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## The 2017 EACTS guidelines on perioperative medication in adult cardiac surgery and patient blood management

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Surgical outcomes are closely related to the appropriate choice of the right procedure and its timing, the patient's risk and technical proficiency. It is generally recognized that these 3 factors contribute more or less equally to the final result [1]. However, early and late outcomes of surgery are also influenced, among other factors, by active prevention of complications, through pharmacological strategies and optimized blood management [2]. Indeed, although surgeons are mostly focused on performing the most technically challenging procedures, the role of medication is often underestimated. A coronary artery bypass grafting operation can be a great technical success, but if a patient suffers a mediastinitis because antibiotic prophylaxis was not administered correctly, he/she will not consider the operation to be very helpful. This is also the case if the patient progresses into heart failure because beta-blockers, angiotensin-converting enzyme inhibitors and antiplatelet agents have not been prescribed to induce left ventricular remodelling and improve graft patency [3].

The European Association for Cardio-Thoracic Surgery (EACTS) guidelines committee and council have decided that perioperative medication in adult cardiac surgery and patient blood management (PBM) are important topics for which there is a sufficient body of evidence to be summarized in comprehensive guidance for cardiothoracic surgeons, anaesthesiologists and allied health professionals. Using the EACTS methodology for guideline development, both guidelines were based on the core principle that evidence gathering and its grading is independently performed by methodologists, while a multidisciplinary task force is responsible for writing recommendations based on the evidence synthesis [4]. It is important to note that a close collaboration between methodologists and task force members is necessary to produce the most appropriate and evidence-based recommendations. Another key feature of the 2 guidelines is that both task forces included a multidisciplinary group of specialists involved with the perioperative care of cardiac surgery patients. Thus, the 2017 guidelines on PBM were jointly produced by a task force composed of experts from the EACTS and European Association for Cardiothoracic Anaesthesia (EACTA) [5], while the 2017 guidelines on

perioperative medication in adult cardiac surgery were co-chaired by a cardiologist and included, in addition to cardiac surgeons, 2 cardiologists and 1 anaesthesiologist [6]. Both measures were employed to increase the credibility and trustfulness of these guidelines [7]. As with many other aspects of surgical management, the level of evidence of many recommendations is based on observational studies and expert opinions. However, the opinion of experts continues to be valued by clinicians although should not prevent the personal assessment of the recommendations. We should not forget that even when randomized trials support recommendations, the final decision is always the responsibility of the treating physician, as trial results often apply to selected populations that may differ from the specific patient.

Perioperative medication in adult cardiac surgery, in its largest sense, is a vast subject that is hard to embrace in a single document. The task force has included the most common medications used in patients undergoing cardiac surgery, excluding those utilized to specifically treat complications, such as pneumonia. One can argue whether drugs used to treat low cardiac output or myocardial ischaemia should have been included, but these topics have been addressed in other publications. We do believe that common complications following cardiac surgery should be covered in separate comprehensive guidelines and expert opinion documents, where the task forces also include medical professionals from other specialities. The perioperative medication guideline has been subdivided into preoperative, intraoperative and postoperative medications [6]. Clear recommendations are provided on (i) when specific types of antiplatelet and anticoagulation (including both vitamin K antagonists therapy and new oral anticoagulants) should be discontinued or continued before surgery and when to restart these postoperatively, (ii) the initiation of statins preoperatively, (iii) when antihypertensive medication should be stopped preoperatively and its role in long-term secondary prevention; (iv) the use, timing and dosing of prophylactic antibiotics; (v) prophylactic administration of steroids; (vi) preoperative and postoperative use of beta-blockers; (vii) glycaemia control in the intensive care unit and on the ward; (viii)

different modalities of pain relief medication; and (ix) lipid-lowering therapies as secondary prevention. Importantly, the recommendations include crucial nuances in the use of these medications.

The new guidelines on blood management incorporate the recent evidence on the blood conservation interventions while continuing to emphasize the importance of teamwork between the surgeons, anaesthesiologists and clinical perfusionist to minimize bleeding and bleeding complications [5]. The authors have covered the entire perioperative period and divided the guidelines into preoperative optimization, intraoperative interventions and treatment of postoperative bleeding disorders.

The preoperative evaluation includes (i) identification of patients at high risk for postoperative bleeding, (ii) preoperative haemoglobin optimization through the identification and treatment of anaemia and (iii) the management of patients on antithrombotic therapy with laboratory assessment: which test and if so, why? Furthermore, the guideline recommends several blood conservation measures in cardiac operations: (i) the limitation of haemodilution during cardiopulmonary bypass with the use of retrograde and antegrade autologous priming, (ii) the routine use of cell salvage systems, (iii) heparin level over the conventionally used activated clotting time-guided heparin management especially in patients who are heparin resistant, (iv) dose of protamine sulphate in a protamine-to-heparin dosing ratio lower than 1:1 based on the initial given heparin dose and (v) preoperative autologous blood and acute normovolaemic haemodilution donation to preserve blood components. On the other hand, several interventions such as the routine use of topical sealants, antithrombin supplementation in bleeding patients, the use of goal-directed haemodynamic therapy and the use of low-molecular-weight starches are not recommended. Importantly, these measures are likely to be most effective when incorporated in a hospital protocol. Concern regarding fluid overload is justified, but the successful limitation of haemodilution requires close collaboration between the anaesthesia team and the perfusionist. Finally, procoagulant interventions and transfusion strategies close the circle of PBM in cardiac surgery. The guideline recommends the routine use of antifibrinolytic therapy if there are no contraindications, but other procoagulant interventions including the use of fibrinogen concentrate and recombinant factor VIIa are indicated only in selected cases. The authors have agreed with the European Medicines Agency [8] that the benefits of aprotinin outweigh the risk in selected patients. However, a definite answer to the question 'which patients should receive aprotinin' requires further investigation through a well-designed safety study.

Anticoagulation and antiplatelet agents have essential implications for patients undergoing cardiac surgery both preoperatively and postoperatively as to when to stop and when to resume and whether bridging is needed. To bring the recommendations to the reality of clinical practice, treatment algorithms were developed separately for management of anticoagulation during the perioperative period as well as antiplatelet therapy in patients undergoing coronary artery bypass grafting surgery. These treatment algorithms are examples of how to apply the recent recommendations in a clinical context, helping clinicians in the translation of evidence-based recommendations into daily

practice. Hence, both guidelines on the perioperative medication in adult cardiac surgery and PBM offer strategies to improve outcome and reduce complications in adult cardiac surgery. However, to find out how useful these documents are, and how they are rated by the medical community, we will need to assess how these recommendations are implemented and how these impact daily practices, through surveys and studies.

The objective of these guidelines is to provide helpful, easy, quick access to essential information for the busy clinician and, at the same time, provide the evidence to support the recommendations for those wishing a more profound understanding on these topics. Moreover, guidelines also identify areas where evidence is lacking, which is important for future study directives. For the first time in EACTS history, these two guidelines have been summarized into a pocket format, in addition to the full-text document published in *European Journal of Cardio-Thoracic Surgery (EJCTS)*. These pocket guidelines were shared with several thousand colleagues during the recent EACTS annual meeting in Vienna. Further copies can be ordered from the EACTS office. The EACTS guidelines committee will also continue to promote the new guidelines by supporting societies on a national level with presentations and pocket guidelines.

**Conflict of interest:** none declared.

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