

End-tidal carbon dioxide in cardiac surgeries: A systematic review

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Abstract

Background: Cardiac surgery requires careful and ongoing monitoring to guarantee the best possible outcomes for patients. One non-invasive indicator of ventilation and perfusion that has gained attention is end-tidal carbon dioxide (ETCO₂). This systematic review investigates the clinical usefulness and dependability of ETCO₂ in open cardiac surgery.

Methods: A comprehensive search across five databases included studies from January 1990 until January 2025. Eligibility criteria encompassed observational studies and clinical trials utilizing ETCO₂ measurements in adults. Study selection involved duplicate removal and independent screening. Data extraction focused on clinical parameters. Risk of bias assessment used the Newcastle-Ottawa Scale (NOS) and the Risk-of-Bias tool for randomized trials-2 (RoB-2). Narrative synthesis summarized ETCO₂ trends and asso-

ciations, without conducting a meta-analysis.

Results: The database search identified 106 articles, with 26 duplicates removed. After title and abstract screening, 19 studies underwent full-text review, leaving five studies in the final analysis. These studies included 169 patients from Australia, Iran, Lebanon, Russia, and the United States. Patients had a mean age of 62.3 years and a body mass index (BMI) of 28.43 kg/m². ETCO₂ showed strong correlations with arterial partial pressure of carbon dioxide (PaCO₂), as well as cardiac output and successful weaning and extubation.

Conclusion: ETCO₂ may provide useful continuous noninvasive information during selected phases of cardiac surgery; however, the available evidence remains exploratory. ETCO₂ should be considered an adjunct rather than a replacement for arterial blood gas monitoring.

Keywords: End-tidal CO₂, open heart surgery, weaning, outcomes.

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Introduction

End-tidal carbon dioxide (ETCO₂) is commonly used as a noninvasive indicator of arterial partial pressure of carbon dioxide (PaCO₂), especially during standard mechanical ventilation. Under typical physiological conditions, ETCO₂ values tend to mirror PaCO₂ levels quite closely. (1,2) Normally, ETCO₂ readings are slightly lower—by about 2 to 5 mmHg—because of the presence of alveolar dead space. Research has shown that as the proportion of dead space (dead-space-to-tidal-volume ratio [V_d/V_t]) increases, the gap between ETCO₂ and PaCO₂ widens in a predictable manner. (1,3) In the context of cardiac anesthesia, ETCO₂ has been studied not just as a marker for ventilation but also as a potential clue to how well the heart is performing. Notably, research by Baraka et al. (4) observed

that in patients undergoing on-pump coronary artery bypass grafting (CABG), an ETCO₂ reading above 30 mmHg during partial bypass was a strong predictor of sufficient cardiac output after separation from cardiopulmonary bypass (CPB). (3) Similarly, during off-pump coronary artery bypass procedures, a noticeable drop in ETCO₂ has been found to occur just before reductions in cardiac output and signs of hemodynamic instability. (5) Beyond the operating room, in post-surgical intensive care unit (ICU) care, capnography has also shown clinical value. A randomized study involving CABG patients demonstrated that ETCO₂ readings at the time of extubation closely aligned with PaCO₂ levels, and using capnography to guide the weaning process helped reduce the duration of mechanical ventilation. (6)

Although ETCO₂ is commonly used as a noninvasive indicator of ventilation, its relationship with PaCO₂ is not fixed. The PaCO₂-ETCO₂ gradient is primarily influenced by alveolar dead space and ventilation-perfusion matching, but may also vary with tidal volume, respiratory rate, positive end-expiratory pressure, pulmonary blood flow, metabolic CO₂ production, body temperature, and sampling conditions. In mechanically ventilated patients with stable cardiopulmonary physiology, ETCO₂ may track directional changes in PaCO₂; however, agreement between the two measures may be inadequate for individual-level estimation of PaCO₂ when dead space or ventilation-perfusion mismatch is substantial.

These limitations are particularly relevant during cardiac surgery. During complete cardiopulmonary bypass, pulmonary blood flow is markedly reduced or absent, and ETCO₂ may approach zero despite ongoing systemic CO₂ production. During partial bypass and following separation from cardiopulmonary bypass, ETCO₂ may be influenced by changes in native pulmonary blood flow, alveolar recruitment, dead space, and post-bypass ventilation-perfusion mismatch. Therefore, an ETCO₂ value should be interpreted as a dynamic physiologic signal within its specific surgical and ventilatory context rather than as a direct substitute for PaCO₂ or cardiac output.

Although recent studies offer encouraging insights, research on ETCO₂ monitoring in cardiac surgery still lacks clarity and cohesion. One key challenge lies in the fluctuating relationship between PaCO₂ and ETCO₂, which tends to vary significantly from one patient to another. (2) Russell et al. (2) showed that—even though a general correlation between PaCO₂ and ETCO₂ was evident among post-surgical patients—many individuals lost this reliable link during their time in the ICU. (2) The surgical

process itself adds another layer of complexity—especially following cardiopulmonary bypass, where the relationship between ETCO₂ and PaCO₂ often changes unpredictably due to variations in pulmonary blood flow, alveolar dead space, and metabolic rate after CPB. In a study by Myles et al., (7) they noted a marked increase in the gradient between these two values after bypass, though a genuinely negative gradient was never observed. This pattern points to ventilation-perfusion imbalances introduced during bypass as a likely disruptor of the typical correlation. (7) Not all studies agree on the usefulness of ETCO₂ monitoring during weaning. For example, one pilot trial showed that using ETCO₂ to guide the process didn't actually shorten the time to extubation, while another study found capnography wasn't dependable in patients who were breathing on their own. (6) Overall, factors like individual physiology, the nature of the surgery, and the methods used for monitoring continue to cloud the picture—raising doubts about whether ETCO₂ consistently mirrors PaCO₂ levels or cardiac output in every cardiac surgical scenario. (6)

In order to fill these gaps our systematic review examines cardiac surgery literature on ETCO₂ from 1990 to 2025, focusing on four key areas: the ETCO₂-PaCO₂ correlation under surgical conditions, the PaCO₂-ETCO₂ gradient behavior, ETCO₂ as a predictor of cardiac output, and its role in ventilator weaning and extubation. We integrate findings from studies such as Baraka et al. (4) and Saleh & Pullan (2011) (5) on CPB and off-pump CABG to assess ETCO₂ as a hemodynamic marker, and from Thrush et al. (1991), (8) and Moradian et al. (2022) (6) on extubation strategies. Also, a study from trauma settings (Al-Aomar et al., 2025) (9) demonstrates that low ETCO₂ or a wide PaCO₂-ETCO₂ gap correlates with poor outcomes. Our review pulls together these insights to not only interpret current findings but also to spotlight what remains unclear, and to guide future research and clinical practice through a comprehensive overview of ETCO₂ monitoring in cardiac surgery.

Methodology

Protocol registration

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (10) and the Cochrane Handbook of Systematic Reviews and Meta-Analysis. (11)

Data sources and search strategy

An electronic search was conducted through five databases: PubMed, Scopus, Cochrane library, Web

of Science, and Clinicaltrials.org. We searched for all relevant articles that are published from January 1, 1990, until January 4, 2025. An updated search will be conducted right before the analysis to include any recently published studies in the time between our original and updated search. No limitation will be put on language. All search strategies are illustrated in **Supplemental Table S1**.

Eligibility criteria

We included observational studies and randomized or non-randomized clinical trials that evaluated ETCO₂ measurements, either invasively via tracheal tube or non-invasively via nasal cannula. Eligible studies included case reports or case series with more than three patients, studies involving valve replacement or coronary artery bypass grafting (CABG), studies conducted after 1990, and studies including adult patients aged 18 years or older.

We excluded animal or cadaver studies, case reports or case series with three or fewer patients, studies involving congenital cardiovascular surgery, studies conducted before 1990, and studies including patients younger than 18 years. Additional exclusion criteria included ineligible populations, ineligible surgical procedures, absence of an eligible ETCO₂-related outcome, ineligible study design, or insufficient extractable clinical data.

Study selection

After excluding duplicates, two reviewers (JFA and ARFA) individually screened the collected studies by titles and abstracts via (Covidence) online software. After that, full-text screening was performed by the same two reviewers using the previously stated eligibility criteria. Any conflicts were solved via a third reviewer (ADS).

Data extraction

Two reviewers (JFA and ARFA) pilot-tested and drafted an extraction sheet for the following data: summary characteristics (study design, country, total participants, age, gender, body mass index (BMI), CPB, ETCO₂ values, PaCO₂-ETCO₂ gradient, correlation between ETCO₂ and PaCO₂ or cardiac output (CO), main ETCO₂ trends, weaning time, intensive care unit (ICU) stay, ventilation time, role of ETCO₂ in weaning, and key clinical implications. Two reviewers (JFA and ARFA) separately extracted the data with two reviewers for each single study. Discrepancies were resolved through discussion with a third reviewer (ADS).

Risk of bias and certainty of evidence

Two investigators (JFA and ARFA) independently

evaluated the quality of the included papers by using Newcastle-Ottawa Scale (NOS) for assessing the risk of bias in non-randomized studies, including case-control and cohort studies, (12) considering selection, comparability, and exposure. If there were any differences of opinion, ADS discussed it with them and came to a consensus. As well as the Cochrane risk-of-bias assessment tool (RoB-2) was employed, which evaluates studies across five key domains, each containing specific criteria. The findings are then synthesized using a flowchart to classify bias into one of three categories: low risk, some concerns, or high risk. (13,14)

Statistical analysis

Given the heterogeneity in study designs, outcome measures, and ETCO₂ reporting formats, no quantitative meta-analysis was conducted. Instead, a narrative synthesis approach was employed to summarize findings across included studies. This synthesis focused on the direction and strength of associations between ETCO₂ and PaCO₂, the clinical utility of ETCO₂ in weaning from mechanical ventilation, and its predictive value for cardiac output or hemodynamic compromise. When applicable, descriptive statistics such as means and standard deviations were reported for continuous outcomes. If a study presented data as median and interquartile range (IQR), these were converted to approximate means and standard deviations (SDs) using the method proposed by Wan et al. to allow consistent reporting. (15)

A meta-analysis was not performed because the included studies were clinically and methodologically heterogeneous. The studies differed in cardiac procedure type, use of cardiopulmonary bypass, timing of measurement, ventilatory state, capnography modality, comparator variables, and reported outcomes. For example, ETCO₂-PaCO₂ studies assessed different perioperative phases and reported different correlation metrics; cardiac-output studies evaluated partial cardiopulmonary bypass or post-operative ICU conditions; and weaning studies used distinct protocols and outcome definitions. No outcome domain contained a sufficient number of clinically homogeneous comparisons to support a meaningful pooled estimate. Therefore, a structured narrative synthesis was considered the most appropriate method of evidence integration.

Results

Search results and study selection

The database search yielded 106 articles, with 26 being duplicates. Following a review of the titles and abstracts, 19 articles were selected for full-text assessment. After this evaluation, fourteen studies

were excluded, leaving five studies (4,6–8,16) to be included in the current systematic review. The PRISMA flow diagram (**Figure 1**) outlines the search and screening process.

Study and patient characteristics

The studies were from different countries (Australia, Iran, Lebanon, Russia, and the United States). This analysis included 4 observational studies and one randomized controlled trial (RCT). This review included 169 patients, who had an overall mean age of 62.3 ± 10.4 years (SD). The percentage of male patients was (67.88%) and (32.12%) for female patients. The overall BMI mean was 28.43 ± 4.37 kg/m² (**Table 1**).

Quality assessment

NOS showed that the four observational studies had moderate quality. Meanwhile, RoB-2 showed that only the RCT had some concerns (**Table 2** and **Figure 2**).

Correlation between ETCO₂ and PaCO₂

Strong correlations were identified between ETCO₂ and PaCO₂. Moradian et al. reported a very high correlation ($r=0.918$) during mechanical ventilation, extubation triggering, and at the time of extubation, suggesting that ETCO₂ is a reliable noninvasive surrogate for PaCO₂. Similarly, Thrush et al. found a good correlation ($r=0.76$), highlighting ETCO₂'s role in estimating PaCO₂ levels in post-CABG patients. Myles et al., while not providing a correlation coefficient, reported that ETCO₂ and PaCO₂ levels remained relatively stable post-CPB, further supporting the reliability of ETCO₂ monitoring under stable conditions (**Table 3**).

PaCO₂-ETCO₂ gradient dynamics

Thrush et al. noted that the gradient between PaCO₂ and ETCO₂ narrowed significantly as ventilatory rates decreased, from 7 mmHg at 8–10 breaths/min to 3 mmHg at zero rate. In contrast, Myles et al. observed a slight but significant increase in this gradient after CPB (7.7 to 10 mmHg) (**Table 3**).

ETCO₂ as a predictor of cardiac output

Two studies, Baraka et al. and Fot et al., evaluated the association between ETCO₂ and hemodynamic performance in distinct clinical settings. During partial cardiopulmonary bypass, Baraka et al. reported that ETCO₂ values >30 mmHg were associated with cardiac output >4.5 l/min after separation from bypass. In a postoperative off-pump coronary artery bypass cohort, Fot et al. found that partial pressure of end-tidal CO₂ (PetCO₂) ≤ 30 mmHg demon-

strated fair discrimination for cardiac index <2.5 l/min/m² (area under the curve [AUC] 0.73; sensitivity 78%; specificity 68%) (**Table 3**).

ETCO₂ in ventilation weaning and extubation

ETCO₂ monitoring was successfully used for ventilator weaning in two studies. Thrush et al. demonstrated that ETCO₂ could guide weaning without the need for repeated arterial blood gas analyses, with an average weaning time of 6.5 ± 1.5 hours. Moradian et al. went a step further in a randomized controlled trial, showing that ETCO₂-guided weaning was equally effective as arterial blood gas (ABG)-guided weaning, with no significant difference in PaCO₂ at extubation (**Table 4**).

Discussion

This review suggests that ETCO₂ is a reliable, non-invasive adjunct in cardiac surgery, particularly for monitoring ventilation and as an indirect indicator of perfusion. Across the five included studies, ETCO₂ demonstrated consistent correlations with PaCO₂. Moradian et al. reported a very strong correlation ($r=0.918$), confirming its accuracy throughout critical care stages, while Thrush et al. also found a good correlation ($r=0.76$). Myles et al. showed stability of ETCO₂ and PaCO₂ after CPB, supporting its reliability under controlled conditions. Other research has also demonstrated similar associations in patients with severe respiratory compromise. (17) It must be noted, however, that only one study directly evaluated ETCO₂ as a predictor of cardiac output under intraoperative conditions, and clinical experience indicates that normal ETCO₂ values may still occur despite markedly reduced cardiac output. Therefore, ETCO₂ should not be regarded as a stand-alone cardiac output monitor.

The PaCO₂-ETCO₂ gradient reflects ventilation-perfusion dynamics. Thrush et al. observed narrowing of the gradient with reduced ventilatory rates, suggesting improved alveolar emptying and more accurate reflection of PaCO₂. (18) This supports the interpretation that decreases in dead space relative to tidal volume enhance ETCO₂ reliability. (1,18) Conversely, Myles et al. reported a modest rise in the gradient after CPB, likely reflecting impaired pulmonary gas exchange or redistribution of blood flow. (19) These results highlight the influence of physiologic and procedural variables on gradient behavior. The PaCO₂-ETCO₂ gradient should be interpreted as a marker of the interaction among ventilation, perfusion, and dead space rather than as a stable patient-independent value. A widened gradient may occur with increased alveolar dead space, pulmonary vascular hypoperfusion, atelectasis, ven-

tilation-perfusion mismatch, or changes in ventilatory settings. Conversely, ETCO₂ may change in response to altered CO₂ delivery to the lungs during abrupt hemodynamic shifts. These mechanisms explain why ETCO₂ may be useful for continuous trend monitoring but may not reliably estimate PaCO₂ or cardiac output in every cardiac surgical setting. Arterial blood gas analysis remains necessary when precise PaCO₂ measurement, acid-base assessment, or confirmation of ventilation is clinically required.

ETCO₂ has also been investigated as a predictor of hemodynamic performance. Baraka et al. and Fot et al. found that ETCO₂ values >30 mmHg were associated with cardiac output above 4.5 l/min during partial CPB, suggesting potential as a perfusion adequacy marker. Although CO₂ exchange is theoretically limited during CPB, residual pulmonary circulation allows ETCO₂ measurement. (20) Higher ETCO₂ may therefore reflect improved blood flow and perfusion, consistent with prior evidence that links ETCO₂ to systemic circulation. (21–24) Nonetheless, these findings require cautious interpretation. During complete CPB, ETCO₂ usually approaches zero due to absent pulmonary perfusion, and the observed correlations applied only to partial bypass. Using ETCO₂ as an intraoperative perfusion target during CPB is therefore of uncertain clinical validity. (25–27)

ETCO₂ has been applied to weaning and extubation protocols. Thrush et al. and Moradian et al. demonstrated that ETCO₂-guided strategies were comparable to arterial blood gas (ABG)-based protocols, reducing the need for repeated sampling without compromising safety. (8,28) However, reliance solely on ETCO₂ is not advisable. Extubation decisions require confirmation of normal bicarbonate status by ABG, as metabolic compensation may conceal CO₂ retention and increase the risk of premature extubation.

Several limitations must be acknowledged. The total number of patients was small (169 across five studies), limiting generalizability. This reflects both strict eligibility criteria and the scarcity of published research on this topic, suggesting that ETCO₂ monitoring—widely used in practice—has not been consistently investigated in academic studies. Both tracheal and nasal ETCO₂ measurements were included; while nasal sampling is less reliable, it reflects real-world practice and was necessary to capture available evidence. Three of the five included studies were published more than two decades ago,

raising concerns about their applicability to modern surgical and anesthetic standards. Finally, one study involved off-pump CABG, introducing heterogeneity and limiting comparability with CPB cohorts. Future research should prioritize larger, contemporary cohorts, standardized measurement protocols, and direct comparisons across different surgical techniques.

Future research should prioritize prospective multicenter studies that use standardized capnography platforms, predefined ETCO₂ sampling time points, and contemporaneous arterial blood gas measurements. Studies should separately evaluate on-pump, partial-bypass, off-pump, and post-extubation settings, because the physiologic determinants of ETCO₂ differ substantially across these phases. Further work should also examine whether ETCO₂-informed multimodal protocols, used alongside arterial blood gas and hemodynamic monitoring, improve clinically important outcomes such as time to extubation, reintubation, postoperative pulmonary complications, ICU length of stay, and hemodynamic deterioration. Such studies are needed before specific ETCO₂ thresholds can be incorporated into routine cardiac surgical decision-making.

Conclusion

Current evidence suggests that ETCO₂ may provide useful continuous, noninvasive information regarding ventilation and pulmonary perfusion during selected phases of cardiac surgical care. However, this evidence is exploratory. ETCO₂ may track directional changes in PaCO₂ during stable mechanical ventilation and may be associated with hemodynamic status in selected settings, including partial cardiopulmonary bypass and postoperative intensive care. Nevertheless, ETCO₂ is influenced by dead space, ventilation-perfusion mismatch, pulmonary blood flow, metabolic CO₂ production, and ventilator settings; therefore, it should not be used as a stand-alone surrogate for PaCO₂ or cardiac output. Until contemporary prospective studies establish standardized measurement methods and clinically validated thresholds, ETCO₂ should be regarded as an adjunct to, rather than a replacement for, arterial blood gas and hemodynamic monitoring.

Conflict of interest

The authors declare that they do not have conflicts of interest relevant to this review.

Table 1. Study and patient characteristics

Study	Country	Study Design	n (patients)	Procedure	Mean age (years)	Gender (M:F)	BMI (kg/m ²)	CPB time (min)
Thrush et al., 1991 (8)	USA	Prospective observational	10	CABG	63±12	8:2	Not reported	98±27
Myles et al., 1997 (7)	Australia	Prospective observational	20	CABG, (16) VR, (3) both (1)	66±12	14:6	Not reported	100±29
Baraka et al., 2004 (4)	Lebanon	Prospective observational	32	CABG	65.2±9	Not reported	28.5±5.2	75.2±9.1
Fot et al., 2017 (16)	Russia	Prospective observational	40	Off-pump CABG	62.33±11.53	30:10	29.33±3.08	Not reported
Moradian et al., 2022 (6)	Iran	RCT (non-blinded)	67 (34 intervention, 33 control)	CABG	59.4±9.5	41:26	27.87±4.58	60.4±26.8

Legend: M=male; F=female; BMI=body mass index; CPB=cardiopulmonary bypass; CABG=coronary artery bypass grafting; VR=valve replacement; RCT=randomized controlled trial.

Continuous data are presented as mean±standard deviation.

Table 2. Quality assessment for observational studies

Study	Selection	Comparability	Outcome	Total	Quality*
Thrush et al., 1991	3	0	3	6	Moderate
Myles et al., 1997	3	0	3	6	Moderate
Baraka et al., 2004	3	0	3	6	Moderate
Fot et al., 2017	3	0	3	6	Moderate

Legend: *Low quality (0–3 stars), moderate quality (4–6 stars), or high quality (7–9 stars) based on their overall score.

Table 3. ETCO₂ and PaCO₂ monitoring parameters

Study	ETCO ₂ values	PaCO ₂ -ETCO ₂ gradient	Correlation between ETCO ₂ and PaCO ₂ or CO	Main ETCO ₂ trends
Thrush et al., 1991 (8)	ETCO ₂ : 31±4 (8–10 bpm), 35±4 (4–6 bpm), 37±4 (0 bpm)	7±3 → 3±3 mmHg as ventilation rate decreases	r=0.76 (ETCO ₂ vs. PaCO ₂)	ETCO ₂ increases as ventilation slows; strong correlation with PaCO ₂
Myles et al., 1997 (7)	Drop in ETCO ₂ pre-CPB (p=0.002), stable post-CPB (p=0.055)	PaCO ₂ -ETCO ₂ increases post-CPB (7.7±2.2 → 10±2.8 mmHg)	Not reported	Stable ETCO ₂ and PaCO ₂ post-CPB except transient early change
Baraka et al., 2004 (4)	ETCO ₂ >30 mmHg associated with CO>4.5 l/min	Not reported	r=0.57 (quarter flow), r=0.6 (post-CPB)	ETCO ₂ >30 mmHg reliably predicts sufficient CO
Fot et al., 2017 (16)	Baseline ETCO ₂ : 30.67±4.61 mmHg; optimal IPI: 37±3.14, suboptimal: 32.67±4.15	ETCO ₂ ≤30 mmHg predicts CI<2.5 l/min/m ²	AUC=0.73, sensitivity 78%, specificity 68%	ETCO ₂ <30 mmHg strongly associated with low CI
Moradian et al., 2022 (6)	ETCO ₂ : 34.76 (baseline), 40.12 (trigger), 39.53 (extubation)	Not reported	r=0.918 (ETCO ₂ vs. PaCO ₂)	Strong linear relationship; ETCO ₂ closely tracks PaCO ₂ at all weaning phases

Legend: ETCO₂=end-tidal carbon dioxide; PaCO₂=arterial partial pressure of carbon dioxide; CO=cardiac output; CPB=cardiopulmonary bypass; IPI=integrated pulmonary index; CI=cardiac index; AUC=area under the curve.

Table 4. Clinical outcomes and key applications of ETCO₂

Study	Weaning time (hours)	ICU stay (days)	Ventilation time (mins)	Role of ETCO ₂ in weaning	Key clinical implications
Thrush et al., 1991 (8)	6.5±1.5	Not reported	Not reported	Used in lieu of frequent ABGs	ETCO ₂ safely used for weaning without PaCO ₂ ; fewer ABGs needed
Myles et al., 1997 (7)	Not reported	Not reported	Not reported	Not used for weaning	Stable Pa-ETCO ₂ gradient suggests reliability during anesthesia and CPB
Baraka et al., 2004 (4)	Not reported	Not reported	Not reported	Not assessed	ETCO ₂ >30 mmHg during CPB can be used to predict sufficient CO post-weaning
Fot et al., 2017 (16)	Not reported	1.58±1.35	174.9±96.6	Not assessed	ETCO ₂ <30 mmHg predicts poor perfusion; useful in hemodynamic monitoring
Moradian et al., 2022 (6)	Not reported	2.03±0.41	Intervention: 312.2±80.6; Control: 342.7±110.7	ETCO ₂ -guided weaning vs ABG	No difference in outcomes, but ETCO ₂ is less invasive and closely mirrors PaCO ₂

Legend: ETCO₂=end-tidal carbon dioxide; ICU=intensive care unit; ABG=arterial blood gas; PaCO₂=arterial partial pressure of carbon dioxide; CPB=cardiopulmonary bypass; CO=cardiac output.

Figure 1. Prisma flowchart

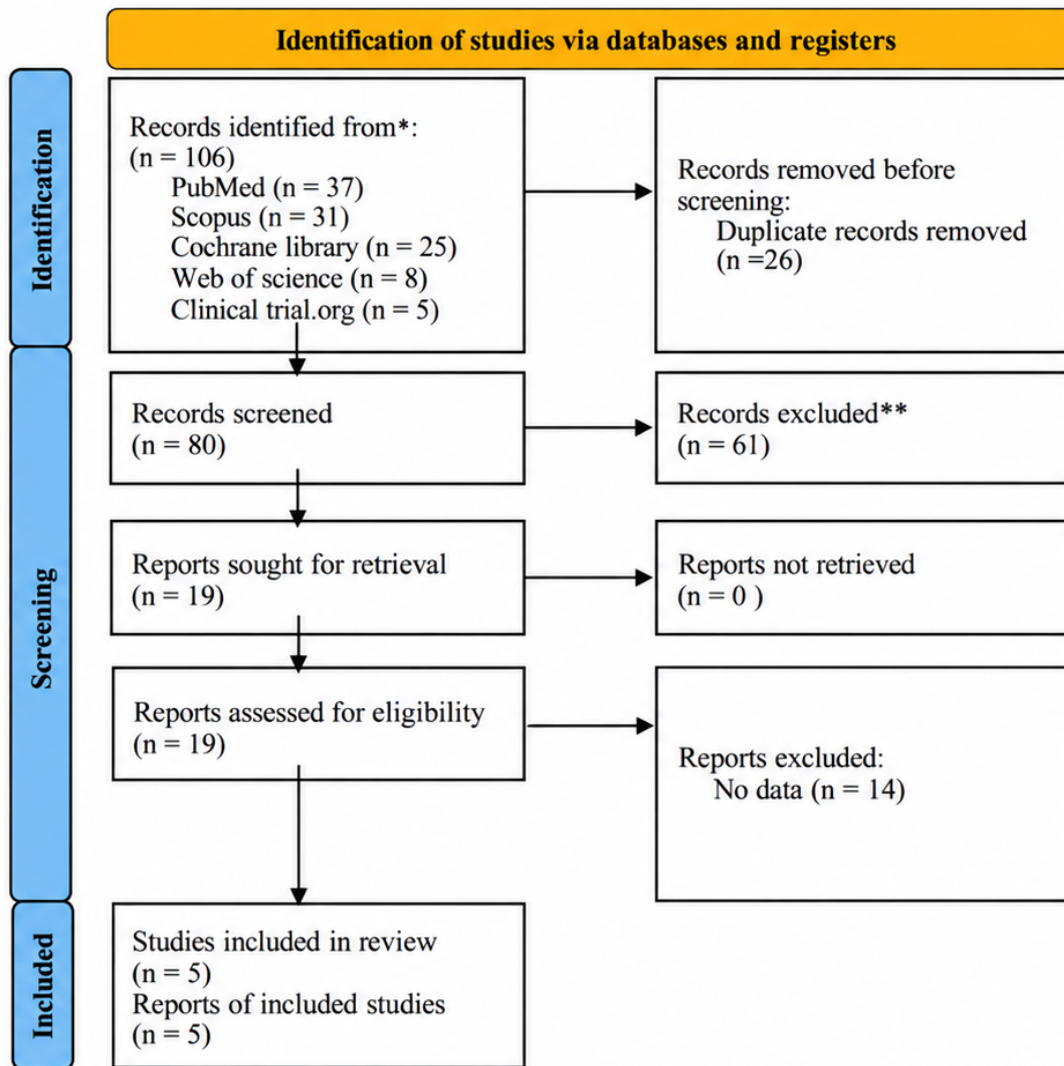
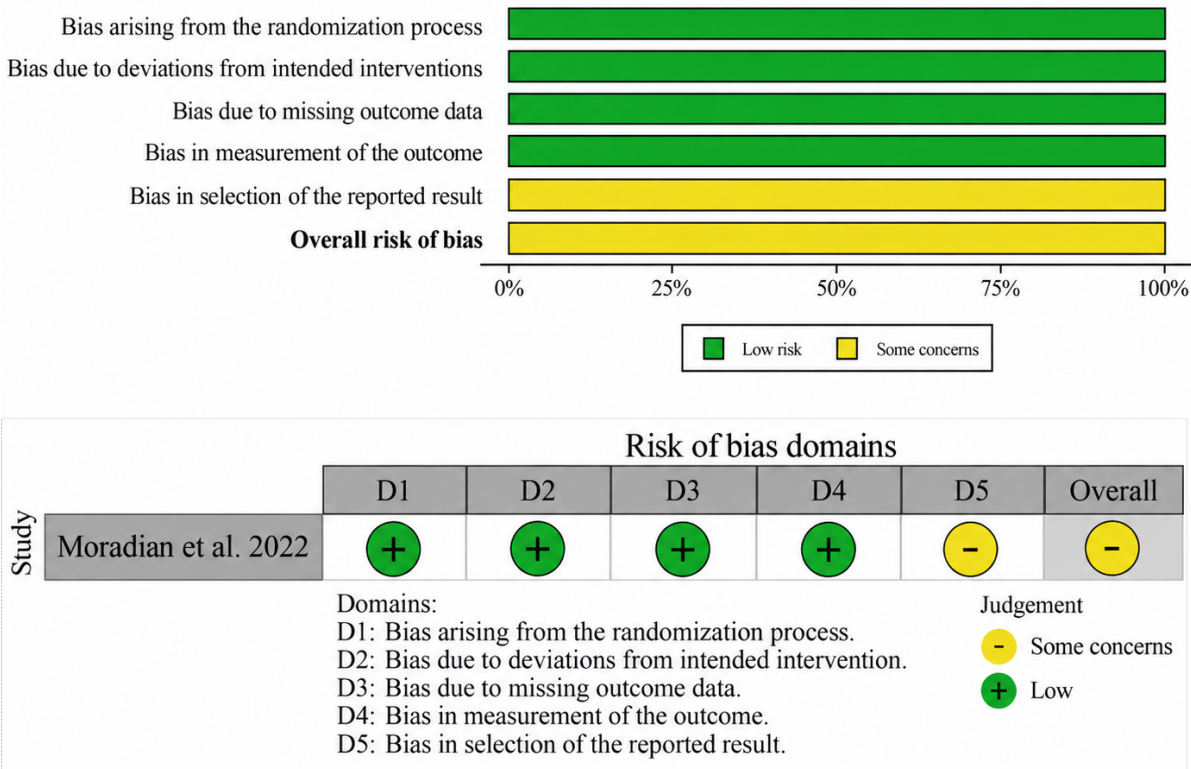


Figure 2. RoB-2



Legend: RoB-2=Risk-of-Bias tool for randomized trials-2.

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