Impact of Standard vs. Modified Sternal Precautions on Function Following Median Sternotomy: A Systematic Review

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Objectives

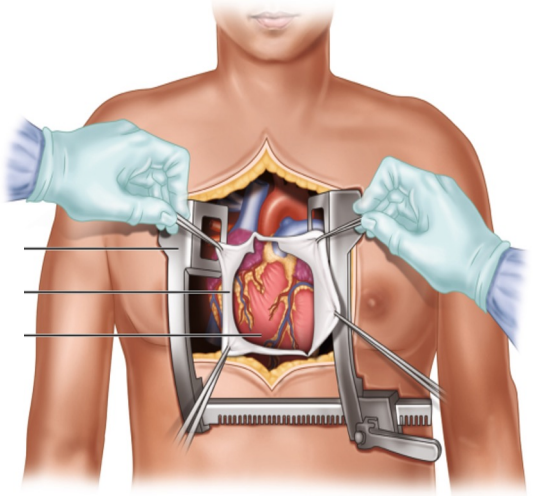
- By the end of this presentation, attendees will be able to differentiate standard sternal precautions from modified sternal precautions

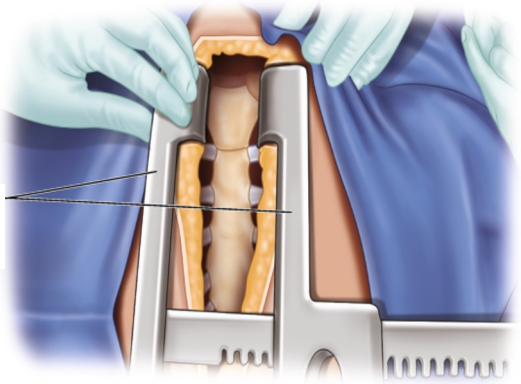
- By the end of this presentation, attendees will understand the benefits of modified sternal precautions on improving recovery status post median sternotomy

Background

- Cardiac surgery utilizing the median sternotomy approach is performed in over one million patients per year world wide[1]
  - Standard sternal precautions post-op
  - 4-12 week duration

- Median Sternotomy[1]
  - Surgical procedure where vertical incision is made and the sternum is divided
    - Allows access to the heart and lungs
  - Two halves are then re-joined back together





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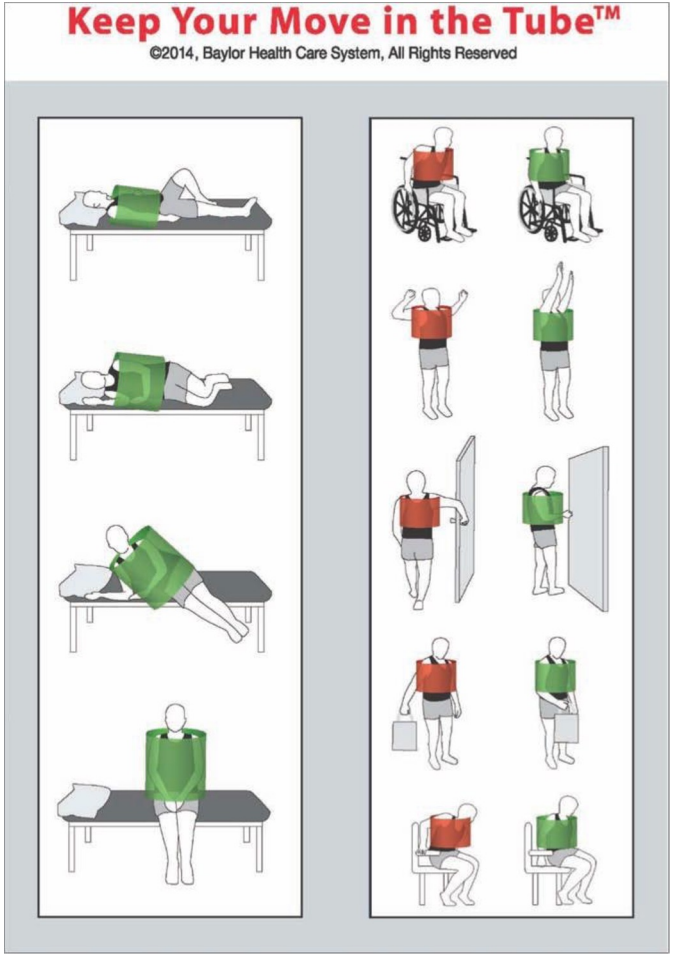
Background

- Standard Sternal Precautions (SSP)[1-7]
  - No lifting more than five to ten pounds
  - No reaching behind the back
  - No pushing or pulling through the arms
  - Prohibit reaching overhead (> 90 degrees) with one or both arms
  - No driving

- Limitations of standard precautions[2-3]
  - Apply the same restrictions for all patients
    - Negative impact on functional mobility and recovery
  - Increased time to return to functional activities
  - Fear of activity
  - Muscle atrophy from inactivity
  - Increased reliance and assistance on others
  - Decreased quality of life and motivation reported

Background

- Modified Sternal Precautions (MSP)[1-7]
  - Rely more on kinesiology principles vs time and load restrictions
  - Specifics vary among studies
  - *Keep Your Move in the Tube* Protocol[7]



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Purpose

- Determine the functional impact of standard sternal precautions (SSP) compared to modified sternal precautions (MSP) on mobility in adults following a median sternotomy

Methods

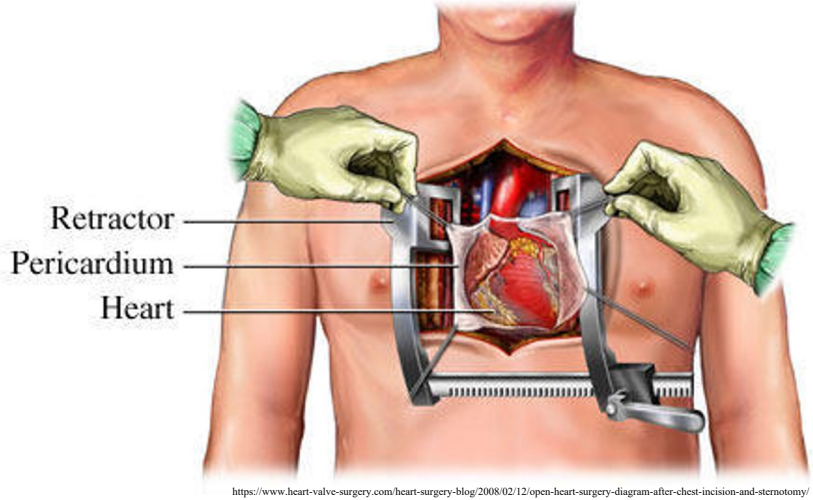
- Databases
  - PubMed
  - CINAHL
  - ScienceDirect
  - APTA EBSCOhost
- Search limits
  - Human subjects
  - Peer reviewed
  - English language

Search Terms

- (“coronary artery bypass graft” **OR** CABG **OR** sternotomy) **AND** (function **OR** ADL **OR** "activities of daily living") **AND** (modified **OR** restrictive) **AND** precaution

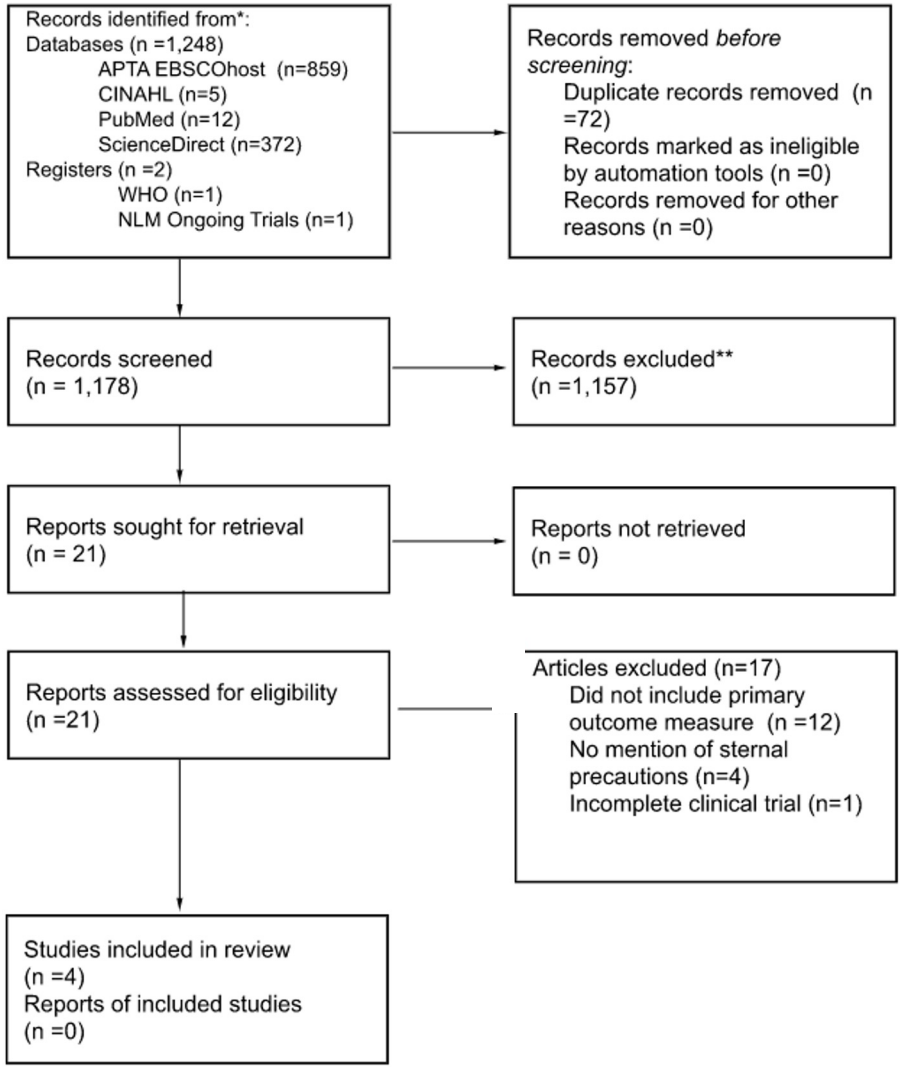
Inclusion Criteria

- Adults
  - 18 years or older
- Status post median sternotomy
- Functional outcome measure
- All study designs



https://www.heart-valve-surgery.com/heart-surgery-blog/2008/02/12/open-heart-surgery-diagram-after-chest-incision-and-sternotomy/

PRISMA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Databases (n =1,248)
APTA EBSCOhost (n=859)
CINAHL (n=5)
PubMed (n=12)
ScienceDirect (n=372)
Registers (n =2)
WHO (n=1)
NLM Ongoing Trials (n=1)
Records removed *before screening*:
Duplicate records removed (n =72)
Records marked as ineligible by automation tools (n =0)
Records removed for other reasons (n =0)
Records screened
(n = 1,178)
Records excluded**
(n =1,157)
Reports sought for retrieval
(n = 21)
Reports not retrieved
(n = 0)
Reports assessed for eligibility
(n =21)
Articles excluded (n=17)
Did not include primary outcome measure (n =12)
No mention of sternal precautions (n=4)
Incomplete clinical trial (n=1)
Studies included in review
(n =4)
Reports of included studies
(n =0)

Oxford Levels of Evidence

Article Authors	Research Method	Oxford Level [8]
Katijjahbe et al.[4]	RCT	Level 2
Park et al.[5]	Quasi- experimental design	Level 2
Gach et al.[6]	Observational	Level 2
Holloway et al.[7]	Cross-sectional design	Level 2

Results

- 21 reports assessed for eligibility
- 4 studies met selection criteria
- Sample ranged from 72-1,104 (n=1,744; average age: 64.96)
- Function assessed through:
  - Short Physical Performance Battery (SPPB)[4]
  - Health Assessment Questionnaire (HAQ)[5]
  - Level of assistance for bed mobility and transfers[6]
  - Functional self-report[7]

Results

- Two studies concluded no statistically significant differences between groups[4,7]
  - SSPB at 4 weeks: MD 1.0 point, 95%, CI -0.2 to 2.3[4]
  - 12 weeks MD 0.4 point, 95% CI –0.9 to 1.6; and self-report with p=0.14[4]
- Two studies found significant differences between groups[5,6]
  - MSP groups with greater return to function (HAQ $p<0.001$)[5]
  - Decreased functional assistance required($p<0.001$)[6]
- Two adverse events unrelated to sternal precaution adherence occurred in both the SSP and MSP groups[4]

Results: Significant Improvements

Article Authors	Key Findings
Park et al.[5]	● Significantly lower HAQ disability index ($p<0.0001$) → indicates greater return to function vs standard sternal precautions group ● Significant decrease in both pain overall for both SSP and KYMITT groups ($p<0.001$) ○ No difference between SSP vs KYMITT pain scores ($p=0.529$)
Gach et al.[6]	● More patients discharged home with KYMITT ($p<0.001$) → less d/c to inpatient rehabilitation or skilled nursing ● Achieved "independent" or "modified independent" functional status on bed mobility or transfers by final PT session in KYMITT ($p<0.001$) ● KYMITT discontinued PT before d/c ($p<0.001$)

Results: No Statistically Significant Differences

Article Authors	Key Findings
Katijjahbe et al.[4]	● No significant difference between less or modified sternal precautions vs. conservative precautions groups for all outcome measures ● No significant differences in SPPB scores: ○ 4 weeks post-op: MD 1.0 point, 95%, CI-0.2 to 2.3 ○ 12 weeks post-op: MD 0.4 point, 95%, CI -0.9 to 1.6 ● Less restrictive sternal precautions for adults after cardiac surgery had similar results: ○ Physical recovery, pain, health related QOL ● No increase in sternal complications noted with the use of modified sternal precautions
Holloway et al.[7]	● No significant differences between KYMITT vs conservative precautions groups for all outcome measures ○ Less restrictive group had less difficulty with functional mobility than standard precautions group (p=.14) ○ Self-care tasks (not further defined) (p=.186)

Conclusions

- Moderate levels of evidence
  - Use of MSP results in equal or more favorable functional outcomes compared to SSP

Limitations

- Varied functional outcome measures
- Multiple sternal precaution protocols
- Lack of reliability of functional outcomes

Future Research

- Well-defined precautions to justify the use of MSP as a means to improve functional outcomes
- Standardization of functional outcome measures
- Consistent use of reliable and valid outcomes to determine the impact of sternal precautions on patient's functional mobility
- Use of different age groups to generalize results

Clinical Relevance

- Experts suggest SSP may inadvertently impede recovery vs. patient-specific sternal precautions[1,2]
- Inconsistencies in reported sternal precaution protocols contribute to insufficient evidence in support of their universal use[3]
- Lack of evidence indicating use of SSP[4-7]
- Advocacy to incorporate MSP in standard sternotomy care to improve[4-7]
  - Functional outcomes
  - Optimize discharge destination

Take Home Message

- Integrate
  - Evidence-Based Practice
  - Clinical Knowledge
  - Patient Values

https://www.ciap.health.nsw.gov.au/training/ebp-learning-modules/module1/evidence-based-practice-is.html

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- Renée Hakim, PT, PhD
- Ian O'Hara
- The University of Scranton Physical Therapy Department

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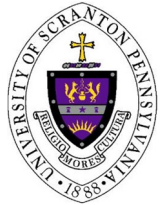
Questions?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Appendix

Functional Outcomes

- Short Physical Performance Battery (SPPB)[4]
  - 3 scores: balance, gait, chair rise task
  - Higher scores independent performance
  - Overall score is often considered to represent a clinical meaningful change in physical function
    - Test-retest reliability: 0.87 (CI: 95%: 0.77-0.96)[9]
- Health Assessment Questionnaire (HAQ)[5]
  - Subjective
  - Eight sections: dressing, arising, eating, walking, hygiene, reach, grip, and activities
  - Scoring: 0 (without any difficulty) to 3 (unable to perform)

Functional Outcomes

- Level of assistance for bed mobility and transfers[6]
  - Independent: no helper or device, timely and safe
  - Modified independent: no helper, needs device or takes longer than normal or concern for safety
  - Supervision: needs verbal cues, supervision or set up
  - Minimal assistance: patient performs 75% or more of task requiring only steadying assistance
  - Moderate assistance: patient performs 50-74% of activity
  - Maximum assistance: patient performs 25-49% of activity
  - Total assistance: patient performs 0-24% of activity and/ or the help of two people in required

- Functional self-report[7]
  - Questionnaire developed by clinical staff
  - Not further defined