

WeAssist™ revolutionises hospital bed transport: Real relief for nursing staff



ISSUED DATE:

September 26, 2025

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Abstract

WeAssist™, an electrically powered wheel designed to replace a hospital bed castor, significantly reduces physical strain on nursing staff during bed transport by lowering hand forces by up to 45%, spinal compression forces by up to 36%, trunk inclination by up to 36%, muscle activity by up to 67%, and perceived physical effort by 69%, while achieving excellent usability scores compared to manual pushing, based on an independent study conducted by FH Münster University of Applied Sciences. ¹

Key findings:

- SUS score for manual pushing: 54 ± 22 (Adequate usability)
- SUS score for WeAssist™: 86 ± 11 (Excellent usability)
- Perceived physical effort reduced by 69% with WeAssist™
- Hand forces reduced by up to 45% on inclines
- Spinal compression forces reduced by up to 36%
- Trunk inclination reduced by up to 36%
- Muscle activity reduced by up to 67%

Introduction – Care for the caregivers

With a shortage of skilled staff, demographic shifts, and increasing cost pressure, hospitals face the enormous challenge of making processes and investments increasingly efficient and of attracting/keeping employees.

During patient transfers between wards or to diagnostic and treatment units, the musculoskeletal system is subjected to considerable strain, primarily due to the distances to be covered and the substantial weight of hospital beds. Overall, moving hospital beds is one of the most physically demanding activities in everyday nursing practice (Ando et al., 2000; Zhou and Wiggermann, 2017).

Back, shoulder and neck pain are common among nursing staff, with more than half reporting back issues, nearly half experiencing shoulder discomfort, and over 40% suffering from neck pain. One of the most physically demanding tasks contributing to this strain is pushing heavy hospital beds over long distances. Depending on its equipment, a hospital bed can easily weigh 150 kilograms or more, and with a patient, the total weight increases significantly.

To reduce the physical burden on healthcare workers during bed transports, the companies TENTE (TENTE-ROLLEN GmbH, Wermelskirchen, Germany) and LINAK (LINAK A/S Nordborg, Denmark) have developed the electrically powered wheel “WeAssist™”, designed to replace one of the four castors on a hospital bed. WeAssist™ is an innovative mobility solution using the e-bike riding principle: You still have to manoeuvre and push the bed, but WeAssist will help you and provide the necessary support. The driving maneuvers become much easier and more comfortable.

By enhancing patient transport, WeAssist™ saves time, cost and effort. It allows for a more flexible allocation of staff resources, boosts employee productivity and accelerates work processes.

The noticeable reduction in workload improves working conditions in hospitals and strengthens their position as attractive employers.

Furthermore, it demonstrates that employees are valued, and employee satisfaction can thereby be boosted.

This White Paper highlights the WeAssist impact on reducing physical strain during bed transport - specifically examining action force, spinal load, trunk inclination as well as muscle activity and usability. It shows proven results and evidence based on an independent scientific study conducted by FH Münster University of Applied Sciences.

Scientifically tested by FH Münster and proven by Nursing Staff

To date, few studies have investigated the physical strain involved in the movement of hospital beds.

In the practical study conducted by Münster University of Applied Sciences, nursing staff evaluated the physical strain involved in manually - versus motorized - pushing of hospital beds with WeAssist.

Study methodology

The study included thirteen nursing professionals and a standard hospital bed with a total weight of 259.8 kg including patient manikin and measurement equipment.

The tests were carried out in real hospital settings - including corridors, lifts, curves and ramps.

Each nurse completed the test course 3 times with and without WeAssist. During this process, hand forces, trunk inclination, spinal compression forces, and muscle activity were measured, and subjective evaluations were made on how participants assessed perceived strain and ease of use.

Excellent user-friendliness

The workday for a nurse at the hospital is busy and time for training and learning how to use equipment is limited. It is vital to have intuitive and easy-to-use equipment.

The SUS scale (System Usability Scale) was used to evaluate user satisfaction and acceptance of moving the bed manually and with WeAssist, which was determined based on ten questions after the test run. SUS scores, ranging from 0 to 100, provide a comparative measure of usability, which can be interpreted as follows:

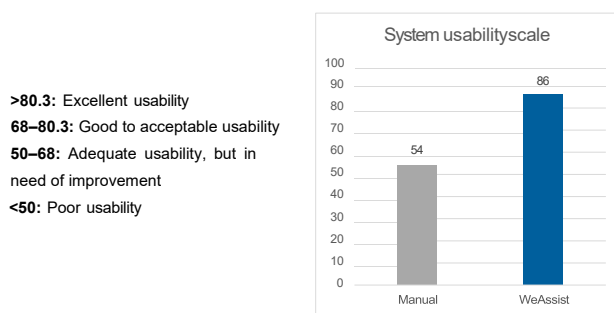


Figure 1: System usability scale results

The subjective evaluations from the nurses revealed significant differences in user acceptance between manual pushing and pushing with WeAssist motorised assistance. Manual pushing received an average rating of 54 ± 22 .

This indicates sufficient but improvable user-friendliness. In contrast, the assistance with WeAssist was rated at 86 ± 11 , which corresponds to excellent user-friendliness.

The personal feedback from the nursing staff was also predominantly positive, particularly appreciating the feature of WeAssist to function without additional control elements and without altering the usual operation of a bed.

The average ratings of perceived physical exertion for moving the hospital bed with and without WeAssist were assessed using the Borg CR10 scale. The difference between both conditions was statistically significant, and manual pushing was rated on average at 6.4 ± 2.0 , corresponding to a perception of „strong to very strong“ exertion. With motorised WeAssist assistance, the rating dropped to 2.0 ± 0.9 , indicating a low level of physical effort.

WeAssist significantly reduces the perceived physical effort by 69%

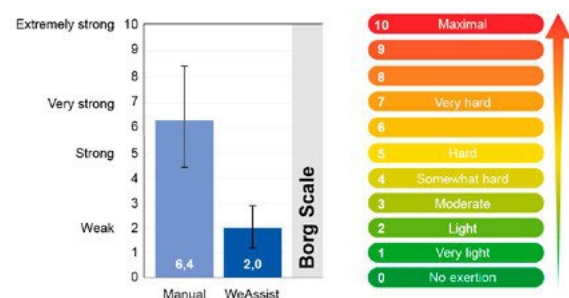


Figure 2: Borg scale results

With the user-friendliness rated as “excellent,” WeAssist can help reduce physical strain in daily clinical care.

Reduce exerted hand forces by up to 45%

The results demonstrated that WeAssist significantly reduced exerted hand forces moving the hospital bed. The relief was particularly pronounced in the ramp intervals with a reduction of up to 45% when starting to push the bed up a 3.5% incline. When pushing the bed down the 3.5% incline, the exerted hand forces were reduced by 34% as WeAssist reduces the speed of the hospital bed, supporting easy manoeuvring.

Lumbar spine and spinal compression forces at the L5/S1 level reduced by up 36% (see Fig.3)

Moving hospital beds often exceeds recommended spinal compression limits. In the study, the compression force between the fifth lumbar vertebra and first sacral vertebra (L5/S1) has been calculated.



Figure 3: Spinal compression forces at the level L5/S1

The study illustrates and documents that the manual movement of hospital beds represents a significant load for the lumbar spine – particularly on ramps. The highest maximum and mean compression forces at L5/S1 occurred during the “pushing start phase ramp +3.5%” and “push up ramp +7%” intervals, reaching maximum values of 3.4 kN and 4.1 kN, and mean values were 2.1 kN and 2.3 kN, respectively.

WeAssist reduced these forces by up to 36% and significant reductions in peak spinal compression forces are detected in 10 out of totally 13 intervals - marked with an asterisk. (see Fig. 4)

The spinal compression forces determined in this study were compared with the revised Dortmund threshold values² for women aged >60 years (1.8 kN) and those aged 50–60 years (2.4 kN). These thresholds were selected because approximately one third of nursing staff in Germany are over 50 years old, and approximately 10% are over 60 years - a proportion that continues to rise.³

The results of this study indicate that the maximum spinal compression force – shown in the upper graph - exceeded the 1.8 kN threshold in all intervals without motorised wheel assistance. With WeAssist, this threshold was met or undercut in four intervals. The higher threshold for nursing staff aged 50-60 years (2.4 kN) was exceeded with WeAssist assistance only during the steepest ramp interval (7% incline) and by unplanned stop.

Based on these findings, motorised wheels like WeAssist are recommended as standard equipment for moving hospital beds to reduce spinal load on nursing staff.

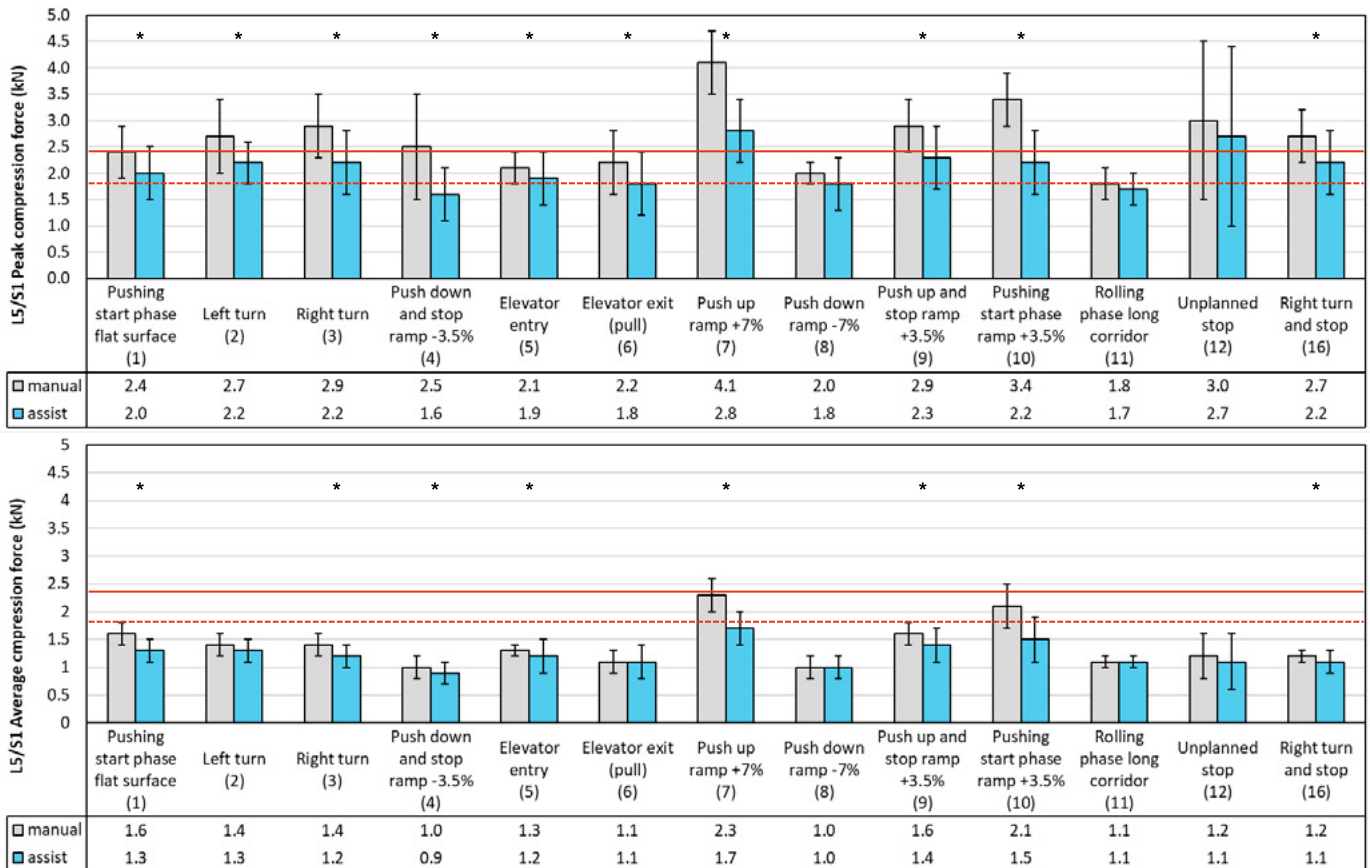


Figure 4: Comparison of maximum (top) and mean (bottom) spinal compression forces at L5/S1 across the respective intervals. Gray bars: manual movement; blue bars: motorised assistance, WeAssist.

* denotes significant differences ($p < .05$).

Red lines: Dortmund reference values; dashed line: threshold for women > 60 years (1.8 kN); solid line: threshold for women aged 50–60 years (2.4 kN).

Trunk inclination reduced by up to 36%

The trunk inclination in connection with the exerted force has a direct influence on the spinal compression forces.

This means: These forces are particularly high during manoeuvring on ramps and during acceleration phases.

Overall, the posture analysis shows that, across all intervals on the test course, WeAssist reduced both maximum and mean trunk inclination by an average

of 18%, indicating a more upright posture compared to manual pushing.

The study results show that the use of WeAssist has a particularly pronounced effect on trunk posture during manoeuvring on ramps and during acceleration phases – that is, when increased exertion is required. One of the greatest reductions in average trunk inclination occurred when pushing the hospital beds up a ramp with a 7% incline. In this case, the angle decreased by 35% from 31° to 20°.

Muscle relief with up to 67%

The motorised assistance by WeAssist when pushing the hospital bed led to a general reduction in muscle activity of the examined muscle groups (see Fig. 5).

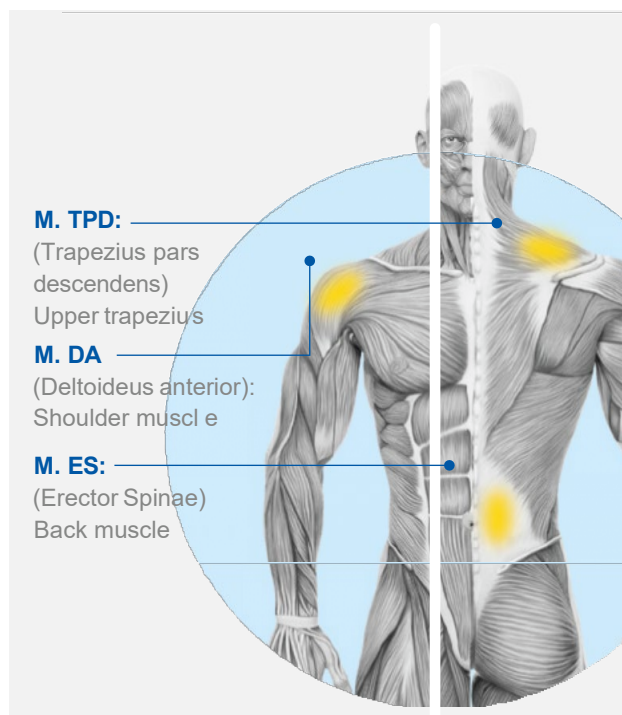


Figure 5: Examined muscle groups

Muscle activity also dropped significantly - by as much as 67% in some cases. Participants reported that motorised assistance made bed transport noticeably less strenuous and rated the usability very positively.

A unique and safe retrofit solution

Hospital beds are generally used for an average of about 15 years. To comprehensively relieve nursing staff, the development of cost-effective retrofit solutions that enable the motorisation of existing hospital beds is of crucial importance.

WeAssist can be mounted on existing hospital beds as a plug-and-play solution without special tools. Unlike other systems, this wheel is not mounted as a fifth wheel but replaces one of the four outer castors. This design allows for the retrofitting of even older hospital beds, offering the potential to significantly reduce the physical workload of many nurses in daily practice.

Conclusion

Although other alternative mobility solutions significantly reduce physical strain, the TOP principles of occupational safety (technical, organisational and personal) favour implementing technical solutions directly into the work equipment. Thus, an integrated drive system within the bed offers a more sustainable solution than external aids.

The system in this study represents a promising approach. WeAssist is currently the only known solution where retrofitting simply involves replacing one of the existing castors on hospital beds from various manufacturers worldwide. This creates the potential to physically relieve a large number of nursing staff. The high usability demonstrated in the study indicates that the system can be used immediately without additional training.

Based on the study results, motorised wheels are recommended as standard equipment for the transport of hospital beds. The goal: the reduction of spinal load on nursing staff. For nursing staff above 60, beds should be moved by two people or with the help of bed transport equipment that provides stronger support.

Nursing means responsibility, dedication – and above all physical effort. WeAssist™ therefore supports the nursing staff at every step and ensures scientifically proven relief by reducing muscle exertion, protecting the back, and noticeably easing the pushing of hospital beds. Completely intuitive, simple and proven.

Hospital management is encouraged to consider WeAssist™ as a standard retrofit solution for hospital beds to reduce physical strain on nursing staff and improve workplace ergonomics.

References

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