

Intraoperative Fluid Strategy

Intraoperative teaching · CA-2

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
Guideline	2025	British journal of anaesthesia	Goal-directed haemodynamic therapy is not recommended routinely for major elective
Cohort	2023	Acta anaesthesiologica Scandinavica	Only 44% of boluses given during goal-directed fluid therapy actually raised stroke
Meta-analysis	2018	European journal of anaesthesiology	Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and
Randomised trial	2020	British journal of anaesthesia	In transthoracic oesophagectomy, goal-directed therapy targeting stroke volume
Review	2018	British journal of anaesthesia	Intraoperatively, maintain euvolemia using an individualized goal-directed therapy
Meta-analysis	2021	England)	Goal-directed therapy reduced overall postoperative complications regardless of the

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

WHERE THE GUIDANCE SITS

What the guidelines and pooled evidence say

3 findings, each on the slide that follows.

BRITISH JOURNAL OF ANAESTHESIA 2025

Goal-directed haemodynamic therapy is not recommended routinely for major elective

Goal-directed haemodynamic therapy is not recommended routinely for major elective abdominal surgery; consider it patient by patient in moderate- to...

EUROPEAN JOURNAL OF ANAESTHESIOLOGY 2018

Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and

Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and pneumonia, kidney injury and wound infection — but subgroup analysis...

ENGLAND) 2021

Goal-directed therapy reduced overall postoperative complications regardless of the

Goal-directed therapy reduced overall postoperative complications regardless of the total volume infused

WHERE THE GUIDANCE SITS

Goal-directed haemodynamic therapy is not recommended routinely for major elective

Guideline · British journal of anaesthesia

Goal-directed haemodynamic therapy is not recommended routinely for major elective abdominal surgery; consider it patient by patient in moderate- to high-risk major noncardiac surgery, and do not use fixed low-dose inotrope infusions as part of the protocol.

Perioperative Quality Initiative Consensus Statement on Goal-Directed Haemodynamic Therapy, British journal of anaesthesia 2025 · PMID 40640043

WHERE THE GUIDANCE SITS

Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and

Meta-analysis · European journal of anaesthesiology

Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and pneumonia, kidney injury and wound infection — but subgroup analysis found no mortality benefit for fluid-only protocols.

Does Goal-Directed Haemodynamic and Fluid Therapy Improve Peri-Operative Outcomes?: A Systematic Review and Meta-Analysis, European journal of anaesthesiology 2018 · PMID 29369117

WHERE THE GUIDANCE SITS

Goal-directed therapy reduced overall postoperative complications regardless of the

Meta-analysis · England)

Goal-directed therapy reduced overall postoperative complications regardless of the total volume infused, but did not reduce perioperative mortality or any single organ-specific complication.

Association Between Perioperative Fluid Administration and Postoperative Outcomes: A 20-Year Systematic Review and a Meta-Analysis of Randomized Goal-Directed Trials in Major Visceral/Noncardiac Surgery, Critical care (London, England) 2021 · PMID 33522953

WHAT THE TRIALS FOUND

In transthoracic oesophagectomy, goal-directed therapy targeting stroke volume

Randomised trial · British journal of anaesthesia

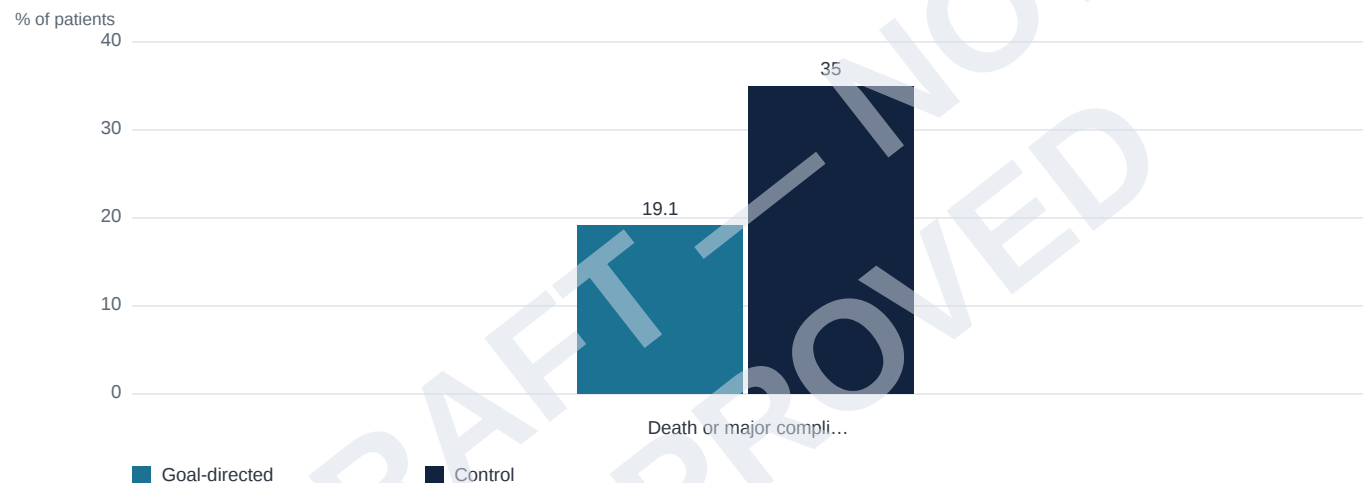
In transthoracic oesophagectomy, goal-directed therapy targeting stroke volume variation below 8% reduced death or major complications from 35% to 19%.

Impact of Intraoperative Goal-Directed Fluid Therapy on Major Morbidity and Mortality After Transthoracic Oesophagectomy: A Multicentre, Randomised Controlled Trial, British journal of anaesthesia 2020 · PMID 33092805

THE NUMBERS

Goal-directed therapy nearly halved major morbidity in oesophagectomy

232 patients randomised, stroke volume variation target <8%.



A 15.9 percentage-point absolute reduction in a high-risk operation.

Impact of Intraoperative Goal-Directed Fluid Therapy on Major Morbidity and Mortality After Transthoracic Oesophagectomy: A Multicentre, Randomised Controlled Trial, British journal of anaesthesia 2020 · PMID 33092805

IN PRACTICE

What the cohorts and reviews add

2 findings, each on the slide that follows.

ACTA ANAESTHESIOLOGICA SCANDINAVICA 2023

Only 44% of boluses given during goal-directed fluid therapy actually raised stroke

Only 44% of boluses given during goal-directed fluid therapy actually raised stroke volume by 10%

BRITISH JOURNAL OF ANAESTHESIA 2018

Intraoperatively, maintain euvoemia using an individualized goal-directed therapy

Intraoperatively, maintain euvoemia using an individualized goal-directed therapy plan based on patient and surgical risk, matching monitoring needs...

IN PRACTICE

Only 44% of boluses given during goal-directed fluid therapy actually raised stroke

Cohort · *Acta anaesthesiologica Scandinavica*

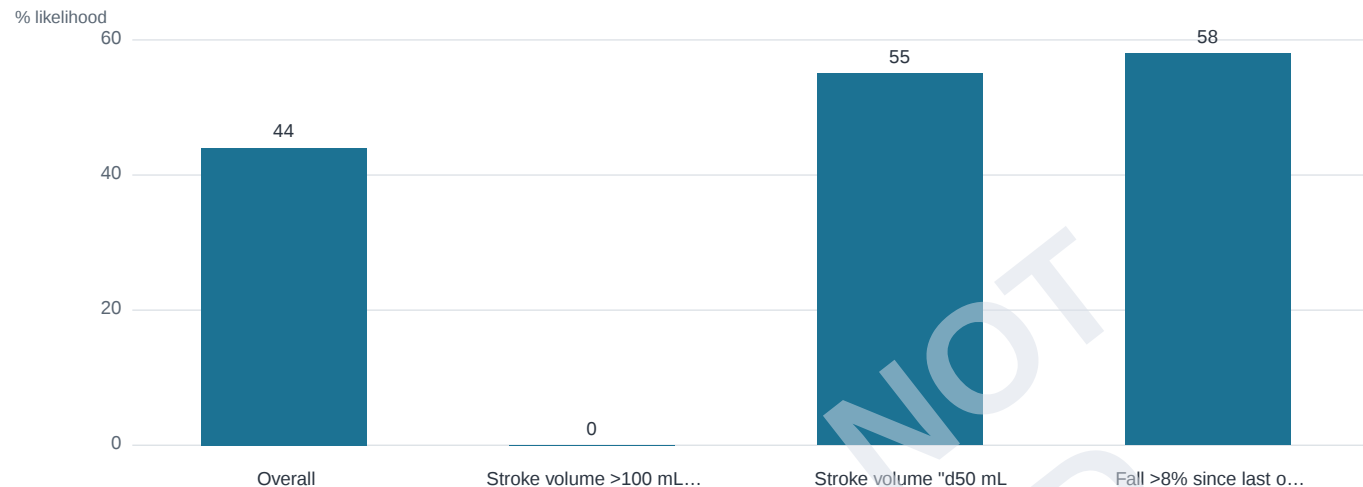
Only 44% of boluses given during goal-directed fluid therapy actually raised stroke volume by 10%, and the chance fell to near zero when stroke volume already exceeded 100 mL and had dropped less than 8% since the last optimisation.

Predicting Fluid Responsiveness Using Esophagus Doppler Monitoring and Pulse Oximetry Derived Pleth Variability Index; Retrospective Analysis of a Hemodynamic Study, Acta anaesthesiologica Scandinavica 2023 · PMID 37140405

THE NUMBERS

Most boluses during goal-directed therapy do nothing

Chance the next bolus raises stroke volume by $\geq 10\%$, by pre-bolus state.



Fluid responsiveness varied sharply with the pre-bolus state in this retrospective analysis; it describes an association, not a validated rule for withholding a bolus.

Predicting Fluid Responsiveness Using Esophagus Doppler Monitoring and Pulse Oximetry Derived Pleth Variability Index; Retrospective Analysis of a Hemodynamic Study, Acta anaesthesiologica Scandinavica 2023 · PMID 37140405

IN PRACTICE

Intraoperatively, maintain euvolemia using an individualized goal-directed therapy

Review · *British journal of anaesthesia*

Intraoperatively, maintain euvolemia using an individualized goal-directed therapy plan based on patient and surgical risk, matching monitoring needs with hemodynamic goals to reduce complications and length of stay.

Current Concepts of Fluid Management in Enhanced Recovery Pathways, British journal of anaesthesia 2018 · PMID 29406186

IN THE ROOM

What this changes about the next case

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

- 1** Goal-directed haemodynamic therapy is not recommended routinely for major elective abdominal surgery; consider it patient by patient in moderate- to high-risk major noncardiac surgery, and do not use fixed low-dose inotrope infusions as part of the protocol.
- 2** Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and pneumonia, kidney injury and wound infection — but subgroup analysis found no mortality benefit for fluid-only protocols.
- 3** Goal-directed therapy reduced overall postoperative complications regardless of the total volume infused, but did not reduce perioperative mortality or any single organ-specific complication.

4

In transthoracic oesophagectomy, goal-directed therapy targeting stroke volume variation below 8% reduced death or major complications from 35% to 19%.

5

Only 44% of boluses given during goal-directed fluid therapy actually raised stroke volume by 10%, and the chance fell to near zero when stroke volume already exceeded 100 mL and had dropped less than 8% since the last optimisation.

KEY TAKEAWAYS

What to carry into the next case

Goal-directed haemodynamic therapy is not recommended routinely for major elective

British journal of anaesthesia 2025

Only 44% of boluses given during goal-directed fluid therapy actually raised stroke

Acta anaesthesiologica Scandinavica 2023

Across 95 trials, goal-directed therapy reduced mortality (odds ratio 0.66) and

European journal of anaesthesiology 2018

In transthoracic oesophagectomy, goal-directed therapy targeting stroke volume

British journal of anaesthesia 2020

Goal-directed haemodynamic therapy is not recommended routinely for major elective

QUESTIONS I'LL ASK YOU IN THE ROOM

1. How does your plan change if the patient is not optimised?
2. What is the physiology behind what we just did?
3. Talk me through the trade-off you made there.
4. What would make you abandon this plan and do something else?

ORAL BOARDS STEM

A 70-year-old is three hours into an open pancreaticoduodenectomy. Estimated blood loss is 600 mL, urine output has been 15 mL/hr for two hours, and the resident wants to give a litre of crystalloid.

BOARD QUESTIONS

1. Within an enhanced recovery pathway, state the intraoperative volume status you should aim for, how the fluid plan should be chosen, and the two outcomes this approach is intended to improve.
2. During goal-directed fluid therapy guided by stroke volume, what proportion of fluid boluses in a retrospective haemodynamic analysis actually raised stroke volume by 10%, and what two measured conditions identified boluses with essentially no chance of working?
3. In a multicentre randomised controlled trial of transthoracic oesophagectomy, goal-directed therapy was titrated to one specific haemodynamic variable. State the target used and the effect on the trial's composite outcome, giving both event rates.
4. A meta-analysis of 95 trials of goal-directed therapy reports a mortality odds ratio of 0.66 along with reductions in pneumonia, kidney injury and wound infection. A resident asks whether this means running fluid by a stroke-volume protocol saves lives. Answer using what the subgroup analysis of that same meta-analysis showed.

ANSWER KEY

1. Aim for euvolemia using an individualized goal-directed therapy plan based on patient and surgical risk, matching the monitoring to the hemodynamic goals. The stated aims are to reduce complications and length of stay.

Euvolemia is the target, and the monitoring you pick should match the haemodynamic goals for that patient and that operation.

Current Concepts of Fluid Management in Enhanced Recovery Pathways, British journal of anaesthesia 2018 · PMID 29406186

2. Only 44% of boluses raised stroke volume by 10%. The chance fell to near zero when stroke volume already exceeded 100 mL and had dropped less than 8% since the last optimisation.

More than half the boluses in that analysis did nothing to stroke volume - a high stroke volume that has barely fallen is a signal to stop giving fluid.

Predicting Fluid Responsiveness Using Esophagus Doppler Monitoring and Pulse Oximetry Derived Pleth Variability Index; Retrospective Analysis of a Hemodynamic Study, Acta anaesthesiologica Scandinavica 2023 · PMID 37140405

3. The target was stroke volume variation below 8%. Death or major complications fell from 35% to 19%.

That 35% to 19% difference belongs to transthoracic oesophagectomy with a stroke volume variation target below 8% - that is the setting in which it was shown.

Impact of Intraoperative Goal-Directed Fluid Therapy on Major Morbidity and Mortality After Transthoracic Oesophagectomy: A Multicentre, Randomised Controlled Trial, British journal of anaesthesia 2020 · PMID 33092805

4. No. The overall pooled result was reduced mortality (odds ratio 0.66) and less pneumonia, kidney injury and wound infection, but subgroup analysis found no mortality benefit for fluid-only protocols, so the mortality signal did not hold for fluid alone.

The headline mortality odds ratio came from goal-directed therapy as a whole; the fluid-only subgroup showed no mortality benefit.

Does Goal-Directed Haemodynamic and Fluid Therapy Improve Peri-Operative Outcomes?: A Systematic Review and Meta-Analysis, European journal of anaesthesiology 2018 · PMID 29369117

Goal-directed haemodynamic therapy is not recommended routinely for major elective

SOURCES

[1] Perioperative Quality Initiative Consensus Statement on Goal-Directed Haemodynamic Therapy, British journal of anaesthesia 2025 · PMID 40640043

[2] Predicting Fluid Responsiveness Using Esophagus Doppler Monitoring and Pulse Oximetry Derived Pleth Variability Index; Retrospective Analysis of a Hemodynamic Study, Acta anaesthesiologica Scandinavica 2023 · PMID 37140405

[3] Does Goal-Directed Haemodynamic and Fluid Therapy Improve Peri-Operative Outcomes?: A Systematic Review and Meta-Analysis, European journal of anaesthesiology 2018 · PMID 29369117

[4] Impact of Intraoperative Goal-Directed Fluid Therapy on Major Morbidity and Mortality After Transthoracic Oesophagectomy: A Multicentre, Randomised Controlled Trial, British journal of anaesthesia 2020 · PMID 33092805

[5] Current Concepts of Fluid Management in Enhanced Recovery Pathways, British journal of anaesthesia 2018 · PMID 29406186

[6] Association Between Perioperative Fluid Administration and Postoperative Outcomes: A 20-Year Systematic Review and a Meta-Analysis of Randomized Goal-Directed Trials in Major Visceral/Noncardiac Surgery, Critical care (London, England) 2021 · PMID 33522953