A Paradigm Shift in Sternal Precautions and Postoperative Care after Cardiac Surgery: Are We There Yet?

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Cardiac surgery via median sternotomy is the most common surgical incision performed globally for coronary revascularisation and valve surgery. It is estimated that over 1 million cardiac surgeries are performed globally (Vervoort et al., 2021), with approximately 2,500 cardiac surgeries performed in New Zealand public hospitals each year (New Zealand Cardiac Surgery Clinical Network, 2018). Cardiac surgery requires an incision that divides the sternum to access the heart. While the sternum is closed using plates or wires, significant complications such as infection, instability, and dehiscence can occur, which can treble the cost of care. Sternal wound complications have been reported to occur in approximately 1–8% of patients (El-Ansary et al., 2019), and may result in delayed recovery, hospital readmission, and increased risk of short- and long-term mortality (Filsoufi et al., 2009; Gaudino et al., 2021).

Historically, health professionals have encouraged patients to avoid upper limb movements, such as heavy lifting or pushing through the arms, based on cadaver and sternal replica studies that cautioned upper limb activity to avoid sternal complications (El-Ansary et al., 2019). Indeed, major restrictions that limit lifting to specific loads (anywhere between 2 kg and 10 kg) for a set time (up to 12 weeks) have traditionally been commonplace in clinical practice (Balachandran et al., 2014; Westerdahl & Moller, 2010). However, there is a lack of in vivo evidence linking loaded arm activities with sternal complications (Cahalin et al., 2011; El-Ansary et al., 2019). In addition, the recommended load restrictions are often less than the force required for many activities performed routinely and safely following cardiac surgery, such as opening a door (Adams et al., 2016). A further challenge to traditional load and time restrictions is robust evidence regarding the safety of early upper limb and trunk tasks, and early upper limb resistance training post-median sternotomy (Balachandran et al., 2019; Pengelly et al., 2022). As such, there seems to be no rationale for maintaining an outmoded restrictive approach to post operative care that delays functional recovery and daily activities.

Consequently, over the past 15 years there has been growing evidence to support a less restrictive approach based on biomechanical principles that reduce sternal loading, such as performing loaded arm activities bilaterally, with the arms close to the body and using pain to guide how much can be lifted, pushed, or pulled. With this approach, there is no specific weight limitation as long as the activity remains pain-free (Adams et al., 2016; Katijjahbe et al., 2018). The most well-known of these less restrictive biomechanical-based approaches is called "Keep Your Move in the Tube" (KYMITT) (Adams et al., 2016), with evidence demonstrating this approach is safe, does not increase the incidence of sternal complications, and leads to better early post-operative functional outcomes and greater patient confidence (Brown et al., 2021; Gach et al., 2021).

However, while a paradigm shift toward less restrictive sternal precaution approaches has occurred in the literature, has the same paradigm shift fully taken place in clinical practice? We would suggest not. In a 2019 survey of post-cardiac surgery physical activity advice provided upon hospital discharge in New Zealand, approximately half the hospital services that participated told patients about KYMITT. However, all these hospital services also told patients to limit lifting to a certain weight alongside the KYMITT advice (Gray et al., 2022). Thus, the intended messaging of KYMITT of using pain to guide how much can be lifted (rather than imposing a specific weight restriction) may not have been adopted by these services. Indeed, combining traditional load restrictions with the KYMITT approach (that is, keep your arms close to the body when lifting) likely places more restrictions on arm activity rather than less. In addition, encouraging the safe performance of upper limb activities and tasks facilitates active participation of patients in their recovery journey. It also ensures health professionals and carers can signpost recovery and postoperative care in a consistent and clear manner, avoiding confusion regarding permitted activities. A recently published scoping review of online information about returning to activity post cardiac events provides a more global indication of what is happening regarding sternal precaution implementation. This review found that out of the 17 included websites that provided advice about activity after cardiac surgery, only one website (from Australia) provided advice based on KYMITT principles, with the remaining 16 websites promoting traditional load- and time-based sternal precaution advice (Bennett et al., 2024). These findings suggest that evidence has not yet been widely translated into clinical practice, not just in New Zealand, but globally as well.

So, if a paradigm shift in clinical practice regarding sternal precautions has not completely occurred, the question is why not? We are currently undertaking a study exploring New Zealand health professionals' knowledge and confidence of sternal precautions before and after watching an online

educational video about KYMITT. One of the survey questions asks about perceived barriers to implementing KYMITT in clinical practice. Data collection is ongoing, but despite participants unanimously agreeing with the evidence and seeing the value in implementing KYMITT, the most common perceived barriers to implementation are that sternal precaution advice is dictated by the surgeons, and perceived difficulty in changing historical practices and mindsets within the wider team (unpublished data). If lack of awareness of the evidence regarding sternal precautions is a reason for surgeons aligning with historical advice, then a starting point for physiotherapists and other health professionals who would like to encourage a change in practice may be to take the lead by engaging in discussions and creating opportunities to present the current evidence around sternal precautions to the rest of the multi-disciplinary team.

Another potential reason for the lack of a paradigm shift in clinical practice could be that some clinicians may yet to be fully convinced by the evidence available. A recent scoping review identified 12 articles exploring the implementation of less restrictive sternal precautions such as KYMITT. The main conclusion from this review was that the available evidence suggests that such movement strategies are safe and allow patients greater engagement in activities that promote improved functional recovery and confidence. However, the authors also noted that most of the evidence was from lower levels of the evidence hierarchy, such as descriptive or retrospective cohort studies and identified only two quasi-experimental studies and one randomised controlled trial (Wiens et al., 2024). Further, while key arguments against traditional load and time sternal precautions include unnecessarily impeding engagement in activity and engendering fear of movement, to the authors' knowledge only one study has compared the effect of less restrictive precautions on kinesiophobia (and found no difference) (Katijjahbe et al., 2018) and no study has yet to explore differences in physical activity levels between traditional and less restrictive approaches. Thus, there is a need for further robust research to continue building the evidence base for this paradigm shift.

So, are we there yet? It appears that while we have travelled a considerable distance, we are yet to arrive at the final destination of having less restrictive sternal precautions embedded fully into clinical practice. The challenge for physiotherapists is to facilitate and implement knowledge translation by taking the lead to make the wider multidisciplinary team aware of the evidence to ensure clinical guidelines for sternal precautions are well founded rather than persisting with historical practices. It is now time to translate evidence into practice through the implementation of models of care that encourage patients to participate in their recovery and commence early moderate intensity exercise inclusive of the upper limb.

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