

Common Failure Modes of Overhead Ceiling Lifts

INTRODUCTION

Ceiling mounted patient lifts are used to assist staff in safe lifting, transferring, and ambulating patients with mobility challenges. They are also used to position patients in beds, for lifting appendages or body parts and for other patient handling tasks. Ceiling lift systems decrease the physical demands on the staff and provide a safe and reliable method of patient handling and care. The ceiling lift system consists of a fixed ceiling Lift Unit which resides in a track system. Rails are typically installed to provide one or two dimensional movement of the ceiling lifts in many areas of a facility, such as patient rooms, bathrooms, dental clinics, dialysis and diagnostic areas among others. The ceiling lift system is usually battery operated and can be moved along the rail from location to location offering flexibility of use. The motor unit carries a bar from which a sling to hold the patient is suspended. A variety of slings are available with different shapes and sizes to suit an array of patient body types and patient handling tasks. The ceiling lift system's coverage of a room is dependent on the configuration of its rails; as a result, room coverage can vary from room to room and facility to facility. Lift system coverage can be modified with the use of gates and stoppers, preventing the Lift Unit from moving to a certain location where it might interfere with staff movement or patient care.

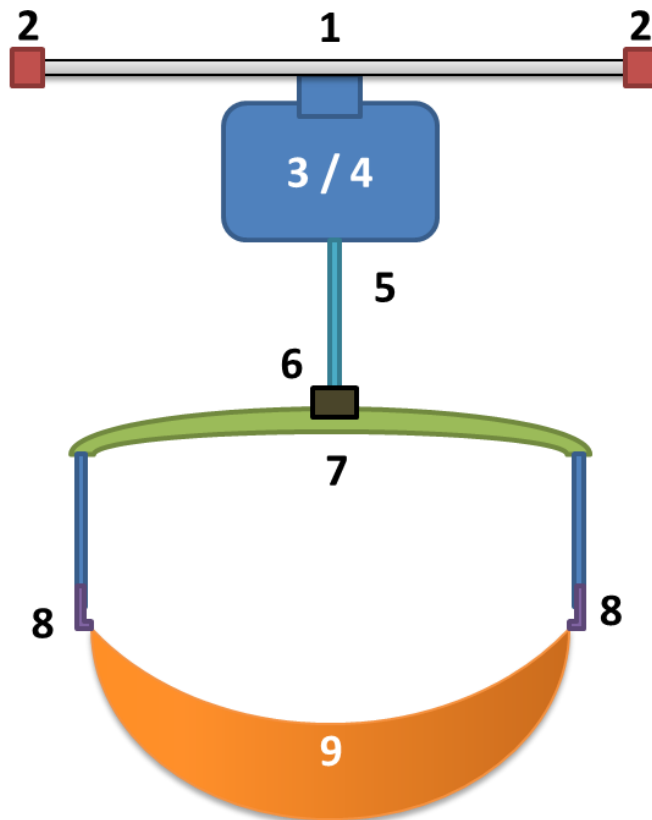


Figure 1: The System

1. Ceiling Track / Rail
2. Ceiling Track Gates / Stoppers / Rail End Stops
3. Lift Unit
4. Lift Unit Battery and Charger
5. Lift Tape / Strap (Central Strap that Descends from the Lift Unit to the Lifting Bar)
6. Lift Tape Hook
7. Lifting Bar (also known as Spreader Bar / Hanger Bar / Lift Bracket / Sling Bar)
8. Sling Securing Mechanism such as Carabineers / Safety Pins / Cotter Pins / Safety Hooks / Sling Hooks
9. Sling
10. Lift Scale (Optional accessory, not shown)

SCOPE

- This hazard summary addresses common failure modes of overhead ceiling lifts and covers frequently occurring events which may result in patient harm that can be prevented during installation, maintenance, or operation.
- This hazard summary is **not** intended to cover or prevent rare events, events resulting from defective units, or events related to patient lifts, standing aids, wall mounted lifts or any lifts that are not overhead ceiling lifts.
- This hazard summary is a supplement; it does not replace latest revisions of existing patient safety alerts or advisories, or guidelines and directives for proper, safe handling, installation, operation and application of overhead ceiling lifts.
- This hazard summary utilizes the “systems approach” to delineate vulnerabilities in a system, where the patient is identified as part of the system.

TYPES OF HAZARDS

The list of hazards below covers the most commonly occurring hazards reported by both VA and non-VA facilities. The data for these hazards were compiled from a thorough search of available databases including NCPS SPOT, FDA MAUDE and ECRI Institute Hazard Alerts.

1. Issues with Ceiling Track Rail Installation, Relocation and Preventative and Corrective Maintenance,

- Track Rail junction or exchange points are points of weakness as they are not solid lengths of track. These points of weakness can bow after repeated use. This can result in the Lift Unit falling off of the Track Rail.
- Track Rail turn tables allow for the Lift Unit to change directions. It is a point of weakness as it is not a solid track. Guardrails and/or gates are required to ensure the security of the Lift Unit during the turning of the turn table. Missing guardrails or gates can result in the Lift Unit falling off of the Track Rail.
- Gaps in the Lift Track created during installation or relocation can cause the Lift Unit to fall off of the Track Rail.
- Missing or unsecured Ceiling Track Gates / Stoppers can cause the Lift Unit to run off of the Lift Track while in motion.

2. Unintentional Exposure to Corrosive Environments

- Most Lift Units are not water tight and are not intended for continuous use in wet or humid environments. Wet or humid environments such as pools and bathrooms can cause early or unexpected signs of wear and, in severe cases, corrosion of internal components of the Lift Unit or Lift Unit Battery. Failure of internal components of the Lift Unit is hard to detect but can result in sudden breakage, a sudden stop to lifting capabilities, or the sudden and uncontrolled drop/release of a patient.

3. Incompatible Accessory Parts for the Lift Unit

- There are many accessory components to any lift such as Slings, Sling Security Mechanisms, Lifting Bars, and Scales. The Lift Unit is designed to attach securely to specific models of accessories.
- The Lift Tape Hook at the end of the Lift Tape could be incompatible with the attachment handle eye on a Lifting Bar. Incompatibilities in these parts create points of weakness that can fail during a lifting operation.
- The Lifting Bar Hooks or Pad-eye can be incompatible with certain Safety Pins or Carabineers. Incompatibilities in these parts create points of weakness that can fail during a lifting operation.
- The use of lift accessories that are inappropriate for the patient such as a lift bar that is not wide enough or a lift sling that is too small for bariatric patients could result in serious patient harm.

4. Failure of the Lift Tape

- Lift Tape shows signs of wear, fraying and tearing most commonly at the seams and at the attachment points. If these signs are neglected it can result in the sudden drop/release of a patient.
- Lift Tape Hook can be loosely or insecurely fastened to the Lift Tape which could result in the sudden drop/release of a patient

5. Failure of the Sling or Sling Attachments / Attachment Points

- Slings are attached to the Lifting Bar with a variety of components such as Carabineers, Safety Pins, Safety Hooks, and Sling Hooks. These components are weak points in the lift system especially if they are loose, insecure or worn. Their failure could cause the sudden drop/release of a patient.
- Slings show signs of wear, fraying and tearing most commonly at the seams and at the attachment points. If these signs go unnoticed it can result in the sudden drop/release of a patient.

6. Snagging of the Lifting Bar or Sling

- Ceiling lift systems have a wide range of movement vertically. As a result, a portion of a Sling or a Lifting Bar can be caught underneath or wrapped around an obstacle creating a tripping hazard for the care taker. Lifting the lift system while a portion of a Sling or a Lift Bar is snagged can result in excessive strain on the Lift Unit causing mechanical malfunction or a sudden drop/release of a patient.

RECOMMENDATIONS TO MITIGATE THE ABOVE IDENTIFIED HAZARDS

1. Utilize a Checklist to Verify Acceptable Lift System Installation, Relocation, and Preventive and Corrective Maintenance.

- Use an acceptance checklist after the installation, relocation, and preventive and corrective maintenance of the lift system and Lift Tracks. A detailed acceptance checklist is included with Patient Safety Alert AL14-07.

- Check for track bowing, particularly at junctions and turn tables as well as for misalignment and gaps.
- Be aware of the installation environment. Most lifts systems are not able to remain in moist or humid environments such as pools or bathrooms for extended periods of time; such use could result in subsequent damage to the lift system after prolonged use.
- For more information refer to Patient Safety Alert AL14-07

2. Identify Weak Points and Spot Check the Lift System Prior to Use

- Points of weakness on a lift system are at the attachment points. There are three major attachment points, one at the Lift Tape Hook and two at either side of the Lift Bar attached to the Sling.
 - Develop a checklist to ensure that these three points are inspected prior to lift operation; ensure the security of the attached components.
 - Visually sweep between these three attachment points during the lifting operation to catch any potential slippage or breakage in order to mitigate the risk of a patient fall/release from the lift.

3. Sling and Lift Tape Care and Continued Inspection

- Develop a checklist to visually inspect the Lift Tape and Slings prior to use for rips, tears, or fraying. Pay careful attention to attachment points of the sling and major seams as they have the highest rate of failure. Refer to Table 2 in the appendix for an example.
- Replacing Lift Tape and Slings prior to them showing any signs of wear on a regular schedule can also mitigate the risk of breakage.
- Schedule annual clinical staff training on sling use, care and inspection.

4. Visually Sweep for Snags

- Prior to lifting, visually sweep the area for lifting clearance, remove any potential obstacles. Refer to Figure 2 in the appendix for an example.

Additional Resources

- 1) [Patient Safety Alert AL14-07 "Issues continue to occur due to improper ceiling mounted patient lift installation, maintenance and inspection"](#)
- 2) [Corrective and Preventive Maintenance Checklist for Ceiling Mounted Patient Lifts](#)
- 3) [Installation or Relocation Checklist for Ceiling Mounted Patient Lifts](#)
- 4) [Ceiling Lift Hazards and Mitigations Presentation](#)

APPENDIX

Table 1: Pre-procurement Checklist

Checklist Items	√
The weight limit for the lift system is clearly displayed and within predetermined parameters.	
The sling weight capacity is clearly displayed.	
A variety of slings are purchased for the variety of patient handling tasks and for the weights and sizes of the estimated patient in the population where they will be used.	
The lifting capacity of the lift system exceeds the estimated weight of the patient in the population where the lift will be used.	
The lift is rated for the conditions where it is installed (bathroom, pool, bed room, etc.).	
There is space for lift installation in the target location.	
The use, inspection and maintenance requirements for the slings are written, communicated, understood and reinforced by documented annual training.	

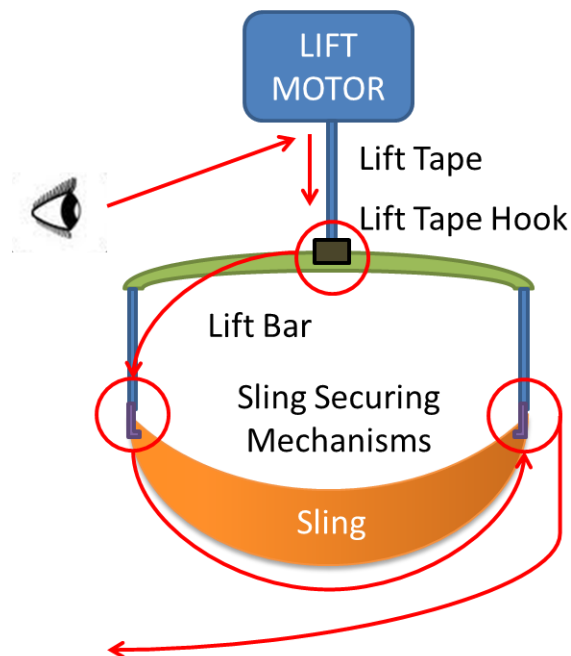


Figure 2: Pre-Lift Visual Sweep – Check Lift Tape, Lift Tape Hook, Sling Securing Mechanisms, and Sling for security and integrity. Check surrounding area for obstructions.

Table 2: Pre-operation Checklist

Checklist Items	√
The Lift Bar is securely attached to the Lift Tape via the Lift Tape Hook.	
The Lift Tape is in good condition, not worn, frayed or torn.	
The Sling is securely attached to the Lift Bar at all attachment points.	
The Sling is in good condition, not worn, frayed, or torn at the seams.	
The Sling is in good condition, not worn, frayed, or torn at the points of attachment.	
The Sling is rated for the weight of the patient.	
The lift system is rated for the weight of the patient.	
The lift area is clear of obstructions.	