

Recognising and Treating Intraoperative Hypotension

THE QUESTION

Where the evidence disagrees

This topic was selected because an evidence synthesis beats a textbook on it: the trials disagree, or the guidance has moved recently.

THE EVIDENCE

What each source contributes, and how strong it is

Study design first — a cohort and a randomised trial do not carry the same weight.

Design	Year	Journal	What it found
Other	2014	World Journal of Cardiology	Cardiac output is the product of stroke volume and heart rate
Other	2019	British Journal of Anaesthesia	The Perioperative Quality Initiative consensus is that intraoperative mean art
Other	2022	BMC Anesthesiology	Reported definitions of intraoperative hypotension are wildly inconsistent acr
Other	2018	Anesthesia and Analgesia	In the VISION cohort a minimum systolic pressure below 100 mmHg together with
Other	2018	British Journal of Anaesthesia	Across 42 studies, organ injury was reported after 10 minutes or more below a
Other	2021	Journal of the American College of	Randomising cardiovascular-risk patients to a mean arterial pressure target of

6 resolved citations behind this deck; every point above traces to one of them.

IN PRACTICE

What the cohorts and reviews add

6 findings, each on the slide that follows.

WORLD JOURNAL OF CARDIOLOGY 2014

Cardiac output is the product of stroke volume and heart rate

Cardiac output is the product of stroke volume and heart rate

BRITISH JOURNAL OF ANAESTHESIA 2019

The Perioperative Quality Initiative consensus is that intraoperative mean art

The Perioperative Quality Initiative consensus is that intraoperative mean arterial pressures below 60 to 70 mmHg are associated with myocardial...

BMC ANESTHESIOLOGY 2022

Reported definitions of intraoperative hypotension are wildly inconsistent acr

Reported definitions of intraoperative hypotension are wildly inconsistent across the literature

ANESTHESIA AND ANALGESIA 2018

In the VISION cohort a minimum systolic pressure below 100 mmHg together with

In the VISION cohort a minimum systolic pressure below 100 mmHg together with a maximum heart rate above 100 bpm was more strongly associated with...

IN PRACTICE

Cardiac output is the product of stroke volume and heart rate

Other · World Journal of Cardiology

Cardiac output is the product of stroke volume and heart rate, and it can only be altered through heart rate or rhythm, preload, contractility or afterload - which is the whole list you have to walk before you reach for a drug.

Mehta et al., World Journal of Cardiology 2014 · PMID 25276302

IN PRACTICE

The Perioperative Quality Initiative consensus is that intraoperative mean art

Other · *British Journal of Anaesthesia*

The Perioperative Quality Initiative consensus is that intraoperative mean arterial pressures below 60 to 70 mmHg are associated with myocardial injury, acute kidney injury and death, and that the injury is a function of both how far the pressure falls and how long it stays down.

Sessler et al., *British Journal of Anaesthesia* 2019 · PMID 30916004

IN PRACTICE

Reported definitions of intraoperative hypotension are wildly inconsistent acr

Other · *BMC Anesthesiology*

Reported definitions of intraoperative hypotension are wildly inconsistent across the literature, and the recommendation from that review is to use the Perioperative Quality Initiative absolute values - a mean arterial pressure below 60 to 70 mmHg or a systolic below 100 mmHg - and to report how long the patient spent there.

Weinberg et al., *BMC Anesthesiology* 2022 · PMID 35277122

IN PRACTICE

In the VISION cohort a minimum systolic pressure below 100 mmHg together with

Other · *Anesthesia and Analgesia*

In the VISION cohort a minimum systolic pressure below 100 mmHg together with a maximum heart rate above 100 bpm was more strongly associated with myocardial injury (odds ratio 1.42) than a systolic below 100 mmHg on its own (odds ratio 1.20), so the heart rate is part of the problem and not a bystander.

Abbott et al., *Anesthesia and Analgesia* 2018 · PMID 29077608

IN PRACTICE

Across 42 studies, organ injury was reported after 10 minutes or more below a

Other · *British Journal of Anaesthesia*

Across 42 studies, organ injury was reported after 10 minutes or more below a mean arterial pressure of 80 mmHg, after shorter periods below 70 mmHg, and at any exposure below 55 to 50 mmHg - depth and duration multiply rather than act separately.

Wesselink et al., *British Journal of Anaesthesia* 2018 · PMID 30236233

IN PRACTICE

Randomising cardiovascular-risk patients to a mean arterial pressure target of

Other · *Journal of the American College of*

Randomising cardiovascular-risk patients to a mean arterial pressure target of at least 75 mmHg instead of at least 60 mmHg cut time spent below 65 mmHg by about 60% but did not reduce acute myocardial injury or 30-day major cardiac and kidney events, so chasing a higher number is not automatically treatment.

Wanner et al., *Journal of the American College of Cardiology* 2021 · PMID 34711333

IN THE ROOM

What this changes about the next case

Colour is the strength of the evidence behind each step, not the urgency.

- 1 Cardiac output is the product of stroke volume and heart rate, and it can only be altered through heart rate or rhythm, preload, contractility or afterload - which is the whole list you have to walk before you reach for a drug.
- 2 The Perioperative Quality Initiative consensus is that intraoperative mean arterial pressures below 60 to 70 mmHg are associated with myocardial injury, acute kidney injury and death, and that the injury is a function of both how far the pressure falls and how long it stays down.
- 3 Reported definitions of intraoperative hypotension are wildly inconsistent across the literature, and the recommendation from that review is to use the Perioperative Quality Initiative absolute values - a mean arterial pressure below 60 to 70 mmHg or a systolic below 100 mmHg - and to report how long the patient spent there.
- 4 In the VISION cohort a minimum systolic pressure below 100 mmHg together with a maximum heart rate above 100 bpm was more strongly associated with myocardial injury (odds ratio 1.42) than a systolic below 100 mmHg on its own (odds ratio 1.20), so the heart rate is part of the problem and not a bystander.

Across 42 studies, organ injury was reported after 10 minutes or more below a mean arterial pressure of 80 mmHg, after shorter periods below 70 mmHg, and at any exposure below 55 to 50 mmHg - depth and duration multiply rather than act separately.

KEY TAKEAWAYS

What to carry into the next case

Cardiac output is the product of stroke volume and heart rate

World Journal of Cardiology 2014

The Perioperative Quality Initiative consensus is that intraoperative mean art

British Journal of Anaesthesia 2019

Reported definitions of intraoperative hypotension are wildly inconsistent acr

BMC Anesthesiology 2022

In the VISION cohort a minimum systolic pressure below 100 mmHg together with

Anesthesia and Analgesia 2018

Cardiac output is stroke volume times heart rate, so walk the list - rate, rhythm, preload, afterload, contractility - and hold the adult to a mean arterial pressure above 65 and a systolic above 100 while you do it.

QUESTIONS I'LL ASK YOU IN THE ROOM

1. Say the equation out loud - which of its terms has actually changed in this patient?
2. Is this rhythm sinus, and at this rate is the rhythm itself the problem?
3. How would you decide whether he needs volume rather than a pressor?
4. What is your mean arterial pressure target here, and where does that number come from?

ORAL BOARDS STEM

You are at the head of the bed on your own for the first time. Forty minutes into a hemicolectomy in a 70-year-old, the cuff cycles and reads 72/38, mean 49. Your attending walks in, does not touch anything, and asks you to talk out loud through why the pressure is low before you treat it - naming the parts of the equation rather than naming a drug.

Cardiac output is stroke volume times heart rate, so walk the list - rate, rhythm, preload, afterload, contractility - and hold the adult to a mean arterial pressure above 65 and a systolic above 100 while you do it.

SOURCES

- [1] Mehta et al., World Journal of Cardiology 2014 · PMID 25276302
- [2] Sessler et al., British Journal of Anaesthesia 2019 · PMID 30916004
- [3] Weinberg et al., BMC Anesthesiology 2022 · PMID 35277122
- [4] Abbott et al., Anesthesia and Analgesia 2018 · PMID 29077608
- [5] Wesselink et al., British Journal of Anaesthesia 2018 · PMID 30236233
- [6] Wanner et al., Journal of the American College of Cardiology 2021 · PMID 34711333