

## Special article

# Perioperative and periprocedural management of antithrombotic therapy: 2025 consensus document of SEC, SEDAR, SEACV, SECCE, AEC, SECOM CYC, SECPRE, SEPD, SEGG, SEGO, SEHH, SETH, SEMERGEN, SEMFYC, SEMG, SEMICYUC, SEMI, SEMES, SEN, S.E.N., SENE, SEPAR, SEO, SEORL-CCC, SEPA, SERVEI, SECOT, and AEU



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#### ABSTRACT

In recent years, the use of anticoagulant and antiplatelet medications has significantly increased, along with rising life expectancy. As a result, many patients on antithrombotic therapy will eventually require invasive procedures. This necessitates decisions on the appropriateness and timing of discontinuing anticoagulation and/or antiplatelet therapy in each case. Although a key multidisciplinary consensus document was published in 2018 to guide this process, its practical application has been limited. Furthermore, adherence to its recommendations has been low, leading to a higher incidence of both thrombotic and hemorrhagic adverse events. To address these issues and reflect advances in knowledge, it has been decided to update the previous consensus document to include developments since 2018. The aim is to simplify clinical decision-making and gain support from a broader range of scientific societies. Ultimately, the goal is to improve the dissemination and practical application of these recommendations to optimize the safety and effectiveness of antithrombotic treatment in patients requiring invasive procedures, reduce complications associated with inappropriate treatment, and enhance clinical outcomes in this increasingly complex scenario.

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### Abordaje del tratamiento antitrombótico durante el perioperatorio y el periprocedimiento: documento de consenso 2025 de SEC, SEDAR, SEACV, SECCE, AEC, SECOM CYC, SECPRE, SEPD, SEGG, SEGO, SEHH, SETH, SEMERGEN, SEMFYC, SEMG, SEMICYUC, SEMI, SEMES, SEN, S.E.N., SENEC, SEPAR, SEO, SEORL-CCC, SEPA, SERVEI, SECOT y AEU

#### RESUMEN

En los últimos años, el uso de fármacos anticoagulantes y antiagregantes ha crecido considerablemente, junto con el aumento de la esperanza de vida. Esto implica que muchos pacientes en tratamiento antitrombótico finalmente necesitarán someterse a procedimientos invasivos, donde habrá que decidir la idoneidad y en qué momento suspender la anticoagulación o la antiagregación en cada caso. Aunque en 2018 se publicó un documento de consenso multidisciplinar clave para guiar este abordaje, su aplicación práctica ha sido limitada. Además, se ha observado un bajo cumplimiento de sus recomendaciones, lo que se ha asociado con una mayor incidencia de episodios adversos, tanto tromboticos como hemorrágicos. Para responder a esta situación y al avance en el conocimiento sobre el tema, se ha decidido llevar a cabo una actualización del documento de consenso que incluya todas las novedades surgidas desde 2018, con la intención de simplificar la toma de decisiones clínicas, además de contar con el respaldo de un mayor número de sociedades científicas. El objetivo es mejorar la difusión y la aplicación práctica de las recomendaciones para optimizar la seguridad y efectividad en el abordaje de pacientes en tratamiento antitrombótico que requieren procedimientos invasivos, para reducir las complicaciones asociadas a un tratamiento inadecuado, y promover mejores resultados clínicos en este escenario creciente y complejo.

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#### Palabras clave:

Antitrombótico

Anticoagulación

Antiagregación

Cirugía

#### Abbreviations

INR: international normalized ratio

PCI: percutaneous coronary intervention

VKA: vitamin K antagonist

#### INTRODUCTION

The use of antithrombotic therapies has expanded substantially in the general population, particularly among older adults. In Spain, approximately 1 million people receive anticoagulant therapy, mainly for atrial fibrillation (AF). The use of antiplatelet therapy is also growing, owing to the high prevalence of cardiovascular disease and the rising number of percutaneous

coronary interventions (PCI) and endovascular procedures.<sup>1–5</sup> With increasing life expectancy, it is highly likely that patients receiving antithrombotic therapy will, at some point, require an invasive procedure. In Europe, it is estimated that more than 6 million patients receiving antithrombotic therapy undergo some type of intervention each year.<sup>1</sup>

In recent years, several clinical practice guidelines have been developed to guide decisions on whether to interrupt antithrombotic therapy and to define the timing and duration of interruption during the periprocedural period. A notable example is the national consensus document coordinated by the Cardiovascular Thrombosis Working Group of the Spanish Society of Cardiology and endorsed by more than 20 Spanish scientific societies.<sup>1,6–9</sup> Although this document had considerable impact when first released in 2018, its uptake has been limited in real-world practice. Importantly, inadequate management in this setting is associated with higher rates of both thrombotic and hemorrhagic adverse events.<sup>10–12</sup> In light of new evidence on optimal periprocedural management, the consensus document has now been updated to incorporate advances since 2018. The aim of this review is to simplify decision-making, broaden endorsement by scientific societies, and facilitate dissemination to improve clinical practice in this area (table 1).

## ASSESSMENT OF THROMBOEMBOLIC RISK

### Anticoagulant therapy

The thromboembolic risk associated with anticoagulant therapy encompasses both arterial thromboembolism (primarily stroke and systemic embolism in patients with AF or mechanical heart valves) and recurrent venous thromboembolism (VTE) in patients with a history of VTE. A stratification of thromboembolic risk in patients requiring anticoagulant therapy, categorized as low-intermediate risk or high risk based on an annual thromboembolic event probability of  $\leq 10\%$  or  $> 10\%$ , respectively, is shown in table 2.<sup>8,9</sup> This new stratification also facilitates correct identification of patients who may later benefit from bridging therapy with heparin. For AF, it takes into account recent recommendations that use the CHA<sub>2</sub>DS<sub>2</sub>-VA risk score rather than the CHA<sub>2</sub>DS<sub>2</sub>-VASc score.<sup>2</sup>

### Antiplatelet therapy

Long-term antiplatelet therapy is commonly prescribed for secondary prevention following vascular events such as stroke, myocardial infarction, or peripheral arterial disease.<sup>13</sup> One of the main determinants of adverse events associated with interruption

**Table 1**  
Scientific societies and representatives who have participated in and endorse the consensus document

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Asociación Española de Urología (AEU)	Juan Francisco Hermida

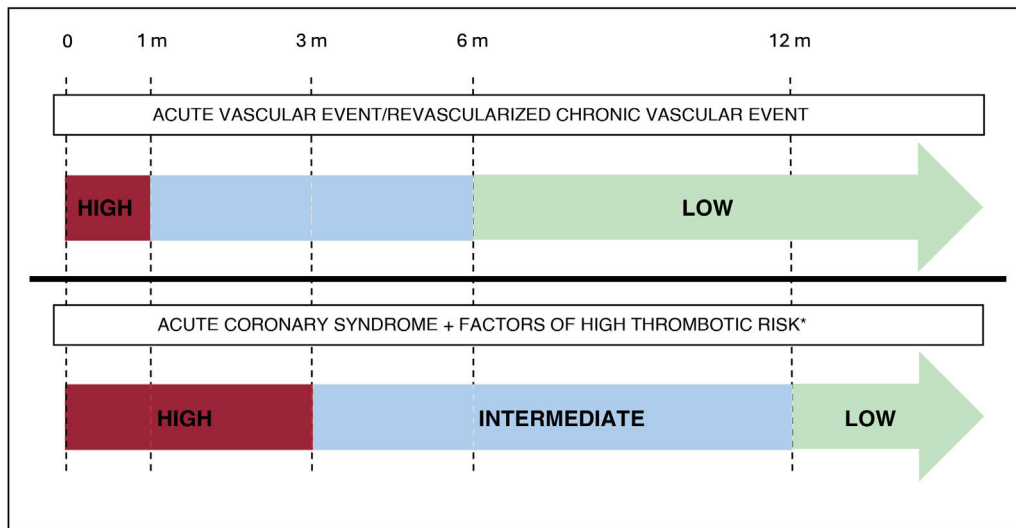
**Table 2**  
Stratification of thromboembolic risk in patients receiving anticoagulant therapy<sup>a</sup>

Risk category	Reason for anticoagulation			
	Mechanical heart valve	Atrial fibrillation	Venous thromboembolism	Other indications
High	Mitral position Aortic position and recent stroke/TIA (< 3 months) or during a previous perioperative period, prior valve thrombosis Older-generation aortic prosthesis (caged-ball or tilting-disc valve)	CHA <sub>2</sub> DS <sub>2</sub> -VA ≥ 7 Rheumatic mitral valve disease Recent stroke/TIA (< 3 months)	Recent VTE (< 3 months) History of VTE with active cancer <sup>b</sup>	High-risk thrombophilia: Deficiency of protein C, protein S or antithrombin; homozygosity for factor V Leiden or prothrombin G20210A mutation or double heterozygosity for each mutation; multiple thrombophilias Antiphospholipid syndrome Previous perioperative stroke Recent cardioembolic stroke (< 3 months) Cardiac chamber thrombus Floating aortic thrombus
Low-intermediate	Aortic position (bileaflet prosthesis) without recent stroke/TIA (≥ 3 months)	CHA <sub>2</sub> DS <sub>2</sub> -VA 1-6 Without recent stroke/TIA (≥ 3 months)	VTE ≥ 3 months Recurrent VTE	Low-risk thrombophilia: Heterozygosity for factor V Leiden or prothrombin G20210A mutation

CHA<sub>2</sub>DS<sub>2</sub>-VA: 1 point for chronic heart failure, hypertension, diabetes mellitus, age 65–74 years, and vascular disease (peripheral artery disease, ischemic heart disease, or complex aortic plaque) and 2 points for age ≥ 75 years and history of stroke, transient ischemic attack or prior arterial thromboembolism; TIA, transient ischemic attack; VTE, venous thromboembolism.

<sup>a</sup> Empirical thrombotic risk stratification is a starting point for assessing perioperative thromboembolic risk and should be combined with clinical judgement incorporating individual patient-related and procedure-related factors.

<sup>b</sup> Cancer associated with high VTE risk: pancreatic cancer, myeloproliferative syndromes, primary brain cancer, gastric cancer, and esophageal cancer.



**Figure 1.** Thrombotic risk stratification in patients receiving antiplatelet therapy. \*Factors indicating high thrombotic risk after an acute coronary event: clinical (recurrent acute vascular event, diabetes mellitus, previous stroke or transient ischemic attack, chronic renal impairment, history of stent thrombosis, or polyvascular disease; and angiographic (implantation of > 3 stents, left main disease, chronic occlusions, bifurcation treated with > 2 stents, long lesions requiring stents > 60 mm, single patent vessel, or > 3 treated lesions).

of antiplatelet therapy before an invasive procedure is the time interval between the ischemic event that prompted the initiation of therapy and the intervention<sup>14</sup> (figure 1). The risk of perioperative stent thrombosis is highest within the first 4 to 6 weeks after PCI and gradually decreases thereafter, although it may persist for up to 6 months. For most patients with chronic coronary syndrome, dual antiplatelet therapy (DAPT) is recommended for the first 6 months, followed by antiplatelet monotherapy (either aspirin or a P2Y<sub>12</sub> inhibitor).<sup>4</sup> In patients with acute coronary syndrome treated with PCI, the higher thrombotic risk

warrants continuation of DAPT for 12 months.<sup>3</sup> However, recent studies suggest that in selected patients, shorter DAPT courses (30–90 days) after PCI may be a reasonable alternative to reduce the overall bleeding risk and surgery-related bleeding complications.<sup>15,16</sup> Thrombotic risk is also lower in patients undergoing surgical revascularization and in those managed with medical therapy alone. Individual patient factors (eg, diabetes mellitus, chronic renal impairment, severe left ventricular dysfunction, recurrent vascular events, and a history of stroke or transient ischemic attack), are additional contributors to thrombotic risk.

Regarding PCI and thrombotic risk, both the safety of new-generation drug-eluting stents and the impact of lesion complexity and procedural factors deserve emphasis. The increasing use of drug-coated balloons without stent implantation may shorten the period of highest thrombotic risk to the first 2 weeks. The improved safety profile is clearly attributable to 2 main factors: discontinuation of bare-metal stents, first-generation drug-eluting stents, and bioresorbable stents in clinical practice; and the favorable safety profile of contemporary, new-generation stents, which deliver antiproliferative drugs via bioabsorbable or biocompatible polymers, and in some cases, through polymer-free designs. Another consideration in stented patients is the complexity of the angioplasty, whether due to the extent of coronary disease or technical challenges. Thus, complex PCIs, defined treatment of  $\geq 3$  lesions, implantation of  $\geq 3$  stents, long lesions requiring stents  $> 60$  mm, bifurcations treated with 2 stents, left main disease, or chronic total occlusions, is associated with worse prognosis in the first year because of a higher incidence of ischemic events.<sup>17</sup>

In patients undergoing endovascular intervention for lower limb arterial disease, DAPT is recommended for at least 1 month and up to 6 months to reduce the risk of cardiovascular events, after which indefinite monotherapy with aspirin or clopidogrel is advised.<sup>18</sup> In patients with a recent ischemic stroke, thrombotic risk is particularly high during the first 30 days and after interruption of antiplatelet therapy. In general, aspirin should be initiated within the first 24 hours after ischemic stroke, with the option of DAPT (aspirin plus clopidogrel) for 21 days in cases of minor stroke or high-risk transient ischemic attack, or for 30 days when stent implantation is performed. Thereafter, long-term monotherapy with aspirin or clopidogrel is recommended.<sup>19</sup>

## ASSESSMENT OF BLEEDING RISK

In addition to thromboembolic risk, this document also addresses bleeding risk assessment in patients receiving antithrombotic therapy who are scheduled to undergo a procedure or surgery. Bleeding risk stratification considers 3 factors: *a*) the volume of bleeding and the need for intraoperative or postoperative transfusion; *b*) the consequences of bleeding in an anemic or frail patient, in a confined anatomical space, in a critical organ, or when compromising the success of surgery; and *c*) patient-related factors. Relevant patient factors include age  $> 65$  years, genetic predisposition, renal impairment, liver dysfunction, hypertension, alcohol consumption, prior bleeding or surgery, previous stroke, malignancy, thrombocytopenia or platelet dysfunction, anemia, unstable international normalized ratio (INR), and concomitant use of antiplatelet, anticoagulant, or anti-inflammatory drugs, among others.

The type of procedure remains the main determinant of bleeding risk and guides management of antithrombotic therapy.<sup>8,20,21</sup> Operator training and experience also influence bleeding outcomes. In addition, some procedures, such as dental interventions, are often performed outside the hospital setting, where working conditions may complicate hemostasis and increase the risk of bleeding. With respect to timing, a recent study showed that most bleeding episodes occur within the first postoperative week, although risk persists for up to 30 days.<sup>22</sup> Procedures most frequently associated with a high likelihood of transfusion include cardiac surgery, aortic aneurysm repair, radical cystectomy, open fracture repair, splenectomy, and hepatic, pancreatic, and colorectal resections.<sup>23</sup>

A list of common procedures and their bleeding risk by specialty is provided in the table 1 of the supplementary data (table 1 of the supplementary data). *Major bleeding* is defined according to the International Society on Thrombosis and Haemostasis (ISTH) as: fatal bleeding; bleeding causing symptoms in a critical organ (brain, spinal cord, eye, retroperitoneum, joint space, pericardium, or intramuscular bleeding with compartment syndrome); bleeding resulting in a hemoglobin drop of  $\geq 2$  g/dL; or bleeding requiring transfusion of  $\geq 2$  units of red blood cells. The following considerations are essential when stratifying bleeding risk:<sup>8</sup>

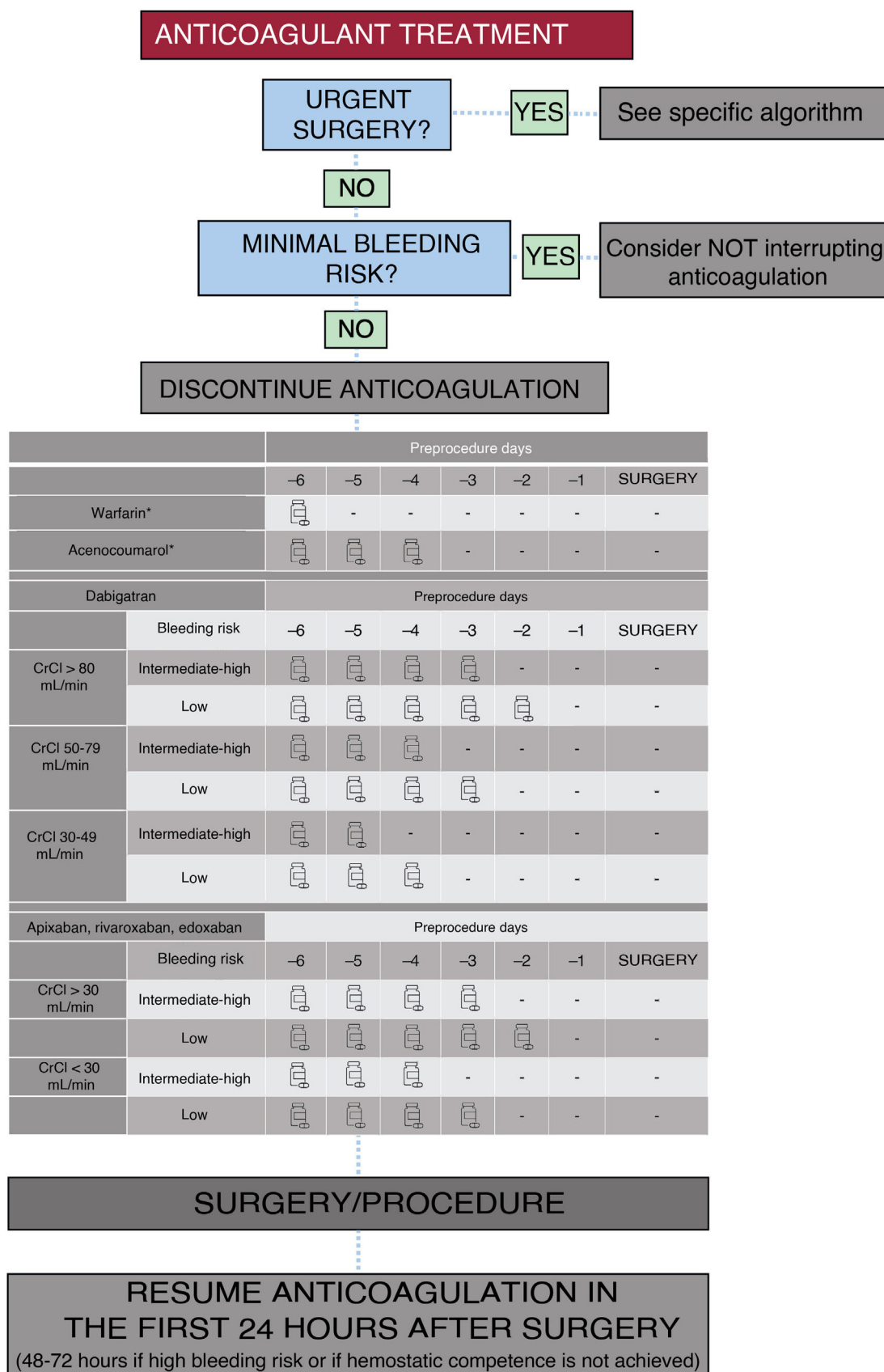
- Minimal risk procedures: These carry a near 0% likelihood of major bleeding. Examples include endoscopy without biopsy, phacoemulsification cataract surgery, cardiac device implantation, and minor dermatological or dental procedures. Hemostasis is generally straightforward, and bleeding rarely requires transfusion, compromises the procedure, or threatens the patient's life.
- Low-intermediate risk procedures: These are associated with an approximately 0% to 2% risk of major bleeding within 30 days. They include interventions in which surgical or endoscopic hemostasis may be more difficult, increasing the likelihood of transfusion or reintervention. Examples are endoscopy with biopsy, complex dental procedures, cholecystectomy, abdominal wall hernia repair, breast surgery, lymph node biopsy, and ophthalmic procedures other than phacoemulsification cataract surgery.
- High-risk procedures: These carry an incidence of major postoperative bleeding  $\geq 2\%$ . They include most major surgical and oncologic operations, complex endoscopic procedures, and all interventions involving neuraxial anesthesia. In these cases, postoperative bleeding may compromise procedural outcomes and, in some instances, become life-threatening. Also included are procedures in which the severity of bleeding depends on its anatomical location or on the difficulty of achieving effective hemostasis.

## RECOMMENDATIONS FOR DISCONTINUATION AND RESUMPTION OF ANTICOAGULANT THERAPY

Before performing an invasive procedure in a patient receiving oral anticoagulant therapy, a key step is to evaluate thrombotic risk, bleeding risk, and the bleeding risk associated with the planned procedure. Management depends on the drug's mechanism of action, half-life, and dosage, which are closely linked to individual patient characteristics such as age, body weight, and hepatic and renal function (figure 2).

### Vitamin K antagonists

Vitamin K antagonists (VKAs) are primarily metabolized in the liver, with minimal renal elimination. For patients whose INR measured 7 days before the procedure is within the therapeutic range (2-3), it is generally recommended to stop acenocoumarol 3 days before and warfarin 5 days before the intervention. If the INR is above the therapeutic range, the interruption period should be extended accordingly. Conversely, if the INR is below the therapeutic range, a shorter interruption period may be considered (2 days for acenocoumarol and 4 days for warfarin). In all patients, INR testing should be performed immediately prior to the procedure. The general target INR is  $< 1.2$ ; however, for some procedures, an INR  $< 1.5$  may be acceptable. If the INR remains  $> 1.5$ , preoperative vitamin K administration is not recommended in elective surgery due to the risk of postoperative resistance to VKAs.<sup>8</sup>



**Figure 2.** Recommendations for discontinuation and resumption of anticoagulant therapy. CrCl, creatinine clearance. The pill-bottle icon indicates drug administration. \* If there is high thromboembolic risk, consider bridging therapy.

Bridging therapy with unfractionated heparin (UFH) or low-molecular-weight heparin (LMWH) is recommended only for selected patients at high thromboembolic risk (table 2). In other situations, bridging provides no benefit in reducing thromboembolic events and increases bleeding risk.<sup>8,24,25</sup> In some cases, postponing the procedure should be considered, if feasible, to further reduce thromboembolic risk. If bridging therapy is indicated, it should be initiated 24 hours after the last VKA dose. When LMWH is used, therapeutic (not prophylactic) doses should be administered. The final dose should be given 24 hours before the procedure at half the usual daily dose. To minimize errors and reduce thrombotic risk, twice-daily LMWH regimens are preferred in the perioperative setting. If UFH is used, treatment should be discontinued 4 to 6 hours before the procedure. For patients receiving prophylactic doses, discontinuation is recommended 12 hours beforehand.

VKAs should be resumed as early as possible, as they require 36 to 48 hours to achieve therapeutic effect. In patients requiring bridging, heparin (either LMWH or UFH) should be restarted at therapeutic doses, according to hemostatic competence, ideally within the first 24 hours.

### Direct oral anticoagulants

The decision to discontinue direct oral anticoagulants (DOACs) prior to a non-urgent intervention should take into account both drug elimination half-life and the bleeding risk of the procedure. For factor Xa inhibitors (apixaban, rivaroxaban, and edoxaban), the elimination half-life is 8 to 12 hours in patients with creatinine clearance (CrCl) > 30 mL/min, calculated using the Cockcroft-Gault formula. Dabigatran elimination is highly dependent on renal function, requiring more precise perioperative adjustment. The half-life is 10 to 14 hours in patients with CrCl > 50 mL/min and 18 to 24 hours in those with CrCl 30–50 mL/min. Dabigatran is not recommended in patients with CrCl ≤ 30 mL/min. Its onset of action is rapid (2–4 hours), so the timing of reinitiation therapy should be guided by both the bleeding risk of the procedure and the patient's hemostatic competence. Bridging with LMWH or UFH is not recommended in patients treated with DOACs.<sup>24</sup>

### Procedures with minimal bleeding risk

Procedures are considered to carry minimal bleeding risk when the probability of major bleeding within 30 days is close to 0%.<sup>8</sup> The most common low-risk procedures are summarized in table 2 of the supplementary data. In this setting, anticoagulation should not be systematically interrupted.<sup>26</sup> However, management should be guided by multidisciplinary consensus. The proposed strategy for these procedures is outlined in table 3.

## RECOMMENDATIONS FOR DISCONTINUATION AND RESUMPTION OF ANTIPLATELET THERAPY

Interrupting antiplatelet therapy requires balancing thrombotic and bleeding risk (figure 3). Understanding the pharmacokinetic properties of these agents is essential when planning both withdrawal and resumption after a procedure. Because thrombotic risk decreases as time passes from the acute vascular event, delaying surgery should be considered whenever feasible. In patients receiving antiplatelet therapy for primary prevention, treatment can be safely discontinued, and permanent discontinuation should be considered.<sup>13</sup> In patients at low thrombotic risk,

**Table 3**

Strategy for anticoagulation management in procedures with minimal bleeding risk<sup>26</sup>

Oral anticoagulants should not be taken on the day of the surgery/procedure.
For patients receiving VKAs, a preprocedure INR measurement is recommended (target INR: 2–2.5, depending on the procedure)
For patients on twice-daily DOAC therapy, it is suggested to omit the evening dose the night before the surgery/procedure, so that the last dose is taken approximately 24 hours before the intervention.
In specific cases where patient characteristics may increase the bleeding risk (eg, renal impairment) short interruption of the DOAC for 24–48 hours should be considered.
Resume anticoagulation as soon as possible, preferably the morning after the intervention. For twice-daily DOACs, consider restarting in the evening of the procedure, depending on thromboembolic risk.

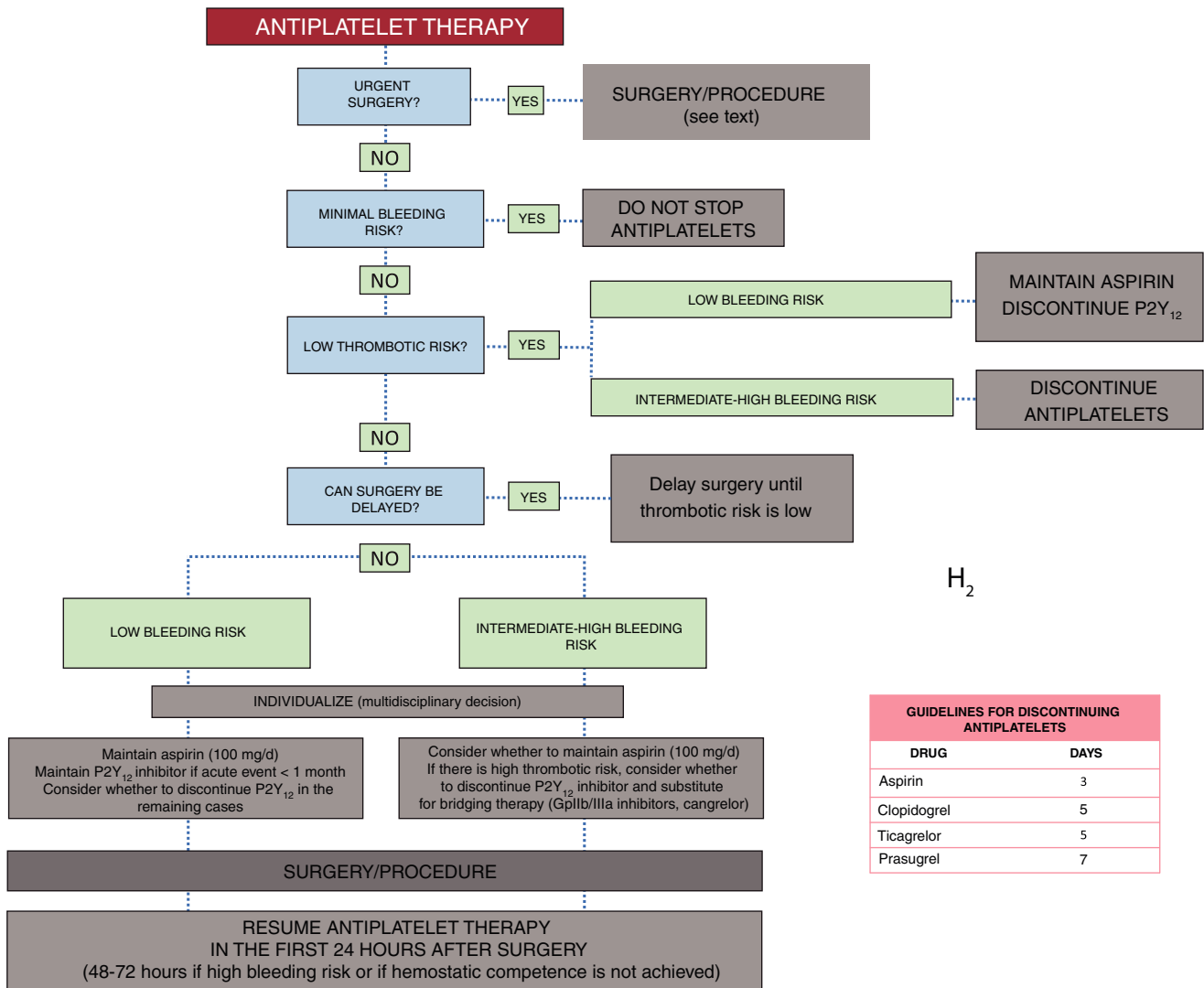
DOAC, direct oral anticoagulant; INR, international normalized ratio; VKA, vitamin K antagonist.

such as those with chronic coronary syndrome and stent implantation > 12 months previously without additional risk factors, continuation of antiplatelet monotherapy during the procedure does not significantly affect ischemic or bleeding outcomes.<sup>27</sup> In these cases, therapy withdrawal may also be considered, particularly when the procedure carries an intermediate-to-high bleeding risk. For patients continuing aspirin, doses < 200 mg/d are recommended; however, in those receiving a higher dose at the time of the procedure (eg, 300 mg/d), there is no justification for postponing the intervention. In patients receiving P2Y<sub>12</sub> receptor inhibitor monotherapy, the following preprocedure interruption periods are recommended: ticagrelor 5 days, clopidogrel 5 days, and prasugrel 7 days. For some interventions, such as coronary revascularization surgery, withdrawal of ticagrelor 3 days before the procedure can be considered. In exceptional cases where other antiplatelet agents are used, discontinuation schedules are as follows: triflusal 3 to 5 days before the procedure, and cilostazol or dipyridamole 48 hours before.

When dual antiplatelet therapy is required due to thrombotic risk and surgery cannot be delayed, individualized management using a multidisciplinary approach is essential. In general, aspirin and a P2Y<sub>12</sub> inhibitor should be continued during the first 30 days after a vascular event for procedures with low bleeding risk, whereas discontinuation of the P2Y<sub>12</sub> inhibitor should be considered if bleeding risk is intermediate to high. As with anticoagulant therapy, bridging with intravenous antiplatelet agents (tirofiban, eptifibatide, or cangrelor) should be reserved for exceptional cases with high risk of both thrombosis and bleeding (figure 1 of the supplementary data).

## ANTICOAGULATION AND URGENT SURGERY

In urgent situations, it is fundamental to recognize different clinical scenarios. Emergent procedures are those that must be performed within 6 hours of clinical presentation. In these cases, anticoagulation should be stopped and supportive measures initiated. When available and indicated, administration of a reversal agent should be considered, or alternatively, the use of prothrombin complex concentrate (PCC), tailored to the specific anticoagulant. Supportive measures include local bleeding control with surgical hemostasis if feasible, transfusion of blood products, and general supportive care (eg, oxygen therapy, fluid resuscita-



**Figure 3.** Recommendations for discontinuation and resumption of antiplatelet therapy. \*In exceptional cases (eg, in neurosurgery), interruption of aspirin may also be required.

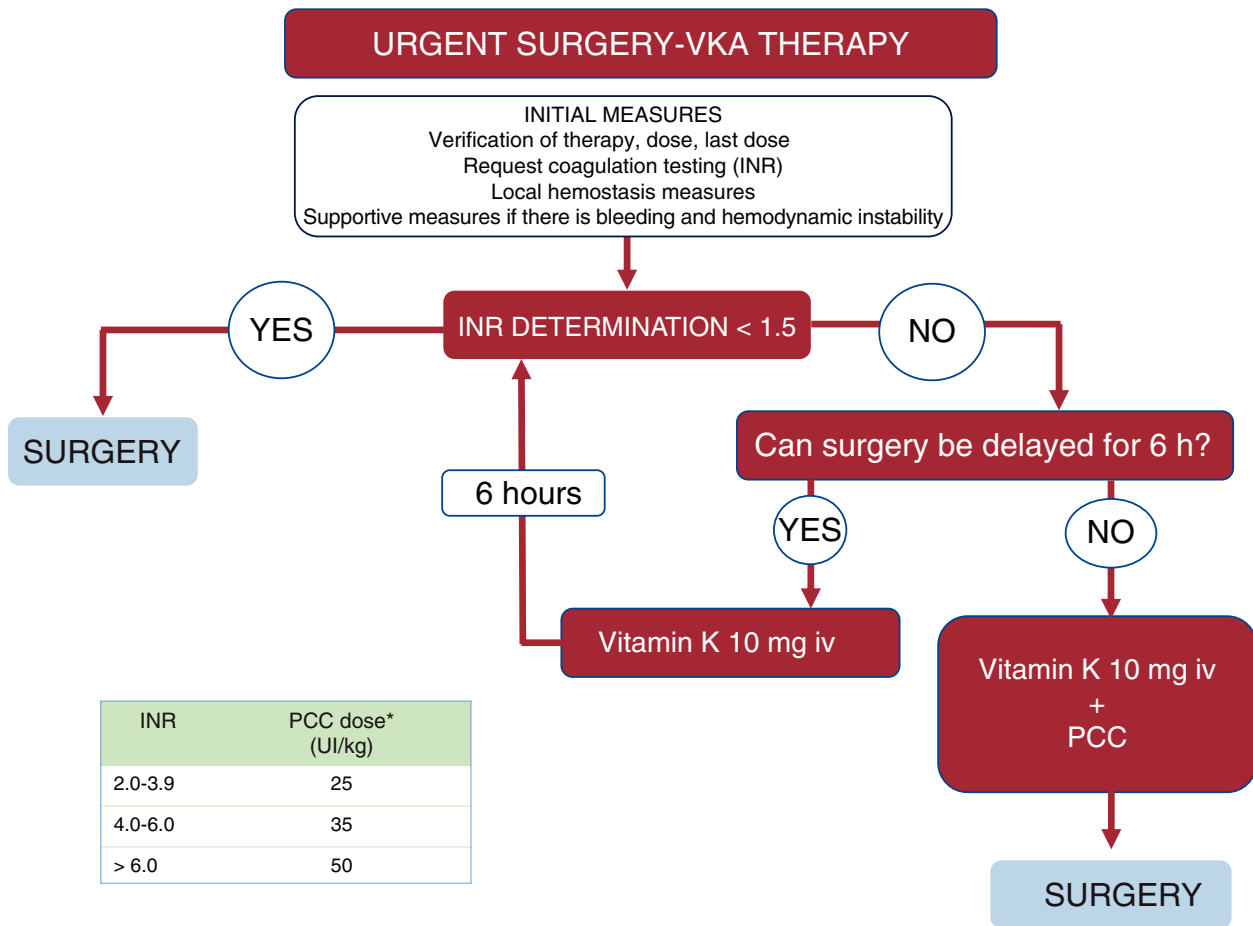
tion, vasoactive drugs). It is also important to identify comorbidities that increase bleeding risk, such as thrombocytopenia, uremia, or concurrent antiplatelet therapy.

Urgent (but nonemergent) procedures are those that can be performed between 6 and 24 hours after clinical presentation. These cases require a management algorithm based on the specific anticoagulant the patient is receiving. It is essential to know the dose and timing of the last administration, as well as the patient's anticoagulant status, assessed using laboratory tests such as INR, prothrombin time, and activated partial thromboplastin time.

In patients receiving VKA therapy, INR should be determined (figure 4). If INR is < 1.5, the surgery can proceed without delay. If INR is > 1.5, management depends on the urgency of the procedure. When surgery can be delayed for 6 to 12 hours, 10 mg intravenous vitamin K should be administered and the INR reassessed after 6 to 8 hours. Because the effect of vitamin K is not immediate, reassessment avoids unnecessary repeat dosing. If surgery cannot be delayed, 10 mg of intravenous vitamin K should be administered together with a procoagulant agent, preferably PCC (25-50 IU/kg) adjusted according to current and

target INR. Fresh frozen plasma is considered a second-line hemostatic agent, and is only effective (at a dose of 15-30 mg/kg) in the setting of VKA therapy; it is not recommended when PCC is available.<sup>28,29</sup>

In patients receiving DOAC therapy who require urgent surgery, tests that measure plasma drug levels or activity can be useful, if available. Although evidence is limited regarding the effect of perioperative DOAC monitoring on reducing bleeding risk, plasma levels < 30 ng/mL are recommended to allow surgery with an acceptable bleeding risk. Qualitative tests may also provide guidance, including activated partial thromboplastin time for dabigatran, and prothrombin time for rivaroxaban (but not for apixaban or edoxaban). A ratio ≤ 1.2 can with high probability rule out significant anticoagulant activity. Conversely, if coagulation testing indicates residual activity or if therapeutic adherence is adequate for apixaban or edoxaban, the maximum allowable surgical delay should be determined based on the patient's clinical condition (bleeding status, hemodynamic stability, and risk of life-threatening complications or sequelae). If surgery can be delayed, the timing should be guided by the last drug dose and renal function. When



**Figure 4.** Recommendations for patients receiving vitamin K antagonists who require urgent surgery. INR, international normalized ratio; iv, intravenous; PCC, prothrombin complex concentrate; VKA, vitamin K antagonists. \* According to the summary of product characteristics.

anticoagulant activity is present and surgery cannot be delayed, reversal agents should be considered: idarucizumab should be used for dabigatran, and andexanet alfa for rivaroxaban and apixaban (but not for edoxaban), if these agents are available. If not, PCC can be used (figure 5). Neuraxial anesthesia is generally contraindicated in these patients.

Patients receiving antithrombotic therapy who sustain a hip fracture represent a special case, as delaying surgery beyond 24 to 48 hours is associated with increased morbidity and mortality. Therefore, despite the inherent bleeding risk of the procedure, surgery is recommended within 24 to 48 hours of admission. Peripheral nerve blocks and the choice of anesthesia (neuraxial or general) should be tailored to the patient's hemostatic status.

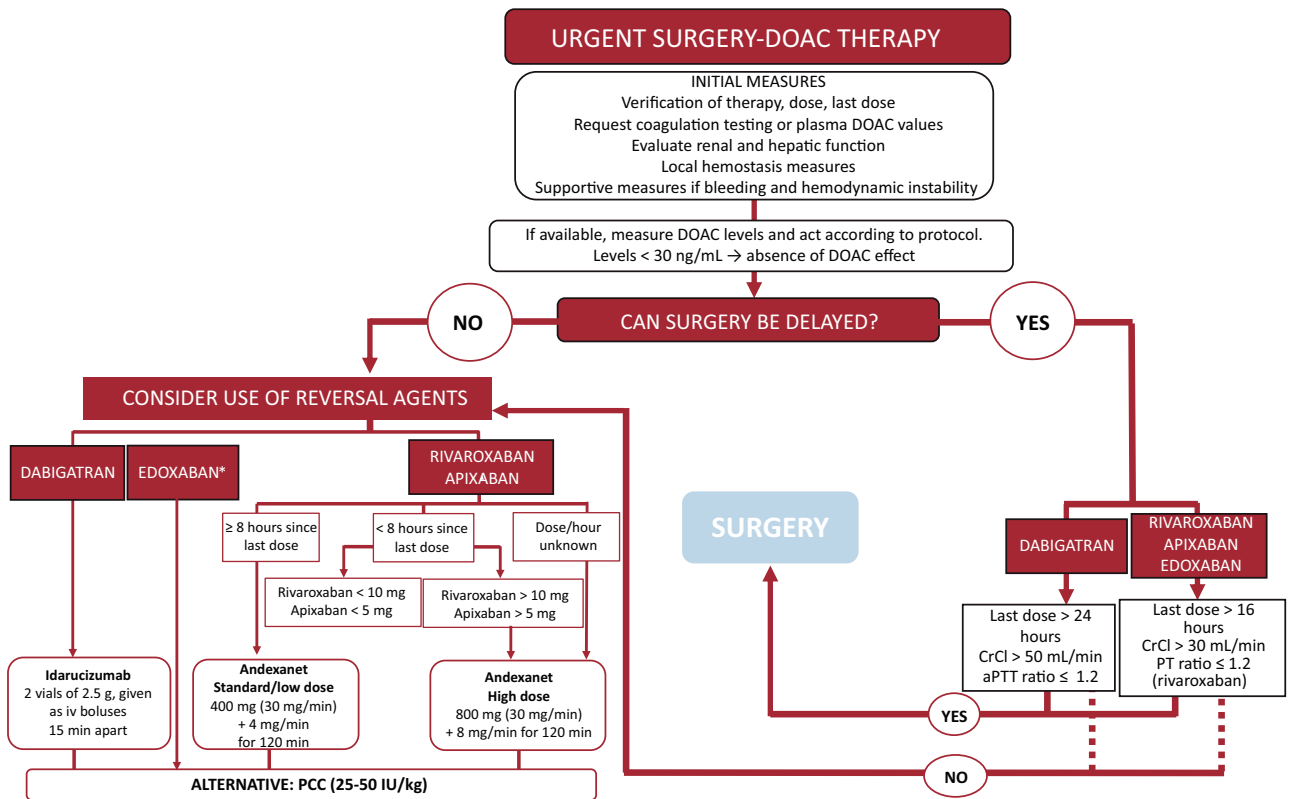
#### ANTIPLATELET THERAPY AND URGENT SURGERY

Despite the potential for increased bleeding, antiplatelet therapy in patients requiring urgent surgery or an invasive procedure generally does not justify delaying the intervention if the patient's clinical status precludes postponement.<sup>6</sup> It is therefore essential to classify the surgery as emergent (within

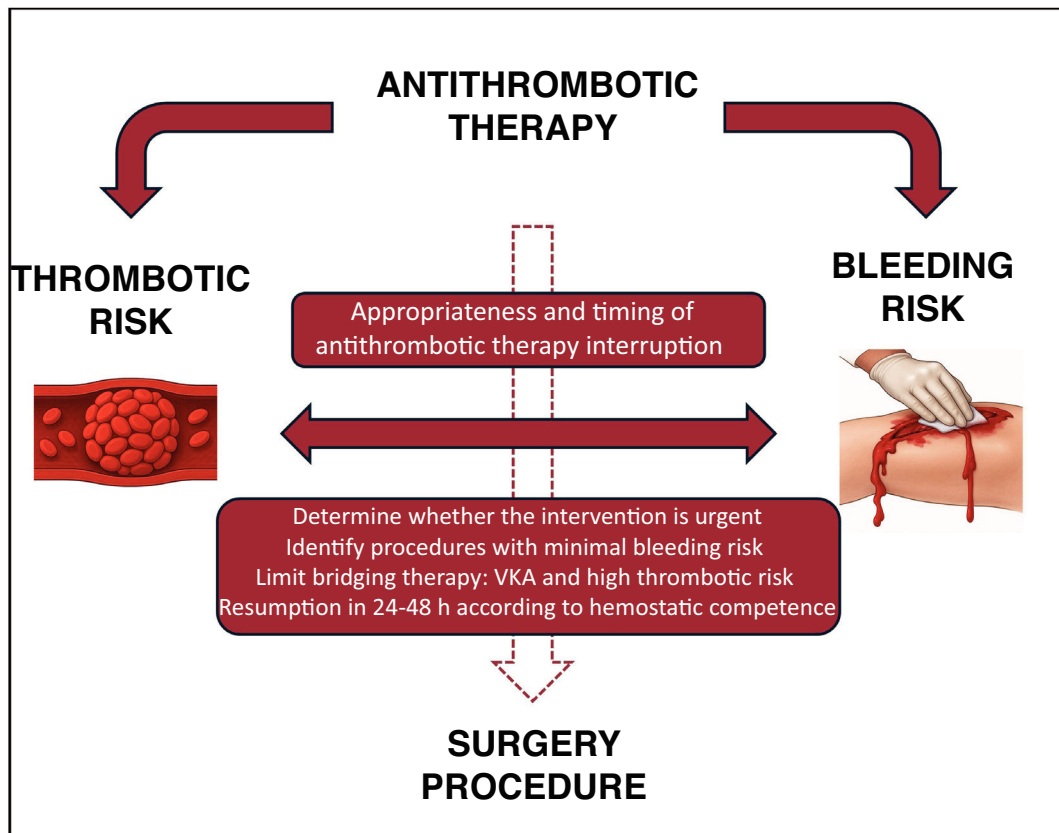
6 hours), urgent (6–24 hours), or deferred urgency (can be delayed beyond 24 hours). The feasibility of implementing measures to reduce or reverse the antiplatelet effect of the drugs—while balancing thrombotic risk—depends on having sufficient time before the procedure.

If urgent surgery can be delayed for a sufficient period, it is possible to evaluate whether to continue or interrupt antiplatelet therapy, including the selective use of bridging therapy. This decision should follow careful assessment of the procedure's bleeding risk, ideally by a multidisciplinary team. Platelet function testing can be used to shorten the discontinuation period for P2Y<sub>12</sub> antagonists.<sup>30</sup> Several assays are available, but no single gold standard has been established (table 3 of the supplementary data). Although interpretation requires experience, point-of-care tests are generally preferred because they are easy to use and do not require specialized laboratory personnel.

When surgery is emergent or cannot be delayed long enough to allow antiplatelet discontinuation, options to reduce periprocedural bleeding risk are limited. The most effective strategies are meticulous surgical hemostasis and platelet transfusion in the event of intraoperative bleeding; prophylactic platelet transfusion is generally not recommended. Transfusion is minimally effective



**Figure 5.** Recommendations for patients receiving direct oral anticoagulants who require urgent surgery. aPTT, activated partial thromboplastin time; CrCl, creatinine clearance; DOAC, direct oral anticoagulants; iv, intravenous; PCC, prothrombin complex concentrate; PT, prothrombin time. \* Andexanet is not indicated as a reversal agent for edoxaban.



**Figure 6.** Central image. Recommendations for the management of antithrombotic therapy during the perioperative and periprocedural periods. VKA, vitamin K antagonist.

in patients receiving ticagrelor, due to its pharmacologic characteristics, particularly reversible receptor binding and the half-life of the drug and its active metabolite. Nevertheless, platelet transfusion may be useful in patients treated with aspirin, clopidogrel, or prasugrel. Typically, 2 to 4 units are required for clopidogrel and prasugrel, with an ideal waiting period of 6 hours after the last dose. In selected cases, such as cardiac surgery, hemoabsorption via an adsorbent filter connected to the extracorporeal circuit can remove most circulating ticagrelor within 2 to 3 hours. Recently, the monoclonal antibody benteracimab has shown promise as a ticagrelor reversal agent in emergent surgery;<sup>31</sup> however, it is not yet available for clinical use. Finally, despite limited evidence for desmopressin, hemostatic or procoagulant agents are not routinely recommended to counteract the effects of antiplatelet therapy in patients requiring urgent surgery, given the potential for increased thrombotic risk.

## CONCLUSIONS

Managing antithrombotic therapy in the periprocedural period remains a clinical challenge, with potentially serious consequences if handled inadequately. This consensus statement, endorsed by the majority of scientific societies involved in perioperative care (table 1), aims to provide clear, practical guidance to support the appropriate use of anticoagulant and antiplatelet therapy. Its goal is to harmonize clinical practice across specialties, ensuring consistent patient care regardless of the treating physician (figure 6).

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## DECLARATION ON THE USE OF ARTIFICIAL INTELLIGENCE

The authors declare that artificial intelligence was not used for the preparation of this article.

## AUTHORS' CONTRIBUTIONS

All authors fulfill the following requisites: 1) they made substantial contributions to the conception and design of the manuscript; 2) they drafted the article or critically reviewed its intellectual content; 3) they approved the final version for publication; and 4) they accept responsibility for all aspects of the article and agree to investigate and resolve any issues regarding the accuracy and integrity of any part of it.

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## SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version, at <https://doi.org/10.1016/j.rec.2025.09.003>.

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