# Περιεγχειρητική Διαχείριση Αντιθρομβωτικής Αγωγής

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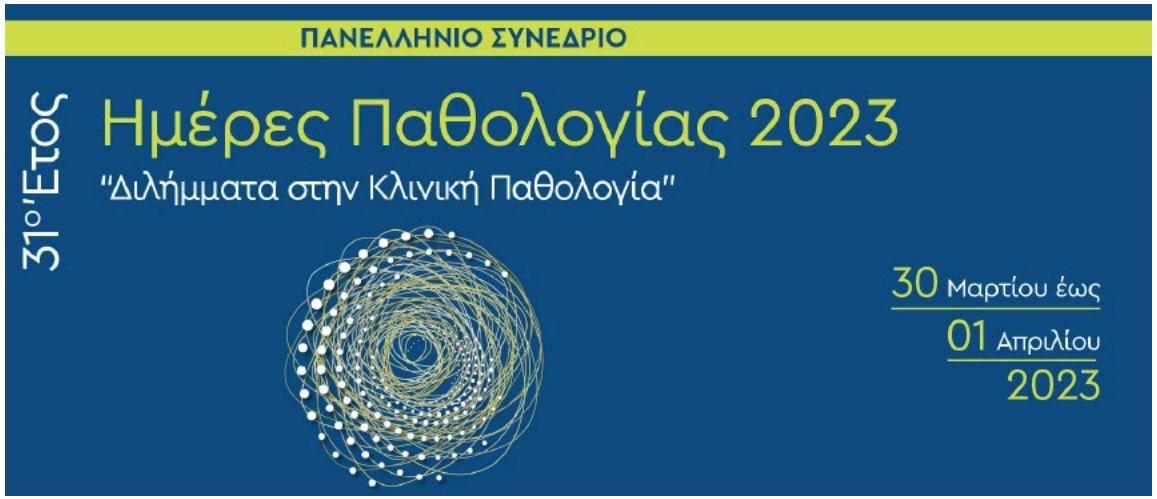
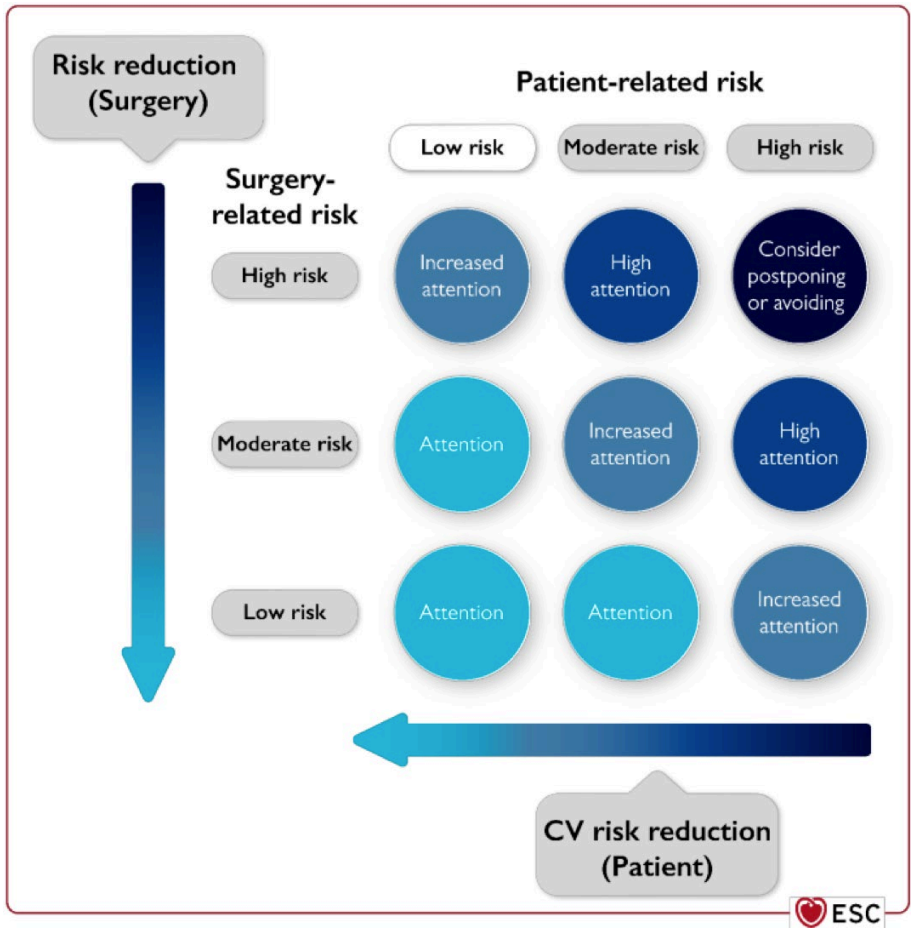
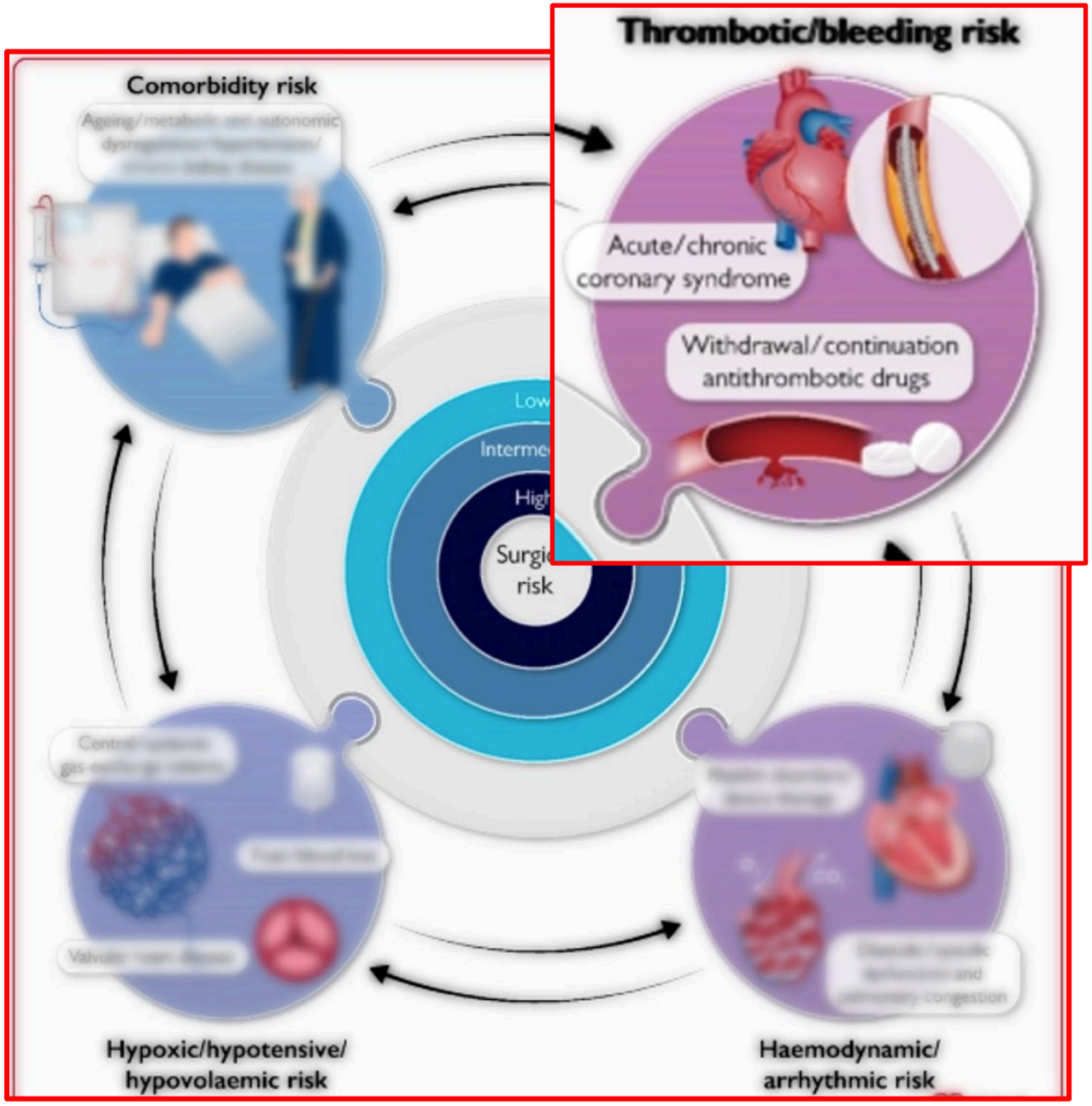


# The complex interplay between the intrinsic risk of surgery and the patient risk of peri-operative cardiovascular complications



ESC
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European Heart Journal (2022) **43**, 3826–3924
https://doi.org/10.1093/eurheartj/ehac270

ESC GUIDELINES

# 2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery

## Developed by the task force for cardiovascular assessment and management of patients undergoing non-cardiac surgery of the European Society of Cardiology (ESC)

## Endorsed by the European Society of Anaesthesiology and Intensive Care (ESAIC)

# Surgical risk estimate according to type of surgery or intervention

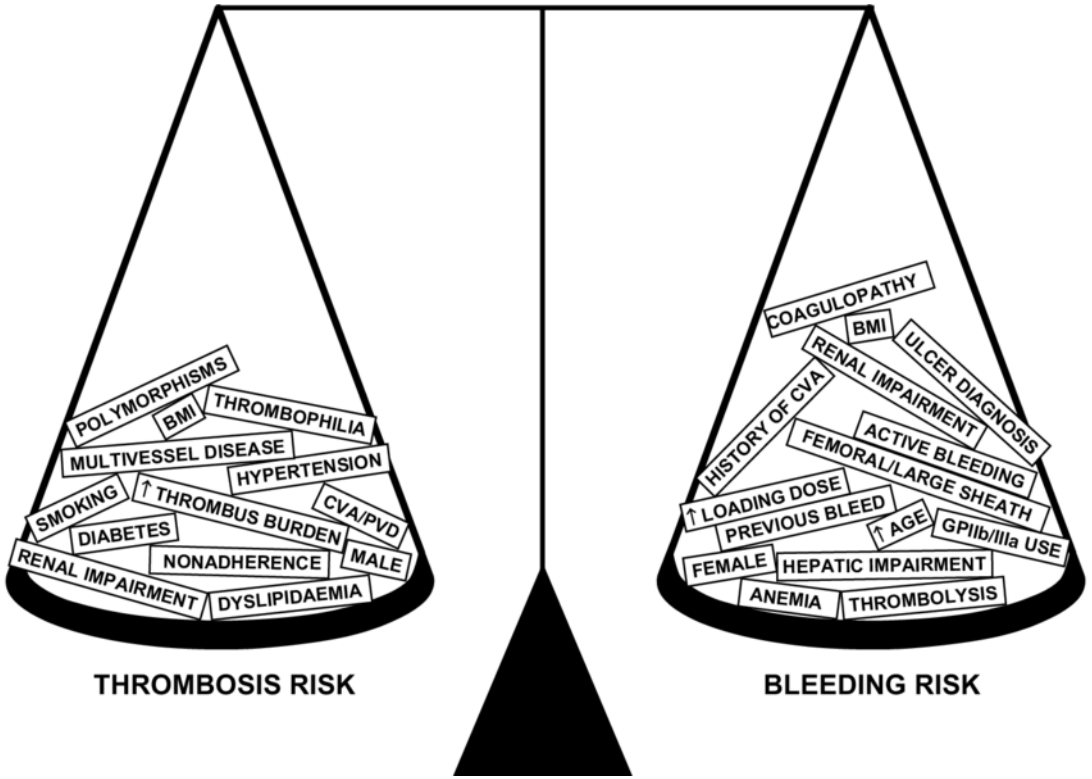
| Low surgical risk (<1%) | Intermediate surgical risk (1–5%) | High surgical risk (>5%) |
|---|---|---|
| • Breast<br>• Dental<br>• Endocrine: thyroid<br>• Eye<br>• Gynaecological: minor<br>• Orthopaedic minor (meniscectomy)<br>• Reconstructive<br>• Superficial surgery<br>• Urological minor: (transurethral resection of the prostate)<br>• VATS minor lung resection | • Carotid asymptomatic (CEA or CAS)<br>• Carotid symptomatic (CEA)<br>• Endovascular aortic aneurysm repair<br>• Head or neck surgery<br>• Intraperitoneal: splenectomy, hiatal hernia repair, cholecystectomy<br>• Intrathoracic: non-major<br>• Neurological or orthopaedic: major (hip and spine surgery)<br>• Peripheral arterial angioplasty<br>• Renal transplants<br>• Urological or gynaecological: major | • Adrenal resection<br>• Aortic and major vascular surgery<br>• Carotid symptomatic (CAS)<br>• Duodenal-pancreatic surgery<br>• Liver resection, bile duct surgery<br>• Oesophagectomy<br>• Open lower limb revascularization for acute limb ischaemia or amputation<br>• Pneumonectomy (VATS or open surgery)<br>• Pulmonary or liver transplant<br>• Repair of perforated bowel<br>• Total cystectomy |





2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery
(European Heart Journal; 2022 – doi:10.1093/eurheartj/ehac270)

# Management of patients taking antithrombotic agents and needing an invasive procedure should consider patient- and procedure-related risk of bleeding and thrombosis



# Bleeding risk associated with different types of interventions

| Surgery with minor bleeding risk | Surgery with low bleeding risk (infrequent or with low clinical impact) | Surgery with high bleeding risk (frequent or with significant clinical impact) |
|---|---|---|
| • Cataract or glaucoma procedure<br>• Dental procedures: extractions (1–3 teeth), periodontal surgery, implant positioning, endodontic (root canal) procedures, subgingival scaling/cleaning<br>• Endoscopy without biopsy or resection<br>• Superficial surgery (e.g. abscess incision, small skin excisions/ biopsy) | • Abdominal surgery: cholecystectomy, hernia repair, colon resection<br>• Breast surgery<br>• Complex dental procedures (multiple tooth extractions)<br>• Endoscopy with simple biopsy<br>• Gastroscopy or colonoscopy with simple biopsy<br>• Large-bore needles procedures (e.g. bone marrow or lymph node biopsy)<br>• Non-cataract ophthalmic surgery<br>• Small orthopaedic surgery (foot, hand arthroscopy) | • Abdominal surgery with liver biopsy, extracorporeal shockwave lithotripsy<br>• Extensive cancer surgery (e.g. pancreas, liver)<br>• Neuraxial (spinal or epidural) anaesthesia<br>• Neurosurgery (intracranial, spinal)<br>• Major orthopaedic surgery<br>• Procedures with vascular organ biopsy (kidney or prostate)<br>• Reconstructive plastic surgery<br>• Specific interventions (colon polypectomy, lumbar puncture, endovascular aneurysm repair)<br>• Thoracic surgery, lung resection surgery<br>• Urological surgery (prostatectomy, bladder tumour resection)<br>• Vascular surgery (e.g. AAA repair, vascular bypass) |

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# Ischemic risk associated with clinical and procedural factors

**TABLE 1 Clinical and Procedural Factors Conferring Increased Risk for Perioperative Ischemic Complications**

| Clinical Factors (9,10,19) | Procedural Characteristics (10,11,19) |
|---|---|
| • Polyvascular disease<br>• Diabetes mellitus<br>• Heart failure<br>• Renal failure<br>• Inpatient admission<br>• RCRI score ≥3<br>  • Elevated surgical risk<br>  • Ischemic heart disease<br>  • Congestive heart failure<br>  • Prior TIA or stroke<br>  • Insulin use<br>  • Creatinine >2.0 mg/dL<br>• ACS as indication for PCI | • 3 vessels treated<br>• ≥3 stents implanted<br>• ≥3 lesions treated<br>• Bifurcation with 2 stents implanted<br>• Total stent length >60 mm<br>• Chronic total occlusion<br>• Ostial or distal PCI<br>• Left main artery PCI<br>• Calcified lesion<br>• Length of atherosclerotic target lesion |

J Am Coll Cardiol 2021;78:1550–1563

# The pharmacokinetic and pharmacodynamic characteristics of antiplatelet drugs

| | ASA | Clopidogrel | Prasugrel | Ticagrelor | Cangrelor | Eptifibatide | Tirofiban |
|---|---|---|---|---|---|---|---|
| **Target (type of blockade)** | COX-1 (irreversible) | $P2Y_{12}$ (irreversible) | $P2Y_{12}$ (irreversible) | $P2Y_{12}$ (reversible) | $P2Y_{12}$ (reversible) | GPIIB/IIIa (reversible) | GPIIB/IIIa (reversible) |
| **Application** | Oral | Oral | Oral | Oral | i.v. | i.v. | i.v. |
| **Time to $C_{max}$** | 0.5–1.0 h | 2 h (after 600 mg LD)[a] | 0.5 h (after 60 mg LD)[a] | 0.5 h (after 180 mg LD)[a] | 2 min | 5 min | 5 min |
| **Prodrug** | No | Yes | Yes | No | No | No | No |
| **Bioavailability (%)** | ~50 | ~50 | 80 | 36 | 100 | 100 | 100 |
| **Drug interactions** | NSAIDs (in particular ibuprofen + naproxen) | CYP3A4, CYP3A5, or CYP2C19 inhibitors or inducers | CYP3A4/A5 and CYP2B6 inhibitor | CYP3A4 inducers or inhibitors | None | None | None |
| **Plasma half-life** | 20 min | 0.5–1 h (active metabolite) | 0.5–1 h (active metabolite) | 6–12 h | 3–6 min | 2.5–2.8 h | 1.2–2 h |
| **Duration of action after last dose** | 7–10 days | 3–10 days[b] | 7–10 days[b] | 3–5 days | 1–2 h | 4 h | 8 h |
| **Renal clearance of the active metabolite (%)** | NR | NR | NR | NR | 58 | ~50 | 65 |
| **Dose regimen** | *o.d.* | *o.d.* | *o.d.* | *b.i.d.* | Bolus, infusion | Bolus, infusion | Bolus, infusion |

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# The pharmacokinetic and pharmacodynamic characteristics of anticoagulants

| | Warfarin | Phenprocoumon | Apixaban | Dabigatran | Edoxaban | Rivaroxaban |
|---|---|---|---|---|---|---|
| **Target (type of blockade)** | VKORC1 | VKORC1 | FXa | FIIa | FXa | FXa |
| **Application** | Oral | Oral | Oral | Oral | Oral | Oral |
| **Time to $C_{max}$** | 2–6 h | 1.52 h ± 1.52 | 3–4 h | 1.25–3 h | 1–2 h | 2–4 h |
| **Prodrug** | No | No | No | Yes | No | No |
| **Bioavailability (%)** | >95 | 100 | 50 | 6.5 | 62 | 80–100 |
| **Drug interactions** | CYP2C9, CYP2C19, CYP2C8, CYP2C18, CYP1A2, CYP3A4, vitamin K | CYP2C9, CYP2C8, vitamin K | CYP3A4 inhibitors or inductors, P-glycoprotein inhibitors or inductors | P-glycoprotein inhibitors or inductors | P-glycoprotein inhibitors | CYP3A4 inhibitors or inductors, P-glycoprotein inhibitors or inductors |
| **Plasma half-life** | 36–48 h | ~100 h | 12 h | 12–14 h | 6–11 h | 7–11 h (11–13 h in the elderly) |
| **Duration of action after last dose** | ~5 days | ~7 days | 24 h | 24 h | 24 h | 24 h |
| **Renal clearance of the active metabolite (%)** | Non-renal | Non-renal | 27 | 85 | 37–50 | 33 |
| **Dose regimen** | Adjusted according to INR | Adjusted according to INR | *b.i.d.* | *b.i.d.* | *o.d.* | *o.d./b.i.d.* |

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# Risk factors for MACE after non cardiac surgery (NCS)

- ✓ Time from PCI to surgery, with the highest risk in the first month
- ✓ Primary PCI for ST-segment elevation myocardial infarction (STEMI)
- ✓ Dual antiplatelet therapy (DAPT) interruptions/discontinuation
- ✓ Lesion characteristics, including ostial and distal lesions
- ✓ Urgency of surgery

JAMA Surg 2016;151:462
Catheter Cardiovasc Interv 2017;89:617–627

# Aspirin in Patients Undergoing Noncardiac Surgery

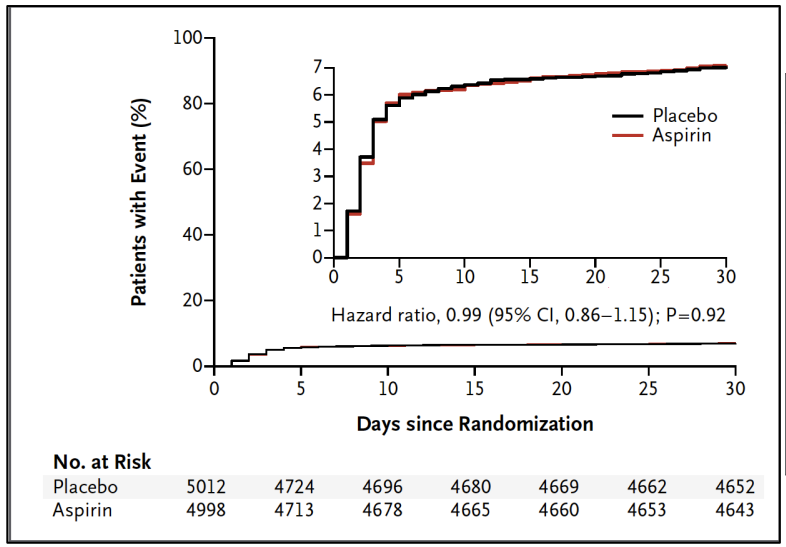
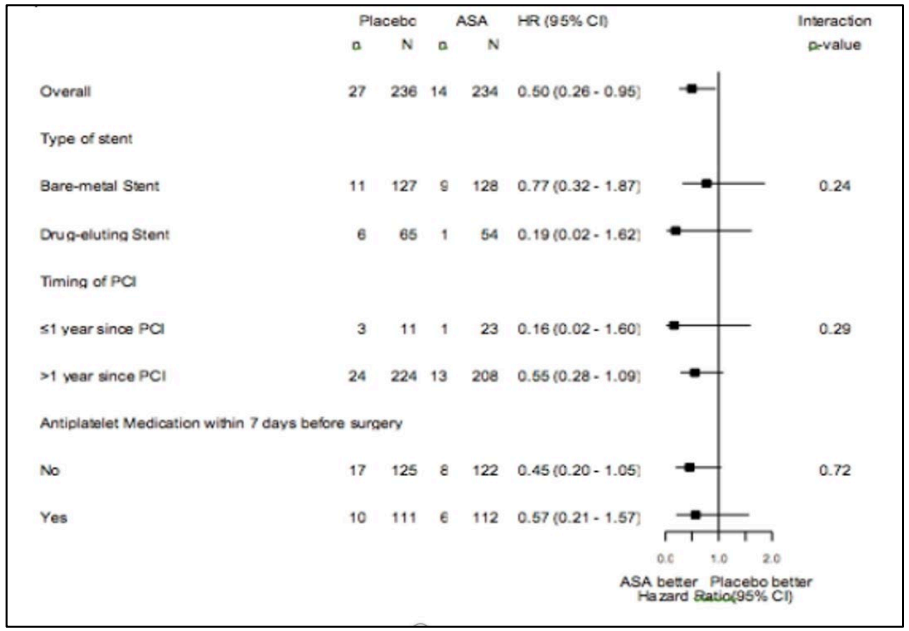



Table 3. Absolute Increase in the Risk of a Composite of Life-Threatening or Major Bleeding with Aspirin Therapy, Starting on Each of the First 10 Postoperative Days until 30 Days after Surgery.*

| Day at Start of Risk Analysis | Aspirin† | Placebo† | Absolute Increase in Risk with Aspirin | P Value |
|---|---|---|---|---|
| | *no./total no. (%)* | | *percentage points* | |
| Day of surgery | 311/4953 (6.3) | 254/4978 (5.1) | 1.2 | 0.01 |
| Day 1 after surgery | 191/4832 (4.0) | 129/4852 (2.7) | 1.3 | <0.001 |
| Day 2 after surgery | 138/4779 (2.9) | 92/4813 (1.9) | 1.0 | 0.002 |
| Day 3 after surgery | 102/4741 (2.2) | 59/4777 (1.2) | 1.0 | <0.001 |
| Day 4 after surgery | 73/4710 (1.6) | 33/4748 (0.7) | 0.9 | <0.001 |
| Day 5 after surgery | 59/4693 (1.3) | 27/4739 (0.6) | 0.7 | <0.001 |
| Day 6 after surgery | 43/4674 (0.9) | 25/4736 (0.5) | 0.4 | 0.03 |
| Day 7 after surgery | 39/4667 (0.8) | 22/4731 (0.5) | 0.3 | 0.03 |
| Day 8 after surgery | 20/2623 (0.8) | 14/2662 (0.5) | 0.3 | 0.29 |
| Day 9 after surgery | 15/2617 (0.6) | 14/2660 (0.5) | 0.1 | 0.82 |
| Day 10 after surgery | 14/2614 (0.5) | 12/2657 (0.5) | 0.0 | 0.67 |




Aspirin before surgery and throughout the early postsurgical period has no significant effect on the rate of a composite of death or nonfatal myocardial infarction but increased the risk of major bleeding ***(POISE 2 trial)***

Among patients with previous PCI, in the absence of a very high bleeding risk, low-dose aspirin should be continued during the peri-operative period. ***(POISE 2 Trial post hoc analysis)***

- If the bleeding risk outweighs the potential CV benefit, aspirin should be discontinued for at least 7 days (e.g. undergoing spinal surgery or certain neurosurgical or ophthalmological operations)

N Engl J Med 2014;370: 1494–1503
Ann Intern Med 2018;168:237–244

# Elective Noncardiac Surgery on DAPT

- The frequency of NCS after PCI for 30 days, 6 months, and 1 year is 1%, 5%, and 9%, respectively.
- MACE (including cardiac death, MI, and stent thrombosis) range between 2–8% in PCI patients undergoing NCS, with a more than two-fold increased risk compared with non-stented patients

JACC Cardiovasc Interv 2010;3: 920–927
Circ Cardiovasc Qual Outcomes 2016;9:39–47
J Am Coll Cardiol 2016;68:2622–2632

# Management of perioperative DAPT

- Risk of stent thrombosis (ST) with premature DAPT interruption
- Intra-procedural bleeding (DAPT continuation)

Kristensen SD et al. Eur Heart J 2014;35:2383–2431

# Interdisciplinary approach

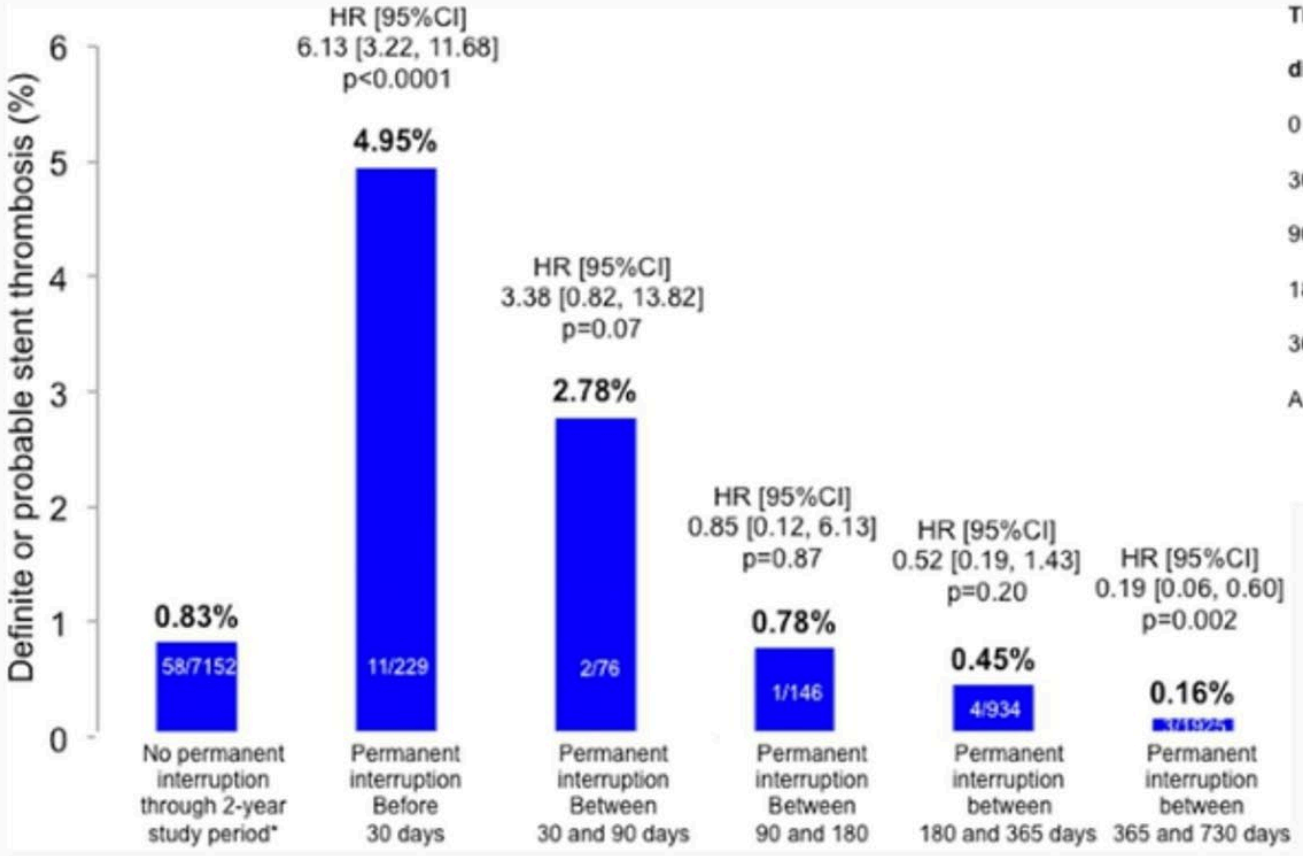
The management of antiplatelet therapy in patients who have undergone recent PCI and are scheduled for NCS should be discussed by the surgeon and cardiologist:

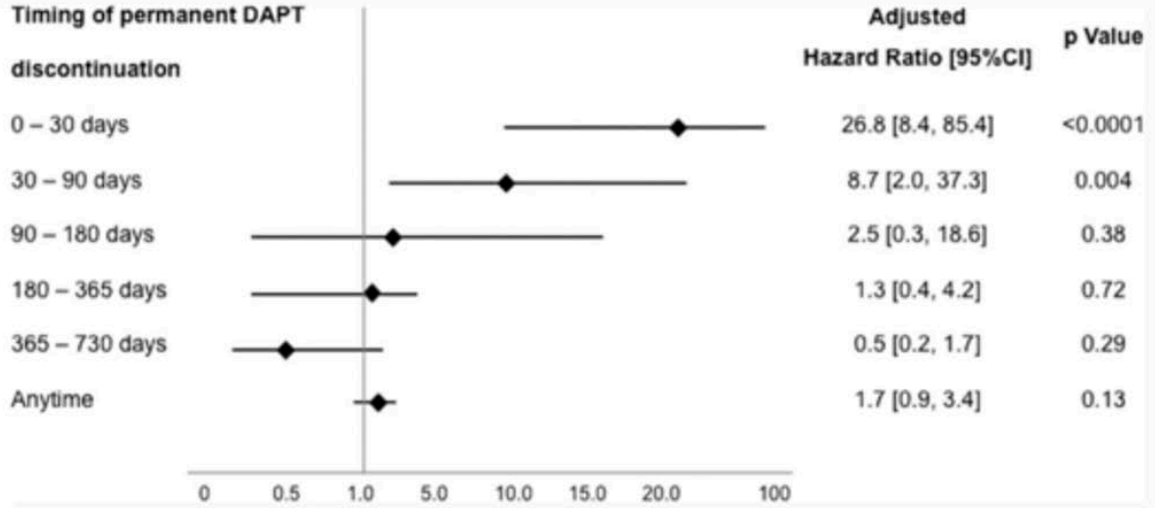
**The risk of life-threatening surgical bleeding on antiplatelet therapy (best understood by the surgeon)**

**The risk of life-threatening stent thrombosis due to premature DAPT discontinuation (best understood by the cardiologist)**

# Stent Thrombosis and DAPT Interruption With Everolimus-Eluting Stents

***pooled analysis of 11 219 patient from 3 randomized trials and 4 registries***



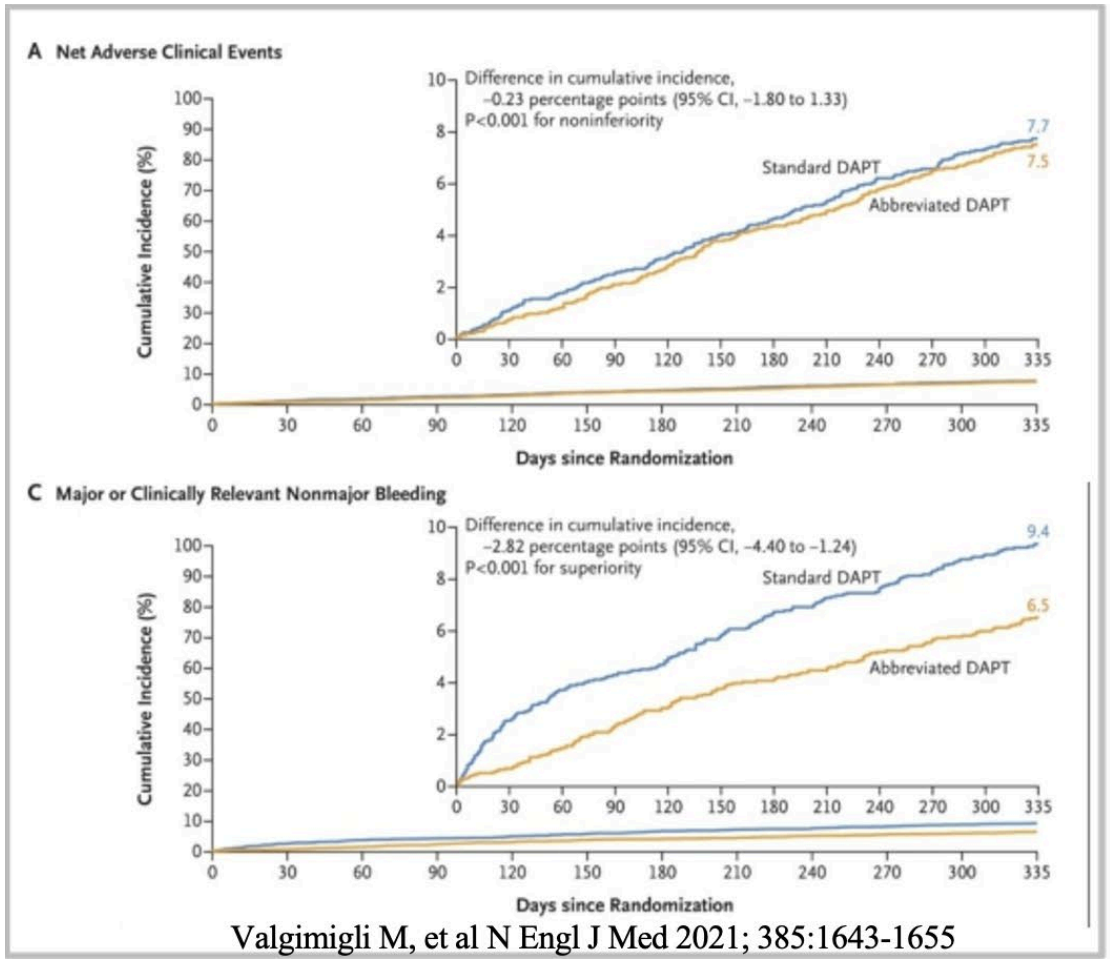

Généreux P, et al. Circ Cardiovasc Interv. 2015 May;8(5):e001362.

# Short vs longer DAPT duration

## MASTER-DAPT

**(One month DAPT vs. continuation for at least 2 additional months)**

**36.5 % NST-ACS, 12% STEMI**

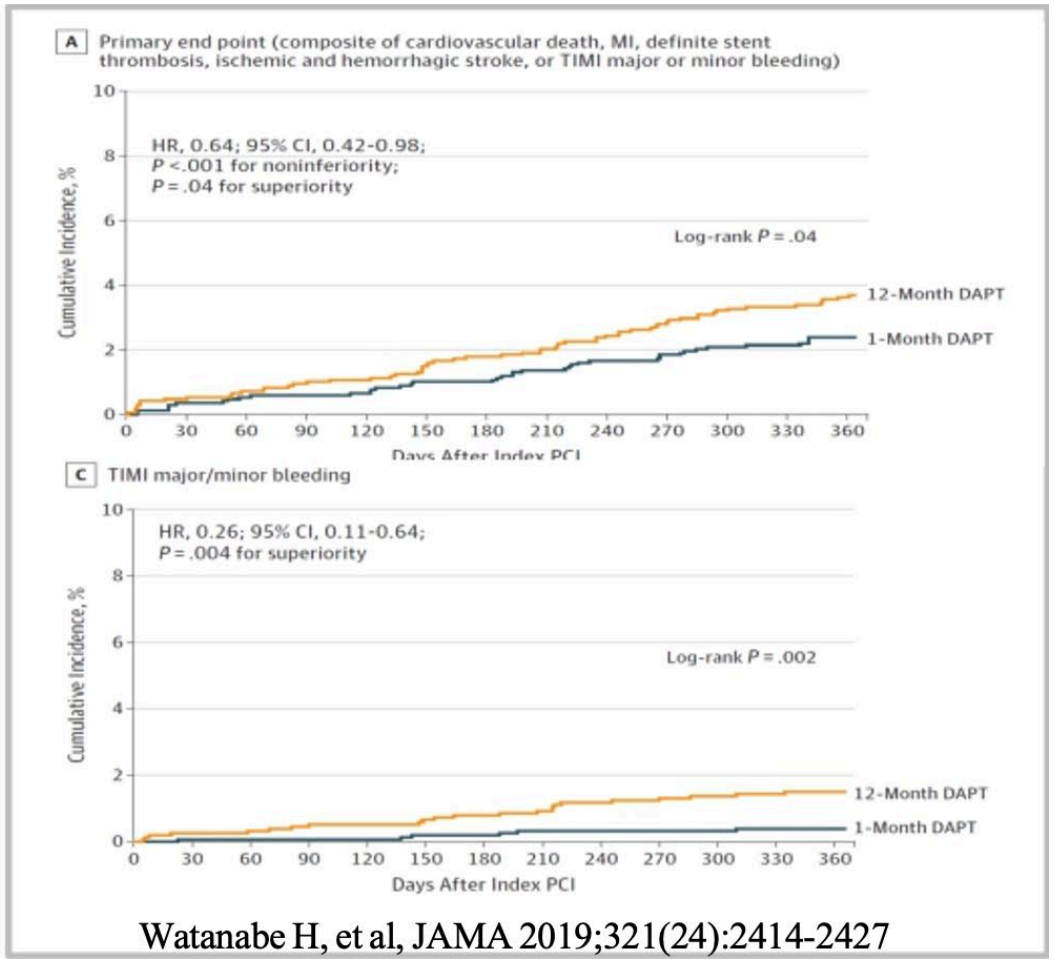



Valgimigli M, et al N Engl J Med 2021; 385:1643-1655

## STOPDAPT-2

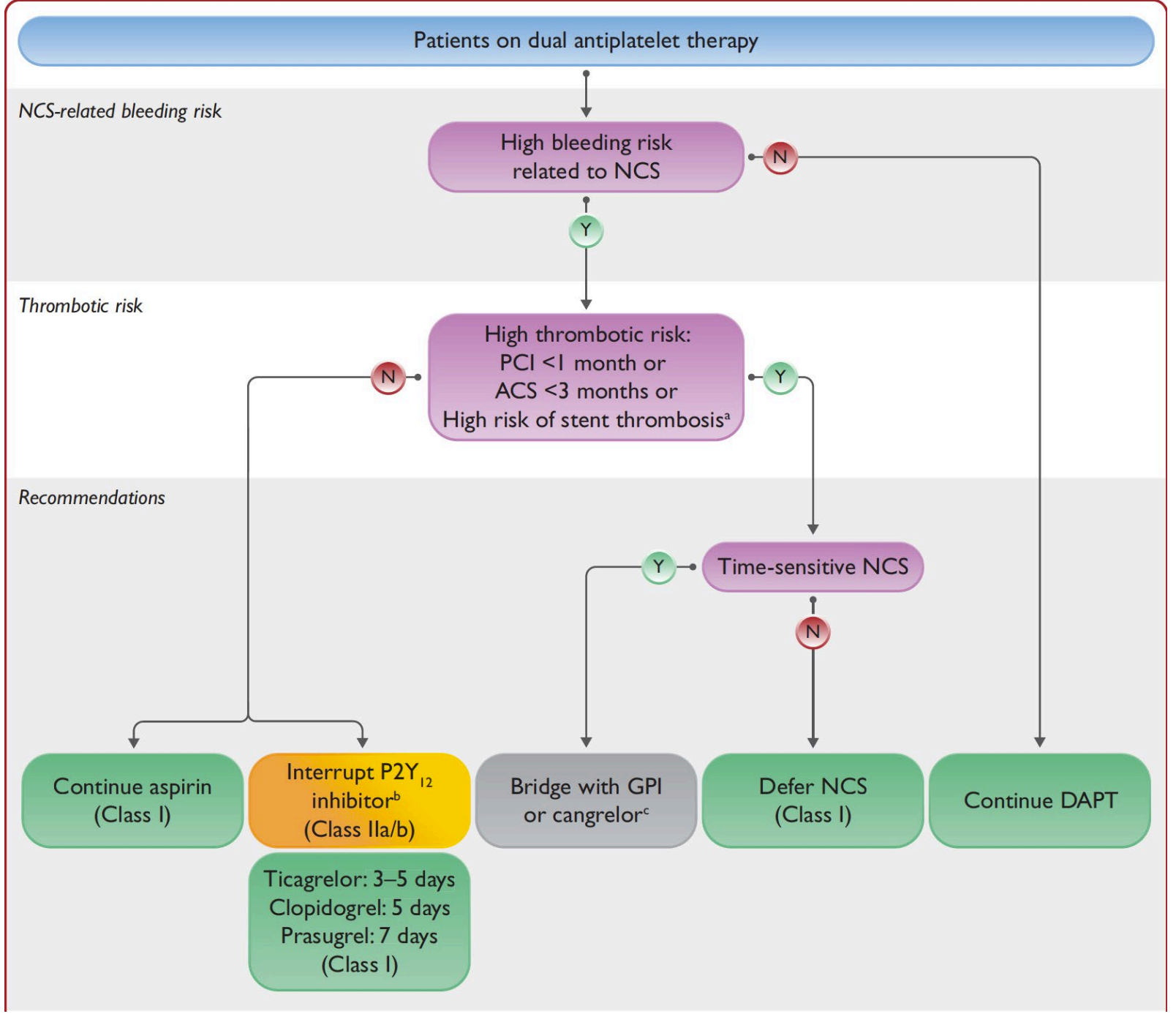
**(One-month vs. 12-month DAPT)**

**19.5 % NST-ACS, 18.6% STEMI**




Watanabe H, et al, JAMA 2019;321(24):2414-2427

# Patients on DAPT undergoing surgery

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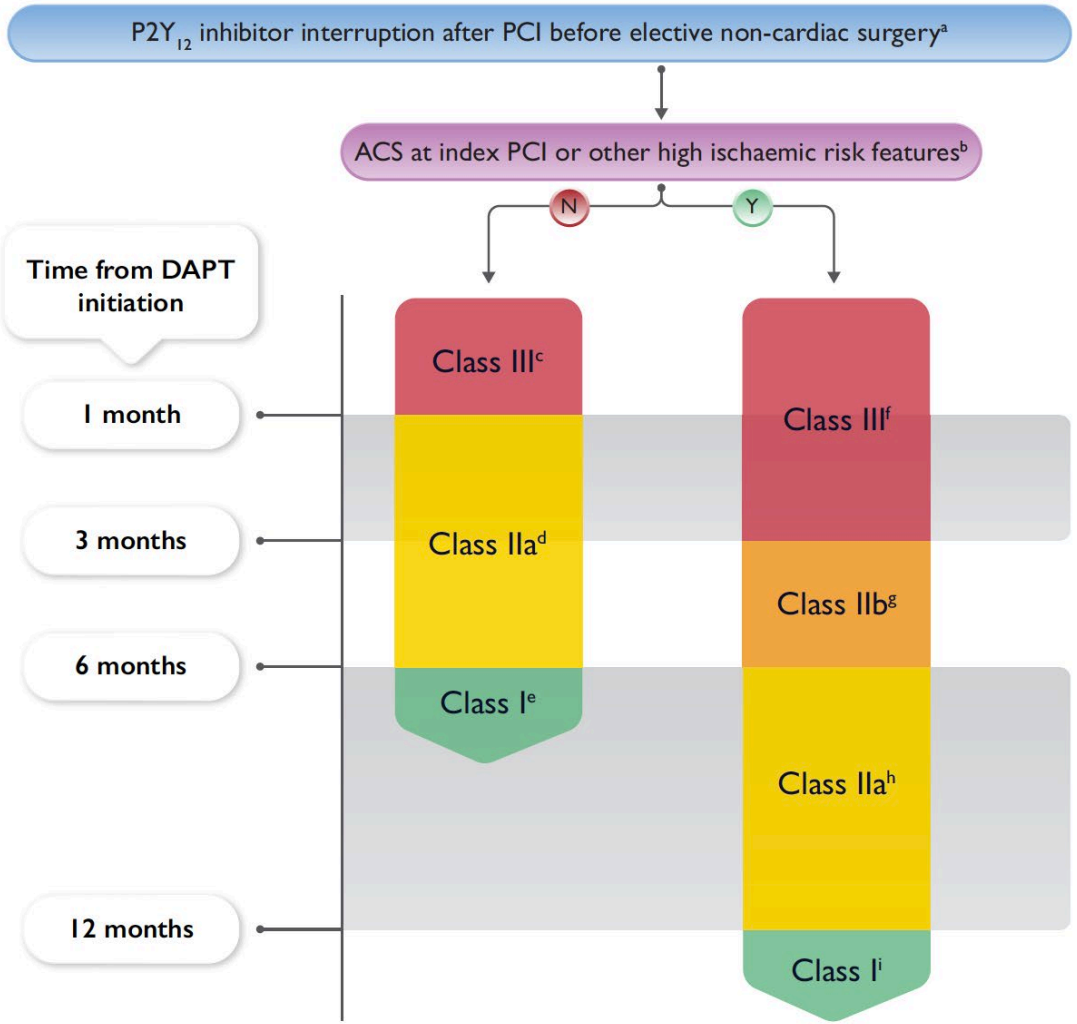
**P2Y12 inhibitor interruption after percutaneous coronary intervention before elective non-cardiac surgery**

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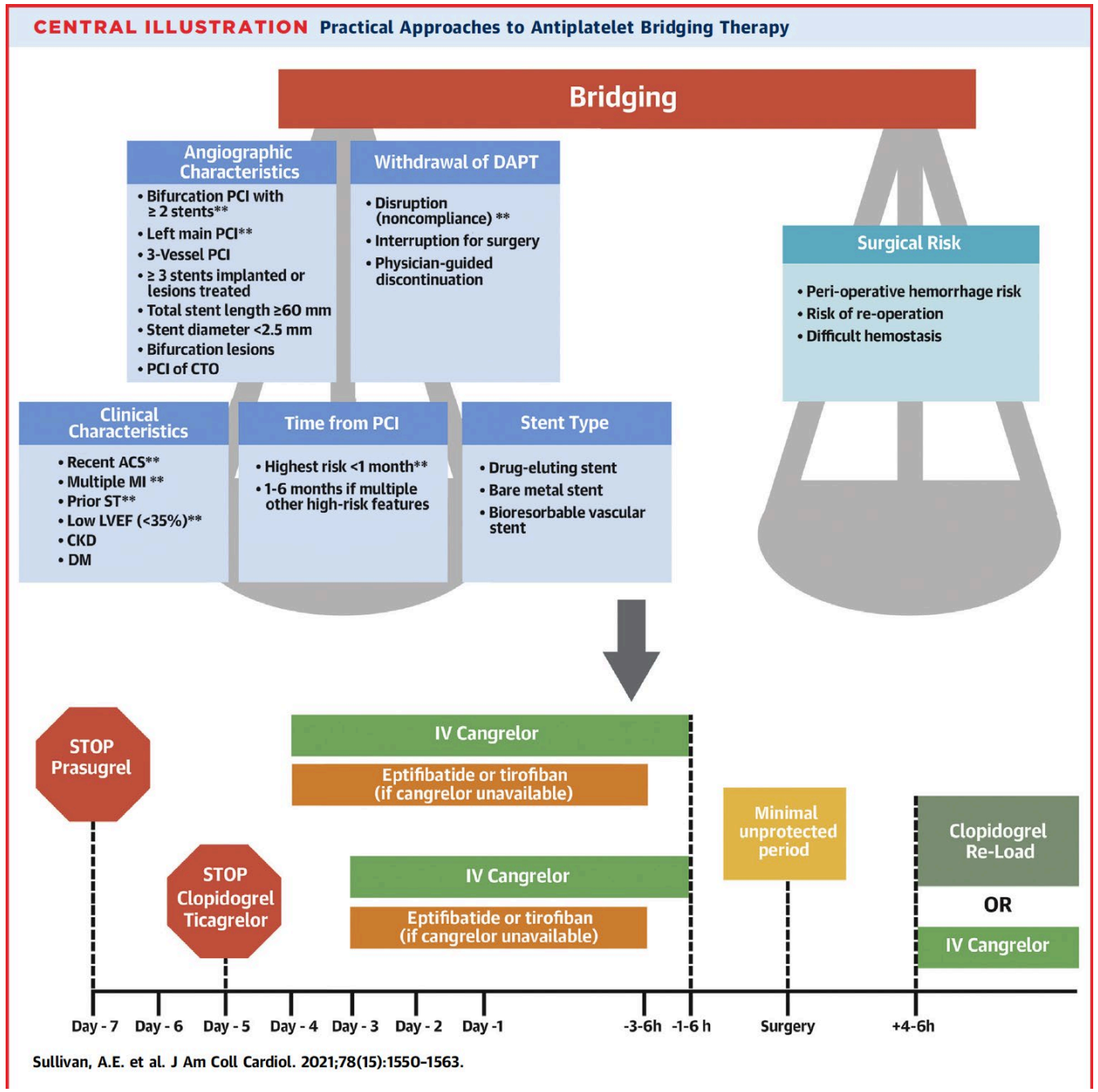
# Bridging strategies




- ✓ Bridging with i.v. compounds (eptifibatide/tirofiban or cangrelor) might be applicable when DAPT cannot be interrupted (e.g. in patients with very high risk of stent thrombosis, history of recurrent MI, recent PCI)

- ✓ For patients undergoing surgery, the established cangrelor dosing regimen is associated with less severe bleeding than glycoprotein IIb/IIIa inhibitors.

J Am Coll Cardiol 2021;78:1550–1563

# Elective Non-Cardiac Surgery on Anticoagulation therapy

- ✓ One in four patients taking anticoagulant therapy will require a surgical or invasive procedure within 2 years.

- ✓ Peri-operative management of oral anticoagulant (OAC) therapy depends on surgery and patient related factors and the specific OAC agent (vitamin K antagonist or NOAC)

*Surgery-related factors include urgency of the intervention and the procedure-related bleeding risk*

*Patient-related factors include age, individual thrombotic risk, history of bleeding complications, renal function, concomitant medication, comorbidity, etc.*

# Patients with mechanical heart valves

## *to bridge or not to bridge…*

✓ Major surgical procedures needing INR ≤1.5 require VKA interruption, and heparin bridging should be considered

**PERIOP2 trial**

| Outcomes | Whole study population | | | | Atrial fibrillation | | | | Mechanical valve† | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No bridging (n=650) | Bridging (n=820) | P value | Risk difference (95% CI) | No bridging (n=496) | Bridging (n=670) | P value | Risk difference (95% CI) | No bridging (n=154) | Bridging (n=150) | P value | Risk difference (95% CI) |
| **Primary** | | | | | | | | | | | | |
| Major thromboembolism* | 8 (1.2) | 8 (1.0) | 0.64 | −0.3 (−1.3 to 0.8) | 8 (1.6) | 7 (1.0) | 0.39 | −0.6 (−1.9 to 0.8) | 0 | 1 (0.7) | 0.49 | 0.7 (−0.6 to 2.0) |
| **Secondary** | | | | | | | | | | | | |
| Ischaemic stroke | 3 (0.5) | 1 (0.1) | 0.33 | — | 3 (0.6) | 1 (0.2) | 0.32 | — | — | — | — | — |
| Transient ischaemic attack | 0 | 1 (0.1) | 1 | — | — | — | — | — | 0 | 1 (0.7) | 0.49 | — |
| Symptomatic myocardial infarction | 3 (0.4) | 3 (0.5) | 1 | — | 3 (0.6) | 3 (0.5) | 0.70 | — | — | — | — | — |
| Peripheral embolism | — | — | — | — | — | — | — | — | — | — | — | — |
| Valve thrombosis | — | — | — | — | — | — | — | — | — | — | — | — |
| Venous thromboembolism | 2 (0.3) | 3 (0.4) | 1 | — | 3 (0.6) | 3 (0.5) | 1 | — | — | — | — | — |
| Vascular death | 3 (0.5) | 0 | 0.09 | — | 3 (0.6) | 0 | 0.08 | — | — | — | — | — |
| All deaths | 8 (1.2) | 6 (0.7) | 0.33 | −0.5 (−1.5 to 0.5) | 6 (1.2) | 5 (0.8) | 0.54 | −0.5 (−1.6 to 0.7) | 2 (1.3) | 1 (0.7) | 1 | −0.6 (−2.8 to 1.6) |
| Major bleeding | 13 (2.0) | 11 (1.3) | 0.32 | −0.7 (−2.0 to 0.7) | 10 (2.0) | 10 (1.5) | 0.49 | −0.5 (−2.1 to 1.0) | 3 (2.0) | 1 (0.7) | 0.62 | −1.3 (−3.8 to 1.3) |
| Clinically relevant non-major bleeding | 25 (3.9) | 50 (6.1) | 0.05 | 2.3 (0.1 to 4.5) | 20 (4.0) | 42 (6.3) | 0.09 | 2.2 (−0.3 to 4.8) | 5 (3.3) | 8 (5.3) | 0.37 | 2.1 (−2.5 to 6.6) |
| Trivial bleeding | 16 (2.5) | 22 (2.7) | 0.79 | — | 14 (2.8) | 18 (2.7) | 0.89 | — | 2 (1.3) | 4 (2.7) | 0.44 | — |
| Major thromboembolism or major bleeding | 21 (3.2) | 19 (2.3) | 0.28 | −0.9 (−2.6 to 0.8) | 18 (3.6) | 17 (2.5) | 0.28 | −1.1 (−3.1 to 0.9) | 3 (2.0) | 2 (1.3) | 1 | −0.6 (−3.5 to 2.2) |
| Major thromboembolism or major bleeding, or death | 25 (3.9) | 24 (2.9) | 0.33 | −0.9 (−2.8 to 1) | 20 (4.0) | 21 (3.1) | 0.41 | −0.9 (−3.1 to 1.3) | 5 (3.3) | 3 (2.0) | 0.72 | −1.3 (−4.8 to 2.3) |

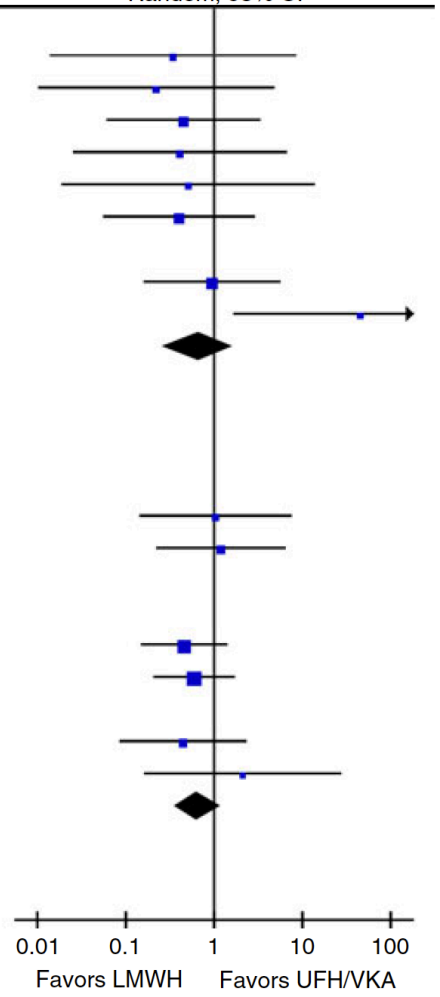
*Major thromboembolism—any one of first seven secondary outcomes: ischaemic stroke, transient ischaemic attack, symptomatic myocardial infarction, peripheral embolism, valve thrombosis, venous thromboembolism (pulmonary embolism or deep vein thrombosis), or vascular death.
†With or without atrial fibrillation.

*BMJ* 2021;373:n1205

# Patients with mechanical heart valves

## *LMWH or UFH…*

| Study or subgroup | Control group UFH/VKA | Weight | Odds ratio Random, 95% CI | Year |
|---|---|---|---|---|
| Thromboembolic events | | | | |
| Montalescot *et al.* | UFH | 7.7% | 0.34 [0.01–8.52] | 2000 |
| Fanikos *et al.* | UFH | 8.4% | 0.22 [0.01–4.78] | 2004 |
| Lee *et al.* | VKA | 18.2% | 0.45 [0.06– 3.35] | 2007 |
| Spyropoulos *et al.* | UFH | 10.1% | 0.41 [0.03–6.63] | 2008 |
| Shannon *et al.* | UFH/VKA | 7.3% | 0.51 [0.02–13.84] | 2008 |
| Daniels *et al.* | UFH | 18.7% | 0.40 [0.06–2.90] | 2009 |
| Bajkin *et al.* | VKA | | No events | 2009 |
| McLintock *et al.* | VKA | 22.3% | 0.95 [0.16–5.63] | 2009 |
| Basude *et al.* | VKA | 7.3% | 45.00 [1.65–1226.89] | 2012 |
| Subtotal (95% CI) | | 100.0% | 0.67 [0.27–1.68] | |
| Heterogeneity: $I^2 = 9\%$ | | | | |
| Test for overall effect: $Z = 0.85$ ($P = 0.40$) | | | | |
| Major bleeding | | | | |
| Montalescot *et al.* | UFH | 9.1% | 1.04 [0.14–7.53] | 2000 |
| Fanikos *et al.* | UFH | 12.6% | 1.19 [0.22–6.42] | 2004 |
| Lee *et al.* | VKA | | No events | 2007 |
| Shannon *et al.* | UFH/VKA | | No events | 2008 |
| Spyropoulos *et al.* | UFH | 28.0% | 0.46 [0.15–1.42] | 2008 |
| Daniels *et al.* | UFH | 31.8% | 0.60 [0.21–1.72] | 2009 |
| Bajkin *et al.* | VKA | | No events | 2009 |
| McLintock *et al.* | VKA | 13.0% | 0.44 [0.08–2.34] | 2009 |
| Basude *et al.* | VKA | 5.4% | 2.11 [0.16–27.58] | 2012 |
| Subtotal (95% CI) | | 100.0% | 0.66 [0.36–1.19] | |
| Heterogeneity: $I^2 = 0\%$ | | | | |
| Test for overall effect: $Z = 1.39$ ($P = 0.17$) | | | | |




Anti-factor Xa activity monitoring with target levels from 0.5–1.0 U/mL may be useful when the dosage may be difficult to determine

J Thromb Haemost 2014;12:650–659

# Vitamin K antagonists for atrial fibrillation / venous thromboembolism

- If low bleeding, risk surgery can be performed without VKA interruption
- If interruption is necessary due to high bleeding risk, the BRIDGE trial in AF patients showed that 3–5 days of warfarin interruption without bridging was superior to heparin bridging.
- Bridging therapy may be considered for patients with a high thrombotic risk (i.e. AF with CHA2DS2-VASc score >6, recent cardioembolic stroke <3 months, or high risk of VTE recurrence) weighing the risk of bleeding against the risk of thromboembolism

Perioperative Bridging Anticoagulation in Patients with Atrial Fibrillation

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**Table 3. Study Outcomes.**

| Outcome | No Bridging (N=918) | Bridging (N=895) | P Value |
|---|---|---|---|
| | *number of patients (percent)* | | |
| **Primary** | | | |
| Arterial thromboembolism | 4 (0.4) | 3 (0.3) | 0.01*, 0.73† |
| Stroke | 2 (0.2) | 3 (0.3) | |
| Transient ischemic attack | 2 (0.2) | 0 | |
| Systemic embolism | 0 | 0 | |
| Major bleeding | 12 (1.3) | 29 (3.2) | 0.005† |
| **Secondary** | | | |
| Death | 5 (0.5) | 4 (0.4) | 0.88† |
| Myocardial infarction | 7 (0.8) | 14 (1.6) | 0.10† |
| Deep-vein thrombosis | 0 | 1 (0.1) | 0.25† |
| Pulmonary embolism | 0 | 1 (0.1) | 0.25† |
| Minor bleeding | 110 (12.0) | 187 (20.9) | <0.001† |

* P value for noninferiority.
† P value for superiority.

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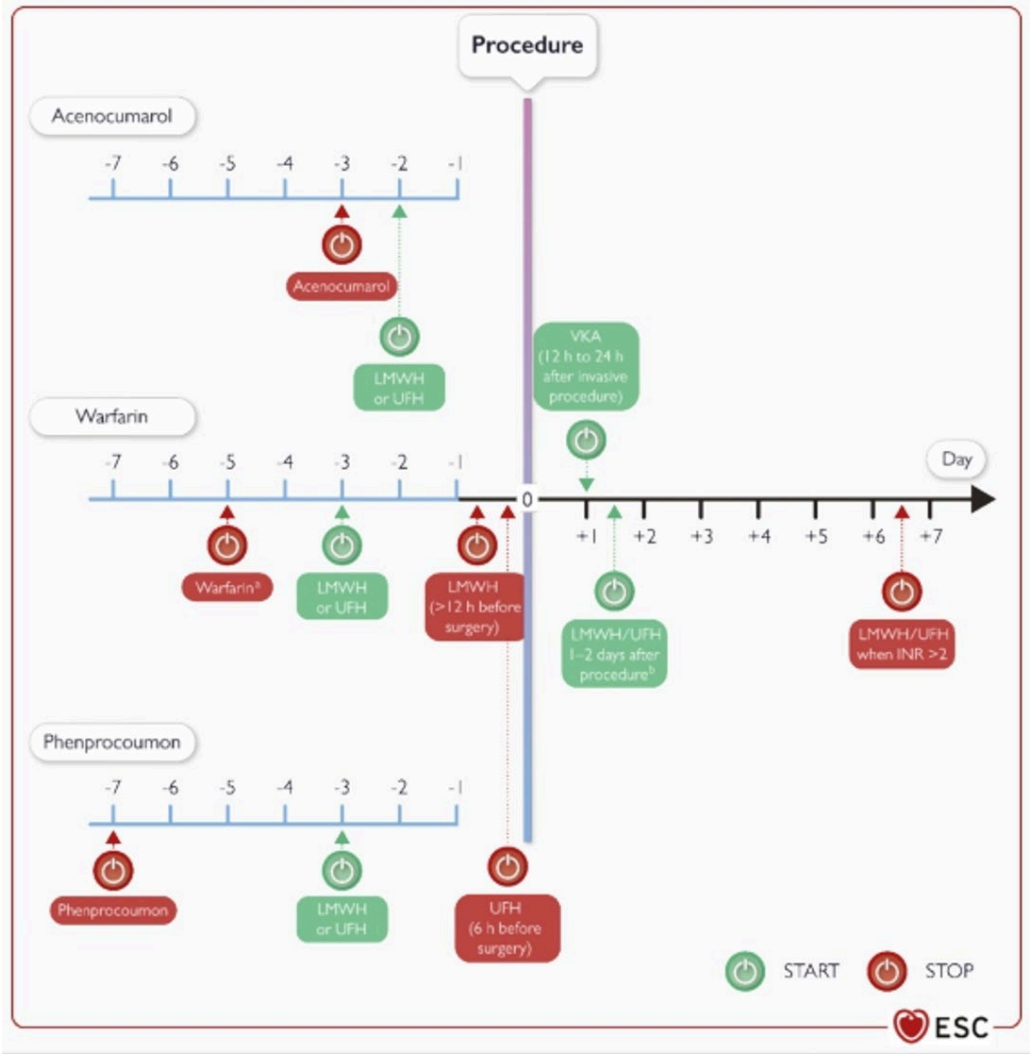
# Restarting vitamin K antagonists after surgery

- **Patients who have interrupted VKA treatment before surgery should restart the OAC 12–24 h after the invasive procedure.**

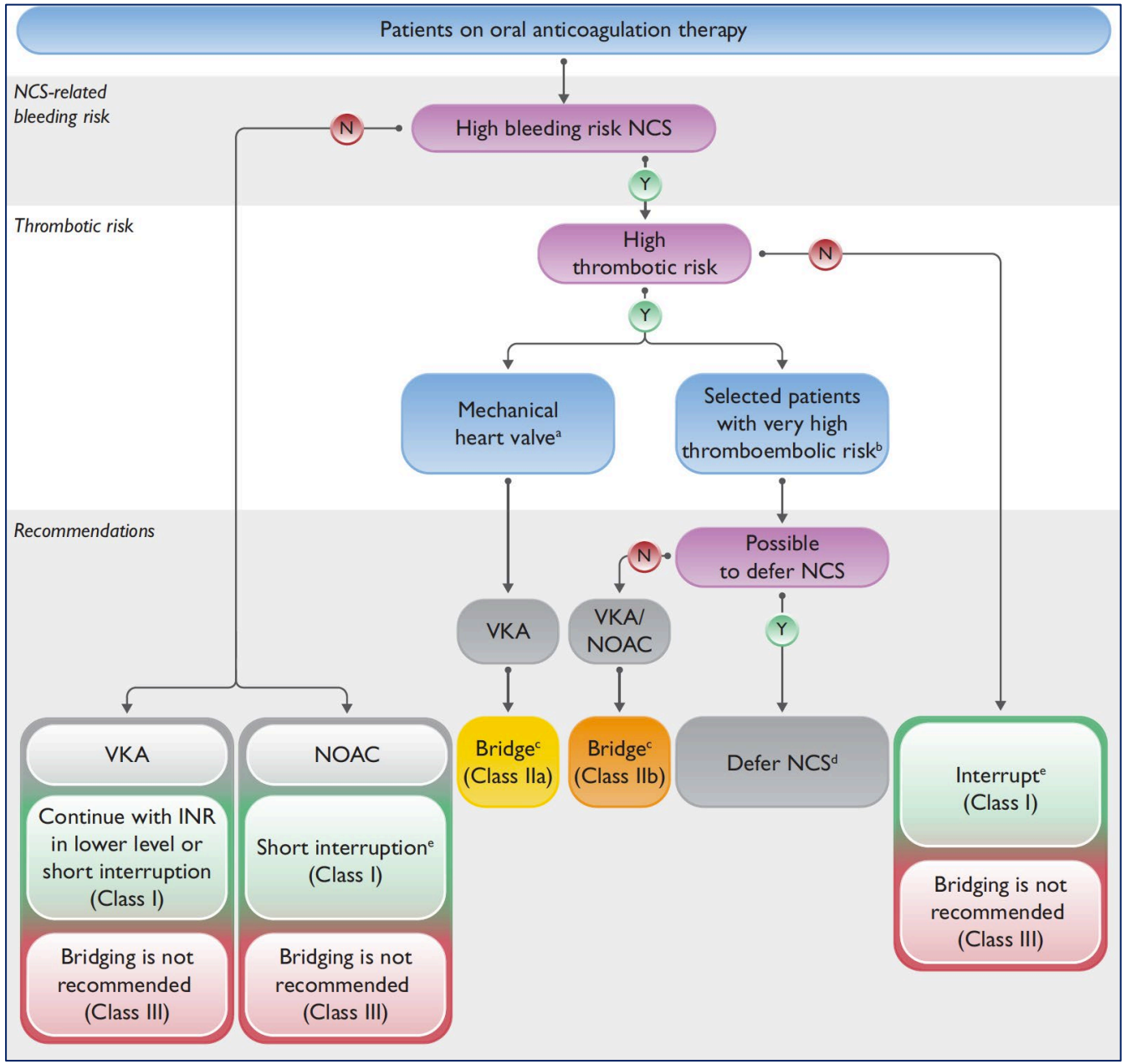
  *restarting dose should be the maintenance dose plus a boosting dose of 50% for 2 days*

- **Patients managed with bridging therapy should start LMWH or UFH together with VKA 24 h after surgery, if the bleeding is well controlled and maintained, until the INR has reached the therapeutic range**




2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery

# Management of oral anticoagulation therapy in patients undergoing surgery

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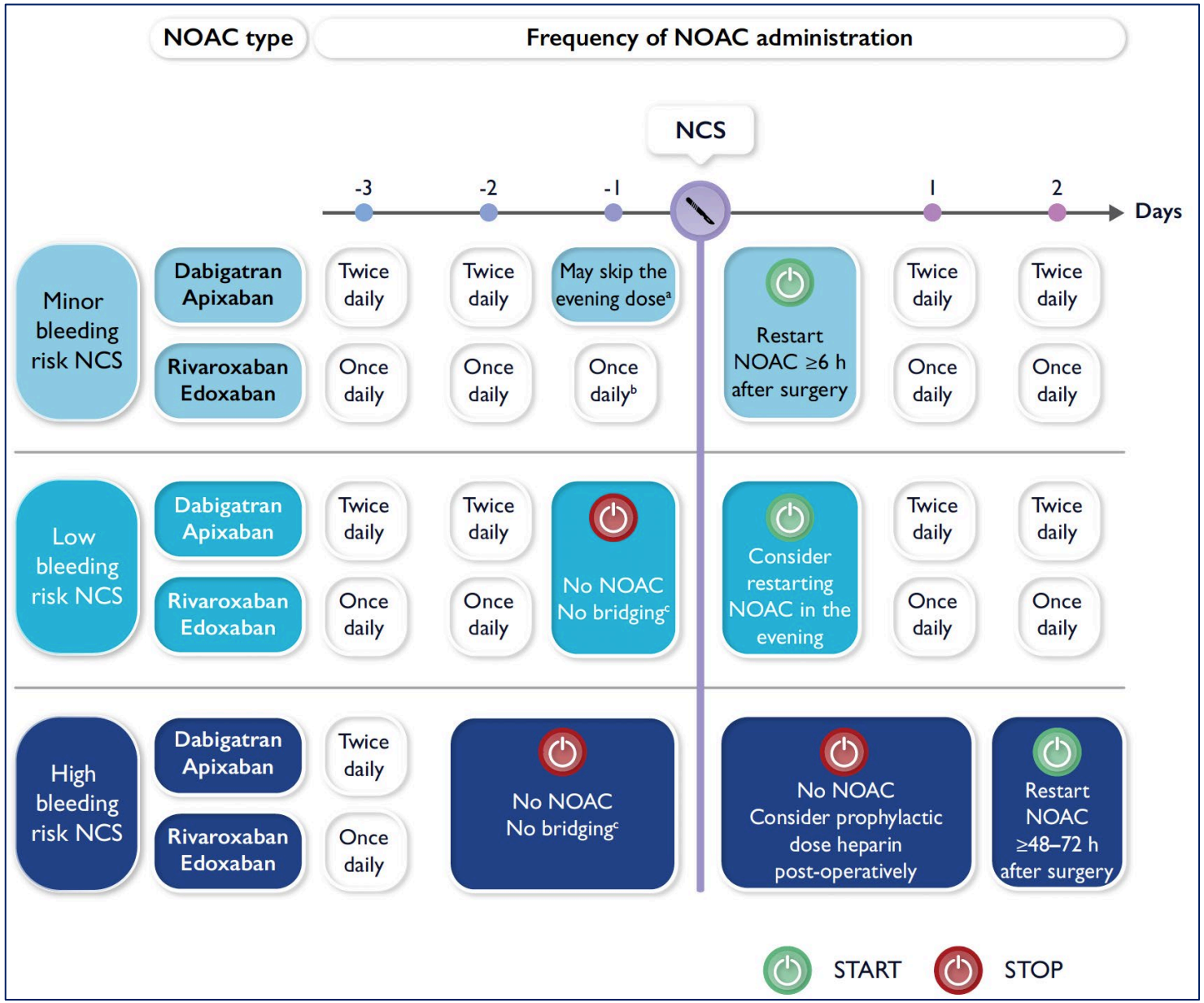
# Peri-operative management of NOAC according to the periprocedural risk of bleeding in patients with normal renal function

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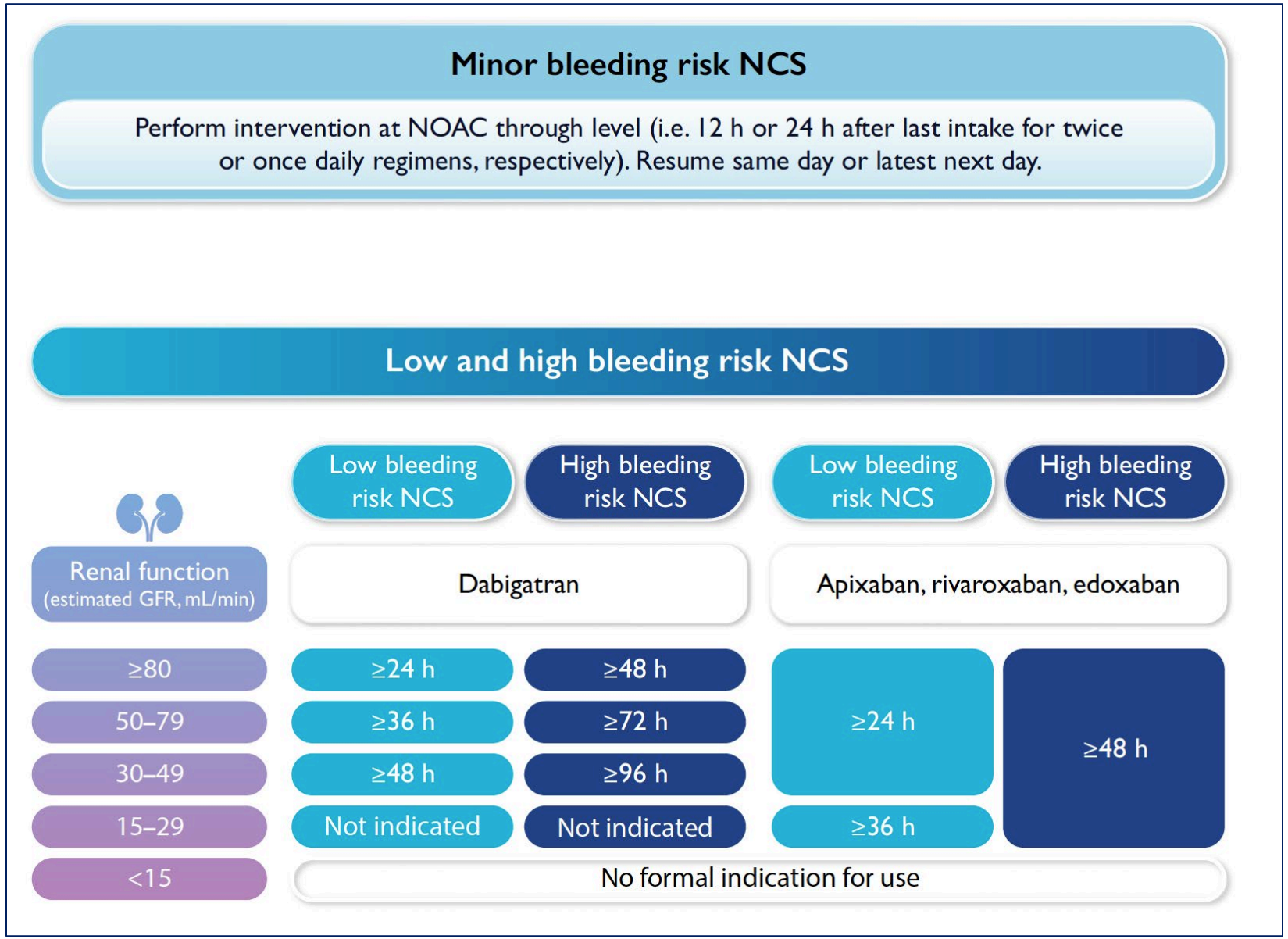
# Timing of last NOAC dose before elective NCS according to renal function

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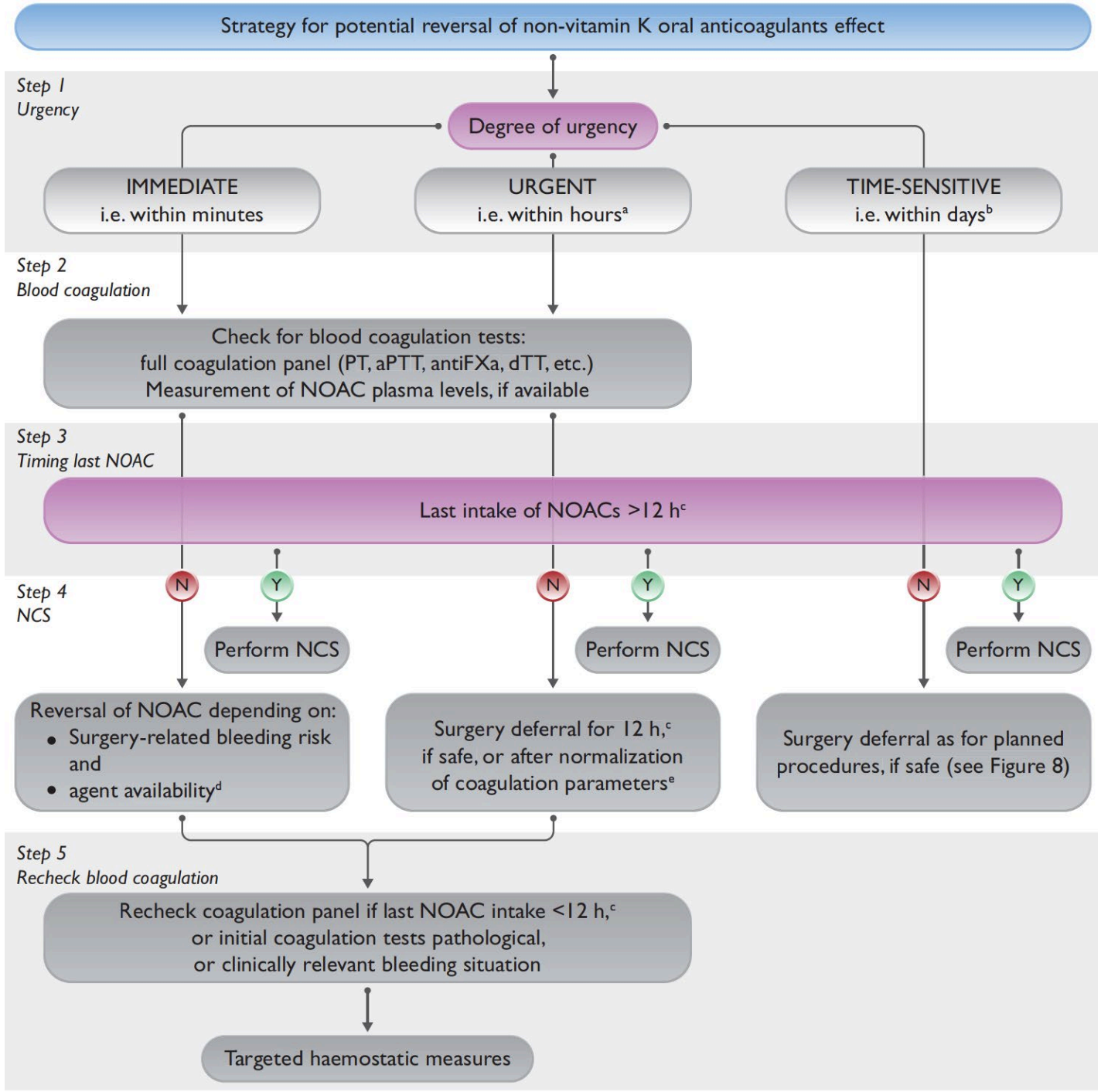
# Suggested strategy for potential reversal of NOAC effect

- Idarucizumab (for dabigatran) has only been tested in patients undergoing urgent surgery.
- Andexanet (for FXa inhibitors) has not been tested in patients requiring urgent surgery.
- Andexanet binds all FXa inhibitors (including UFH) nonspecifically.
- When specific reversal agents are unavailable, prothrombin complex concentrate (PCC) should be considered, although there is a lack of evidence



# Conclusions/Gaps in evidence

- Complex clinical decision, Interdisciplinary consensus
- Rapidly changing field involving newer drugs and drug-device interactions
- Need for more evidence regarding the need for bridging of anticoagulation in patients with MHVs
- Lack of evidence regarding the optimal strategies before emergent or time-sensitive NCS for patients on antithrombotic treatment at high risk of thromboembolic events
- Insufficient evidence regarding the need for and benefit of anticoagulation in NCS patients with post- operative AF is still lacking