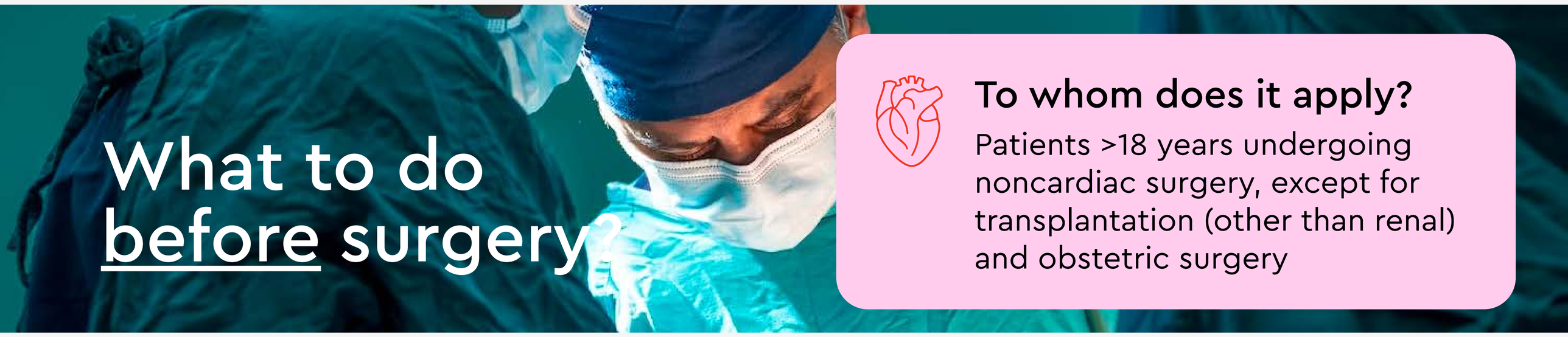
European Society of Anaesthesiology and Intensive Care

How and when to use cardiac biomarkers in non cardiac surgery: A visual summary



What to do before surgery?

To whom does it apply?

Patients >18 years undergoing noncardiac surgery, except for transplantation (other than renal) and obstetric surgery

Prognosis:	Should I routinely measure cardiac biomarkers before surgery in order to assess if my patient might have increased risk for postoperative events?	
cTn	"We suggest measuring cardiac troponins preoperatively to assess prognosis" ***See why***	**Quality of evidence** ★☆☆☆ Very low
B-Type NP	"We suggest measuring B-type natriuretic peptides preoperatively to assess prognosis" ***See why***	**Quality of evidence** ★★★☆ Moderate
Prediction:	Should I routinely measure and add preoperative cardiac biomarkers to clinical risk scores to predict postoperative events?	
cTn	"No recommendation due to very low quality data, use in research only" ***See why***	**Quality of evidence** ★☆☆☆ Very low
B-Type NP	"We suggest measuring B-type natriuretic peptides preoperatively to improve prediction of postoperative events" ***See why***	**Quality of evidence** ★☆☆☆ Very low
Management:	Should I routinely use preoperative cardiac biomarkers to change my patient's postoperative care and improve outcome?	
cTn	"No recommendation due to lack of data, use in research only"	**Quality of evidence** No data
B-Type NP	"No recommendation due to lack of data, use in research only"	**Quality of evidence** No data

Clinical practice statements *See more*

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What to do before surgery?

Prognosis: Should I routinely measure cardiac biomarkers before surgery in order to assess if my patient might have increased risk for postoperative events?

cTn "We suggest measuring cardiac troponins preoperatively to assess prognosis"

Quality of evidence ★☆☆☆ Very low

Why? Following events might be associated with elevated pre-operative cTn

- 30 day all cause mortality	★★★★ High
- 1 year all cause mortality	★☆☆☆ Very low
- 30 day MACE	★★☆☆ Low
- 1 year MACE	★☆☆☆ Very low
- 30 day cardiac complications	★★☆☆ Low
- 30 day cardiac and non-cardiac complications	★☆☆☆ Very low

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What to do before surgery?

Prognosis: Should I routinely measure cardiac biomarkers before surgery in order to assess if my patient might have increased risk for postoperative events?

B-Type NP

"We suggest measuring B-type natriuretic peptides preoperatively to assess prognosis"

Quality of evidence

★★★☆ Moderate

Why? Following events might be associated with elevated pre-operative B-Type NP

- 30 day all cause mortality	★☆☆☆ Very low
- 1 year all cause mortality	★★★☆ Moderate
- 30 day death or myocardial infarction	★★★★ High
- 30 day MACE	★★★★ High
- 1 year MACE	★★☆☆ Low
- 30 day cardiac complications	★★★☆ Moderate
- 30 day myocardial injury	★☆☆☆ Very low
- 30 day cardiac and non-cardiac complications	★☆☆☆ Very low

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What to do before surgery?

Prediction: Should I routinely measure and add preoperative cardiac biomarkers to clinical risk scores to predict postoperative events?

cTn

"No recommendation due to very low quality data, use in research only"

Quality of evidence

★☆☆☆ Very low

Why? The prediction of the following events might be improved with the addition of pre-operative cTn

- 30 day all cause mortality	★☆☆☆ Very low
- 30 day MACE	★☆☆☆ Very low
- 1 year MACE	★☆☆☆ Very low
- 30 day cardiac complications	★☆☆☆ Very low

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What to do before surgery?

Prediction: Should I routinely measure and add preoperative cardiac biomarkers to clinical risk scores to predict postoperative events?

B-Type NP

"We suggest measuring B-type natriuretic peptides preoperatively to improve prediction of postoperative events"

Quality of evidence

★☆☆☆ Very low

Why? The prediction of the following events might be improved with the addition of pre-operative B-Type NP

- 30 day all cause mortality	★☆☆☆ Very low
- 1 year all cause mortality	★☆☆☆ Very low
- 30 day death or myocardial infarction	★☆☆☆ Very low
- 30 day MACE	★★★☆ Moderate
- 1 year MACE	★☆☆☆ Very low
- 30 day cardiac complications	★★☆☆ Low

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cTn:
The evidence for stand-alone preoperative cardiac troponins as a prognostic factor was of very low certainty across critical outcomes. However, stand-alone preoperative cardiac troponins may be used to help evaluate risk of some adverse events, in particular 30-day mortality, to inform patients and encourage shared decision-making.

Based on lack of evidence for risk prediction for the majority of the 12 outcomes and the lack of evidence for cardiac troponin-enhanced management, preoperative cardiac troponins should not be used on a routine basis to guide clinical decisions.

Of note, this does not preclude cardiac troponin measurement upon clinical suspicion based on symptoms, e.g. chest pain, to detect acute cardiac events.

B-Type NP:
Based on moderate to high certainty evidence for some critical outcomes, preoperative BNP/NT-proBNP may be used to help evaluate risk of adverse events (i.e. prognosis), in particular 30-day MACE, 30-day death and myocardial infarction, to inform patients and encourage shared decision-making.

Based on low certainly of evidence for risk prediction for the majority of the 12 outcomes and the lack of evidence for BNP/NT-proBNP-enhanced management, preoperative B-type natriuretic peptides should not be used on a routine basis to guide clinical decisions.

Of note, this does not preclude the use of BNP/NT-proBNP measurement preoperatively upon clinical suspicion based on clinical signs or symptoms, e.g. dyspnoea, hypoxia, to detect and manage heart failure.

Clinicians should be aware that different B-type natriuretic peptide assays are commercially available and ensure that appropriate cut-off and interpretation are used.

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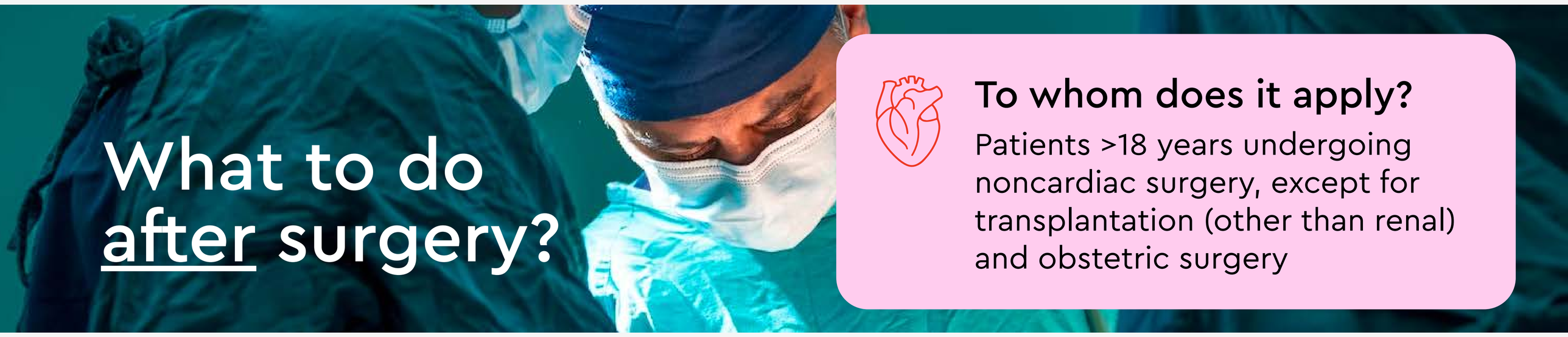

What to do after surgery?

To whom does it apply?

Patients >18 years undergoing noncardiac surgery, except for transplantation (other than renal) and obstetric surgery

Prognosis:	Should I routinely measure cardiac biomarkers after surgery in order to assess if my patient might have increased risk for postoperative events?	
cTn	"We suggest measuring cardiac troponins postoperatively to assess prognosis" ***See why***	**Quality of evidence** ★★★☆ Moderate
B-Type NP	"No recommendation due to lack of data, use in research only"	**Quality of evidence** ★☆☆☆ Very low
Prediction:	Should I routinely measure and add postoperative cardiac biomarkers to clinical risk scores to predict postoperative events?	
cTn	"We suggest measuring cardiac troponins postoperatively to improve prediction of postoperative events" ***See why***	**Quality of evidence** ★★☆☆ Low
B-Type NP	"No recommendation due to lack of data, use in research only"	**Quality of evidence** ★☆☆☆ Very low
Management:	Should I routinely use postoperative cardiac biomarkers to change my patient's postoperative care and improve outcome?	
cTn	"No recommendation due to lack of data, use in research only"	**Quality of evidence** ★☆☆☆ Very low
B-Type NP	"No recommendation due to lack of data, use in research only"	**Quality of evidence** No data

Clinical practice statements ***See more***

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How and when to use cardiac biomarkers in non cardiac surgery: A visual summary

What to do after surgery?

Prognosis: Should I routinely measure cardiac biomarkers after surgery in order to assess if my patient might have increased risk for postoperative events?

cTn "We suggest measuring cardiac troponins postoperatively to assess prognosis"

Quality of evidence ★★★☆ Moderate

Why? Following events might be associated with elevated pre-operative cTn

- 30 day all cause mortality	★★★★ High
- 1 year all cause mortality	★★★☆ Moderate
- 30 day death or myocardial infarction	★☆☆☆ Very low
- 30 day MACE	★☆☆☆ Very low
- 1 year MACE	★★☆☆ Low
- 30 day cardiac and non-cardiac complications	★★☆☆ Low

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What to do <u>after</u> surgery?

Prediction: Should I routinely measure and add postoperative cardiac biomarkers to clinical risk scores to predict postoperative events?

cTn

"We suggest measuring cardiac troponins postoperatively to improve prediction of postoperative events"

Quality of evidence
★★☆☆ Low

Why? The prediction of the following events might be improved with the addition of post-operative cTn

- 30 day all cause mortality	★★★★ High
- 1 year all cause mortality	★☆☆☆ Very low
- 30 day MACE	★★☆☆ Low
- 30 day cardiac and non-cardiac complications	★☆☆☆ Very low

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cTn:
There is a larger body of evidence based on older studies for the use of postoperative cardiac troponins for prognosis and risk prediction compared to delta troponins (increased postoperative over preoperative values). These studies generally investigated non-high-sensitivity assays.
The measurement of postoperative cardiac troponins alone does not exclude chronic troponin elevations; however, higher postoperative concentrations are associated with a higher risk of adverse events.

Clinicians should be aware that different cardiac troponin assays are commercially available and ensure that appropriate cut-off and interpretation are used. Preference should be given to assays that have demonstrated analytical robustness and clinical utility in the non-cardiac surgery setting.

Clinicians should be aware of the high prevalence of postoperative cardiac troponins >99th URL among patients with high cardiovascular risk. In these patients, we advocate the exclusion of acute cardiac events (e.g. ECG, symptoms) bearing in mind that cardiac troponin elevations are also seen in many chronic conditions (e.g. renal failure, heart failure).

One large randomized clinical trial (MANAGE) conducted in patients with myocardial injury after non- cardiac surgery with presumed ischaemic origin was not included in our systematic review as the outcome did not reach critical importance as pre-specified by Delphi consensus. For clinicians and patients who see benefit in reduction of major vascular complications, treatment with dabigatran twice daily may be considered.

B-Type NP:
Based on lack of evidence for prognosis, risk prediction, and B-type natriuretic peptide-enhanced management for the majority of the 12 outcomes, systematic postoperative BNP/NT-proBNP measurement should not be used on a routine basis to guide clinical decisions

Of note, this does not preclude the use of postoperative B-type natriuretic peptides measurement postoperatively upon clinical suspicion based on clinical signs or symptoms, e.g. dyspnoea, hypoxia, to detect and manage heart failure.

Clinicians should be aware that different B-type natriuretic peptide assays are commercially available and ensure that appropriate cut-off and interpretation are used.

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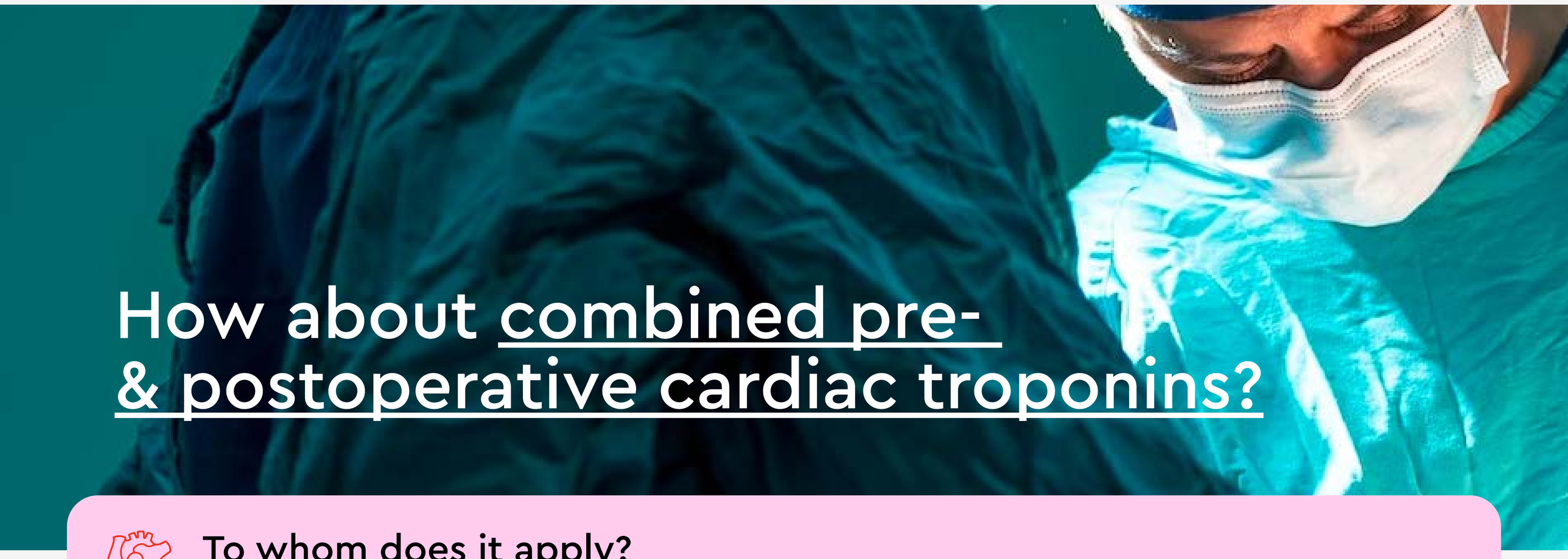

How about combined pre- & postoperative cardiac troponins?

To whom does it apply?
Patients >18 years undergoing noncardiac surgery, except for transplantation (other than renal) and obstetric surgery

Prognosis: Should I routinely measure pre- and postoperative cTns in order to assess if my patient might have increased risk for postoperative events?

cTn	"We suggest measuring combined pre- and postoperative cTn to assess prognosis" *See why*	Quality of evidence ★★★☆ Moderate

Prediction: Should I routinely measure and add pre- and postoperative cTns to clinical risk scores to predict postoperative events?

cTn	"We suggest measuring combined pre- and postoperative cTn to improve prediction of postoperative events" *See why*	Quality of evidence ★☆☆☆ Very low

Management: Should I routinely use pre- and postoperative cTns to change my patient's postoperative care and improve outcome?

cTn	"No recommendation due to no consensus"	Quality of evidence ★☆☆☆ Very low

Clinical practice statements *See more*

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How and when to use cardiac biomarkers in non cardiac surgery: A visual summary

How about <u>combined pre- & postoperative cardiac troponins?</u>

Prognosis: Should I routinely measure pre- and postoperative cTns in order to assess if my patient might have increased risk for postoperative events?

cTn

"We suggest measuring combined pre- and postoperative cTn to assess prognosis"

Quality of evidence
★★★☆ Moderate

Why? Following events might be associated with an increase in post-operative cTn compared to pre-operative cTn

- 30 day all cause mortality	★★★★ High
- 1 year all cause mortality	★★★☆ Moderate
- 30 day MACE	★★★★ High
- 1 year MACE	★★☆☆ Low
- 30 day cardiac and non-cardiac complications	★☆☆☆ Very low

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How about <u>combined pre- & postoperative cardiac troponins?</u>

Prediction: Should I routinely measure and add pre- and postoperative cTns to clinical risk scores to predict postoperative events?

cTn

"We suggest measuring combined pre- and postoperative cTn to improve prediction of postoperative events"

Quality of evidence

★☆☆☆ Very low

Why? The prediction of the following events might be improved with the addition of post-operative cTn compared to pre-operative cTn

- 30 day all cause mortality	★★☆☆ Low
- 30 day MACE	★★★☆ Moderate

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How about combined pre- & postoperative cardiac troponins?

Clinical practice statements

cTn:
While the panel could not recommend combined pre-and postoperative cardiac troponin-enhanced management on a routine basis, it acknowledges that some centres have made the decision to implement pre- and postoperative cardiac troponin surveillance and corresponding management algorithms to improve outcomes, in particular 30-day and 1-year all-cause mortality. However, due to the very low certainty of evidence the panel considered it prudent to have such strategies embedded in a clinical research framework. A further rationale for measuring combined pre-and postoperative cardiac troponins, as opposed to postoperative cardiac troponin alone is that the combined measurement facilitates the differentiation between acute perioperative changes and chronic elevations.

Despite very low certainty of evidence to support management strategies, perioperative myocardial injury may only be reliably detected using cardiac troponin surveillance. The combined measurement of pre- and postoperative cardiac troponins can aid the diagnosis of asymptomatic myocardial injury/infarction and other treat- able conditions (e.g. heart failure, arrhythmias, pulmonary embolism, sepsis) since increased levels may flag the presence of these complications. A management algorithm in case of elevated perioperative cardiac troponins has been proposed by the European Society of Cardiology.

The panel considered an absolute increase of >99th upper reference limit (URL) of a high-sensitivity cardiac troponin assay as a pragmatic and clinically implementable approach. However, clinicians should be aware that this approach has not been validated for all assays.

The panel encourages a multidisciplinary approach when establishing cardiac troponin surveillance (based on combined pre- and postoperative measurements) for the management of perioperative myocardial infarction/injury.

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