LINET

INVESTING IN HYBRID SUPPORT SURFACES HYBRIMATT FOR IMPROVED HOSPITAL EFFICIENCIES



BACKGROUND

Hospital acquired pressure injuries (HAPIs) are a significant adverse event (HHS, 2010), and are currently under scrutiny by healthcare facilities. Hospitals are required to actively treat patients when HAPIs develop, and in the case of United States the treatment is not covered since 2006 by health insurance (CMS, 2006). Also linked to this are the increasing costs of litigation following the development of a HAPI, and in 2019 the NHS costs related to this were approximately £20,000,000 (Stephenson, 2019) . Treating HAPI may also result in prolonged patient stays a and increased treatment costs (Lahmann N, 2024; Padula WV, 2019). When HAPI affects geriatric patients, it can be a primary or contributing factor to their mortality, which can be almost 22% if patient develop category IV (Wassel CL, 2020). HAPI not only impacts on increased care needs for patients but also have psychological effect on caregivers (Qian L, 2024). Caregivers must take specific precautions to prevent continuous skin deterioration. One such precaution may involve changing the support surface to match the patient's current condition. This can take up to seven hours in the case of change foam mattress to alternating (Jones, 2014). Time can differ in health care facilities, and it can be also influenced by staffing particularly in healthcare facilities with high patient-to-nurse ratios.

CONCLUSION

In this white paper, we explain the challenges healthcare facilities face when using alternating support surfaces for pressure injury prevention. Alternating surfaces are used for patients at risk of pressure injuries or those who have already developed them. However, pressure air designs face limitations in implementation due to clinical evidence, cost, staffing, logistics, and storage constraints. Not all challenges are easily overcome. In such cases, a hybrid alternating mattress can be a solution.

LINET developed hybrid mattresses, HybriMatt family, to offer operational efficiency and improve the implementation of pressure injury prevention strategies. The HybriMatt Family is versatile, combining passive and alternating mattresses in one. Switching modes involves simply connecting a compressor, allowing the patient to stay on single mattress throughout their hospital stay. This improves time management, logistics, and staffing efficiency. Additionally, healthcare facilities can equip a large proportion of departments with HybriMatt mattresses and purchase a smaller number of compressors.

HybriMatt mattresses offer various options and models, including evacuation covers and x-ray sleeves for easy in-bed examinations. HybriMatt compressors are available as an integrated solution to the hospital bed Essenza 300 or as external option of mattress replacement. These options offer versatility and cost-efficient solution, which also include maintenance. HybriMatt has serviceability that allows for the replacement of individual parts when worn out or damaged, prolonging the product's life.

Another aspect of HybriMatt family is support of caregivers by providing easy step-up or step-down adjustments in pressure injury prevention as patient conditions change, without requiring extensive equipment logistics. Cable management features securely attach compressor cables alongside the mattress, preventing tripping hazards. The design also facilitates inspection for fluid leakage in each layer for detailed infection control.

In summary, the HybriMatt Family offers a practical and efficient solution for pressure injury prevention strategies with easy implementation and financial benefits, providing a seamless transition from comfortable foam mattress to mattress with gentle alternation in one design.

Challenges to organization to use effectively alternating support surfaces

As explained in the background, alternating support surfaces are important for pressure injury prevention strategies. However, the application of these surfaces depends on the healthcare facilities (HCF) and their local policies for pressure injury prevention.

What are the limitations that prevent alternating support surfaces from being fully integrated into pressure injury prevention strategies?

- **Clinical evidence:** Pressure injury prevention guidelines in HCF do not always incorporate alternating support surfaces.
- **Staff training:** Effective use of alternating support surfaces requires proper staff training to ensure correct settings and use.
- **Cost and availability:** HCF can have limited budget for investing in alternating support surfaces.
- **Staffing and logistics:** Alternating support surface use is limited due to staffing shortages that impact on the utilisation of surfaces when patient's condition changes.
- **Maintenance and storing:** Serviceability and insufficient storage space for support surfaces.

This list of barriers is also supported by Wan's 2023 study, which discusses the limitations of implementing pressure injury prevention and management guidelines in acute care settings (Wan CS, 2023).

CLINICAL EVIDENCE

Alternating support surfaces are designed to redistribute pressure by periodically inflating and deflating cells (EPUAP/NPIAP/PPPIA, 2019). The EPUAP/NPIAP/PPPIA clinical guidelines recommend these surfaces for patients at risk of developing pressure injuries and those who already have them. However, it is important to evaluate all benefits and use clinical judgment to decide if an alternating support surface is the best choice for each patient. With proper nursing care and regular manual repositioning, high-specification foam mattresses can achieve similar outcomes in preventing pressure injuries. (EPUAP/NPIAP/PPPIA, 2019).

Alternating support surfaces can be used for patients at risk of pressure injuries (PI) or those who have already developed PI.
(EPUAP/NPIAP/PPPIA, 2019)

Despite the proven utility of alternating support surfaces, there remains a notable gap in research concerning which specific designs and mechanisms are most effective (EPUAP/NPIAP/PPPIA, 2019). The variety of available systems such as pressure air overlays, mattress replacement and cushions or hybrid alternating mattresses, leave healthcare providers without clear guidance on the best choices for specific patient needs.

Moreover, patient comfort can be also another factor, which is not with these systems universal; some individuals find the periodic movements of the surfaces to be disruptive, particularly if it affects their sleep quality or if they have

conditions that make them sensitive to such disturbances. Thus, while alternating support surfaces represent a significant advancement in patient care technology, their application must be carefully considered, balancing clinical benefits with individual patient preferences and comfort.

COST AND AVAILABILITY

The cost can be a major barrier, particularly in healthcare facilities (HCFs) with limited resources. These advanced systems are often more expensive than standard mattresses. Such high costs can restrict their availability. This is also connected with the number of available equipment in department, which depends on patient population in department, the type of department or HCF.

Therefore, it should be kept in mind that some HCFs can have a higher rate of patients with limited mobility, advanced age, and co-occurring comorbidities, there is a greater need for alternating support surfaces compared to HCFs that serve a patient population with fewer such conditions.

This patient population and the availability of resources are also connected to the type of department. For example, intensive care units (ICUs), even though they cater to highly dependent patients, typically have a higher budget compared to long-term care facilities, which also serve highly dependent patients. This creates situations where ICUs are able to afford high-performing alternating support surfaces, whereas long-term care facilities may have only a few such surfaces or may resort to purchasing low-performing, low-cost equipment, which can have limited preventive outcome for patients.

STAFFING AND LOGISTICS

When it is identified that a patient requires an alternating support surface for pressure injury prevention, it can take up to 7 hours to exchange mattresses (Jones, 2014). This is influenced by staffing in hospital, location of storage from patient room, time needed for inflation of pressure air support surface and transfer of patient from-to another surface.

Accessing support surface can be also impacted by acuity on the ward and then staff not having time to order and transfer patient on to support surfaces, this happens especially over nights and weekends (Greenwood, 2016).

It can take up to 7 hours to exchange foam mattress for active pressure air mattress.
(Jones, 2014)

Accessing support surfaces can be also impact by acuity on the ward and limited capacity of staff, especially over nights and weekends.
(Greenwood, 2016)

MAINTENANCE AND STORING

Maintaining alternating support surfaces involves complexities not encountered with foam mattresses, primarily due to the inclusion of electronic components and the distinct design elements of these advanced systems. Additionally, it is necessary to periodically check the air cells for leaks, which can compromise the functionality of the system. Not all air pressure mattresses are designed in a way that allows for easy patching or replacing of cells; in such cases, replacing the entire mattress can be expensive.

Storing alternating support surfaces adds another layer of complexity. These systems require space not only for the compressor and the deflated mattress but also for storing foam mattress when the alternating mattress is in use. Not all healthcare facilities have the luxury of excess storage space to accommodate both types of mattresses simultaneously. This requirement for additional space can be a significant constraint, particularly in smaller facilities or those already facing challenges in managing physical resources efficiently.

Alternating support surfaces designs

The most common designs of alternating support surfaces on the market are pressure air support surfaces. These can be designed as overlays, mattress replacements, or cushions.



Exploration of hybrid alternating mattresses

Hybrid alternating mattresses have gained popularity in recent years due to their versatility. They can be used as a passive system or as an active system when connected to a compressor. Now, let's examine how hybrid mattress systems can overcome barriers to implementing alternating support surfaces.

CLINICAL EVIDENCE

Clinical evidence supports the use of alternating mattresses for patients at risk of developing pressure injuries (PIs) or those who have already developed them. However, a common issue with pressure air mattresses is that they can limit patient movement due to the patient being enveloped by the mattress. Hybrid mattresses offer a solution by allowing patients at risk of PIs to use alternating support surfaces without restricting their mobility.

The use of hybrid mattresses in pressure injury prevention guidelines allows patients to remain on one mattress throughout their hospital stay. These mattresses enable easy step-up and step-down adjustments based on the risk of developing PIs

or the severity of existing PIs. This approach does not eliminate the use of pressure air support surfaces but reserves them for higher-risk or more severe pressure injuries that require more intensive alternation.

The step-up and step-down approach with hybrid mattresses saves time compared to the traditional concept of using separate foam mattresses and alternating pressure air surfaces (Fletcher J, 2015).

STAFF TRAINING

Implementation of hybrid mattresses can be easier and safer for patients. Patients can lie on hybrid mattresses throughout their entire hospital stay, even when their risk for developing pressure injuries changes. This means that if the department is equipped with the same hybrid mattresses and compressors, which reduce use of different brands of mattresses.

Additionally, using hybrid mattresses reduces the chance of errors in setting the wrong pressure. Hybrid mattresses are made of air cells with foam cores, which protect patients against bottoming out, even if the mattress is not set to the ideal pressure for the patient.

COST AND AVAILABILITY

The cost of alternating pressure air support surfaces can be challenging as was explained. In comparison to alternating mattresses, hybrid mattresses, although potentially higher in price , they offer the advantage of providing two mattresses in one. Additionally, there is no need to purchase a compressor with each mattress.

The cost-efficiency of hybrid mattresses may vary, this depend on whether they are compared to high-quality mattresses from premium brands or lower-priced mattresses of lesser performance or quality. However, investing in higher-performance support surfaces should be considered because it is already proven that preventing hospital-acquired pressure injuries (HAPI) costs less than treating them. The cost of treatment includes treating the condition, extended length of stay, and even the return of patients to the HCF after being discharged with pressure injury.

Existing studies on the cost of treating pressure injuries have found that treatment ranges from £1,214 to £14,108 in the UK, based on the category of pressure injury (DeDealey C, 2012). In Germany, the cost ranges from €1,633 to €2,074 per case, due to the extended length of stay (Lahmann N, 2024). If we combine these numbers with the worldwide prevalence of HAPI, which is 6–18% in acute care settings (Tervo-Heikkinen TA, 2022), it becomes clear how much could be saved by reducing the incidence of HAPI in healthcare facilities.

In the UK Treatment of PI ranges from £1,214 to £14,108 based on category PI.
(DeDealey C, 2012)

In the Germany Treatment of PI ranges from €1,633 to €2,074 per case.
(Lahmann N, 2024)

STAFFING AND LOGISTICS

Hybrid mattresses minimize the logistical burden on hospital staff. By allowing caregivers to simply connect a compressor, hybrid mattresses avoid the need for excessive movement of traditional mattresses across the healthcare facility (Jones, 2014). This can be beneficial not only in departments with a high patient-caregiver ratio. Because the time for switching hybrid mattresses to active mode is reduced to a minimum compared to the 7-hour period required for exchanging traditional mattresses. (Jones, 2014).

MAINTENANCE AND STORING

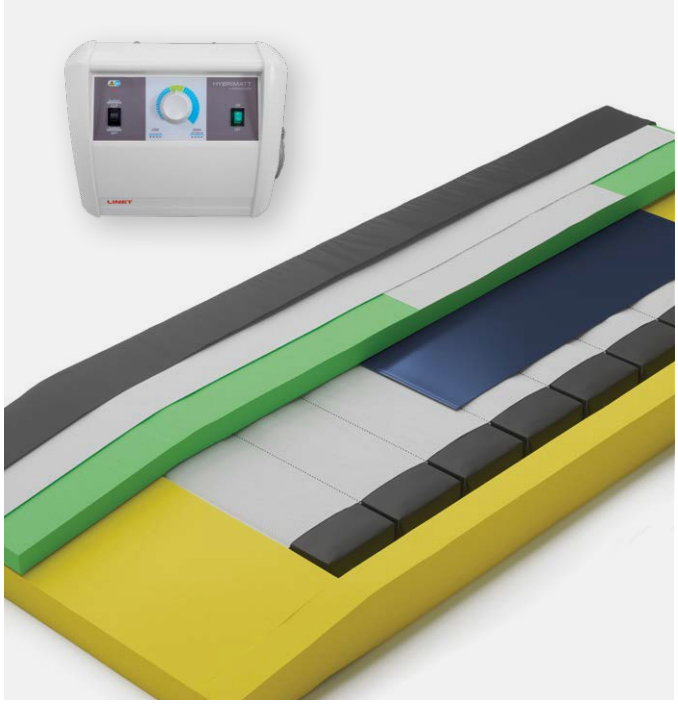
The availability of storage and servicing of active mattresses depend on the size of the healthcare facility (HCF). Not all HCFs have their own biomedical engineers and large storage spaces for all equipment, as explained in the previous chapter.

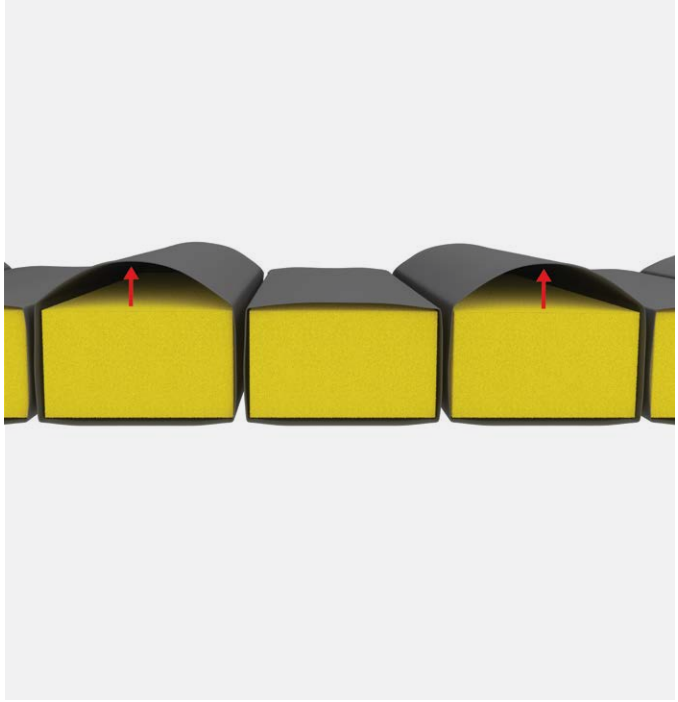
Hybrid mattresses offer interesting possibilities from a storage perspective because only the compressors need to be stored. Compressors do not take up much space and can be stored in the department or ward, eliminating the need to keep them in large, distant storages.

For servicing or maintenance, only the compressor needs to be sent out, allowing the mattress to still be used in its passive mode. Additionally, some manufacturers provide the option to replace mattress parts when they are worn out or damaged.

LINET solution with HybriMatt Family

LINET decided to develop the HybriMatt family mattress portfolio to address the challenges of implementing alternating support surfaces in healthcare facilities (HCF) that struggle with staffing, availability, time, and physical space. The following section lists the safety and financial benefits that the HybriMatt family offers to HCFs, patients, and caregivers.





CLINICAL SOLUTION FOR EASIER IMPLEMENTATION INTO PRESSURE INJURY PREVENTION STRATEGIES

2 mattresses in 1 solution
HybriMatt mattresses can be used as a comfortable foam mattress or as an active alternating mattress when connected to a compressor.

Patient protection
Cells with foam cores protect patients against bottoming out during transport, when the mattress pressure is insufficiently set, or when the compressor is malfunctioning.

CLINICAL SOLUTION FOR EASIER IMPLEMENTATION INTO PRESSURE INJURY PREVENTION STRATEGIES

Affordable purchase
Hospitals do not need to purchase the same number of HybriMatt mattresses and compressors, because they are used only when patient required active mode.

Evacuation cover
The HybriMatt 200 model can incorporate covers with evacuation straps, allowing immobile patients to be safely evacuated on the mattress in case of disasters.

Modular servicibility
The HybriMatt mattresses are modular, so when mattress parts are worn out or damaged, such as the cover, foam layers, cells, etc., they can be replaced to prolong the lifespan of the mattress.

X-ray sleeve
The mattress cover can optionally be equipped with an x-ray sleeve for fast and easy x-ray examinations using a mobile or stationary x-ray, without the need of patient transfer.

Integrated compresor
The HybriMatt 100 IN model offers an integrated compressor in the LINET Essenza 300 hospital bed. This integrated compressor can also be used for the Air2Care 6 or 8 alternating pressure air mattresses.

Mattress replacement
HybriMatt is available not only in an integrated version but also as a mattress replacement with external compressors for any compatible beds.

CLINICAL SOLUTION FOR EASIER IMPLEMENTATION INTO PRESSURE INJURY PREVENTION STRATEGIES

Time and staff efficient
When a step-up or step-down in pressure injury prevention is needed, minimal preparation is required for the use of the mattress. This means no mattress exchange, inflation, or handling of the patient is necessary.

Single mattress for patient's entire hospital stay
HybriMatt mattresses can be used throughout the entire hospital stay, even if the patient's risk of developing PI changes.

Infection control
The modular system of HybriMatt mattresses allows for easy inspection of each layer for fluid ingress and replacement of only the damaged parts.

Cable management
All cables are securely attached to loops in the mattress cover to create a safe environment without tripping hazards around the patient's bed.

This chapter covers features of HybriMatt family contributing to hospital operational efficiencies. For more information on clinical impact of hybrid systems and HybriMatt family, refer to the LINET White Paper: "Next-Gen Hybrid Mattresses: The Evolution of Pressure Injury Prevention in Healthcare. (LINET, 2024)

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