g. articulation)		
		Arthroscopy	
Neurology & neurosurgery		Non-major orthopaedic surgery (foot/hand)	Major orthopedic surgery (e.g. shoulder replacement)
			Lumbar puncture
Anesthesiology			Neurosurgery (intracranial, spinal) (Attention: very high bleeding risk)
			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

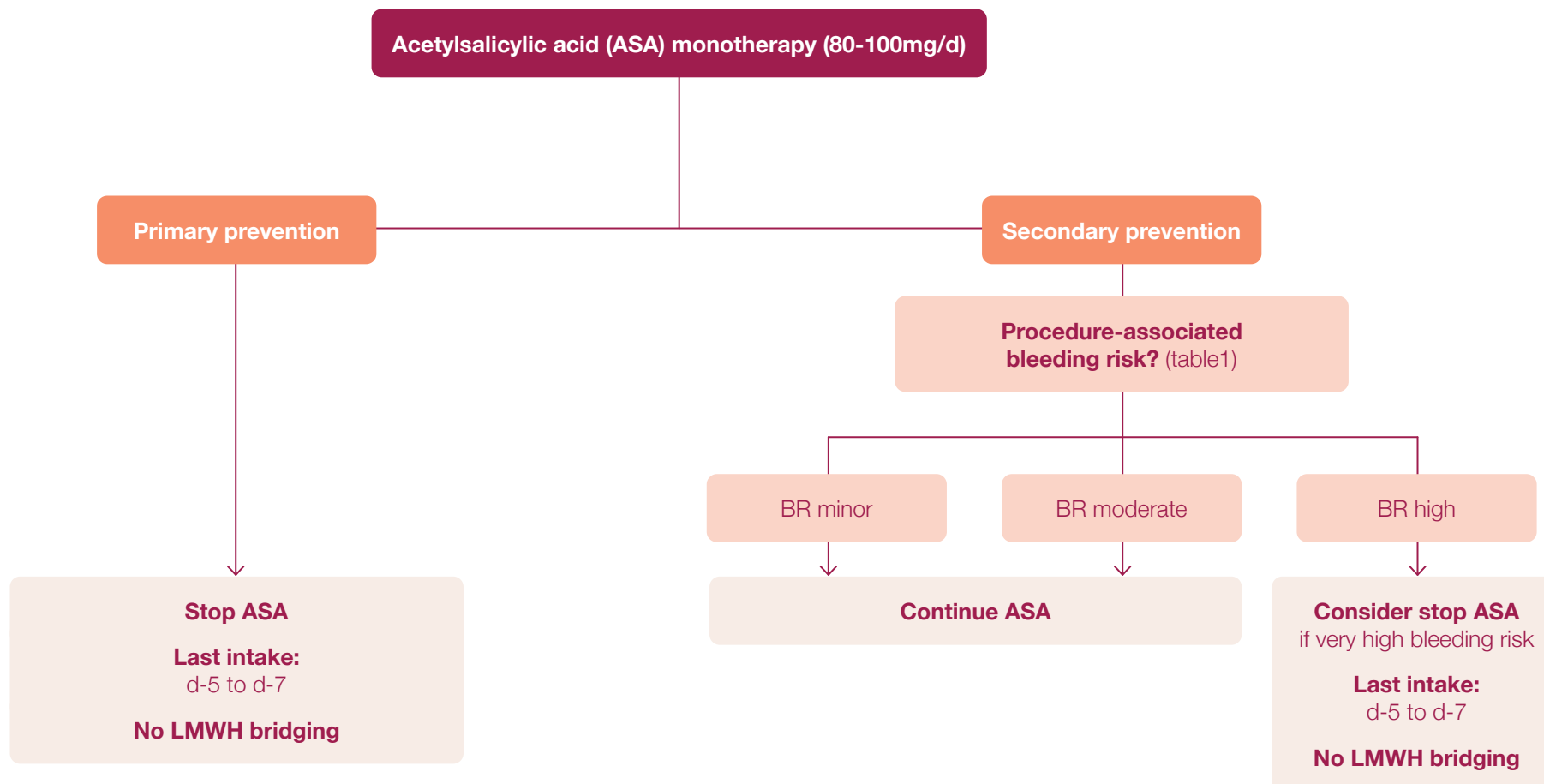
	Low	Intermediate	High
Atrial fibrillation	CHA2DS2-VASc <4	CHA2DS2-VASc 4-6	CHA2DS2-VASc >6 post CVA/TIA with mitral stenosis
Prosthetic heart valve	Biological valve >3m	Biological valve <3m Mechanical aortic valve WITHOUT any thromboembolic risk factor: <ul style="list-style-type: none"> atrial fibrillation previous thromboembolism/stroke/TIA severe left ventricular dysfunction hypercoagulable state 	Mechanical aortic valve AND any thromboembolic risk factor: <ul style="list-style-type: none"> 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 Mild thrombophilia: <ul style="list-style-type: none"> Prot C or S deficiency heterozygous FV Leiden/prothrombin mutation 	DVT and/or PE <3m* Severe thrombophilia: <ul style="list-style-type: none"> 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 Venous graft in peripheral vascular disease >3m	Left ventricular apex thrombus 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)



POST-OPERATIVE

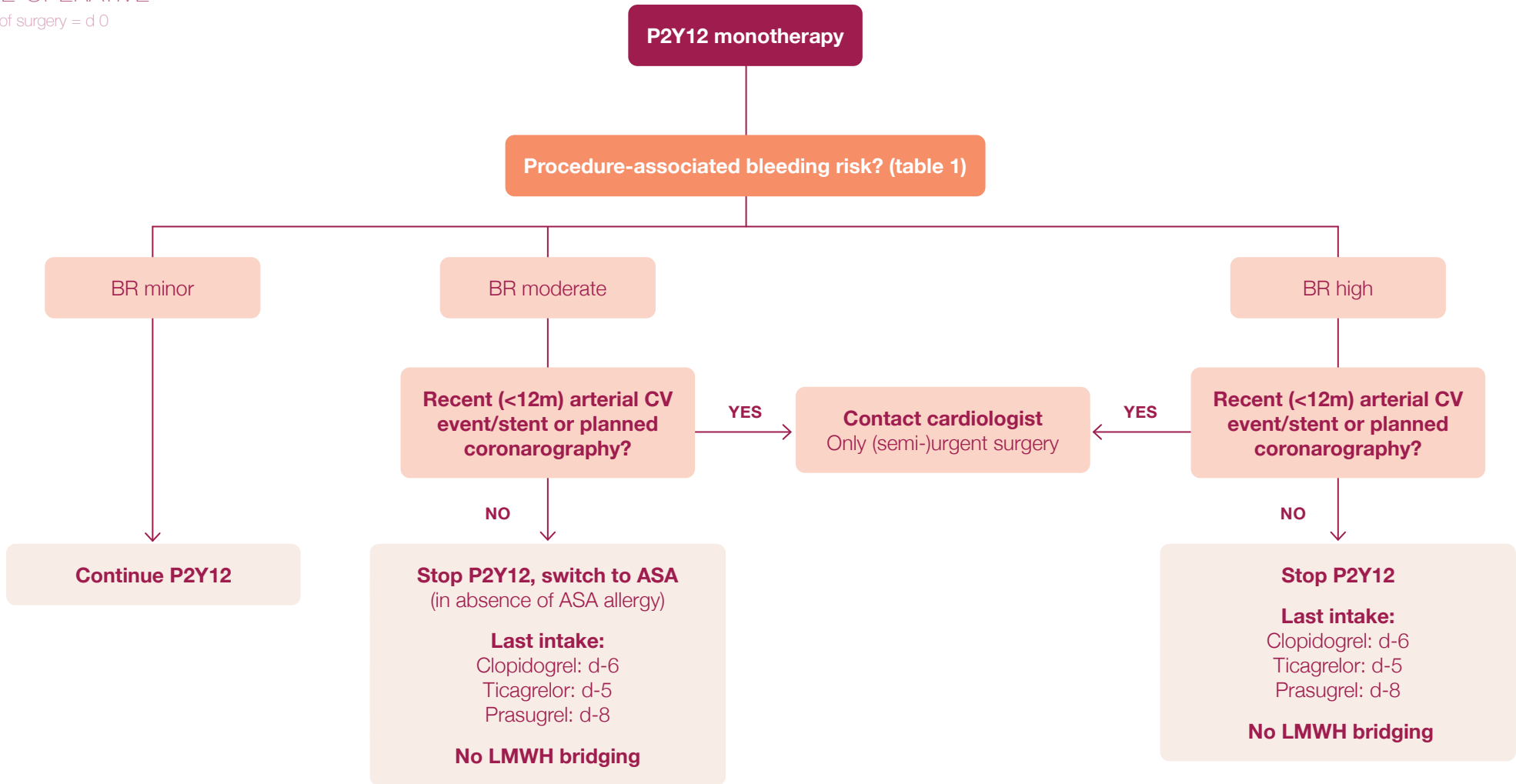
In consultation with surgeon/anesthetist**Start ASA 24h post-op:**

- 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®)



POST-OPERATIVE

In consultation with surgeon/anesthetist

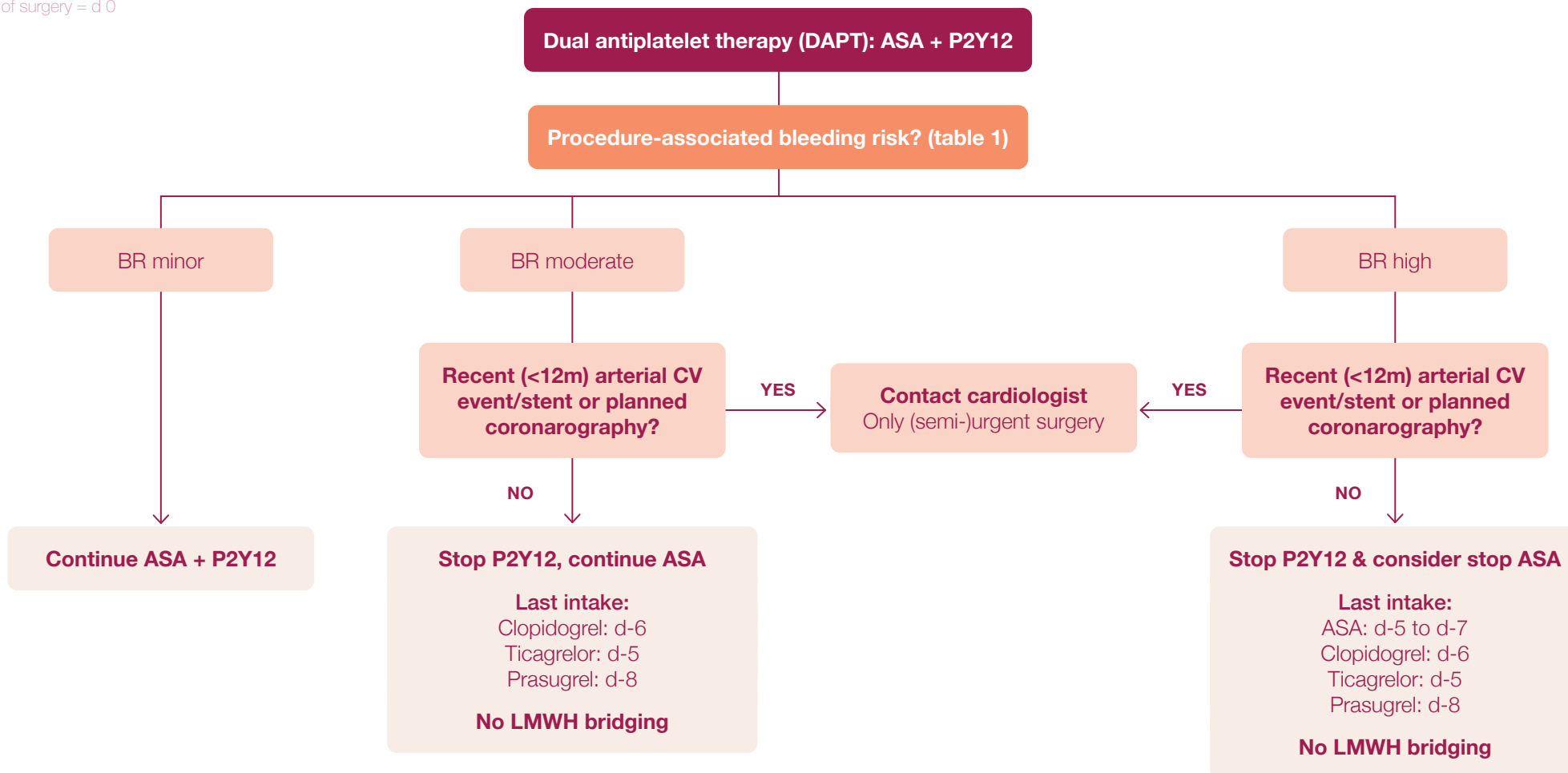
Start P2Y12 24h post-op:

- 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



POST-OPERATIVE

In consultation with surgeon/anesthetist

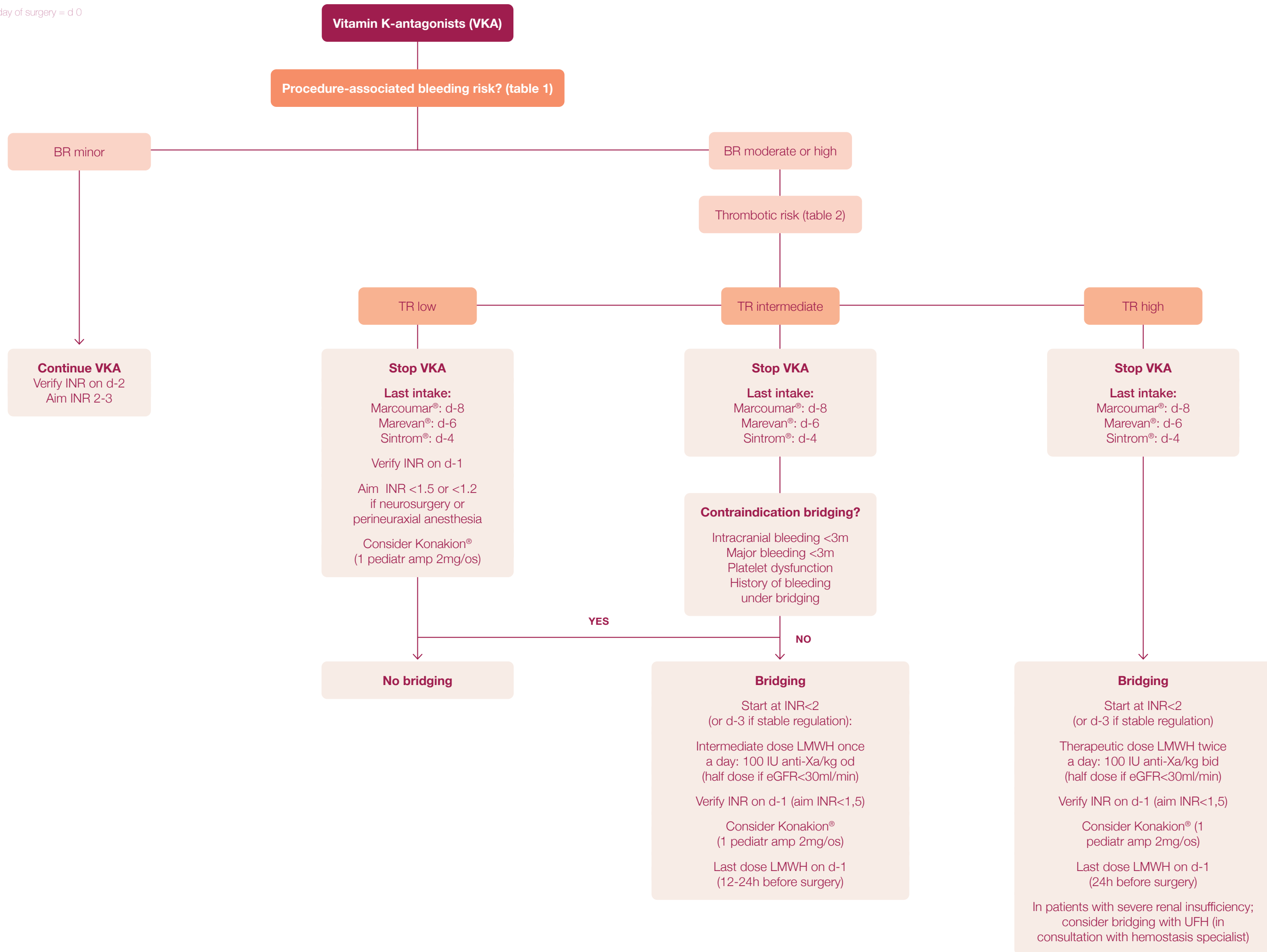
Start ASA + P2Y12 24h post-op:

- 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®



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)

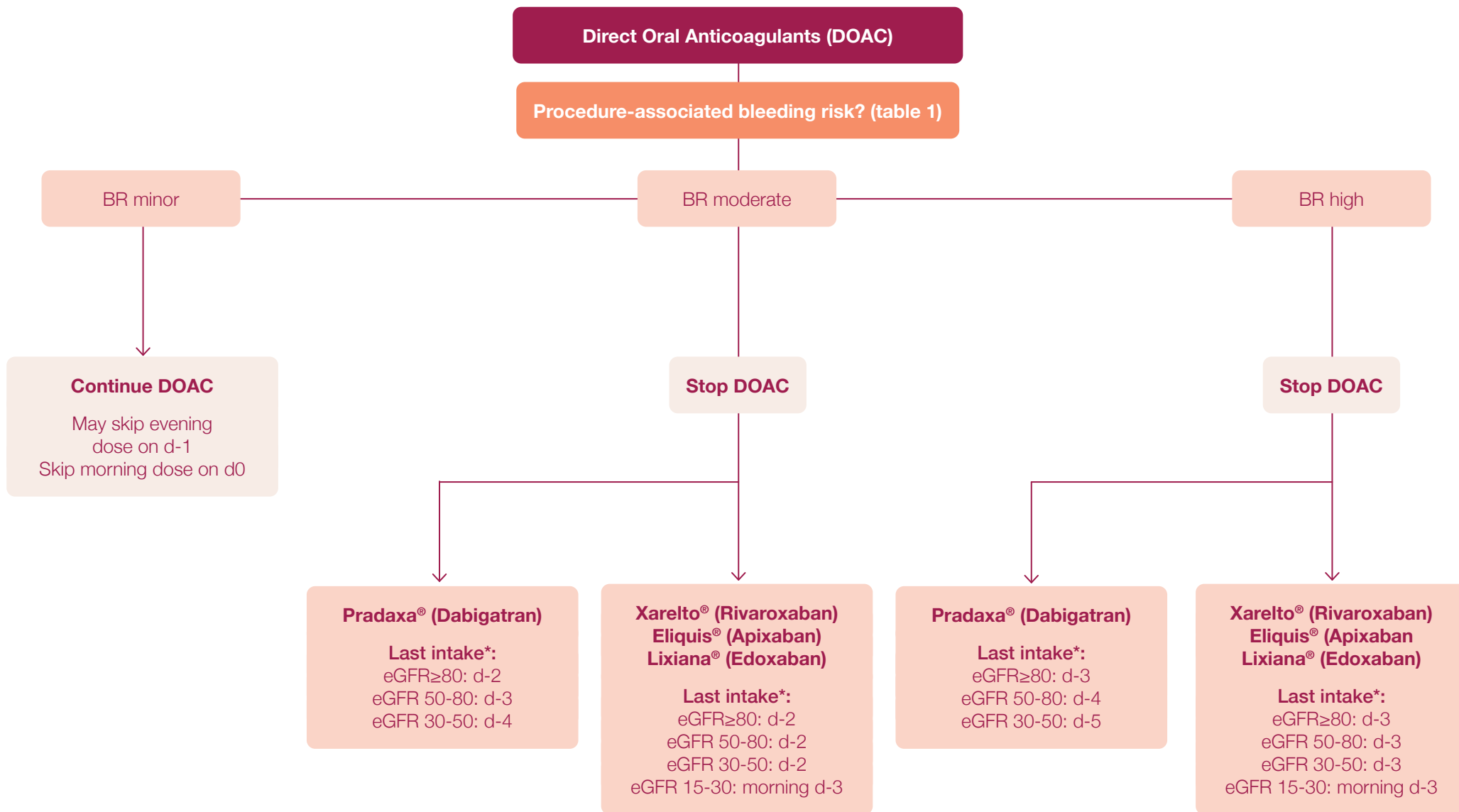
Start VKA:

- 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 accumulation), 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

LMWH (including 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

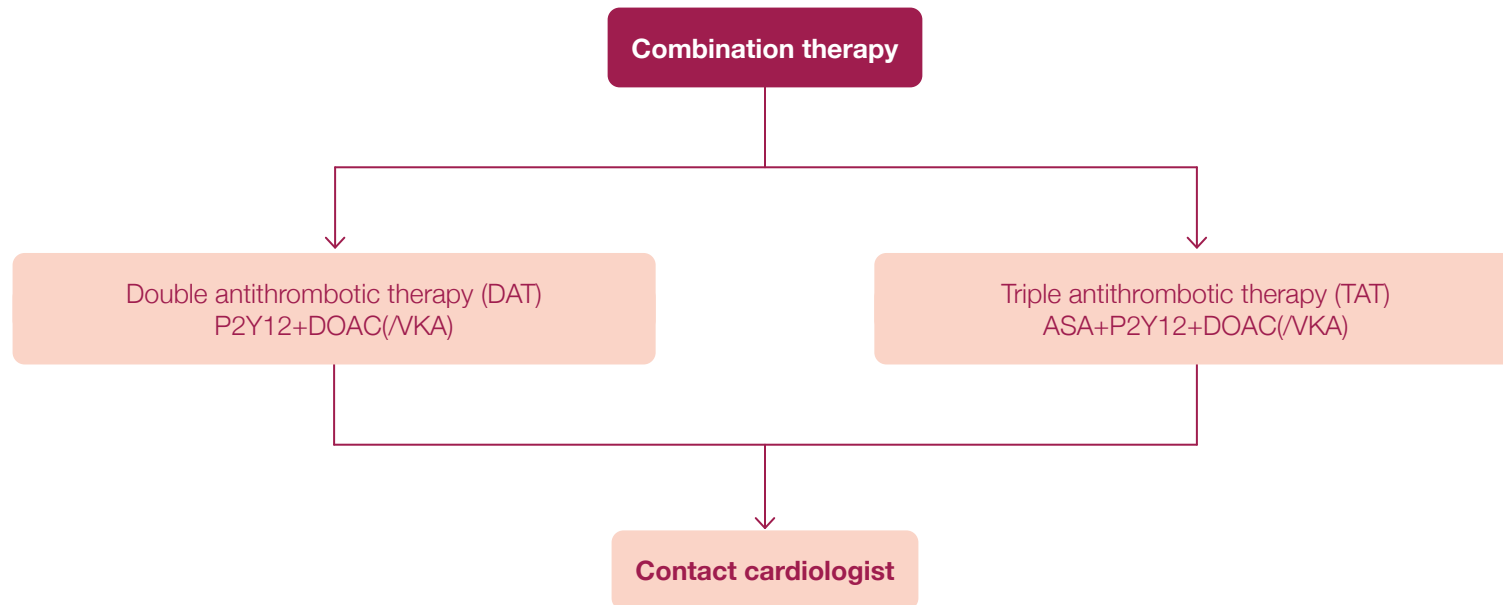
≥8h post-op	prophylactic
≥24h post-op*	intermediate
≥48-72h post-op*	therapeutic

* 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



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-pancreaticography
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



BSTH

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and Haemostasis*



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