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## **Cardiac complications following non-cardiac surgery: A call for interdisciplinary and interprofessional collaboration**

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## **Cardiac complications following non-cardiac surgery: A call for interdisciplinary and interprofessional collaboration**

**Short title:** Cardiac complications following non-cardiac surgery

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### **Related article**

by Polok et al.

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We wish to congratulate Polok and colleagues [1] for their important work on self-reported functional capacity within the MET-REPAIR trial, a large multicenter prospective cohort study including patients aged  $\geq 45$  years undergoing elective, elevated-risk non-cardiac surgery from June 2017 to April 2020. In their current study they demonstrated that the predictive value of self-reported functional capacity was restricted to sites that were able to reliably detect patients with elevated cardiac troponin (cTn) concentration postoperatively due to their institutional active surveillance program. Accordingly, self-reported functional capacity should continue to complement other clinical information and high-sensitivity cTn (hs-cTn) concentration in the preoperative risk assessment in high-risk patients undergoing major non-cardiac surgery [1–5].

Based on the accumulating evidence generated from large prospective cohort studies with central adjudication of cardiac complications following major non-cardiac surgery, the latest European Society of Cardiology (ESC) guidelines on cardiovascular assessment and

management of patients undergoing non-cardiac surgery, which were endorsed by the European Society of Anaesthesiology and Intensive Care (ESAIC), summarized the key messages for clinicians [1–10]. First, at least in part due to intra- and postoperative analgesia and anesthesia, the vast majority of patients developing acute myocardial injury associated with non-cardiac surgery do NOT report typical ischemic symptoms [1–5]. Therefore, these events are missed in hospitals that restrict the measurement of hs-cTn to patients experiencing acute chest discomfort. Unfortunately, this is still the case in the majority of hospitals worldwide. The perioperative community needs to massively increase its efforts to heighten the awareness among physicians, including cardiologists, that the reliable detection of these prognostically highly relevant (deadly) events requires active surveillance using serial hs-cTn measurements [1–10]. Second, a preoperative measurement of hs-cTn is mandatory to reliably detect acute myocardial injury as a result from surgery and differentiate it from chronic myocardial injury that was preexisting preoperatively and has nothing to do with surgery (Figure 1). Accordingly, perioperative myocardial infarction/injury (PMI) should only be diagnosed, if the hs-cTn concentration postoperatively has shown a relevant increase above the preoperative concentration. Third, the magnitude of increase in hs-cTn above the preoperative concentration required is a matter of ongoing debate and research [1–10]. Current ESC guidelines recommend to use an increase of at least the upper limit of normal of the individual hs-cTnT/I assay used above the preoperative concentration. This definition is simple, easy to use, and scientifically preferable to previous ones as it incorporates intraindividual differences in preoperative hs-cTnT/I concentrations as well as analytical differences between hs-cTnT/I assays [10]. Fourth, PMI is not a homogenous disease, but a working diagnosis with several different possible underlying etiologies. These include myocardial infarction, but also acute heart failure, tachyarrhythmias, takotsubo cardiomyopathy, and even primarily non-cardiac disorders like severe sepsis, stroke, and pulmonary embolism, that result in acute myocardial injury and thereby an acute rise in hs-cTnT/I concentration. Therefore, it is important to use the bulky word “perioperative myocardial infarction/injury” initially to highlight to colleagues and ourselves that at this time point we usually have not yet fully understood the cause of cardiomyocyte damage. The detection of PMI must therefore be followed by a systematic PMI work-up (Figure 2) to allow cause-specific therapy.

Implementing active surveillance of PMI and a systematic PMI work-up, as endorsed with a class I recommendation by current ESC guidelines, is a major undertaking for institutions. It requires close interdisciplinary collaboration between anesthesia, surgery, cardiology, and laboratory medicine, but also close interprofessional collaboration between

nurses, physicians, and IT-specialists [10]. This investment, however, is crucial to address the major problem of perioperative cardiac complications including death. Sites that have successfully implemented active surveillance of PMI and a systematic PMI work-up should serve as role models and help other sites learning from their experience.

In parallel, we need to continue investing in large, prospective, high-quality studies in the perioperative setting to step by step overcome our ignorance on the real driving forces and exact mechanisms that cause perioperative cardiac damage, PMI, and its corresponding clinical etiologies. The fact that most randomized controlled intervention studies in the perioperative setting have shown neutral results should help us acknowledge how much we still have to learn to finally better serve the needs of our patients.

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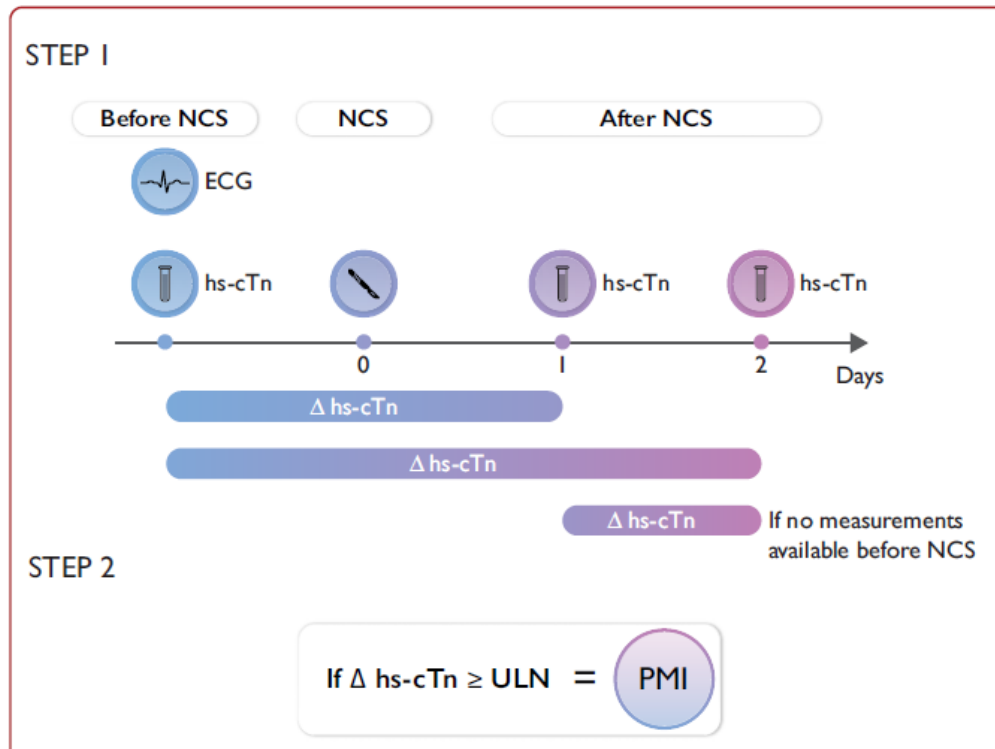
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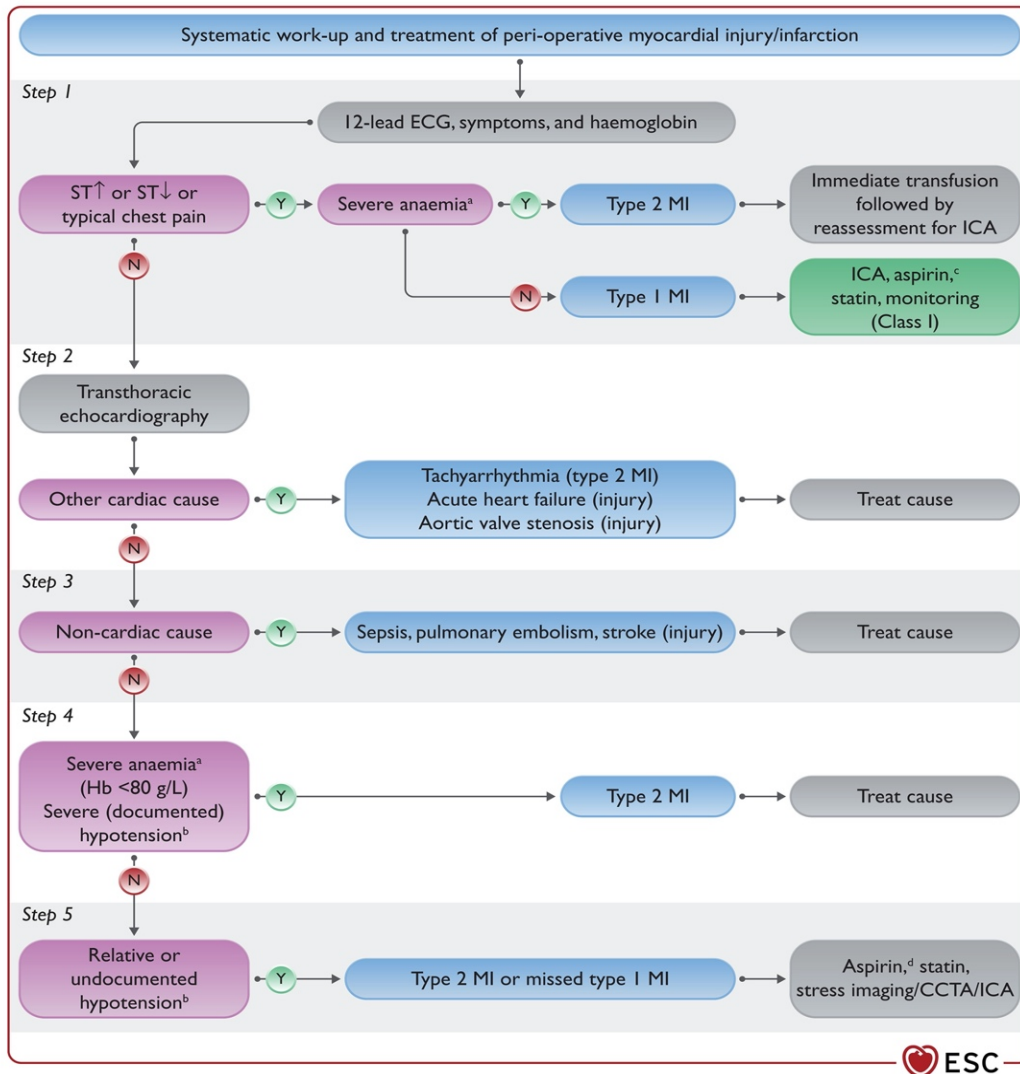
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**Figure 1.** Current recommendation for the timing of the measurement of hs-cTn for the detection of PMI in high-risk patients undergoing non-cardiac surgery [10]

Abbreviations: ECG, electrocardiogram; hs-cTn, high-sensitivity cardiac troponin; NCS, non-cardiac surgery; PMI, perioperative myocardial infarction/injury; ULN, upper limit of normal



**Figure 2.** Systematic work-up and treatment of patients detected to suffer from perioperative myocardial infarction/injury [10]

Abbreviations: CCTA, coronary computed tomography angiography; Hb, hemoglobin; ICA, invasive coronary angiography; MI, myocardial infarction; N, no; ST, ST-segment; Y, yes; other — see **Figure**