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# Use of intraoperative haemostatic checklists on blood management in patients undergoing cardiac surgery: a scoping review protocol

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## ABSTRACT

**Introduction** A major complication of cardiac surgery is bleeding which can require surgical re-exploration and the transfusion of allogeneic blood products. Re-operative procedures for bleeding have been associated with higher rates of mortality and morbidity, therefore an intervention to reduce this complication would be important. Previous investigation has demonstrated that low-cost solutions, such as the use of an intraoperative haemostatic checklist may result in the reduction of bleeding and subsequent transfusion. The goals of this scoping review aim to assess the efficacy of the use of intraoperative haemostatic checklists on blood management in patients undergoing cardiac surgery. Specifically, the objective is to understand if the use of intraoperative haemostatic checklists has been associated with a reduction in bleeding and blood product utilisation in patients undergoing non-emergent cardiac surgery.

**Methods and analysis** A scoping review of literature identifying randomised control and observational trials, reporting on haemostatic checklists in cardiac surgery, will be undertaken. The proposed review will be guided by the methodological framework proposed by Arksey and O'Malley. A search will be conducted for published and unpublished (grey) literature. Published literature will be searched in the following electronic databases: Scopus, MEDLINE, EMBASE and the Cochrane Library. Relevant grey literature will be identified through conference abstracts. Outcomes chosen are patient centred to ensure reduced bleeding and overall positive experience that reduces complications intraoperatively.

**Ethics and dissemination** This study does not require ethical approval as the data used are from available publications. Our dissemination strategy includes peer-review publication, presentation at conferences and relevant stakeholders.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The final search strategy for this scoping review is rigorously peer reviewed prior to implementation.
⇒ The results of this review will inform the need to focus on future research on the topic as well as provide preliminary recommendations.
⇒ This review is limited to publications in English and may limit all relevant articles from being included in this review.
⇒ Grey literature is limited to only conference abstracts.

## INTRODUCTION

Postoperative bleeding in cardiac surgery is associated with significant morbidity and mortality.[1 2] Surgical re-exploration to address bleeding has been associated with an 11% risk of mortality and significantly increased risk of severe complications such as acute kidney injury, wound infection and stroke.[1 3] While the use of cell-saving devices, haemostatic agents and antifibrinolytics has been assessed, they have variable impact on blood management and involve additional cost. As such, investigation in to lower-cost solutions has been sought. One example is the use of intraoperative checklists, prompting the surgical team to investigate common locations of bleeding prior to chest closure. The first of such checklists was developed in 2011 by Loor and colleagues.[4] Their checklist directed the surgeon to visually inspect surgical sites such as proximal and distal anastomoses, as well as the mediastinum, chest wall and sternum. They demonstrated a significant reduction for surgical re-exploration with implementation of their checklist.

A similar checklist produced in the UK included coagulation indices to prevent coagulopathic bleeding which accounts for a third of all postop bleeding in adult cardiac surgery.[1 5] Adoption of this checklist provided significant reduction in the use of blood products and the length of ICU and hospital stay and provided cost savings per patient.[6] Although the use of haemostatic checklists in cardiac surgery is not a widespread practice, there does exist a body of evidence suggesting that they may provide value for patients. Notably, recent guidelines have

Table 1 Sample search strategy for scoping review

| | Primary search term | | Synonym 1 | | Synonym 2 |
|---|---|---|---|---|---|
| P | Cardiac surgery | OR | Cardiac surgical procedures | OR | Thoracic surgery |
| | AND | | | | |
| I | Hemostatic checklist OR Hemostasis checklist OR Hemostatic techniques/ | OR | Hemostasis OR haemostatic OR hemostatic OR haemostasis | OR | Checklists/ |
| | AND | | | | |
| O | Blood management | OR | Postoperative complications/pc (prevention & control) (subject heading) | OR | Blood* OR bleed* |
| Other limits: none | | | | | |

provided direction on an approach to address perioperative bleeding and coagulopathy, however, there is no reference to the use of checklists.[7]

The purpose of this scoping review is to evaluate the type and extent of evidence on the use of intraoperative checklists for the mitigating postoperative bleeding and subsequent blood product utilisation in patients undergoing cardiac surgery. Inclusion in this review will be limited to papers in English only (non-English papers with a copy translated into English will also be included) that focus on cardiac surgery, defined as a surgical procedure performed in an operating theatre on the human heart and its major blood vessels. Papers from randomised control trials (RCTs) or observational studies will be included. Grey literature will also be considered. Studies focusing on the use of postoperative haemostatic checklists are outside the scope of this review as well as those considering non-cardiac surgeries.

The scoping review represents an appropriate approach to investigating this topic as the type and extent of literature has not yet been reported. Using the definition described by Arksey and O'Malley,[8] a scoping review allows for a broader take on the subject, identifying weak points in the literature and aiding in the development of a more defined research questions suitable for systematic review. The results of this review will inform the need and focus of future research on the topic as well as provide preliminary recommendations.

## METHODS AND ANALYSIS

The proposed scoping review will be conducted in accordance with the Preferred Reporting Items for Systematic reviews and Meta Analyses (PRISMA) extension for scoping reviews (PRISMA-ScR)[9] by following the five-step methodological framework created by Arksey and O'Malley.[8] The planned start sate for this scoping review is July 2022 and a proposed end date by September 2022. Outcomes chosen are patient centred to ensure reduced bleeding and overall positive experience that reduces complications intraoperatively

### Patient and public involvement

The aim of this scoping review will be to map out available literature to promote better outcomes for patients intraoperatively. Although patients were not directly involved in the study design, outcomes chosen are patient centred to ensure reduced bleeding and overall positive experience intraoperatively.

### Identifying the research questions

This review will aim at providing responses to the following questions:

1. What intraoperative haemostatic checklists are being used in cardiac surgery?
2. Does the implementation of an intraoperative haemostatic checklist result in less bleeding, blood product utilisation and re-exploration?
3. What are the challenges in the implementation of intraoperative haemostatic checklists?
4. Is there any data describing the cost-effectiveness of this intervention?

Answering these questions will help to identify the current research gaps that may exist on the use of intraoperative haemostatic checklists. This scoping review will be used to inform key stakeholders on the role intraoperative haemostatic checklist may play in cardiac surgery and improving patient outcomes.

### Identify studies

#### Eligibility criteria

Inclusion criteria: studies to be included must meet the following criteria:

1. Adult patients undergoing cardiac surgery.
2. Haemostatic checklists used intraoperatively.
3. RCTs and observational trials
4. English only
5. All geographical locations
6. No time limit

Exclusion criteria:

1. Studies where the full-text article could not be found.
2. Post-operative haemostatic checklist
3. Non-cardiac surgery

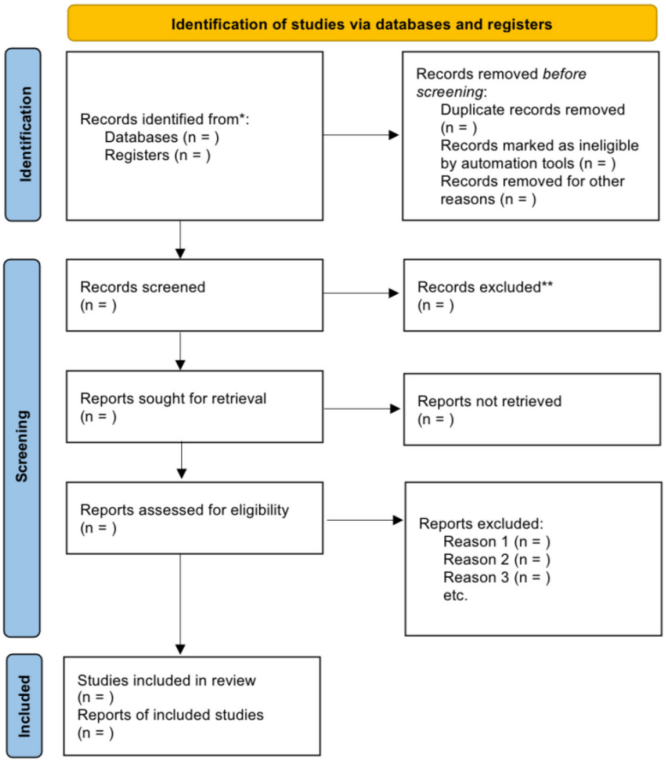


**Figure 1** PRISMA 2020 flow diagram. From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. PRISMA, Preferred Reporting Items for Systematic reviews and Meta Analyses.

## Search strategy

A search will be conducted by the team librarian (BC) using a clearly outlined search strategy within the following electronic databases: Scopus, MEDLINE, EMBASE and the Cochrane Library. Search terms will include a mix of controlled vocabulary (ie, Medical Subject Headings) and keywords, such as 'cardiac surgery', 'haemostatic checklist' and 'bleeding'. The search strategy (table 1) will be piloted to check the appropriateness of keywords and databases. Keywords may be refined on an iterative basis based on the preliminary results from the initial search. The final search strategy will be peer reviewed by another health focused librarian at the team librarian's institution to test for exhaustiveness and published as an appendix in the final paper. An initial limited search was conducted on PubMed in consultancy with a research librarian to create the search strategy (table 1). The reference list from key papers included in the review will be hand searched for any relevant papers which were not included in the initial search. Relevant grey literature will be identified through targeted searches of conference abstracts. Citations of included studies will be organised using EndNote, as well as online copies of the paper for easy access.

## Study selection

Following the search, all identified citations will be collated and uploaded into Endnote where the research team members will have shared access and duplicates on the reference list will be removed. Following a pilot test, titles and abstracts will then be screened, using the screening software Covidence, by two independent reviewers (BEI and AK) for assessment against the inclusion criteria for the review. At this point, the inter-rater agreement will be calculated using a kappa statistic. The result of this, if less than 70%, will require a review of the selection criterion. However, if over 70%, the selection process will move to a full-text retrieval and review stage. Potentially relevant sources will be retrieved in full, and their citation details imported. The full text of selected citations will be assessed in detail against the inclusion criteria by two independent reviewers. Both reviewers will first complete the title/abstract screen independently before comparing differences in the selection process together. Once complete, the two reviewers will come together to finalise a list of included citations. This is typically completed via a consensus process. A third reviewer (RCA) will resolve any disagreements between the two reviewers. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria will be recorded and reported in the scoping review. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion, or with an additional reviewer. The results of the search and the study inclusion process will be reported in full in the final scoping review. A flowchart of the review process will be drawn using the PRISMA-ScR (figure 1).

## Data extraction

Data will be extracted from papers included in the scoping review by the two independent reviewers after deduplicating studies that meet eligibility criteria. A shared excel spreadsheet will be used to retrieve the data from the included studies by both independent reviewers. All information included on the table will be reviewed by team members and any disagreements that occur will be resolved through discussion and where there is no consensus then a third reviewer (RCA) will decide. The data to be retrieved from the paper follow the descriptive analytical method that was highlighted by Arksey and O'Malley (table 2).

**Table 2** Sample data extraction table

| Author, year published, location | Study objective(s) | Study population | Study design | Intervention | Main findings |
|---|---|---|---|---|---|
| – | | | | | |

## Data analysis and presentation

The goal of this scoping review is to map the available research evidence on intraoperative haemostatic checklists in cardiac surgery, therefore there will be no evaluation of the data but instead a summary of the results. The data will be presented in the format of table 2 in alignment with the objective of this review.

## Ethics and dissemination

This review will include data already published, therefore there is no requirement for ethical approval. The scoping review will be disseminated through peer-reviewed journals and appropriate key stakeholders.

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## REFERENCES

1 Biancari F, Kinnunen E-M, Kiviniemi T, *et al*. Meta-analysis of the sources of bleeding after adult cardiac surgery. *J Cardiothorac Vasc Anesth* 2018;32:1618–24.
2 Haneya A, Diez C, Kolat P, *et al*. Re-exploration for bleeding or tamponade after cardiac surgery: impact of timing and indication on outcome. *Thorac Cardiovasc Surg* 2015;63:51–7.
3 Biancari F, Mikkola R, Heikkinen J, *et al*. Estimating the risk of complications related to re-exploration for bleeding after adult cardiac surgery: a systematic review and meta-analysis. *Eur J Cardiothorac Surg* 2012;41:50–5.
4 Loor G, Vivacqua A, Sabik JF, *et al*. Process improvement in cardiac surgery: development and implementation of a reoperation for bleeding checklist. *J Thorac Cardiovasc Surg* 2013;146:1028–32.
5 Ali JM, Gerrard C, Clayton J, *et al*. Reduced re-exploration and blood product transfusion after the introduction of the Papworth haemostasis checklist†. *Eur J Cardiothorac Surg* 2019;55:729–36.
6 Ali JM, Gerrard C, Clayton J, *et al*. Hemostasis checklist reduces bleeding and blood product consumption after cardiac surgery. *Ann Thorac Surg* 2021;111:1570–7.
7 Raphael J, Mazer CD, Subramani S, *et al*. Society of cardiovascular Anesthesiologists clinical practice improvement Advisory for management of perioperative bleeding and hemostasis in cardiac surgery patients. *J Cardiothorac Vasc Anesth* 2019;33:2887–99.
8 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
9 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.