

LINET

STREAMLINING PATIENT TRANSPORT AND MAXIMIZING OPERATIONAL EFFICIENCY



BACKGROUND

The demand for healthcare services is rising. Worldwide, nurses' workload and time are being pressured and challenged by a high patient turnover as a result of a possible new era of infectious diseases, shorter hospital lengths of stay, the ageing population and increasing rates of chronic disease (Myny D, 2012).

In response to increased levels of patient turnover, hospitals around the world have introduced a range of bed management strategies that had the unfortunate consequence of increasing "the inflow and outflow of patient admissions, discharges and transfers" (Hughes, 2010). As a result, transporting patients in beds throughout hospitals is becoming more frequent at each day. If we consider that patient transportation has been rated as one of the most frequent patient moving and handling activities that increase the risk of musculoskeletal injuries and that these injuries are often debilitating, career-ending, and life changing, it becomes urgent to investigate, develop and promote evidence based best practices that support ergonomic solutions for patient transportation within the hospital (Gunther P, 2015).

This white paper intends to review this evidence whilst boosting potential solutions brought by Essenza 300' latest technology – EasyDrive.

CONCLUSION

A review of studies about patient transportation within hospitals enlightened us about different aspects of challenges faced by the healthcare system. Hospital beds equipped with castors were introduced more than half a century ago and still caregivers are being requested to continue to use traditional methods of patient transportation that may negatively impact their own health. Due to the transport of occupied hospital beds, caregivers face high spinal compression forces and excessive backloading during these activities (Waters TR, 2007) leading to the potential development of musculoskeletal disorders (MSDs), especially when the required force for pushing is high. Implementing ergonomic principles for safe bed transportation can be challenging for various reasons, such as malfunctioning driving elements on the bed, shortage on healthcare professionals (ICN, 2020) and, consequently, lack of time (EU-OSHA, 2020). All of those highly contributing for a low compliance with safety guidelines and standards for safe transportation.

If musculoskeletal disorders develop, the consequences impact not only the caregivers themselves but also the healthcare organization. The absence of caregivers creates an even deeper staffing shortage, and it overloads the remaining caregivers

when the healthcare institution is unable to provide substitution. Furthermore, this absence impacts significantly healthcare systems not only by the cost of caregivers' absence due to MSDs, but also due to the increase in patient transports within the hospital to manage safe ratios. Ultimately, this can result in a need for 11.3 full-time equivalent nurses monthly exclusively for patient transportation within the hospital (Blay N, 2017).

Currently, hospital policies are mainly based on previous bed solutions and safety guidelines, which typically require two and more caregivers to transport a patient safely through hospital corridors. This is supported by AORN (Association of Perioperative Registered Nurses) ergonomic tool 7, which suggests that a single caregiver should not exceed an initial pushing force of 199 N (Waters T, 2011). However, the massive advancements in design and technology should be followed by healthcare policies evolution also. As a medical driven company, LINET invests its full potential to innovate and promote innovation within the HealthCare Industry. Patient Transportation is no different, and our solutions have shown that the use of power transport devices has a massive impact on the safety and efficiency of hospital operations leading to a reduction on the number of necessary caregivers to complete this high-risk activity. LINET internal tests have shown that it is safe for a single caregiver to drive Essenza 300 with EasyDrive up to its safe working load even when time lacks to set the bed according to ergonomic principles.

The Evolution of Patient Transportation in Hospitals

Hospital beds have been utilized for in-hospital patient transportation since the development of hospital beds with castors in 1945. (Keil, 2015) Castors have enabled the transport of patients whilst in bed and have facilitated its movement within rooms accordingly bed management best practices. Over time, a fifth castor was also developed to improve manoeuvrability and enable easier driving within long distances whilst maintaining a stable position. Subsequently, the focus shifted towards larger castors that could overcome thresholds and potentially reduce the force required by caregivers to push the bed.

The innovation of technologies and electric engines associated to all the solutions brought to hospital beds along time, have resulted on a significant reduction of effort during a high-risk task for caregivers – in-hospital patient transportation. However, the technology remained expensive and was not affordable for all healthcare environments. Consequently, powered beds were primarily implemented for hospital stretchers and ICU (Intensive Care Unit) beds. At LINET, we have now developed an affordable powered 5th wheel for Essenza 300 unlocking the same potential for both acute and long-term care segments.

How Patient Transportation Impacts Caregivers' Musculoskeletal System

Patient transportation is considered a high-risk activity for caregivers that can ultimately result into musculoskeletal disorders (MSDs) (Waters TR, 2007; Davis KG, 2015). A recent study has shown that driving beds up and down slopes and around corners requires more physical exertion when compared to driving beds in straight plans. Furthermore, it has also shown that the lower back is the most impacted area by this increased spinal load. (Kotowski SE, 2022)

On another hand, Waters (2011) has investigated and concluded that pushing and pulling activities create predominantly high shear forces. Shear forces tolerance limits for spinal discs in compression may be significantly higher (i.e., about two-thirds higher) than for decompressed ones (Waters T, 2011). Therefore, it is important for caregivers to be aware and to limit their exposure to these risks.

Caregivers are still amongst the professions suffering the most from work-related MSDs.

(BLS, 2021)

Safety First: Best Practices and Recommendations for Ergonomic Patient Transportation

Musculoskeletal injuries can arise when the physical exertion demanded by an activity exceeds an individual's ability to respond safely. However, there is a lack of extensive research, long term investigation or specific recommendations regarding the forces involved in pushing and pulling occupied beds and its consequences.

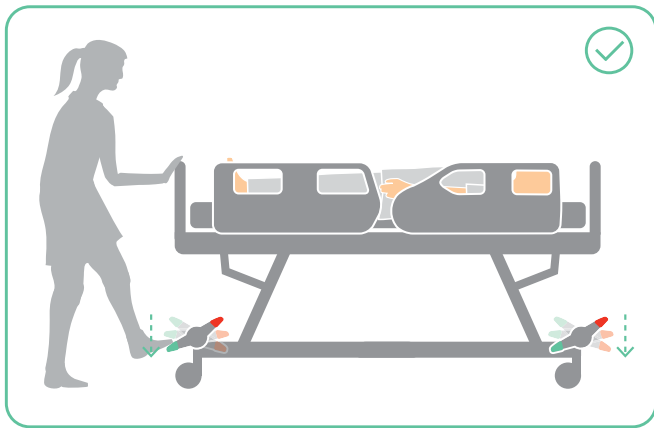
One of the most detailed studies ever developed is actually part of a series of Ergonomic tools written by the AORN (Association of Perioperative Registered Nurses). AORN has compiled several recommendations for pushing, pulling and moving equipment on wheels at the Ergonomic Tool 7. This tool encompasses also various procedures and the application of ergonomic principles regarding hospital beds transportation and manoeuvrability. (Waters T, 2011)

AORN's Ergonomic Tool 7 has concluded that pushing is more ergonomic than pulling and that maintaining the speed of a bed is not as physically demanding as the initial pushing force. Based on this information, AORN has established relevant ergonomic recommendations to the initial pushing force of different pieces of equipment on wheels. As an example, if the pushing force necessary to move a hospital bed exceeds 199 N it is recommended that this activity should be performed by two caregivers. On the other hand, if the pushing force exceeds 279 N, then a powered transport device is advised. (Waters T, 2011)

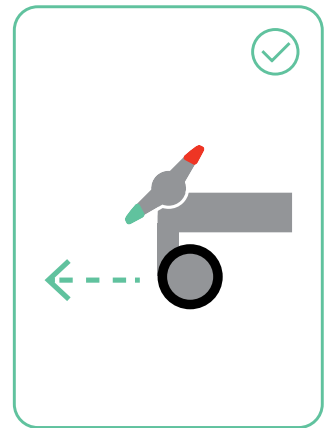
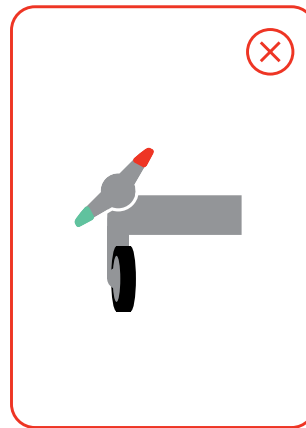
Another recommendation brought by this tool focus on the pushing point height. According to the AORN, it is recommended to have a middle vertical height of 92 cm above the floor (Waters T, 2011). However, this recommendation does not consider that the middle pushing height is directly related on the caregiver's height. On another study, the location of the hospital bed's push handles was investigated. The conclusion was that the preferred height of the push handles should be slightly below the caregiver's elbow height and that the handle should be adjustable, as a single handle height will not be suitable for all users (Zhou J, 2017).

ERGONOMIC RECOMMENDATIONS TO DRIVE A HOSPITAL BED

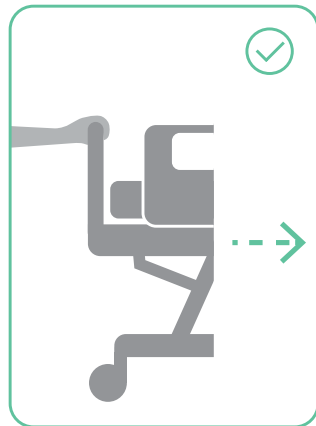
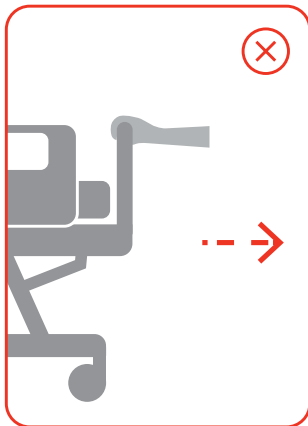
① Don't forget to unbrake the bed by pushing the green pedal down



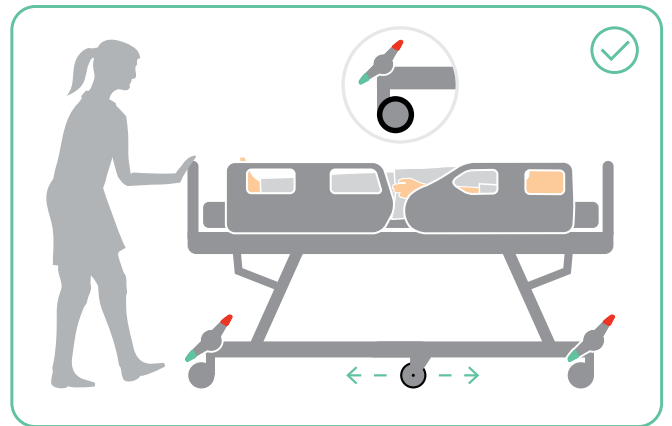
② Make sure that castors are in the steering direction



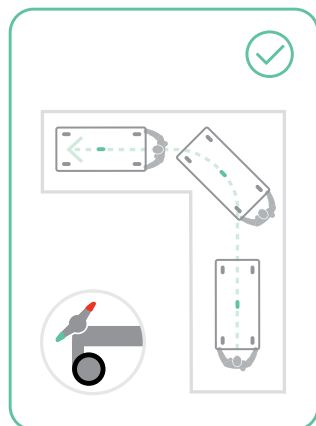
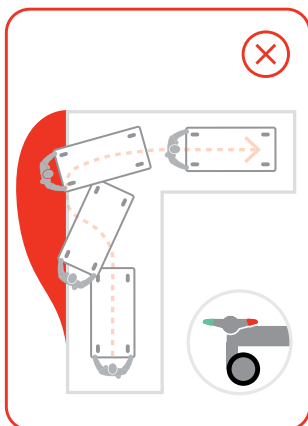
③ Prefer pushing over pulling



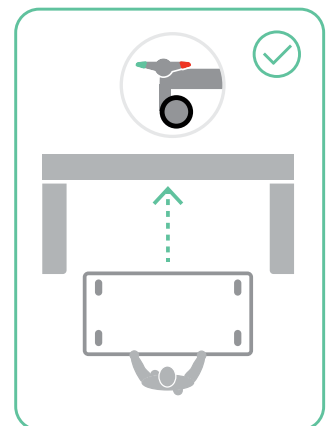
④ Drive the bed with the 5th wheel activated



⑤ Use the 5th wheel to drive in corridors and around corners



⑥ Don't use the 5th wheel when parking the bed



Driving Efficiency and Patient Care: The Organizational Benefits of investing into Powered Beds in Acute Care

According to WHO (World Health Organisation), despite the increased demands for care, the number of public hospital beds per 10,000 population has declined during the last years (WHO, 2023). Consequently, more patients need to be accommodated in fewer beds which increases drastically the hospital occupancy levels, that may reach even 90% of its full capacity. This unfortunate reality may potentially decrease operations efficiency and patient safety whilst increasing staff workload. (Dixit SK, 2018) In response to increased levels of occupancy and patient turnover, hospitals worldwide have introduced a range of bed management strategies that had the consequence of increasing patient transfers within units and even hospitals.

A recent study has comprehensively investigated bed and ward transfers over a 1-year period and has related the data obtained with the impact on nursing workload. According to Blay et al (2017), more than 10,000 patients were moved 34,715 times during a full year which means an average of 2.4 transfers per patient. Furthermore, patient transfers took on average 42 min and bed transfers took 11 min of nurses' time. If we consider the frequency of patient moves, 11.3 full-time equivalent nurses would be needed to perform patient transportation within the hospital each month (Blay N, 2017). Results reinforce that patients are being moved more frequently than ever before during their hospital stay. The outcomes from this study reinforce even previous studies conclusions that transferring a patient can take approximately 1 hr (Kibler J, 2011)..

11.3 full-time equivalent nurses each month is needed to perform patient transportation within hospital

(Blay N, 2017)

Based on the premises that patient transportation relying on traditional methods requires two (or more) caregivers and that the remaining ward staff must care for patients already on the unit, there is no wonder the greater impact not only on nurses' workload and workflow, but also on patient safety (Jennings BM, 2013).

Investing on innovative and affordable powered beds within Acute Care may be a potential effective solution to many challenges impacting or being impacted by the burden of the higher patient transportation rates. Nurses' time saved, coupled with reductions in MSDs rates, would more than offset the financial cost of investing in solutions to aid the bed transfer process.

Empowering Safe Driving: Unveiling the Impact of Essenza 300 Solutions

LINET is driven by creating solutions that support both patients and caregivers overcoming challenges. Therefore, a package of solutions was designed to tackle the difficult challenges associated with manoeuvring hospital beds across several hospital settings. These solutions include larger castors, a 5th wheel, a powered 5th wheel and ergonomic handles at both bed ends.



Essenza 300 series Castors

LINET enables the hospital bed to be tailored accordingly to the unit needs and, therefore, offers for example two types of castors: 125 mm and 150 mm. The 150 mm castor requires less force to drive on different surfaces and increase the easiness to overcome thresholds. On the other hand, the 125 mm castor is designed for harder surfaces and to achieve lower bed heights that can reach below 26 cm. Depending on the bed configuration regarding castors, different braking systems may be also available. Once again, LINET brings innovation also in this field with the newly developed pedals, specifically for 150 mm castors, called SoftBrake and that enable caregivers to effortlessly brake the bed.

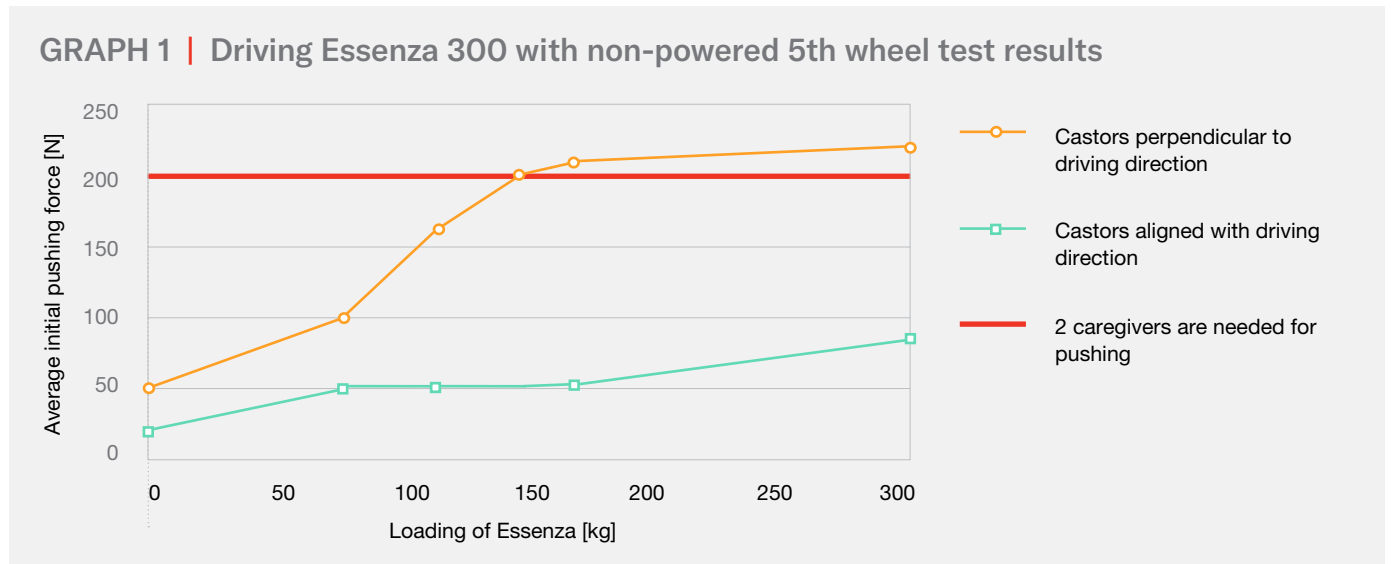
DRIVING ESSENZA 300 WITH 5TH NON-POWERED WHEEL



The 5th wheel has become a standard for hospital beds transportation. The activation of the 5th wheel is achieved by pushing down the green pedal to its lowest position. When configuring the bed, the braking pedals can be selected across all four wheels or restricted to only two depending on the hospital needs.

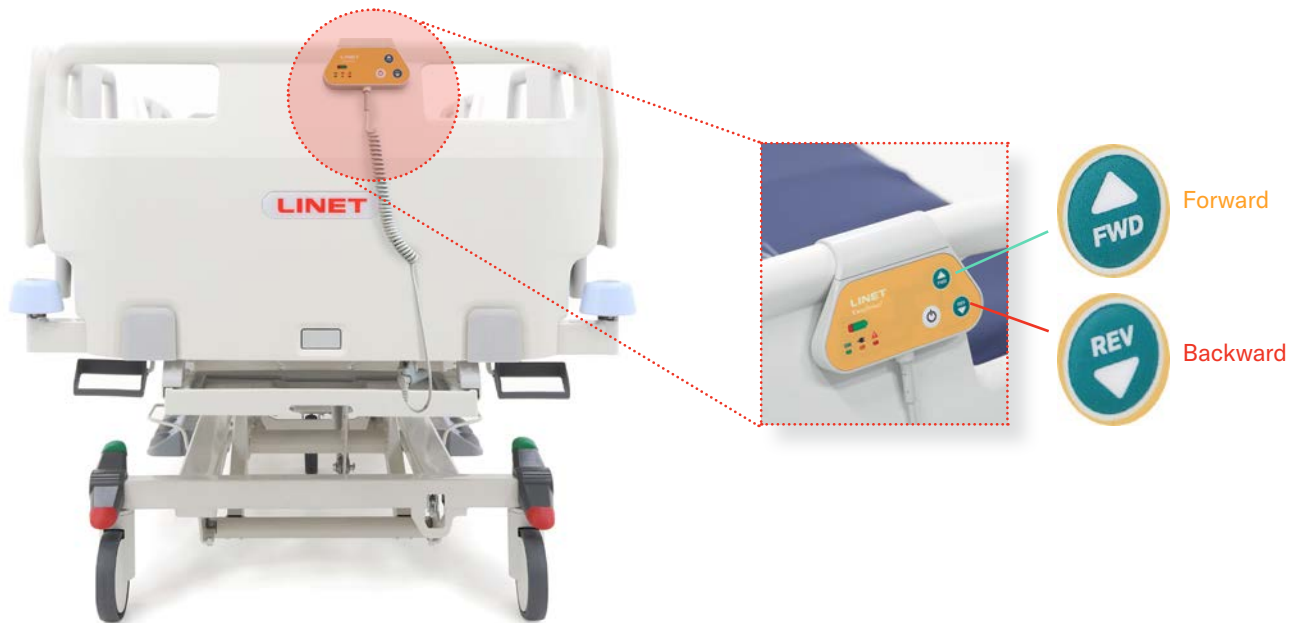
We have conducted internal tests on the Essenza 300' 5th wheel with the purpose to measure the force required to initiate the movement of the bed under different loads, and then we have compared our results with the AORN Ergonomic tool 7 (Waters T, 2011).

The measures were carried out on a flat and hard surface, with an initial force applied in accordance with ergonomic guidelines for optimal pushing force at elbow height. We also took into consideration the alignment of the castors with the direction of movement. At this occasion, we focused exclusively on the initial pushing force since it is greater than the force needed for sustaining bed movement. The average results for different bed loads are depicted in Graph 1.



Based on the measurements, it is evident that one caregiver can drive the bed with aligned castors up to Essenza 300 safe working load (SWL), although some force may still be required. However, when compared to the castors in a perpendicular direction, a greater amount of initial force is needed. Additionally, for loads exceeding 160 kg, the initial pushing force reaches a threshold where two caregivers are required to push the bed under safe conditions (the threshold being 199 N (Waters T, 2011)).

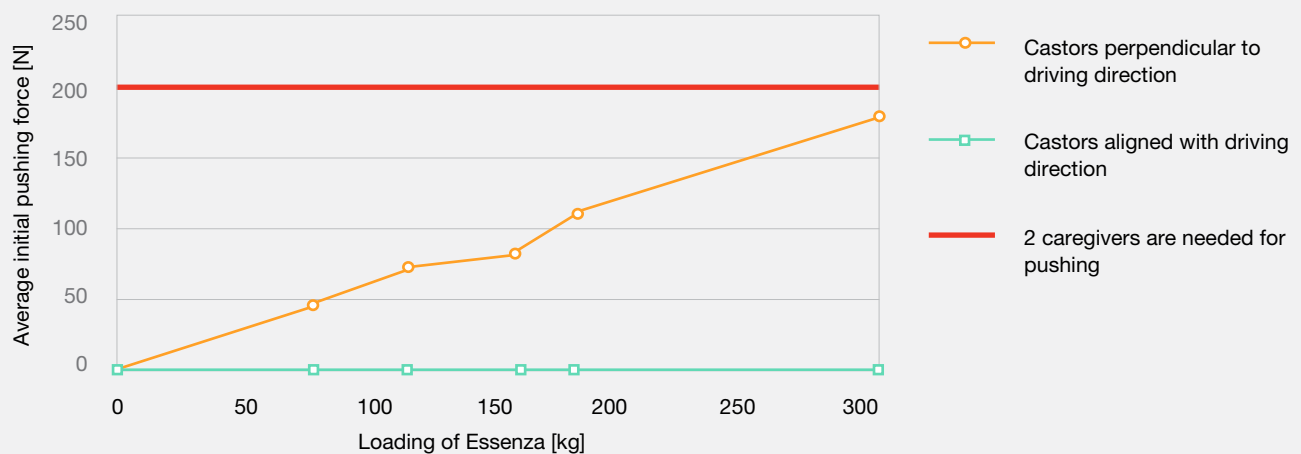
DRIVING ESSENZA 300 WITH EASYDRIVE



The development of new technologies over the last two decades, unlocked several solutions thought impossible or unaffordable in the past. Essenza 300 series was specifically designed to incorporate a powered 5th wheel called EasyDrive to answer the needs of the Acute and Long-term Care environments. EasyDrive supports caregivers by reducing the initial pushing force required for driving the bed regardless its castors direction. Due to the time constraints faced by caregivers, it becomes more challenging to maintain ergonomic principles whilst driving a hospital bed.

We have performed internal measurements on Essenza 300' EasyDrive using the same premisses as the ones already described for the non-powered 5th wheel. Once again, we have compared our results with the AORN ergonomic tool 7 (Waters T, 2011). The results of this tests can be visualized in Graph 2.

GRAPH 2 | Driving Essenza 300 with EasyDrive test results



Considering the measurement results, we can conclude that EasyDrive requires minimal effort by reducing the initial pushing force to 0 N when the castors are aligned into the driving direction. Furthermore, this data clearly shows that the bed can be driven with the push of a button. Even in situations where the castors are not optimized to its most ergonomic and safe setup, EasyDrive still enables a single caregiver to drive safely Essenza 300 up to 300 kg (SWL).

DRIVING ELEMENTS ON FOOTBOARD AND HEADBOARD OF ESSENZA 300

When discussing the manoeuvrability of a bed, our initial thoughts are usually focused on the castors and the height of the pushing handles. However, there are many other equally important driving elements on the bed that involve the handles design and accessibility. The Essenza 300 has been designed with interchangeable headboard and footboard, enabling the caregiver to choose the direction of the bed movement, whether from the side of the patient's head or feet. This design allows the caregiver to decide whether the patient should face the direction of the movement or have immediate access to them during transportation. This optimized manoeuvrability is complemented by EasyDrive, which can be configured either at the headboard or footboard.

Last but not the least, the handles on the footboard and headboard are shaped to allow a secure grip with both hands. In order to manoeuvre the bed within a room or in any other situation where moving a bed side by side is required, the caregivers can also utilize the Mobi-Grips available on all plastic siderails.



Images of Essenza 300: footboard (left), headboard (middle), siderail with Mobi-Grip (right)

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