An alternative approach to prescribing sternal precautions after median sternotomy, “Keep Your Move in the Tube”

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2. We measured the force required for common load-bearing activities, such as pulling out a full dishwasher rack (5 pounds), removing a gallon of milk from a refrigerator (10 pounds), and pushing a glass door to exit the hospital (22 pounds).

3. We found that the force across the sternum during a cough (regularly tolerated by sternotomy patients) was 60 pounds, or greater than the force exerted while lifting two 20-lb weights simultaneously.

4. We compared the force across the sternum during a sneeze with the force exerted during a bench press exercise and found that a sneeze exerted a force of 90 pounds and was not significantly different than the force exerted while lifting 70% of one-repetition maximum.

Because sternotomy patients commonly endure coughing and sneezing without incident during recovery, these research findings may seem to imply that lifting loads in the range of 60 to 90 pounds is safe. This is definitely not the case, as sternal wound dehiscence from intense coughing has been reported (22), and sneezing may also pose a risk (1). This knowledge, coupled with the fact that sternal complications have been linked to risk factors such as obesity, diabetes mellitus, and smoking (23), led us to realize that our research efforts to determine a single ideal load restriction were futile. As a result, our team pursued an alternative approach to sternal precautions.

INTRODUCING KEEP YOUR MOVE IN THE TUBE

We moved away from load and time restrictions and instead used standard kinesiological principles to develop this new approach. Because Keep Your Move in the Tube is based on the ergonomics that shorten the length of the outstretched arm (lever arm reduction), it enables patients to perform previously contraindicated movements.

The first step in applying this approach is to explain to patients in layman’s terms what happened to their sternum during surgery, using an illustration of the attachments of the pectoralis major on the sternum, the humerus, and the clavicle (Figure 1).

![Figure 1. Illustration used to teach patients about their sternotomy, the attachments of the pectoralis major, and the imaginary truncal tube that is the basis of the Keep Your Move in the Tube approach.](image)

This brief anatomy lesson provides the foundation for understanding the concept behind the Keep Your Move in the Tube graphic (Figure 2). By keeping their upper arms close to their body, as if they were inside an imaginary truncal tube, patients can modify load-bearing movements and thus avoid excessive stress to the sternum. More specifically, limiting the movement of the humerus minimizes the lateral pull on the sternum and decreases the leverage of the hand and forearm during load-bearing actions such as rolling a wheelchair, opening a heavy door, or lifting a toolbox. The graphic’s simple drawings show movements that are “in the tube” (green) versus “out of the tube” (red). These color-coded differences are easy to comprehend, and the overall format overcomes barriers related to language preference and reading ability.

In addition to information on basic movement patterns, sternotomy patients need instruction on basic mobility skills. Immediately after surgery, they often find it painful to sit up from a supine position or to stand up from a chair. The left side of the Keep Your Move in the Tube graphic contains visual tips for staying “in the tube” while performing commonly recommended techniques for getting out of bed, such as side-lying and placing one or both hands in front of the body, leaning forward, and pushing up to a sitting position (11); log rolling (24); and/or the elbow method (log rolling and counterweighting) (1). However, for non-load-bearing activities such as personal hygiene, patients are allowed to reach “out of the tube” (above the head, out to the side, or behind the back).

With traditional sternal precautions, patients in the hospital are advised not to use their arms to push up during bed mobility and transfers. As a consequence, they often require assistance from the nursing staff, the therapy team, or family members to complete these movements. Toward the end of the hospital stay, the therapy team’s assessment of mobility status is a major determinant of whether a patient needs rehabilitative care after being discharged. Instead of going home with a physician referral for outpatient cardiac rehabilitation, patients who have no available friends or family to help with mobility may be sent to an inpatient rehabilitation facility. Keep Your Move in the Tube, by contrast, enables patients to use their arms and thus perform bed mobility and transfers more efficiently, which may increase the likelihood that they will be discharged to their home.

Because individual patient healing time can be affected by factors such as age, underlying medical conditions, nutritional status, medications, and use of tobacco, our educational approach does not impose time limits during which loads are restricted. We allow patients to resume their normal load-bearing activities at their own pace, within pain-free limits, as long as they stay “in the tube.” With an emphasis on partnership and creative problem solving, we also suggest ways that family members can help the patient during recovery without being overprotective or overly controlling (e.g., using the correct “in the tube” movements, the patient can mow the grass, but only after a family member pulls the cord to start the mower’s engine).
IMPLEMENTATION

Several essential elements have emerged during the implementation of *Keep Your Move in the Tube*. First, the approval of cardiologists and cardiothoracic surgeons has been crucial, along with acceptance by nursing staff members. Furthermore, the ongoing process of including nurses from the intensive care unit is necessary to ensure that patients receive consistent educational advice throughout their hospital stay. Finally, our success to date can be attributed to a positive collaboration between physical therapists, occupational therapists, and cardiac rehabilitation specialists.

At this writing, *Keep Your Move in the Tube* is being used at four facilities in Texas. Three are within Baylor Scott & White Health: Baylor Institute for Rehabilitation, where it has replaced traditional sternal precautions in physician order sets; Baylor Heart and Vascular Hospital, where it is included in presurgical educational materials; and Baylor University Medical Center at Dallas, where it has been added to the therapy team’s mobility criteria. The fourth is Seton Medical Center Austin, where it is used in phase I cardiac rehabilitation. As a multidisciplinary team, we are united in the belief that *Keep Your Move in the Tube* encourages active living after sternotomy and thus offers a useful alternative to traditional sternal precautions.

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