Bed Entrapment Prevention Program

Region of Peel Long Term Care Centres

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Bed Entrapment Prevention Program – Region of Peel Long Term Care Centres
PURPOSE, GOALS AND OBJECTIVES OF THE BED ENTRAPMENT PREVENTION PROGRAM

Purpose
The purpose of the Bed Entrapment Prevention Program is to assist in the reduction of risk for bed entrapment using an interdisciplinary team approach to improve bed safety and mitigate the risk of bed entrapment.

Goals and Objectives
- To prevent bed entrapment.
- To ensure that residents are assessed for risks associated with bed rail use.
- To ensure that any decision to utilize or remove rails occurs within the framework of a documented individual resident assessment.
- To ensure that all bed systems are tested across all seven potential zones of entrapment.

RELEVANT POLICIES & TOOLS

MANDATE:
This program is in accordance with the Long Term Care Homes Act, 2007 (s.30, 31, 33) and Regulation 79/10 (s.15), and the centre’s operational practices.

Forms/Tools:
LTC 06-06.24 Bed System Testing
LTC 09-06.12 Bed Rail Risk Assessment
FSF-06 Bed System Safety Measurement Test
IDF-40 Alternatives to Restraint Use
Bed Rail Risk Assessment (electronic health record)

WHAT IS THE BED ENTRAPMENT PREVENTION PROGRAM?

Several surveys of deaths occurring in the bed environment demonstrate the risk of entrapment when a resident slips between the mattress and bed rail or when the resident becomes entrapped in the bed rail itself. The populations at risk for entrapment are residents who are frail or elderly or those who have conditions such as agitation, delirium, confusion, pain, uncontrolled body movement, hypoxia, fecal impaction, and acute urinary retention that cause them to move about the bed or try to exit from the bed. The absence of: timely toileting, position change, and frequent individualized care are factors that may also contribute to the risk of entrapment. The risk may also increase due to technical issues such as improperly sized mattresses, bed rails with winged edges, loose bed rails, or design elements such as wide spaces between vertical bars in the rails themselves.
The bed entrapment prevention program focuses on:

- Assessment of residents for risks associated with bed rail use
- Monitoring of residents’ health status that may affect the risk of bed entrapment
- Testing of bed systems to ensure compliance with safety guidelines

Each resident must have a formal bed rail risk assessment on admission and be reassessed on readmission, at significant condition changes and following any incident related to safety in bed.

**DEFINITIONS**

**Bed entrapment:** An occurrence involving a resident who is caught, trapped, or entangled in the hospital bed system, which includes the spaces in or around the bed rail, hospital bed mattress, or hospital bed frame. Entrapped body parts associated with risk for severe injury include the head, neck, and chest.

**½ length rail:** A one-piece rail that extends along the side of the bed one-half the length of the bed from the head of the bed

**¾ length rail:** A one-piece rail that extends along the side of the bed three-quarters of the way down from the head of the bed

**Full rail:** A one-piece rail that extends along the side of the bed from the head to the foot section

**Split rail:** A pair of half-rails. One set extends along the side of the bed from the head of the bed to the mid-section of the bed. The other set extends from the mid-section of the bed to the foot of the bed. Generally, there is a space between the two sets of rails.

Note: The divisional standard for bed rails is ½ rails unless otherwise indicated based on an individual resident assessment.

If a bed rail of any size is used for the purpose of assisting a resident with a routine activity of living (such as turning themselves independently), the device is considered to be a personal assistance service device (PASD).

If a bed rail is used to restrain a resident (i.e. limit or inhibit a resident’s freedom of movement) but not to assist with a routine activity of living, then the device is considered to be a restraint.

Please refer to the Minimizing of Restraint Use and the Use of Personal Devices (PASD) Program.
INTERDISCIPLINARY APPROACH

Bed Rail Risk Assessment

The principles that follow are intended to guide the development of the care plans.

1. The automatic use of bed rails may pose unwarranted hazards to resident safety.
   When planning resident care the following should be considered:
   - The potential for serious injury is more likely to be related to a fall from a bed with raised bed rails when the resident attempts to climb over, around, between, or through the rails, or over the foot board, than from a bed without rails in use.
   - Evaluation is needed to assess the relative risk of using the bed rail compared with not using it for an individual resident.
   - Bed rails sometimes restrain residents. When used as restraints, bed rails can pose the same risk to resident safety as other types of physical restraints.
   - Resident safety is paramount. In an emergency situation the caregiver needs to do whatever is necessary in his or her professional judgment to secure the resident’s safety. Consider that using a bed rail or other device to restrain the resident could place the resident’s safety at risk.
   - Strangling, suffocating, bodily injury, or death can occur when residents or parts of their bodies are caught between rails or between the bed rails and mattresses.

2. Decisions to use or to discontinue the use of a bed rail should be made in the context of an individualized resident assessment using an interdisciplinary team with input from the resident and family or the resident’s legal guardian.
   - The composition of the interdisciplinary team may vary depending upon the nature of the resident’s individual needs.
   - Team members for consideration should include, but are not limited to: nursing, social work, dietary personnel; physicians (or their designees); medical director; rehabilitation staff (physical and occupational therapists); and resident; family (or substitute decision make).
   - The resident and family (or substitute decision maker) play a key role in the creation of a safe and comfortable bed and sleeping environment. These individuals can provide information about the resident’s previous sleeping habits and bed environment that caregivers need to design the bed environment. Their participation in discussions facilitates creation of a bed and sleeping environment that meets resident’s needs.

3. The rights of the resident and family to participate in care planning and make choices should be balanced with caregivers’ responsibility to provide care according to an individual assessment, professional standards of care, and any applicable regulations.

4. Use of bed rails should be based on the resident’s assessed medical needs and should be documented clearly and approved by the interdisciplinary team.
   - Bed rail effectiveness should be reviewed on a regular basis.
• The resident’s electronic health record should include a bed rail risk assessment that identifies why other care interventions are not appropriate or not effective if they were previously attempted and determined not to be the treatment of choice for the resident.

5. Bed rail use for treatment of a medical symptom or condition should be accompanied by a care plan designed for that symptom or condition.
   • The plan should present clear directions for further investigation of less restrictive care interventions.
   • The documentation should describe the attempts to use less restrictive care interventions and, if indicated, their failure to meet residents’ assessed needs.
   Please refer to the Minimizing Restraint Use and the Use of Personal Assistive Devices (PASD) Program.

6. Bed rail use for resident’s mobility and/or transferring, for example turning and positioning within the bed and providing a hand-hold for getting into or out of bed, would be reflected in the care plan.
   • The resident should be encouraged to participate in care planning to help design a safe and comfortable bed environment.
   • The care plan should:
     - include educating the resident about possible bed rail danger to enable the resident to make an informed decision; and
     - address options for reducing the risks of the rail use.
     - include educating the family about possible bed rail danger at the six week care conference

7. The process of reducing and/or eliminating existing use of bed rails should be undertaken incrementally using an individualized, systematic, and documented approach.

8. In creating a safe bed environment, the following general principles should be applied:
   • Avoid the automatic use of bed rails of any size or shape. Residents must be individually assessed.
   • Restrict the use of physical restraints of any kind on individuals in bed.
   • Inspect, evaluate, maintain, and upgrade equipment (beds/mattresses/bed rails) to identify and remove potential fall and entrapment hazards and appropriately match the equipment to resident needs, considering all relevant risk factors.
   • Re-assess the resident’s needs and re-evaluate the equipment if an episode of entrapment or near-entrapment occurs, with or without serious injury. This should be done immediately because fatal “repeat” events can occur within minutes of the first episode.

   Please refer to Appendix C: Resident Risk Assessment and Interventions
Bed System Safety: Bed Entrapment Zones

**Zone 1: Within the rail:**

![Diagram of Zone 1](image)

Zone 1 is any open space within the perimeter of the rail. Openings in the rail should be small enough to prevent the head from entering. A loosened bar or rail can change the size of the space. *Recommended space: less than 4 ¾ inches.

**Zone 2: Under the rail between the rail supports or next to a single support:**

![Diagram of Zone 2](image)

Zone 2 is the area under the rail and above the mattress. *Recommended space: less than 4 ¾ inches or 120 mm.

**Zone 3: Between the rail and the mattress:**

![Diagram of Zone 3](image)

The space between the inside surface of the rail and the mattress, if too large, presents risk of head entrapment. *Recommended space: less than 4 ¾ inches or 120 mm.

**Zone 4: Under the rail at the end of the rail:**

![Diagram of Zone 4](image)

The gap between the mattress and the lowermost portion of the rail presents risk of neck entrapment. Recommended space: less than 2 3/8 inches or 60 mm.
Zone 5: Between split bed rails:

When partial-length head and foot side rails (split rails) are used on the same side of the bed, the space between the split rails presents risk of neck or chest entrapment.

Recommended space: < 60 mm (<2.375”) OR > 318 mm (>12.5”)

Zone 6: Between the end of the rail and the side edge of the head or foot board

The gap between the end of the bed rail and the side edge of the head or foot board presents risk of entrapment.

Recommended space: < 60 mm (<2.375”) OR > 318 mm (>12.5”)

Zone 7: Between the head or foot board and the end of the mattress

The space between the inside surface of the head or footboard and the end of the mattress presents risk of head entrapment.

Recommended space: < 120 mm (<4.75”) *Note, this zone must be tested even if there are no bed rails in use.

ROLE OF THE REGISTERED NURSING STAFF

Bed Rail Use

1. Assess the resident for bed rail risk on admission and re-admission, with any significant change in condition, and following any incident related to safety in bed. See: Bed Rails Risk Assessment in the electronic health record.

2. The assessment must be completed:
   • within 24 hours of admission
   • following readmission from hospital or other LTC facility
   • When a resident exhibits a change in health status
• Following any incident related to safety in bed

3. Individualized resident assessment should include:
   • Medical diagnosis, conditions, symptoms, and/or behavioral symptoms
   • Sleep habits
   • Medication
   • Acute medical or surgical interventions
   • Underlying medical conditions
   • Existence of delirium
   • Ability to toilet self safely
   • Cognition
   • Communication
   • Mobility (in and out of bed)
   • Risk of falling

4. Document the decision to utilize, remove or change bed rails in current use. If a bed rail of any size is used, it must be identified as a restraint or a PASD.

5. Monitor and evaluate the care plan at least quarterly and more frequently as required based on the resident’s condition in collaboration with the interdisciplinary team. If the interventions have not been effective, initiate alternative approaches and update as necessary.

6. Communicate to the team and the resident/SDM whenever there is a significant change to the care plan regarding the use of bed rails on an ongoing basis and annually at the care conference.

7. Consider the following risk intervention approaches:
   • Provide individually scheduled toileting
   • Develop a schedule for turning and positioning
   • Clean urine and/or feces promptly
   • Elevate head of bed for residents with congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), reflux, and actively infusing enteral fluids
   • Position residents to maximize comfort and change positions in a timely manner, maintaining comfort and reducing risk for skin breakdown
   • Accommodate residents’ preferred bedtime habits whenever possible
   • When medically indicated, use padded bed rails for individuals with an active seizure disorder or active movement disorder
   • Use of a high-impact mat (bedside floor mat)
   • Provide distractions such as music, television, or food and fluids for residents who do not sleep through the night
   • Provide calming interventions and pain relief
   • Plan time during the day to provide periods of physical activity that help promote a restful sleep
   • Re-evaluate and revise resident’s treatment program as needed if an episode of entrapment or near-entrapment occurs with or without serious injury
When using a therapeutic surface/mattress overlay:
These products have therapeutic benefits such as reducing pressure on skin but are easily compressed by the weight of a patient and may pose an additional risk of entrapment when used with existing bed systems. When these types of mattresses compress, the space between the mattress and the bed rail may increase and pose an additional risk of entrapment. Additional caution should be taken when using these products to ensure a tight fit of the mattress to the bed system. If a powered air mattress is replacing a mattress on a bed system that meets the recommendations in the guidance with the original mattress, the resulting bed system with the new air mattress may now pose a risk of entrapment and must be re-tested. The substitution of the original mattress for a surface such as a powered air mattress, or the addition to the existing mattress of, for example, a mattress overlay, may have an effect on the height of the top of the side rail above the surface the patient lies on. This may have an impact on the potential for patient falls.

When using pressure reduction products, the clinical benefit should outweigh the risk of entrapment presented by the use of such systems. There must be a risk mitigation plan in place to ensure resident safety. This may include but is not limited to, the purchase of new therapeutic mattresses that reduce the gap between the mattress and the rails, the use of gap fillers, the use of a high impact mat on floor, or the gradual discontinuance of bed rails (based on individual resident’s clinical condition and assessment).

**Bed System Testing**

1. The nursing staff will initiate the bed re-testing process:
   - Following a change in physical or clinical condition increasing the risk of entrapment
   - Following a bed entrapment incident
   - Following a change in components of the bed system (e.g. rails or mattress)
   - When there is reason to believe that some components are worn (e.g. rails wobble, rails have been damaged, mattress is softer)
   - When accessories such as mattress overlays (therapeutic surfaces) or positioning poles are added or removed

   *Note, Zone 7, the area between the head or foot board and the end of the mattress must be tested even if there are no bed rails in use.

2. Registered nursing staff will report any mattresses and bed frames that require maintenance (e.g. are ripped, torn, bent bed frame), fit poorly or are worn to the supervisor of care/director of care who will generate a work order request and request that facilities services staff perform a bed system measurement test using FSF-06.

3. Any incidents of residents being caught, trapped or entangled will be reported to the supervisor of care/director of care, and the facility services supervisor who will request that facilities services staff perform a bed system measurement test using FSF-06.

4. The director of care maintains the record of the test and corrective actions at the nursing station, and communicates with nursing staff on the unit to ensure that corrective actions are incorporated into the care plan.

5. Nursing staff must re-assess the resident following bed testing and corrections and document the assessment in the care plan.
Please refer to Appendix B Bed System Safety Test Process Map

ROLE OF THE FACILITY SERVICES STAFF

2. Ensure proper installation of bed rails and proper match of bed rails to bed frame.
3. Assess the bed system using FSF-06 Bed System Safety Measurement Test form;
   i. On admission/re-admission of a resident.
   ii. Following a change in physical or clinical condition increasing the risk of entrapment.
   iii. Following a bed entrapment incident.
   iv. Following a change in components of the bed system (e.g. rails or mattress).
   v. When there is reason to believe that some components are worn (e.g. rails wobble, rails have been damaged, mattress is softer).
   vi. When accessories such as mattress overlays (therapeutic surfaces) or positioning poles are added or removed.

*Note, Zone 7, the area between the head or foot board and the end of the mattress must be tested even if there are no bed rails in use.
4. Please refer to Appendix C: Resident Risk Assessment and Interventions.
5. Confirm the outcome of the bed system testing with the director of care and collaborate to develop a corrective action plan if needed.
6. Provide completed forms (FSF-06), with documented corrective actions to the director of care for filing.

ROLE OF THE ATTENDING PHYSICIAN/NURSE PRACTITIONER

1. Minimize use of medications that alter mental status.
2. Use alternatives to sleeping medications.
3. Dispense diuretics before the late afternoon/evening.
4. Assess and treat pain.
5. Screen and treat for hypoxia.
6. Assess the clinical status of delirious residents to rule out reversible etiologies.
7. Promote mobility and fitness, e.g., restorative care to enhance abilities to stand safely and to walk.

ROLE OF THE PERSONAL SUPPORT WORKER (PSW)

1. Follow the interventions as outlined on the care plan.
2. Report decrease in any of the following: energy, continence and sleeping patterns.
3. Share with team members resident interventions that are most effective.
4. Report to the registered nursing staff:
   i. Following a change in physical or clinical condition increasing the risk of entrapment.
   ii. Following a bed entrapment incident.
   iii. Following a change in components of the bed system (e.g. rails or mattress).
iv. When there is reason to believe that some components are worn (e.g. rails wobble, rails have been damaged, mattress is softer)

v. When accessories such as mattress overlays (therapeutic surfaces) or positioning poles are added or removed

*Note, Zone 7, the area between the head or foot board and the end of the mattress must be tested even if there are no bed rails in use.

5. If the care plan requires the bed rails to be in the down position, the PSW must consult with the registered staff. Document the use of bed rails in the electronic health record.

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**ROLE OF THE SOCIAL WORKER**

1. The social worker will notify the facility services supervisor of new resident admissions and request that facilities services staff perform a bed system safety measurement test using FSF-06.

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**ROLE OF THE PHYSIOTHERAPIST (PT)/OCCUPATIONAL THERAPIST (OT) AND ASSISTANTS**

1. Determine and document the functional ability of the resident to determine if there is a risk if bed entrapment or falls to necessitate the use of bed rails.
2. Recommend alternatives.
3. Promote mobility and fitness, e.g., restorative care to enhance abilities to stand safely and to walk.

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**ROLE OF THE ACTIVATION THERAPIST**

1. Follow the interventions as outlined on the care plan.
2. Share with team members resident interventions that are most effective.
3. Support resident comfort and interests.

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**ROLE OF THE PHARMACIST**

Provide consultation as requested.

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**ROLE OF THE PROGRAM SUPPORT NURSE (PSN)**

1. Coordinate education relating to bed entrapment prevention.

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**ROLE OF THE RESIDENT/SUBSTITUTE DECISION MAKER (SDM)**

1. Attend the interdisciplinary care conference.
2. Work with staff for input into, support and evaluation of the plan of care.
3. Provide input about the resident to assist in identifying nursing and medical risk interventions.
4. Talk to the health care team about whether bed rails are indicated.
5. Learn about bed safety and appropriate care options.
MONITORING AND EVALUATION

Registered Nursing Staff:

Individual Resident

1. Monitor according to the care plan.
2. Evaluate to determine if bed entrapment prevention strategies are effective. Update resident’s plan of care when there is a change in resident’s status.

DOCUMENTATION AND PARTIES RESPONSIBLE

The following table describes the various forms of documentation required and the responsibility of the interdisciplinary team:

<table>
<thead>
<tr>
<th>Documentation</th>
<th>Parties Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written order</td>
<td>Physician, Nurse Practitioner</td>
</tr>
<tr>
<td>Bed Rail Risk Assessment</td>
<td>Registered Nursing Staff</td>
</tr>
<tr>
<td>MDS-RAI</td>
<td>Registered staff for measureable objectives and outcomes</td>
</tr>
<tr>
<td>Care plan</td>
<td>Registered Staff, Interdisciplinary Team</td>
</tr>
<tr>
<td>Quarterly reassessment</td>
<td>Physician, Nurse Practitioner, Registered Nursing Staff</td>
</tr>
<tr>
<td>Change in Status or return from hospital</td>
<td>Registered Staff</td>
</tr>
<tr>
<td>Annual evaluation of the effectiveness of the policy and improvement introduced resulting from the evaluation</td>
<td>Interdisciplinary Team</td>
</tr>
<tr>
<td>Bed System Measurement Test</td>
<td>Facility Services Staff/Completed tests maintained by the Director of Care for communication with nursing staff</td>
</tr>
</tbody>
</table>

PROGRAM EVALUATION

The Bed Entrapment Prevention program will be evaluated and updated at least annually in accordance with evidence-based practices and, if there are none, in accordance with prevailing practices. A written record of the evaluation will be kept which will include the date of the evaluation, names of the persons who participated in the evaluation, a summary of the changes made and the date those changes were implemented.
STAFF TRAINING AND EDUCATION

Prior to assuming their job responsibilities, direct care staff will be orientated and receive annual retraining on bed entrapment prevention including bed rail risk assessment. Facility services staff will be trained to complete a bed system safety measurement test.
Appendix A: Bed Rail Safety Guidelines

If it is determined that bed rails are required and that other environmental or treatment considerations may not meet the individual resident’s assessed needs, or have been tried and were unsuccessful in meeting the resident’s assessed needs, then close attention must be given to the design of the rails and the relationship between rails and other parts of the bed, refer to LTC 06-06.24 Bed System Safety Testing.

1. The bars within the bed rails should be closely spaced to prevent a resident’s head from passing through the openings and becoming entrapped.
2. The mattress to bed rail interface should prevent an individual from falling between the mattress and bed rails and possibly smothering.
3. Care should be taken that the mattress does not shrink over time or after cleaning. Such shrinkage increases the potential space between the rails and the mattress.
4. Check for compression of the mattresses outside perimeter. Easily compressed perimeters can increase the gaps between the mattress and the bed rail.
5. Ensure that the mattress is appropriately sized for the selected bed frame, as not all beds and mattresses are interchangeable.
6. The space between the bed rails and the mattress and the headboard and the mattress should be filled either by an added firm inlay or a mattress that creates an interface with the bed rail that prevents an individual from falling between the mattress and bed rails.
7. Latches securing bed rails should be stable so that the bed rails will not fall when shaken.
8. Older bed rail designs that have tapered or winged ends are not appropriate for use with residents assessed to be at risk for entrapment.
9. Maintenance and monitoring of the bed, mattress, and accessories such as resident/caregiver assist items should be ongoing.
Appendix B

Bed System Safety Test Process Map

- **New resident admission/re-admission**
- **Change in physical or clinical condition increasing the risk of entrapment**
- **Bed safety/entrapment incident**
- **Change in components of the bed system** (e.g., rails or mattress/accessories such as overlays added or removed)
- **Components of the bed system are worn** (e.g., rails wobble, mattress is softer)

Nursing staff initiate bed system testing/re-testing by reporting to supervisor of care (SOC)/director of care (DOC) or designate.

SOC/DOC request facility service staff to test the bed system as per Dimensional Test Methods, using PSF-016 Bed System Measurement Test form.

Facility services staff conducts the test as per Dimensional Test Methods, using PSF-016 Bed System Measurement Test form.

- **Pass or Fail?**
  - **Pass**
    - Facility services staff provides all completed documentation to the facility services supervisor for confirmation. FSS informs DOC of results.
  - **Fail**
    - Facilities and nursing institutes corrective actions (e.g., replace mattress, repair bed frame)

DOC ensures that nursing staff has updated the care plan with the current bed rail use.

DOC maintains the completed testing forms at the respective nursing station in the Bed Entrapment Test binder.

Facility services staff provides all completed documentation to the facility services supervisor (FSS) who collaborates with the DOC to develop a corrective action plan.

Note: The resident must be assessed on admission/re-admission and re-assessed following any change to the bed system.
**Appendix C: Resident Risk Assessment and Interventions**

1. A resident is assessed to be at low risk for injury, as defined by these factors:

   - transfers safely to and from the bed to a wheelchair without assistance;
   - ambulates without assistance to and from the toilet without falling;
   - has not fallen, or is unlikely to fall, out of bed; and
   - notifies staff appropriately using call system.

Consider using a bed for this resident without a bed rail.

2. A resident is assessed to be unsafe in bed, or at high risk for injury, as defined by these factors:

   - inability to transfer safely to and from the bed independently
   - previous entrapment or near-entrapment episode;
   - inability to ambulate to and from the toilet without falling;
   - history of bed-related serious injury;
   - episodes of falling out of bed, or likelihood that such episodes will occur; or
   - inconsistent in notifying staff of needs or unable to access the call system.

Consider utilizing adjustable height feature on bed that can go very low to the floor for sleeping and raised for transfers and activities of daily living care, or an alternative such as a concave mattress as determined by the interdisciplinary care team. Use a high-impact mat next to the bed.

3. A resident is assessed to need a low bed, but an assessment determines that the resident is in danger of hurting him/herself while exiting from the low bed or is in danger of an unstable transfer after standing up by grabbing onto a bed side table or sink:

   - consider using a bed alarm to alert nursing staff when resident is leaving the bed.
   - consider use of high impact mat on floor
   - base the decision on the individual resident’s clinical condition and assessment.
   - carefully consider the use of bed alarms for the resident who is agitated or confused.

4. Steps should be taken to reduce risk of injury to residents and caregivers. Keep the bed in the lowest position with the wheels locked when occupied, adjusting the level for activities such as administering care or for resident transfers in/out of bed:

   - place a high impact mat next to the low bed to cushion falls from the low bed as long as this does not create a greater risk of accident to the resident or caregivers.
• raise the bed to give care and lower it when finished. If the bed is not adjustable, utilize body mechanics techniques such as kneeling on one or both knees on the high impact mat rather than bending over.
• store the high impact mat when it is not in use.
• assess area for objects that may cause injury.
• move furniture far enough away from the bed to avoid risk of injury.
• train caregivers on the proper use of low beds and proper body mechanics.
Appendix D: Dimensional Test Methods for Bed Systems

Description of Test Tools

Each test requires the use of simple tools, including a cone, a cylinder, and a spring scale. Tools used, if obtained may look slightly different from the tools in the figures, but they will work the same way.

Cone and Cylinder

The cone and cylinder is a combination tool (see Figure 5). It can be easily taken apart so that the cone and cylinder can be used separately. Tests 1, 2 and 3 use only the cone. Test 4 uses the combined assembled tool.

![Cone and Cylinder Tool](image)

Figure 5: Cone and Cylinder Tool

- The diameter of the large end of the cone represents the width of a small adult head (120 mm, or approximately 4 ¾ inches).
- The diameter of the cylinder represents the size of a small adult neck (60 mm, or approximately 2 3/8 inches).
- The cone and cylinder together weigh 66.7 N (15 lbs). This represents the combined weight of an adult head (53.4 N or 12 lbs.) and neck (13.3 N or 3 lbs.).
- The red area of the cylinder defines contact angles in which the neck could become wedged (60 degrees or narrower)

The cone tool includes the following features:

- A loop at the end for attaching a spring scale to measure applied forces.
- A safety strap to prevent the tool from falling on the tester's feet.
- A marked center line on the large face of the cone to help assess the depth of the cone in the Zone 3 test.
The cylinder includes the following features:

- Red and green zones for identifying pass/fail at siderail ends (Zone 4 test).
- A level to aid in tool positioning (Zone 4 test).

To prevent personal injury during the measurement process, attach the strap to a secure point on the bed and shorten the length of the safety strap enough to keep the tool from dropping on the tester's feet if it should fall during a test. Make sure the strap is long enough to not interfere with the test measurement.

**Tool Assembly and Disassembly**

*Note:* General procedures for tools with a screw-type connection are described here. (Some tools may have a different type of connection.) Follow the instructions supplied with the tools for more detailed information.

**To take the cone and cylinder tool apart:**
- Turn the knob to loosen and remove the connection shaft.
- Pull the cylinder from the cone.

**To put the cone and cylinder tool together:**
- Align the red and green areas of the cone and cylinder.
- Insert the pins of the cone into the cylinder.
- Insert the connection shaft and turn the knob to tighten.

Figure 6: Use of Cone and Cylinder Tool

**Use of the Spring Scale**

Use the spring scale to apply 12 lbs (53.4 N) of force to the cone when testing Zones 1 and 2. At the small end of the cone tool, insert the scale hook into the metal loop. Pull the scale slowly until the needle points to 12 lbs (53.4 N).

For other types of scales (sliders, digital, etc.), and for information on scale calibration, consult the instructions supplied with the tool kit.

Figure 7: Use of Spring Scale
General Testing Considerations

- **Bed Occupancy**: For ease of mattress movement and measurement, and general safety, the patient should not be in the bed during the measurement procedures.
- **Bed Height**: To avoid unnecessary bending or back strain, position the bed at a comfortable working height.
- **Bed Wheels**: To prevent movement of the bed during testing, lock the wheels.
- **Linens/Sheets**: Perform the tests with sheets in place as is typical for patient care. Remove any pillows and blankets.
- **Infection Control**: To avoid cross-contamination, disinfect the tools each time a different bed is measured. Follow the supplier's recommendations for tool disinfection.
- **Personal Safety**: To avoid injury, use care when pulling the tool through openings in the bed rails. If the tool suddenly pulls through, you could lose your balance and fall. Always use the safety strap to keep the tool from injuring your feet if it falls.
- **Intermediate Rail Position**: Some rails have an intermediate stopping position or a high and low locking position. Follow the individual test instructions, which may require testing the rails at both positions.
- **Bed Position**: Most tests should be done with the bed in the flat position. The exception is the test for Zone 2. Follow the individual test instructions carefully.
- **Type of Rails to Test**: Any type of rail attached to a bed should be assessed for entrapment risks. Full-length rails should be tested in the same manner as any other type of rail. Note that some full-length rails can present an entrapment risk when the bed is articulated (e.g., head elevated, knees raised), thus testing full-length rails in articulated bed positions is particularly important.

Test Methods

**Zone 1 Test**

*This test assesses the potential for head entrapment within the perimeter of the rail.*

The tools needed to do this test are the cone, the safety strap and the spring scale.

**Prepare for the Zone 1 Test:**

1. Lock the bed's wheels/ lower bed to a position where leg posts are still engaged with the floor.
2. Put the bed in the flat, horizontal position.
3. Fully raise all bed rails.
4. Position the bed at a comfortable working height (while still ensuring the wheels are locked, the bed is secured and the leg posts are engaged).
Do the Zone 1 Test:

1. With the cone resting on the mattress, attach the safety strap of the cone to the rail being tested. Make sure the strap is short enough to keep the tool from injuring your feet if it falls, and long enough so it does not interfere with the test.

2. From inside the rail, insert the cone, small end first, into the largest opening in the rail. Try to pull through the space (see Figure 8).

3. If the tool does not pull through freely, attach the spring scale to the loop on the small end of the cone. Try to pull the cone through the rail by pulling on the attached spring scale using 12 lbs. (53.4 N) of force. Use care when pulling. If the tool suddenly pulls through the opening, you may lose your balance and fall, or the tool may fall on you.

4. Repeat steps 2 and 3 to check all other openings within the same rail.

5. Interpret test results.

Interpret the Zone 1 Results:

If the large end of the cone does not enter any of the openings, this space passes the test (see Figure 9a).
Figure 9a. Zone 1 test: **Pass**, large end of cone **does not** enter rail opening

If the large end of the cone **does** enter or pass through any of the openings, this space **fails** the test (see Figure 9b).

![Image](72x50) Zone 1 test: **Fail**, large end of cone **does** enter rail opening

**Repeat the Zone 1 Test:**

*On the other rails:* Repeat the test for all other rails on the bed; do not assume that the openings will all be the same.

**Zone 2 Test**

*This test assesses the potential for head entrapment under the rail, at a location between the rail supports or next to a single support.*

The tools needed to do this test are the cone, the safety strap and the spring scale.

**Prepare for the Zone 2 Test:**

1. Lock the bed's wheels/lower bed to a position where leg posts are still engaged with the floor.
2. Put the bed in the flat, horizontal position.
3. Fully raise all bed rails.
4. Position the bed at a comfortable working height (while still ensuring the wheels are locked, the bed is secured and the leg posts are engaged).

**Do the Zone 2 Test:**

1. Firmly push the mattress away from the rail being measured until it stops.
2. Identify the space where the test will be done (see Figure(s) 10a and 10b).
3. Determine whether the bed will be tested in the flat position or a different position.
4. Raise and lower the head and foot sections of the bed while you observe the space that
will be tested.

5. If the space(s) where the test will be done becomes smaller or does not change as the bed moves, do the test with the bed in the flat position.

6. If the space(s) becomes larger as the bed moves, find the bed position that creates the largest space. Perform the test with the bed in the position where the space is the largest.

7. Attach the safety strap of the cone to the rail being tested. Make sure the strap is short enough to keep the tool from injuring your feet if it falls, and long enough so it does not interfere with the test.

8. From the inside of the rail, insert the cone, small end first, into the gap between the mattress and the lower edge of the rail, between the rail supports. Let the cone compress the mattress. Do not force the cone into the area.

9. Attach the spring scale to the loop on the cone.

10. Pull on the spring scale with 12 lbs (53.4 N) of force at any angle that increases the chances of the cone going through the space. Use care when pulling. If the tool suddenly pulls through the opening, you may lose your balance and fall, or the tool may fall on you. Observe whether the large end of the cone enters through the opening.

11. Interpret test results.
Interpret Zone 2 Test Results:

If the large end of the cone does not enter the space under the rail, or pass under the rail, this space passes the test (see Figures 11a and 11b).

If the large end of the cone does enter the space under the rail, or if it passes under the rail, this space fails the test (see Figures 11c and 11d).

Repeat the Zone 2 Test:

On the same rail: If the rail has intermediate locking positions, perform the test for every intermediate position.

On the other rails: Perform the test for all other rails on the bed, including intermediate and raised positions; do not assume that the openings will all be the same.

Zone 3 Test

This test assesses the potential for head entrapment between the inside of the rail and the surface of the mattress (compressed by the weight of a resident's head) or edge of the mattress.

The tools needed for this test are the cone and the safety strap.

Prepare for the Zone 3 Test:

1. Lock the bed's wheels/ lower bed to a position where leg posts are still engaged with the floor.

2. Put the bed in the flat, horizontal position.

3. Fully raise all bed rails.

4. Position the bed at a comfortable working height (while still ensuring the wheels are locked, the bed is secured and the leg posts are engaged).

Do the Zone 3 Test:

1. Firmly push the mattress away from the rail being measured until it stops.

2. Put the cone near the rail being tested and attach the safety strap. Make sure the strap is short enough to prevent the tool from injuring your feet if it falls, and long enough so it does not interfere with the test.

3. Gently place the cone horizontally in the gap (see Figure 12a). Do not push the tool down into the gap.
4. Turn the cone until the line on the face of the large end is horizontal (see Figure 12b).

5. Let the cone sink into the space by its own weight. If the cone is tilted, use one hand to gently level it (see Figure 12c). **Do not** push the tool down into the gap.

   **Note:** If a mattress stop, rail support, or other structure keeps the cone from sinking in the gap, put the cone tool at a different location along the rail where there is no interference.

6. Determine whether the cone's center line is above or below the surface of the mattress.

7. Interpret test results.

![Figure 12a. Zone 3 test: between the mattress and the inside of the rail.](image)

![Figure 12b. Zone 3 test: turning the cone.](image)

![Figure 12c. Zone 3 test: tipping the cone.](image)

**Interpret Zone 3 Test Results:**

If the line across the flat end of the cone is **above** the surface of the mattress, the space **passes** the test (see Figure 13a).

If the line across the flat end of the cone is **at or below** the top surface of the mattress, the space **fails** the test (see Figure 13b).
Repeat the Zone 3 Test:

*On the same rail:* If the rail has any intermediate positions, perform the test at every intermediate position.

*On the other rails:* Perform the test for all other rails on the bed, including the intermediate positions; do not assume that the openings will all be the same.

**Zone 4 Test**

*This test assesses the potential for neck entrapment between the top of the mattress (compressed by the resident) and the lower-most portion of the rail, at the end of the rail.*

The tools needed for this test are the assembled cone and cylinder with safety strap.

**Prepare for the Zone 4 Test:**

1. Lock the bed's wheels/ lower bed to a position where leg posts are still engaged with the floor.

2. Put the bed in the flat, horizontal position.

3. Fully raise all bed rails.

4. Position the bed at a comfortable working height (while still ensuring the wheels are locked, the bed is secured and the leg posts are engaged).

**Do the Zone 4 Test:**

1. Firmly push the mattress away from the rail being tested until it stops.

2. Attach the safety strap of the cone tool to the rail being tested. *Make sure the strap is short enough to prevent the tool from injuring your feet if it falls, and long enough so it does not interfere with the test.*

3. Just beyond the end of the rail, rest the cone portion of the cone and cylinder tool on the mattress. The test area is shown in Figure 14. (If the bed has split rails, you may need to lower the rail next to the one being measured to make room for the tools.)
**Note:** If the cylinder tool cannot fit into an area between the head or footboard and the end of a rail, and if the large end of the cone does not enter or pass through the space below the rail defined by the end of the rail, the headboard (or footboard) and the mattress, the space passes since the patient cannot in these circumstances place his neck between the lower portion of the rail at the end of the rail and the top surface of the mattress.

4. Position the tool so that the large face of the cone is flush or even with the edge of the mattress (see Figure 15a).

5. Let the weight of the cone compress the mattress, but do not force the tool down onto the mattress or under the rail. Slide the tool towards the rail until it touches the rail or support (see Figure 15b).

6. Hold the cylinder section and use the level on the end of the cylinder to keep the cone level.

7. If the cylinder slides completely under the rail, this space fails. If the cylinder touches the rail, observe the color on the cylinder where it makes contact: Red fails; Green passes (see Figure 16).

8. Interpret test results.
Interpret Zone 4 Test Results:

If the cylinder touches the rail in the **green** area, the space **passes** (see Figure 16a).
If the cylinder touches the rail in the **red** area, the space **fails** (see Figure 16b).
If the cylinder passes completely **under** the rail, the space **fails** (see Figure 16c).

Reminder: If the cylinder tool **cannot fit** into an area between the headboard or footboard and the end of a rail and if the large end of the cone does not enter or pass through the space below the rail defined by the end of the rail, the headboard (or footboard) and the mattress, the space **passes**.

Repeat the Zone 4 Test:

*On the same rail:* If the rail has any intermediate positions, perform the test at every intermediate position.
*On the other rails:* Perform the Zone 4 test at both ends of all other rails on the bed, including the intermediate positions; do not assume that the openings will all be the same.

**Zone 5 Test**

*This test assesses the potential for neck or chest entrapment in the space between the split rails.*

Measure to ensure that the space between the split rails is $< 60$ mm ($< 2.375”$) OR $> 318$ mm ($> 12.5”$).

**Zone 6 Test**

*This test assesses the risk of entrapment in the gap between the end of the bed rail and the side edge of the head or foot board.*

Measure to ensure that the gap is $< 60$ mm ($< 2.375”$) OR $> 318$ mm ($> 12.5”$)

**Zone 7 Test**

*This test assesses the risk of head entrapment in the space between the inside surface of the head or footboard and the end of the mattress.*  *Note, this zone must be tested even if there are no bed rails in use.*

Measure to ensure that the space **between the inside surface of the head or footboard and the end of the mattress** is $< 120$ mm ($< 4.75”$)
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