Understanding Movement Strategies in Adults Post Sternotomy: A Scoping Review Protocol

Author Information:

Karen Wiens¹; K. Alix Hayden²; Kathryn M. King-Shier^{1,3}

¹ Faculty of Nursing, University of Calgary, 2500 University Drive NW, Calgary, AB T2N 1N4, Canada

² Libraries and Cultural Resources, University of Calgary, Calgary, AB, Canada
³ Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

PCC mnemonic

Population: Adult patients (18 years of age or older) with open/median/hemi sternotomy *Concept*: Movement strategies for patients resuming activity post sternotomy *Context*: Safe return to activity postoperatively within the first 12 weeks

Scoping review question

What is the available evidence for movement strategies in adults following sternotomy?

Introduction

An open sternotomy approach is most frequently used in cardiac surgery; recovery post sternotomy can be complex and restrictive to patient's activity. Identifying safe movement strategies for individuals post sternotomy is essential to promote independence and a return to daily activities without having negative impacts on recovery. Open-heart surgery, via median sternotomy, remains a common practice with over a million cases worldwide annually (Virani et al., 2021). Open heart surgery refers to a sternotomy approach where the sternum is vertically cut, allowing full access to the thoracic cavity to operate on the heart. Since the 1960s, median sternotomy has been the technique of choice to perform coronary artery bypass graft (CABG) surgery to treat coronary heart disease (Cahalin et al., 2011) as well as a variety of valve repair/replacement surgeries and congenital heart defects repair surgeries (Virani et al., 2021). At the time of closure, sternal wiring is performed to ensure approximation of the bone to initiate the healing process. Sternal healing is vital for recovery, as "consequences of sternal complication can be grave with a 15 to 40% mortality rate" (Adams et al., 2016, p. 97). Patient recovery post sternotomy is thus focused on returning to normal daily activities safely while the sternum is healing. Currently, many centers focus on using traditional sternal precautions to limit tension on the sternum and enhance healing. However, approaches other than using sternal precautions could facilitate safe recovery, and promote the patient's optimal function (Cahalin et al., 2011).

The basis for sternal precautions, which often include restrictions to activity and load (e.g., not using arms to bare weight), is to aid in the healing process post sternotomy (Cahalin et al., 2011). The instructions for sternal precautions limits activity for a set amount of time (often 6-12 weeks post operatively) to allow sternal healing. Sternal precautions are activities that restrict patients from lifting, pushing, or pulling weights of greater than 5-20 pounds, driving, or using their arms to assist with sitting or rising (Adams et. al., 2016). Yet, traditional sternal precautions may have

a wide variance in their enactment, "including arbitrary load and time restrictions" (Adams et al., 2016, p. 97), and often have "no consistency in the type or duration of restriction" (Cahalin et al., 2011, p. 5). The standardized practice of using sternal precautions may be too restrictive, pose a risk of muscle atrophy due to limited movement, and is vague in definition (Cahalin et al., 2011; Gach et al., 2021; Katijjahbe et al., 2018). Many authors agree that sternal restrictions are not evidence-based, suggesting they are likely supported by expert opinion (Cahalin et al., 2011; Katijjahbe et al., 2020).

Reviewing the literature has highlighted variation and fundamental differences in sternal precautions and suggests that patient mobility and independence are impeded (Adams et al., 2016; Cahalin et al., 2011; Gach et al., 2021). Furthermore, it validates the need to examine the evidence for movement practice strategies used in practice and compare it with new movement approaches. Fear of movement, or kinesiophobia, is a common phenomenon experienced postoperatively by cardiac surgical patients and can impose an additional perceived restriction on patients themselves; the literature suggests that new movement strategies can instill a positive impact and lessen this fear (Katijjahbe et al., 2018). Also, a recent study by Gach et al. (2021) found novel movement strategies were safe, promoted an increase in patients' autonomy and independence to activity, and led to more patients being discharged home versus discharged to a rehabilitation facility; this is both beneficial to patients and the health care system. Additionally, the independence that patients experience may also free up physiotherapy and nursing resources within acute care, potentially easing the cost burden further (Gach et al., 2021).

The practice of using sternal precautions for a movement strategy post sternotomy has been used for decades. It is essential to evaluate the evidence to promote the best approach for patient outcomes. Novel patient-centered methods for movement post sternotomy exist and are published; conducting a scoping review is appropriate to evaluate, map, and synthesize the overall evidence to guide healthcare professionals in best practice.

This scoping review protocol has been informed by the Joanna Briggs Institute (JBI); the relevant literature will be identified and mapped in this scoping review.

Inclusion criteria

Participants:

Articles focusing on adult patients (18 years of age or older) with open/median/hemi sternotomy will be included. Studies that focus on minimally invasive surgical approach that do not use a sternotomy approach will be excluded. Articles focusing on pediatric population will also be excluded.

Concept:

The general concept of interest is gaining an understanding of upper body movement strategies prescribed for patients, as an intervention, to resume activity post sternotomy. Articles that focus on lower body movement, walking, or rehabilitation will be excluded as these movements do not exert stress on the healing sternum.

Context:

Safe return to activity postoperatively within the first 12 weeks will be the focus of this review. Articles exploring return to activity after this timeframe will be excluded.

Types of evidence sources

Inclusion: Articles published in English Peer reviewed studies Any study design (e.g., experimental, non-experimental, or qualitative) Systematic Reviews, any evidence synthesis review, descriptive, and narrative review that meet the inclusion criteria will be considered Case reports

Exclusion: Non-English publications Books or book chapters Grey literature Dissertations Conference abstracts Editorials Opinion Study Protocol Popular Literature Social Media Literature

Search strategy

Initially a pre-scan of the literature will be performed to determine searchable concepts, identify terminology and language, and locate seed or known articles; applicable concepts of sternotomy and movement strategies during the first 12 weeks postoperatively will be searched. Then keywords will be identified to search in the abstract, title or subject headings in one database (MEDLINE). OVID databases to be searched include: Medline Epub Ahead of print, In-Progress & Other Non-Indexed Citations and Daily, and Embase. Additionally, we will also search PEDro (physiotherapy evidence database) and EBSCO databases: CINAHL Plus with full text Academic Search Complete and SportDiscus with full text. Scopus, as well as the Cochrane Central Register of Controlled Trials and the Cochrane Database of Systematic Reviews via the Cochrane Library will also be searched. The literature search will be led by the University of Calgary librarian Dr. Alix Hayden and all database search strategies will be included in the final manuscript as supplementary material; the Medline search strategy is outline in the Appendix A. This protocol will be archived through open-access deposition in the University of Calgary's Digital Repository PRISM. Amendments to the protocol will be reported in the scoping review manuscript.

Sources of evidence selection

COVIDENCE software will be used for the management of the search results. Database results will be uploaded to Covidence, and the results will be automatically deduplicated. Titles and abstracts of records will be reviewed first. An exercise to examine consistency between

reviewers (KW, KKS) will be undertaken first by examining 50 records to verify consensus of inclusion and exclusion specifications; inter-rater reliability will be examined. Any discordance will be rectified through team consensus building. A similar process will be used with full text articles. A 90% agreement amongst screeners before proceeding with study selection will ensure clarity and consistent interpretation of the inclusion and exclusion criteria. PRISMA-flowchart will be used to document process and reasons for exclusion.

Data extraction

One reviewer will extract data from the included studies, which will be verified by a second reviewer. Data extraction will be presented descriptively and, in an investigator-formatted table (informed by the TIDieR checklist), outlining the key findings relevant to the concepts of movement post sternotomy. The table will include author, year, study origin, study aim, study design, participants, sample size, attrition, fidelity, upper body movement strategy details, data collection, and key findings. The draft data extraction template will be piloted with five diverse studies and revised as required, modifications will be detailed in the full scoping review. Any disagreements that arise between the reviewers will be resolved through discussion. A draft data extraction table is provided in Appendix B.

Data analysis and presentation

The analysis will be focused on reporting the findings of the evidence available for movement strategies in adults following a sternotomy. The evidence will be presented in a narrative summary and tabular form. The specific upper body movement strategy will be defined to gain an understanding of the movement presented in the articles. A narrative summary will accompany the tabulated results and will describe how the results relate to the review's objectives and questions The data synthesis will be completed by collating, summarizing, and mapping the literature

Scoping review and summary of evidence

The scoping review will be reported as per the PRISMA-ScR reporting guidelines. The publication of the scoping review manuscript will be submitted to an interdisciplinary journal.

Reference

- Adams, J., Lotshaw, A., Exum, E., Campbell, M., Spranger, C. B., Beveridge, J., Baker, S., Mccray, S., Bilbrey, T., Shock, T., Lawrence, A., Hamman, B. L., & Schussler, J. M. (2016). An alternative approach to prescribing sternal precautions after median sternotomy, "Keep Your Move in the Tube." *Proceedings - Baylor University Medical Center*, 29(1), 97–100. https://doi.org/10.1080/08998280.2016.11929379
- Cahalin L. P., Lapier, T. K., & Shaw, D. K. (2011). Sternal precautions: Is it time for change? Precautions versus restrictions - A review of literature and recommendations for revision. *Cardiopulmonary Physical Therapy Journal*, 22(1), 5–15. https://doi.org/10.1097/01823246-201122010-00002
- Gach, R., Triano, S., Ogola, G. O., da Graca, B., Shannon, J., El-Ansary, D., Bilbrey, T., Cortelli, M., & Adams, J. (2021). "Keep Your Move in the Tube" safely increases discharge home following cardiac surgery. *Physical Medicine and Rehabilitation*, 13(12), 1321–1330. https://doi.org/10.1002/pmrj.12562
- Katijjahbe, M. A., Granger, C. L., Denehy, L., Royse, A., Royse, C., Bates, R., Logie, S., Nur Ayub, M. A., Clarke, S., & El-Ansary, D. (2018). Standard restrictive sternal precautions and modified sternal precautions had similar effects in people after cardiac surgery via median sternotomy ('SMART' Trial): A randomised trial. *Journal of Physiotherapy*, 64(2), 97–106. https://doi.org/10.1016/j.jphys.2018.02.013 https://doi.org/10.1186/s12874-018-0611-x
- Park, L., Coltman, C., Agren, H., Colwell, S., & King-Shier, K. M. (2020). "In the tube" following sternotomy: A quasi-experimental study. *European Journal of Cardiovascular Nursing: Journal of the Working Group on Cardiovascular Nursing of the European Society of Cardiology*, 20(2), 160–166. https://doi.org/10.1177/1474515120951981
- Peters, M. D. J., Godfrey, C. M., McInerney, P., Munn, Z., Tricco, A.C., & Khalil, H. (2020). Chapter 11: Scoping Reviews. In *JBI Manual for Evidence Synthesis*, JBI 2020. Aromataris, E., Munn, Z., Eds. https://synthesismanual.jbi.global
- Virani, S. S., Alonso, A., Aparicio, H. J., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., Chamberlain, A. M., Cheng, S., Delling, F. N., Elkind, M. S. V., Evenson, K. R., Ferguson, J. F., Gupta, D. K., Khan, S. S., Kissela, B. M., Knutson, K. L., Lee, C. D., Lewis, T. T., ... Tsao, C. W. (2021). Heart disease and stroke statistics - 2021 update: A report from the American Heart Association. *Circulation (New York, N.Y.)*, 143(8), e254–e743. https://doi.org/10.1161/CIR.000000000000950

Appendix A

Medline Search Strategy

Database(s): Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily 1946 to October 14, 2022

#	Searches	Results	Comments
1	Cardiac Surgical Procedures/	59208	Subject heading indicated with /
2	Sternotomy/	2960	
3	Thoracic Surgery/	13513	
4	Coronary Artery Bypass/	52154	
5	Thoracic Surgical Procedures/	7326	
6	(sternotom* or poststernotom*).tw,kf.	11240	Keywords in title, abstract and author
7	(coronary artery bypass graft* or CABG).tw,kf.	40991	supplied keywords .tw,kf.
8	((cardiac or thoracic or cardiothoracic or cardio-thoracic or valve) adj2 surger*).tw,kf.	77582	ADJX = proximity searching; words must appear, in either order, within X number of works of each other
9	or/1-8	186458	Subject headings and keywords combined
10	physical therapy modalities/ or exercise movement techniques/ or exercise therapy/	85365	
11	Resistance Training/	11619	
12	((modified or restrict* or adapt*) adj3 (precaution* or exercis* or approach* or movement* or mobility or activit*)).tw,kf.	45677	
13	(sternal adj2 precaution*).tw,kf.	26	
14	((exercise* or resistance) adj2 train*).tw,kf.	34792	
15	(upper adj3 (limb* or body or extremit*) adj3 (resistance or train* or exercis* or movement* or precaution* or mobility or restrict*)).tw,kf.	4947	
16	((activit* or exercis*) adj3 (protocol* or prescription*)).tw,kf.	10666	
17	(early adj3 (exercis* or movement* or activt* or mobility or resistance or train*)).tw,kf.	9820	
18	"move in the tube".tw,kf.	5	
19	or/10-18	179983	
20	9 and 19	1214	Both concepts combined

Appendix B

Draft Data Extraction Table

First author/year/study origin	Aim/ purpose	Study Design	Participants/ sample size/ attrition/fidelity	Upper body movement strategy	Data Collection	Key Findings