

# Management of sterna precautions following mediansternotomy by physiotherapists in Mumbai metropolitan region(MMR): A web-based survey.

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## Abstract

**Background:** The median sternotomy, also known as a midline sternotomy, is the most common incision made during cardiac surgery because it provides simple access to the heart and the blood vessels that surround it. Sternal precautions prevent the breastbone from separating as it heals, which can prolong the healing process. They also avoid undue strain on the sternum. Dehiscence, infection, instability/non-union, and mediastinitis are sternal consequences. Recent literature questions sternal precautions following median sternotomy, arguing existing regimens are too tight and hinder recovery and quality of life. Few studies have examined physical therapists' sternal precautions when treating median sternotomy patients.

**Materials and methods:** Questionnaire were sent to fifty four (54) rehabilitation centers. However only fifty (50) responded. We found majority 96% of therapists use wound support during median sternotomy.

**Results:**40% of therapists said wound support stops after the sternum is stabilized. 56% of therapists said the lifting height was 90 degrees shoulder flexion. Current practice must be documented and assessed to promote more research, improve patient care, and develop evidence-based clinical standards.

**Conclusion:** This study proves variation in median sternotomy treatment regimens.

**Key words used:** Sternotomy, standard restrictions, modified restrictions, daily activities.

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## I. Introduction

In the treatment of heart illness, cardiac surgery such as coronary artery bypass grafting (CABG) and valve replacement is routinely utilized.<sup>(1)</sup> The median sternotomy, also known as a midline sternotomy, is the most common incision performed during cardiac surgery. This is chosen option because it allows for easy access to the heart and accompanying blood arteries.<sup>(4,5)</sup> Over a million cases of cardiac surgery using median sternotomy are performed each year around the world.<sup>(2,3)</sup>

Sternal precautions are adjustments that need to be considered to prevent the separation of the breastbone as it heals. Separation of the sternum may slow the healing process of the bone, and sternal precautions also help to prevent excessive load on the sternum. Dehiscence, wound infection, sternal instability/non-union, and mediastinitis are examples of sternal problems.<sup>(6)</sup>

To prevent sternal complications, routine sternal precautions that restrict the use of the upper limbs and trunk are implemented immediately following surgery. These precautions are utilized globally, albeit for varying post-operative durations (4 weeks to 3 months).<sup>(6,7,8)</sup> Patients who have undergone cardiac surgery involving a median sternotomy are routinely asked to follow sternal precautions post-operatively that are not standardized, with significant variation in the type and duration for which they are recommended.<sup>(6)</sup>

Institutions have developed protocols and policies regarding the sternal precautions physical therapists must take when treating patients who have undergone median sternotomy.<sup>(9-11)</sup> Other sternal precautions include restrictions on movement and sternal loading, which are frequently imposed on patients, including limiting upper-limb movements to bilateral movements only and limiting weight bearing through the upper limbs.<sup>(9-12)</sup> Despite the widespread use of postoperative restrictions, it is unknown how upper-limb movement and loading will affect the healing sternum. As a result, current precautions are only based on theoretical justifications.<sup>(11-14)</sup>

Recent literature has questioned sternal precautions after median sternotomy, claiming that current regimens are unduly restrictive and obstruct patients' recovery and postoperative quality of life.<sup>(12,13,15,16)</sup> There is

limited research investigating the sternal precautions used by physical therapists in their treatment of patients who have undergone median sternotomy, and no clinical guidelines in this area have been published.<sup>(13,15,16)</sup> To encourage additional research, improve patient care, and lay the groundwork for the development of evidence-based clinical standards, current practice must be documented and assessed.<sup>(17)</sup> This study will aid us in finding variations in the treatment protocols of patients who have undergone median sternotomy.

Current practice must be documented and assessed to promote more research, improve patient care, and develop evidence-based clinical standards. This study will help us uncover differences in median sternotomy treatment regimens. This study will help in creating awareness regarding sternal precautions and their standard practices while treating patients who have undergone median sternotomy. It will also help in investigating, whether the limitations and safety measures followed are uniform and whether the protocol used has some rationale.

This study aimed to investigate and document current sternal care practices that are being practiced by physiotherapists in treating patients who have undergone median sternotomy in the Mumbai metropolitan region (MMR). The Mumbai Metropolitan Region (MMR) spread over 6,328 sq. km. consists of nine Municipal Corporation and nine municipal councils along with more than 1,000 villages. The objectives of this study were to investigate and document the use of wound support, restrictions to upper extremity movements, transfer restrictions, and mobility aid restrictions, as a part of sternal precautions by physiotherapists in the treatment of patients following median sternotomy in hospitals coming in the MMR region. To find out perceptions amongst physiotherapists about sternal precautions and related protocol was also one of the study objectives.

## **II. Methodology**

The design of the study was survey based. An online Questionnaire. We included Physiotherapists in the MMR region. We chose convenience sampling, the size was calculated to be 54 respondents. The study duration was six months. We included criteria for physiotherapists who treat patients following median sternotomy. While, we excluded physiotherapists who were unaware of the protocol, following cardiac surgery and those who are not involved in cardiac rehabilitation.

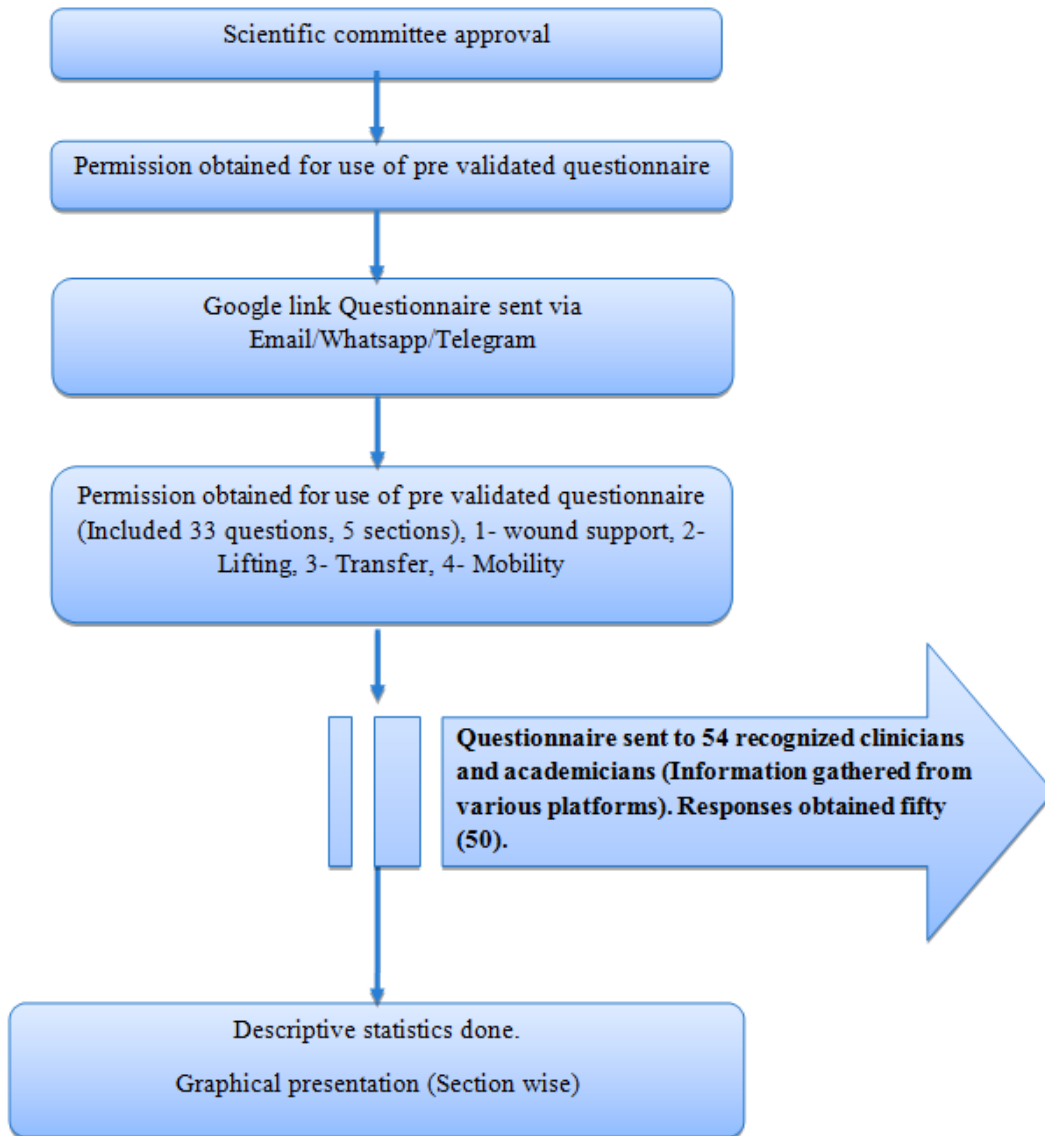
## **III. Procedure**

The topic was selected and discussed with the ethical committee, and their approval was taken. (Figure 1) This study was carried out as a final year internship project. The web-based survey was created using an online Google form application, which included 33 questions, and the validation of the questionnaire was done. All the senior faculty members and subject experts contributed to the process.

On their social media accounts (email and Whatsapp), the link was sent to the groups of people who met the criteria. The web-based survey questionnaire consisted of questions pertaining to the consent form, demographic data, and other validated questions. The web-based survey questionnaire consisted of four sections, respectively. The Web-based survey questionnaire consisted of thirty six questions in four sections. The first four sections were related to domains of practice (wound support, lifting, transfer, and mobility aid restrictions). The first section talked about the wound care support and consisted of five sub questions, followed by restrictions to upper extremity movements, which consisted of ten sub questions. Bed mobility and transfer restrictions included six sub questions, and lastly, mobility aid restrictions included six sub questions. Respondent demographics, factors impacting practice, and a final open-ended section where respondents could submit any more information were the remaining sections. The majority of the questions were closed categorised, with a few open-ended questions requesting written solutions.

The participants were explained the purpose and procedure of the study.

Data was collected through a Google form and descriptive statistical analysis was done.



*Fig 1: Flowchart showing steps followed during execution of study*

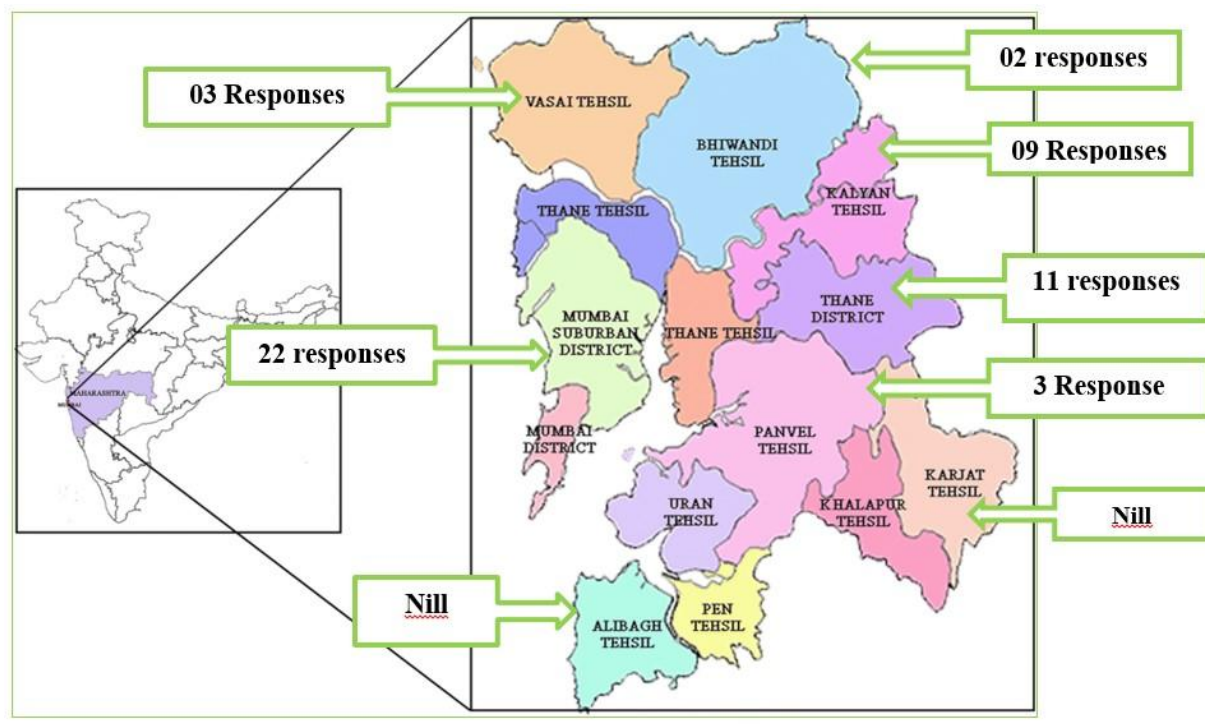
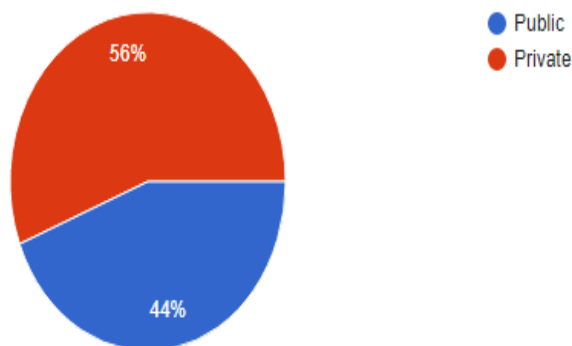


Figure 2: Region wise distribution of responses obtained

#### IV. DATA PRESENTATION & ANALYSIS

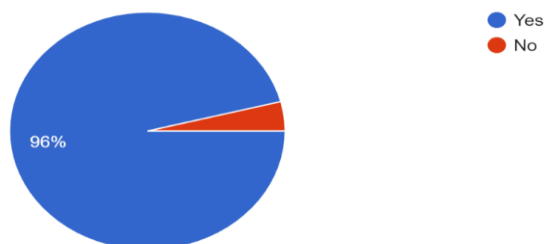
##### Types of Cardiac rehabilitation centers



**INFERENCE:** More than half of the respondents were from public sector.

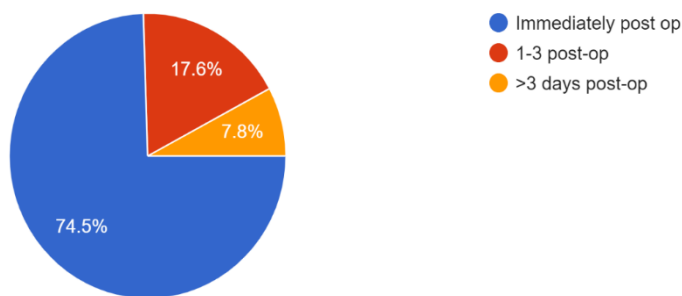
##### Wound Support

##### USE OF WOUND SUPPORT



**INFERENCE:** Wound support was used by almost all the physiotherapists (96%).

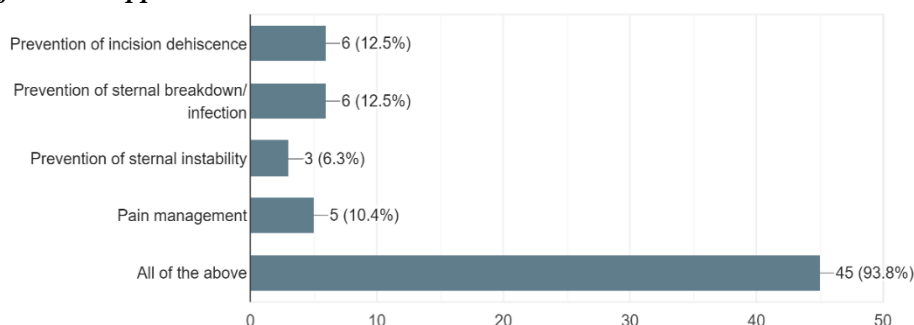
**COMMENCEMENT OF WOUND SUPPORT**



Sr No	Commencement of wound support	Percentage%
1	Immediately post-op	74.50%
2	1-3 days post-op	17.60%
3	>3 days post-op	7.80%

**INFERENCE:** Most of the therapists reported that wound support commenced immediately post-surgery (74.5%).

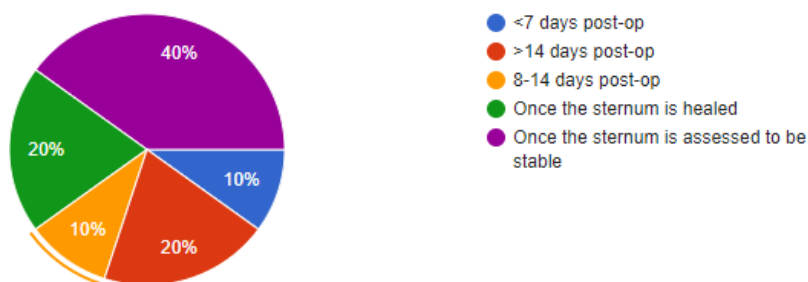
**Purpose of wound support**



Sr No	Purpose of wound support	Percentage%
1	Prevention of incision dehiscence	12.50%
2	Prevention of sternal instability	6.30%
3	Prevention of sternal breakdown/infection	12.50%
4	Pain management	10.40%
5	All of the above	93.80%

**INFERENCE:** Most of the therapists suggested that lifting restrictions is in regard with the prevention of sternal instability.

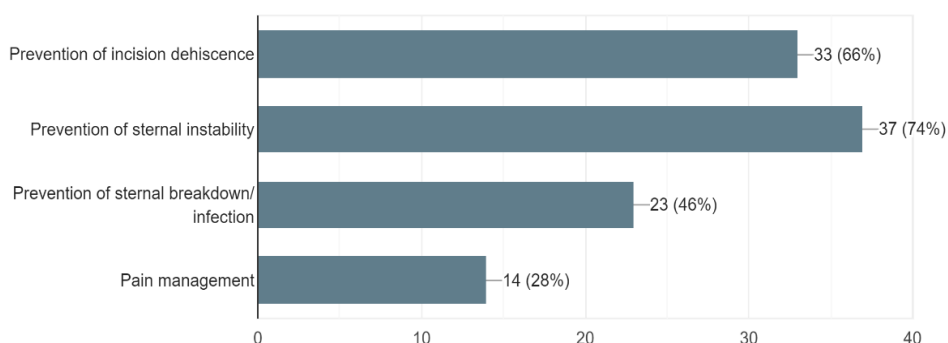
**Cessation of wound support**



Sr No	Cessation of wound support	Percentage%
1	<7 days post-op	10.00%
2	<14 days post-op	20.00%
3	8-14 days post-op	10.00%
4	Once the sternum is healed	20.00%
5	Once the sternum is assessed to be stable	40.00%

**INFERENCE:** Most of the therapists stated that wound support is ceased, once the sternum is assessed to be stable.

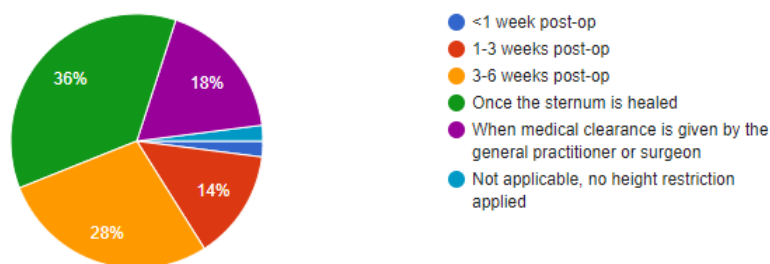
**Purpose of lifting restrictions**



Sr No	Purpose of lifting restrictions	Percentage%
1	Prevention of incision dehiscence	66.00%
2	Prevention of sternal instability	74.00%
3	Prevention of sternal breakdown/infection	46.00%
4	Pain management	28.00%

**INFERENCE:** Most of the therapists suggested that lifting restrictions is in regard with the prevention of sternal instability.

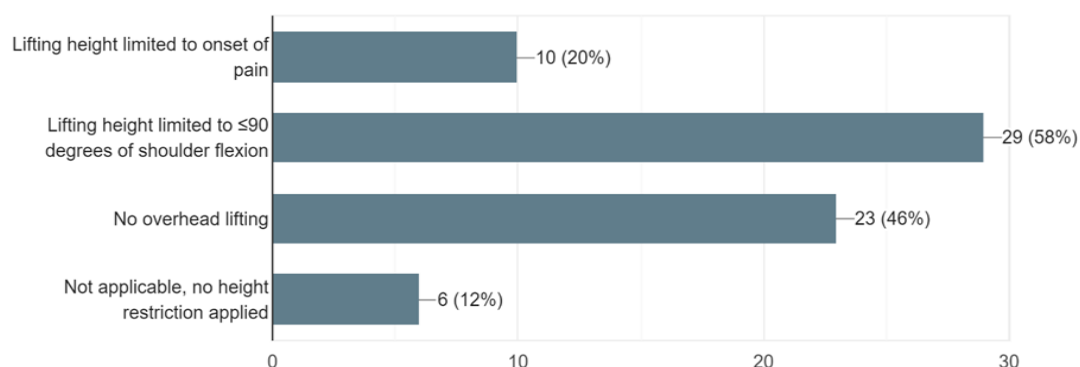
**Cessation of weight restrictions**



Sr No	Cessation of weight restrictions	Percentage%
1	<1 week post-op	2.00%
2	1-3 weeks post-op	14.00%
3	3-6 weeks post-op	28.00%
4	Once the sternum is healed	36.00%
5	When the medical clearance is given by the surgeon	18.00%
6	Not applicable, no weight restrictions applied	2%

**INFERENCE:** Weight restrictions are ceased once the sternum is healed.

**Height restrictions during discharge**

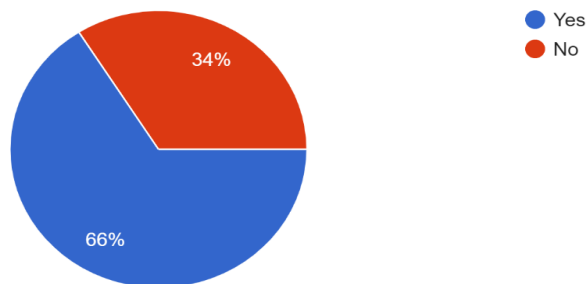


Sr No	Height restrictions during discharge	Percentage%
1	Lifting height limited to onset of pain	20.00%
2	Lifting height limited to ≤90 degrees of shoulder flexion	58.00%
3	No overhead lifting	46.00%
4	Not applicable, no height restrictions applied	12.00%

**INFERENCE:** Almost half of the therapists suggested that during discharge, lifting height is limited to ≤ 90 degrees of shoulder flexion.

**BED MOBILITY AND TRANSFER RESTRICTIONS**

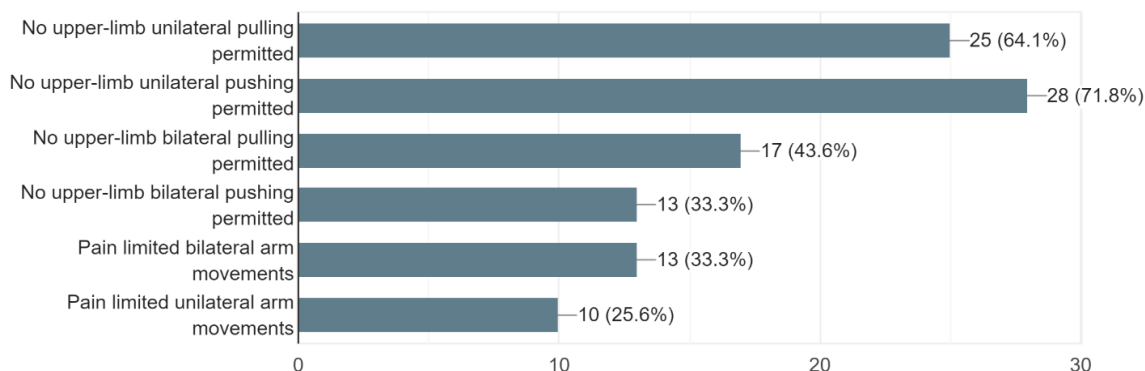
**Management of patients including transfer restrictions**



Sr No	Management of patients including transfer restrictions	Percentage%
1	Yes	66.00%
2	No	34.00%

**INFERENCE:** More than half of the therapists suggested transfer restrictions.

**Bed mobility and transfer restrictions**

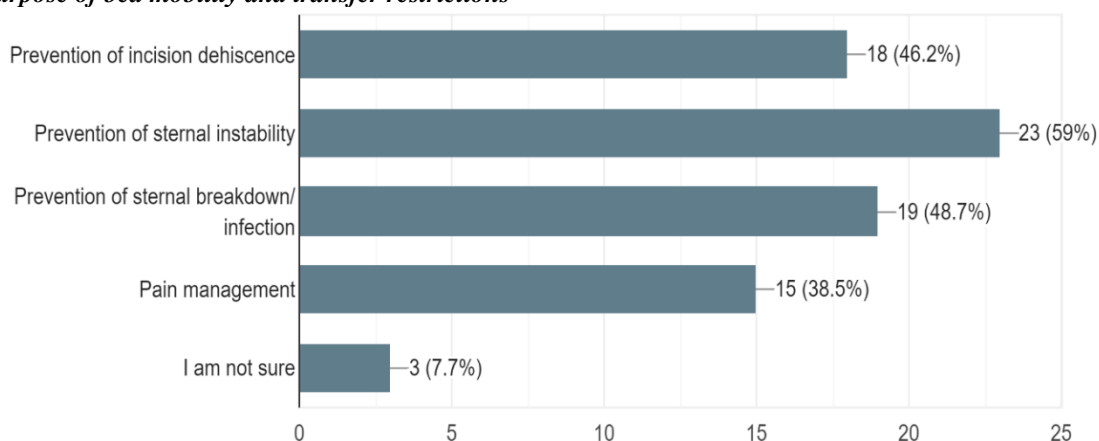


Sr No	Bed mobility and transfer restrictions	Percentage%
1	No upper-limb unilateral pulling permitted	64.10%
2	No upper-limb unilateral pushing permitted	71.80%
3	No upper-limb bilateral pulling permitted	43.60%
4	No upper-limb bilateral pushing permitted	33.30%
5	Pain limited bilateral arm movements	33.30%
6	Pain limited unilateral arm movements	26%

**INFERENCE:** Most of the therapists do not permit upper limb unilateral pushing and pulling.



**Purpose of bed mobility and transfer restrictions**



Sr No	Purpose of bed mobility and transfer restrictions	Percentage%
1	Prevention of incision dehiscence	46.20%
2	Prevention of sternal instability	59.00%
3	Prevention of sternal breakdown/infection	48.70%
4	Pain management	38.50%
5	I am not sure	7.70%

**INFERENCE:** Most of the therapists mentioned prevention of sternal instability as one of the reasons for transfer restrictions.

**V. Results**

96% (48) of therapists mentioned the use of wound support for the management of median sternotomy. 40% (20) of the therapists alleged that the use of wound support is stopped, once the sternum is assessed to be stable. 52% (26) of therapists mentioned that the initial weight restriction given to patients post sternotomy should be around 1 kg. More than half of the therapists 56% (28) mentioned the lifting height being ≤90 degrees of shoulder flexion. Transfer restrictions were included in the management of patients post sternotomy as per 66% (33) of the therapists. Unilateral pulling to 61.5% (31) and unilateral pushing to 71.8% (36) were restricted by the therapists. Almost half of the therapists 52%, (26) include restrictions on the type of mobility aid used. 56% (28) of the therapists restricted the use of unilateral walking sticks post median sternotomy.

**VI. Discussion**

Many institutions follow sternal precautions in order to prevent sternal complications such as wound infections, sternal instability, etc. Even though the protocols vary, the rationale for the same remains unanswered. The reliability of these protocols remains questionable.

The findings of this study revealed that there is significant variation in the sternal precautions used by physiotherapists throughout various institutes. In most cases, sternal wound support was needed, and lifting, transfer, and mobility aid restrictions were typical.

Wound support is in the form of a chest binder. The chest binder or front-closing brassiere helps to support the breastbone and prevent the separation of the incision. It was clear that wound care was taken into account in all settings, though the time it took to start and stop depending on the institution.

There were both weight and height restrictions on lifting. Although the type of restrictions imposed and the timing of their abolition varied, both factors were variable. Moving and exercising the upper limbs during the healing process is designed to be very helpful following median sternotomy<sup>(11,12,15)</sup>. It benefits the sternum by improving blood flow, shoulder girdle, and chest wall muscles.<sup>(11, 12)</sup>. In order to avoid the formation of adhesions and muscle atrophy, it is crucial to continue with your current activities.<sup>(11, 12)</sup>. The restrictions on upper-limb activity that patients were given at discharge, could potentially harm their ability to recover by limiting their functional capacity and preventing or delaying recovery.<sup>(9,12,13)</sup>. Restrictive restrictions may make it more difficult for patients to perform basic independent functional tasks like getting out of bed, getting up from a chair, especially if they are older, have other comorbid conditions, or both.<sup>(13)</sup> The most common reasons

given for following lifting restrictions in the upper extremities were to keep the sternum from becoming unstable and to reduce pain.

In terms of transfer and bed mobility restrictions, unilateral pushing and unilateral pulling were the most commonly restricted movements during hospitalization and after discharge. Bilateral upper-limb movements produce symmetrical loads on the sternum and might be more useful in early healing of the sternum as compared to unilateral upper-limb movements as they produce asymmetrical loads on the sternum, which might hamper the healing process.<sup>(11,17)</sup> Unilateral pushing and unilateral pulling were the movements that were most typically restricted during the inpatient as well as outpatient phases. Variations were observed in both the types of restrictions based on the type of mobility aids used as well as the cessation of these restrictions. Significant variations were seen. Although a sizable majority of the public mentioned limiting the kinds of mobility aids allowed, many said that limitations were not used if the patients couldn't walk on their own or were in danger. Patients who need mobility aids after surgery may be more prone to having several co-morbid conditions, including obesity or diabetes mellitus. Since these co-morbidities are known to increase the risk of sternal complications.<sup>(18,19,20)</sup> There are some limitations to our study, like the limited hospitals or area covered. With the need to cover various aspects, the questionnaire was lengthy. This might have led to boredom and the respondent may have run through the questions. Potential inadequacy of response.

In the future scope of study, we recommend a nationwide survey. Further investigations can be done to check whether private and public sector clinical setups make any difference.

The clinical application of this survey helps in providing a generalised protocol for every patient undergoing median sternotomy surgery, allowing for a frugal and fast recovery of patients. Collaborative work with medical, surgical, and nursing staff can be designed for cardiac rehabilitation. Surgeons will get an idea related to post-operative management. Uniformity of protocols in both urban and rural settings. It will be helpful for society and will also help in creating awareness.

## **VII. Conclusion**

Our study shows that physiotherapists in different institutions use sternal safety measures that are very different from each other.

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Ethical Approval: IEC obtained.

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