LINET

SMARTER TOOLS, SAFER TEAMS: ANALYZING LATERAL PATIENT TRANSFERS WITH SPRINT 200/400



BACKGROUND

Musculoskeletal disorders (MSDs) associated with lateral patient transfers are among the most prevalent occupational injuries in nursing practice, posing a significant risk to caregiver health and workplace safety (Waters TR, 2007). The likelihood of developing MSDs is influenced by patient weight, the number of assisting caregivers, the physical condition of healthcare workers, and the availability of appropriate transfer devices. Patient‘s transfers involve high biomechanical loads, particularly due to repetitive lifting, pulling, and awkward postures, placing excessive strain on the lumbar spine, shoulders, and upper extremities.

Beyond individual health consequences, MSDs contribute to high rates of absenteeism, reduced workforce retention, and increased financial burdens on healthcare systems. With staffing shortages worsening globally (USASH, 2021), the physical demands of patient handling further exacerbate burnout and injury risks, ultimately affecting the quality of patient care. Addressing these challenges requires advanced solutions that reduce mechanical strain while maintaining efficiency and ergonomics for caregivers.

CONCLUSION

The findings from this study highlight the significant advantages of the Sprint 200/400 stretcher with Zero Gap siderails in improving the efficiency and safety of lateral patient transfers. When compared to a stretcher with standard siderails, the Sprint 200/400 reduces the required transfer force by an average of 40% when using a slide sheet and by 11% when using a slide board. Additionally, it minimizes the number of caregivers needed for patient transfers, contributing to a safer and more ergonomic working environment for healthcare professionals.

Across the globe, there are notable disparities in the availability of equipment designed to assist nurses and caregivers in patient handling. Considering these variations, our study confirms that the least suitable tool for patient transfers is a cotton sheet, as it requires excessive physical effort or number of caregivers and presents a high risk of musculoskeletal injuries for caregivers.

Conversely, the tubular slide sheet and slide board have proven to be critical assets in reducing the physical strain and the number of caregivers required for a safe patient transfer. When used in combination with the Sprint 200/400 and its Zero Gap siderails, the benefits are even more pronounced, offering an optimized solution that enhances caregiver safety during their work.

The principles of safe lateral patient transfer

In hospitals, patient lateral transfer is an everyday necessity, occurring multiple times during a patient's stay—for examinations, procedures, and department transfers. However, these transfers pose a significant risk to both patients and caregivers. **Excessive pulling forces during transfers can lead to caregiver injuries, patient discomfort, and inefficiencies in hospital workflows.**

To address these challenges, hospitals typically rely on either increasing staff involvement or incorporating specialized equipment. Understanding the forces required for safe and efficient transfers is essential for optimizing patient handling procedures while ensuring compliance with best-practice safety standards.

GUIDELINES FOR SAFE TRANSFERS

Research by Waters T. (2011) for AORN (Association of periOperative Registered Nurses) recommends that one caregiver should pull maximally 16 kg (35 lb) of patient mass when performing a lateral transfer (Waters T, 2011). However, in real-world hospital environments, patient weight often exceeds this limit, increasing the risk of musculoskeletal injuries among caregivers and compromising patient safety.

Additionally, unconscious or immobile patients require at least two additional caregivers to support their head and feet, further straining hospital resources. The type of equipment and surfaces involved in the transfer also play a significant role in determining the force required, directly impacting the efficiency of hospital workflows.

LINET solution for lateral transfer with use of zero gap siderails in Sprint 200/400

To improve transfer efficiency and reduce physical strain on caregivers, we developed the Sprint 200/400, an advanced emergency stretcher featuring specialized siderails that fold under the mattress to minimize the gap between surfaces.
Why does gap reduction matter? When transferring a patient from a stretcher to a bed, the larger the gap, the greater the force required. By eliminating this gap, the Sprint 200/400 significantly reduces the effort needed to move a patient, lowering the risk of caregiver injuries and improving transfer efficiency.
Caregivers and non-medical staff regularly employ various strategies to minimize the physical effort required for patient transfers. This is typically done by increasing the number of caregivers involved or by using specialized equipment to facilitate the process. To gain a precise understanding of the forces involved, a comprehensive evaluation was conducted at the LINET lab.

MEASUREMENT METHODOLOGY

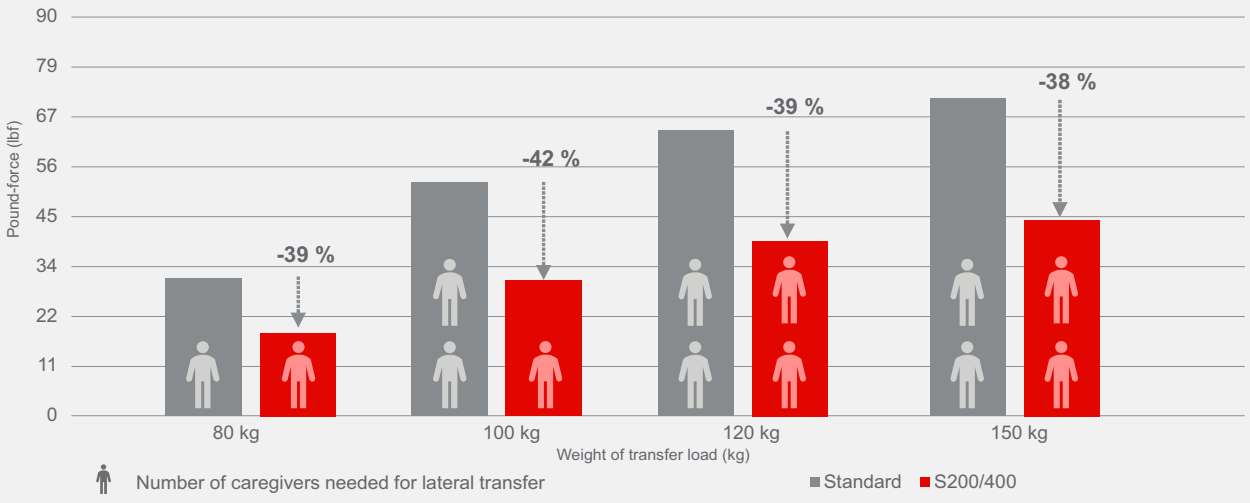
We conducted testing in the LINET lab using a mannequin simulating an immobile patient with varying weights to assess the effectiveness of different transfer tools with stretchers. The tools tested included a tubular slide sheet, a slide board, and a cotton sheet, which were used to transfer the mannequin onto two types of stretchers: a standard stretcher and the Sprint 200/400, both equipped with an additional cotton sheet placed over the stretcher mattress. The transfer was then performed from a standard hospital bed Eleganza 2 to the stretcher. Hospital bed had flat mattress platform and was equipped with passive mattress with another cotton sheet.

In this test performed with single lab technician, was measured the amount of force required to drag the mannequin from the hospital bed to both the standard stretcher and the Sprint 200/400 (No lifting was involved in the test). This allowed us to compare the stretchers and transfer tools in terms of effort required. Difference of required force is not caused only by used transfer tool but also by the gap between the bed and each stretcher, what was already mentioned before. The standard stretcher had a gap twice as large as that of the Sprint 200/400 with folding Zero Gap siderails.
Our analysis compared the measured force with the AORN recommendation (Waters T, 2011) which states that a single caregiver should not pull more than 16 kg (35 lb). Based on these guidelines, we calculated the number of caregivers required to safely pull a patient based on force measurement, considering the that 16 kg is equivalent to 160 N force as threshold for 1 caregiver. The findings are presented separately for each transfer tool in relation to the standard stretcher and Sprint 200/400, while also evaluating which tool is the most beneficial for safe patient transfer.

RESULTS OF LINET TESTING

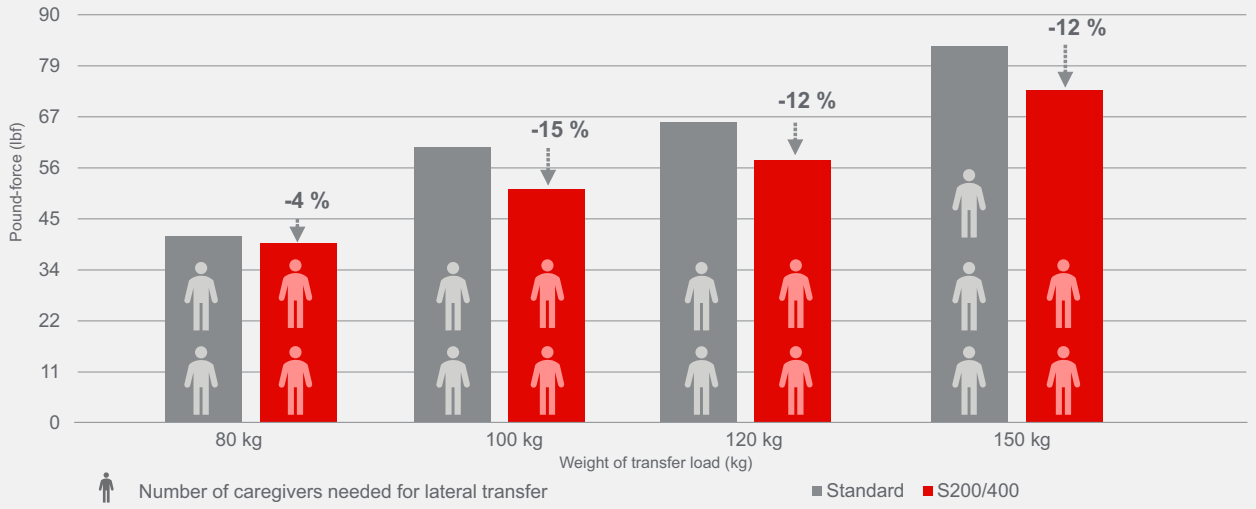
Considering the stretcher and the individual tools used for patient transfer, Graph 1 presents a comparison of forces and the number of caregivers required for transferring patients of different weights using slide sheets. As was mentioned in methodology, number of caregivers is based on recommended force for 1 caregiver, which is 35 lb (Waters T, 2011). The percentages in graph represent the reduction in force achieved by the Sprint 200/400 Zero Gap siderails compared to a stretcher with standard siderails .
Graph 1 represents comparison of Sprint 200/400 with standard stretcher, where was used slide sheet as transfer tool. In graph is visually demonstrated the required number of caregivers, who were similar for both stretchers, except for the 100 kg patient, where the Sprint 200/400 required only one person due to the significantly lower force needed. Overall, the graph clearly shows that the Zero Gap siderails of the Sprint 200/400 reduce the necessary transfer force by an average of 40% when using a slide sheet

GRAPH 1 | Comparison of needed force and caregivers for lateral transfer from Standard stretcher and from Sprint 200/400 to bed with use of slide sheet



Graph 2 compares transfer of manequinn on the same stretchers as in Graph 1, with the only exception being that the testing was performed using a slide board instead of a slide sheet. The slide board has the advantage of being a flat surface, meaning that the gap between the bed and stretcher had less impact on the required force. However, its sliding vability was lower compared to a slide sheet.

GRAPH 2 | Comparison of needed force and caregivers for lateral transfer from Standard stretcher and from Sprint 200/400 to bed with use of slide board



For the slide board, the main difference lies in the required force for transfer, where the Zero Gap siderails offer an 11% reduction in force needed for the transfer on average.

Lateral transfer of patient from Sprint 200/400 to hospital bed requires 40 % less force with slide sheet and 11 % with slide board compare to standard hospital stretcher

(LINET lab testing)

In Graph 2, it is shown that for a stretcher with standard siderails, the number of caregivers required is almost the same as for the Sprint 200/400 with Zero Gap siderails. The only visible difference appears with the 150 kg mannequin, where three caregivers are required for a transfer on standard stretcher.

During the measurements, we discovered that it is not possible to measure the force required to pull a mannequin on a cotton sheet from a standard stretcher. This is because the mannequin must be lifted to pass the gap, which, in a real-life scenario with a patient, could pose a risk of injury.

For that reason, we conducted measurements with the cotton sheet only on the Sprint 200/400 stretcher, as these models minimize the gap between the bed and stretcher thanks to their folding under-platform design and visualized results only in Graph 3.

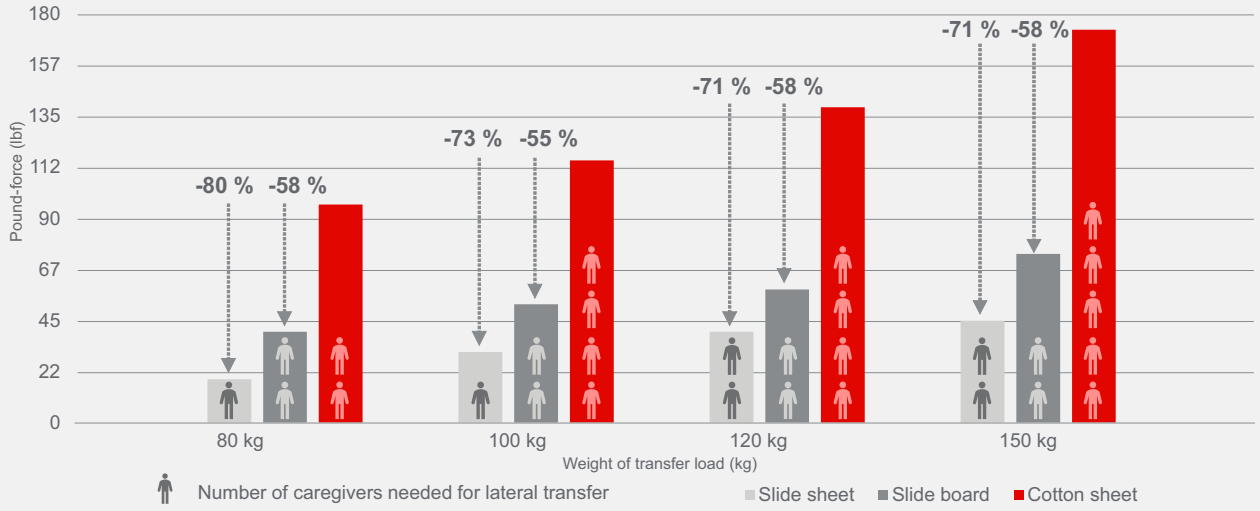
In Graph 3, we present a comparison of different tools for patient transfer from the Sprint 200/400 to a hospital bed. This measurement clearly demonstrates that using a cotton sheet for patient transfer is highly unergonomic, as it requires significant physical effort.

The data shows a significant reduction in the required force when using alternative tools:

- Slide sheets reduce the required force by 75% compared to a cotton sheet.
- Slide boards reduce the required force by 57% on average compared to a cotton sheet.

These findings emphasize the importance of selecting the right transfer tool to improve efficiency and reduce caregiver strain.

GRAPH 3 | Comparison of needed force, its reduction and caregivers for transfer with cotton sheet, slide board and slide sheet



Tools such as slide sheet or slide board in combination with the stretcher Sprint 200/400 and its Zero Gap siderails offers an optimized solution that enhances caregiver safety in patient transfer.

(LINET lab testing)

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