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# Improved pressure ulcer care and efficiency using a powered hybrid mattress in a complex care facility

*This scientific editorial heart page plays an important role in sharing valuable knowledge and providing of in-depth insights and expertise to wound professionals and readers of NTVW magazine. It serves as an essential platform for the growth and advancement of wound care, enabling professionals and readers to improve their skills and knowledge.*

## Summary

The prevalence of bedsores (pressure sores) remains relatively high in the Netherlands, especially in long-term care institutions. Hybrid mattresses, which have been used across Europe for almost a decade, have shown positive results both clinically and in terms of efficiency. Zon & Schild, a long-term care institution for elderly patients with psychiatric or severe psychosocial disorders, usually uses viscoelastic static foam mattresses for patients up to and including decubitus category I or II. For more complex cases or higher pressure-ulcer categories, a switch is made to dynamic air-change mattresses, which are often difficult to obtain.

## Abstract

In a 12-week trial in the department Eikenstaete A of Zon & Schild, powered hybrid mattresses were tested to assess the impact on the efficiency and quality of pressure ulcer care. Ten hybrid mattresses and four pumps replaced the existing foam and dynamic air alternating mattresses. During the trial period, the coordinating nurse recorded weekly interventions and the development of pressure ulcers. In addition, all nurses involved completed a questionnaire on their experiences to assess the impact on work efficiency.

Of the 11 patients who were on hybrid mattresses during the trial period, three with pre-existing pressure ulcers all healed within 1-9 weeks. Of the eight

patients without pre-existing pressure ulcers, seven did not develop a pressure ulcer. One patient developed a pressure ulcer due to prolonged sitting. The questionnaires completed showed that the hybrid mattresses had a positive impact on work efficiency.

The results suggest that the hybrid mattress system offers positive clinical advantages by preventing and healing pressure ulcers. The system is user-friendly, contributes to time savings in the clinical setting and can influence the prevention of physical strain.

The study has limitations, such as the lack of pre-trial data, which prevents direct comparisons between systems. A detailed-

assessment of time savings could provide more insight.

The hybrid mattress system used in this study provides a clinically effective support surface that can ultimately contribute to cost savings by preventing pressure ulcers, freeing up more time for nursing care, simplifying the choice of mattresses to be used, and reducing the physical strain on caregivers.

## Background

Despite progress in pressure ulcer prevention and treatment, its prevalence, especially in long-term care institutions, still remains relatively high in the Netherlands. A survey of 547 long-term care patients, divided between 240 in the Netherlands and 307 in Germany, found a significantly higher pressure ulcer incidence (33.3%) in Dutch nursing homes, compared with German nursing homes (14.3%).<sup>1</sup>

Also in the hospital setting, the prevalence of pressure ulcers ranges from 12.8% to 20.3% in both general and academic hospitals.<sup>2</sup> Conservative estimates indicate that about 1% of the total Dutch healthcare budget is spent on the treatment of pressure ulcers.<sup>3</sup> Supportive surfaces for the prevention and treatment of pressure ulcers are generally divided into two categories: reactive surfaces that provide pressure redistribution through the principles of immersion and envelopment, and active surfaces that generally provide pressure relief through the mechanical alternation of air cells.<sup>4</sup> In the last decade, active hybrid supportive surfaces have also become available. These mattresses consist of a combination of both static foam

and air, to maximise the benefits of both a reactive and active mattress, by providing pressure redistribution and pressure relief. These systems can be divided into foam-over-air and foam-in-air designs, whose mechanisms of action are well documented.<sup>5,6</sup>

The positive benefits that a powered hybrid mattress surface can offer, both from a clinical perspective and from a resource and cost-efficiency perspective, have been well studied, especially in the UK. A large-scale study shows a 56% reduction in the incidence of pressure ulcers and a reduction in associated costs. Reductions in costs such as those required to treat pressure ulcers and costs associated with renting air exchange mattresses. The study also shows that more nursing time is freed up for care.<sup>7</sup>

Within a psychiatric institution for the elderly, there is a need to provide most clients with high-quality static foam mattresses (reactive therapy) to prevent and treat category 1 and 2 pressure ulcers through pressure redistribution. Additionally, dynamic air alternating mattresses (active therapy) for pressure relief are essential for a group of highly vulnerable patients. Other interventions include repositioning, heel protectors, cushions,

and the use of barrier agents.

Eikenstaete A, a ward of GGZ Centraal Zon & Schild, treats elderly people with psychiatric or severe psychosocial disorders, sometimes with other physical or social problems. Eikenstaete A is a ward with 18 patients who need more support with physical care and has a palliative unit for patients in the last phase of their lives.

Beds with memory foam mattresses have recently been procured, but high-performance dynamic air alternating mattresses remain scarce, making it a lot of work to provide clients with the right type of mattress. Obtaining such systems is a lengthy process through budget requests. Recently, there were several pressure ulcer cases on the ward, ranging from category 1 to 4. This has created a need for more mattresses that can provide active therapy.

Scaling up from a static to a dynamic mattress can be a difficult and time-consuming process that has a negative impact on the efficiency and quality of care delivery. This clinical study at Eikenstaete A ward looked at the impact that the hybrid mattress, **Dyna-Form® Mercury Advance** from DHG BV of Pijnacker (see Figure 1), would have on both the efficiency and quality of decubitus care.

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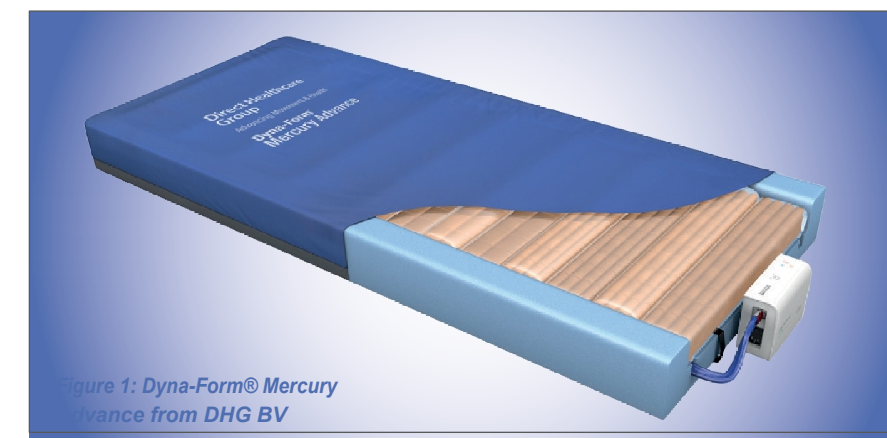
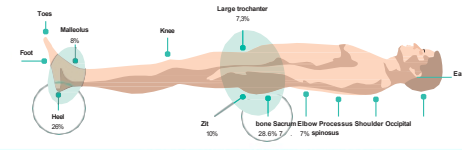


Figure 1: Dyna-Form® Mercury Advance from DHG BV

Matras 11



Algemeen					Locatie en classificatie Decubitus																
Week	Konvalescentie (instellen)	Wisselen op	Wisselen met pomp	Wisselen zonder pomp	Overname	Heel	Sacrum	Elbow	Shoulder	Occipital	Heel	Sacrum	Elbow	Shoulder	Occipital	Heel	Sacrum	Elbow	Shoulder	Occipital	
1	Mu. X	Gering risico	Matras met pomp		Motivatie anders te gaan liggen in bed.	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
2	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
3	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
4	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
5	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
6	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
7	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
8	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
9	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
10	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
11	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
12	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen
13	Mu. X	Gering risico	Matras met pomp			geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen	geen

Figure 2. Weekly data collection for one client.

» Method

Within Eikenstaete A, 10 hybrid mattresses and 4 pumps were introduced to replace the previous mattresses. This ratio of 4 pumps to 10 mattresses was determined by the department's need for air alternating systems and mattresses with pressure-distributing foam. The hybrid mattresses offer a one system approach, eliminating the need to organise dynamic air mattresses and swap them with static foam mattresses. If clinically necessary, the system can be switched from reactive pressure distributing therapy to active pressure relieving therapy and vice versa by connecting a pump to the mattress. This saves physically demanding mattress replacements and can enable faster intervention.

Prior to the assessment period of hybrid mattresses, no data was collected from the situation with foam and air alternating mattresses. However, during this previous period, there were clients with, in some cases, multiple pressure ulcers ranging from category 1 to 4. These wounds were located on the ischium, sacrum, trochanter and heels. These clients were placed on an air alternating mattress.

The evaluation period of the clinical trial was 12 weeks, during which 9 out of 10 mattresses were used continuously. One mattress was located in a room for palliative patients and was not used continuously. Based on clinical assessment and risk assessment, it was determined whether to use a mattress without a pump (reactive therapy) or a mattress with a pump (active therapy).

ring the 12-week evaluation period, the coordinating nurse noted for each patient the category and location of pressure ulcers and which intervention had been applied. In addition, a questionnaire was administered to the four nurses working with the system to record their user experience with the system. The questions concerned the usability of the mattress, the usability of the pump unit, the outcome of using the mattresses with and without the pump, patient feedback and support during the trial. The extent to which the mattress met the questions asked could be answered on a 5-point Likert scale ranging from excellent, good, average, poor or very poor. At the end of the questionnaire, there was an opportunity to add any additional comments.

Results

During the 12-week trial period, a total of 11 (11) patients were placed on the hybrid mattress. Of the 11 (11) patients placed on the hybrid mattress, three (3) users had pre-existing pressure ulcers with a total of 5 pressure ulcers. The pressure ulcers were located on the heel (2), the ischial tuberosity (1), the sacrum (1) and the elbow (1). These decubitus patients were classified as category I (3), category II (1) and category III (1). After placement on the hybrid support surface, all three (3) of these users had their pressure ulcers healed within a period of one to nine weeks.

Of the eight patients who were placed on the hybrid mattress without pre-existing pressure ulcers, seven did not develop pressure ulcers.

One (1) care recipient developed a category I pressure ulcer on the ischial tuberosities, but this appeared to be due to the fact that the care recipient was placed in a sitting position in a chair/wheelchair for 13 hours a day. (Figure 2)

A total of four (4) user experience questionnaires were completed by all four (4) nurses who had worked with the system. Not all respondents answered all the questions. No answer was given if the question was not applicable or if the respondent could not give a value judgment on it. The results can be seen in Figure 3 opposite. The overall summary of user experiences indicates that the hybrid mattress was rated as having a positive effect on clinical effectiveness in preventing and treating pressure ulcers, on ease of use, on saving clinical time, on no longer having to change a mattress and on com-patibility with the bed.

Patient experiences were asked out to the respondents, with four (4) stating that the system was comfortable and three (3) that it was quiet. In the comments, a nurse stated that one (1) patient indicated that the mattress was too hard and one that they found the sound of the pump undesirable.

Discussion

The results indicate that the hybrid mattress offers positive clinical benefits both in preventing pressure ulcers and healing pressure ulcers. Based on the parameters of this study, this improvement is not exclusively attributable to the hybrid system

» and this improvement cannot be separated from the other interventions used such as patient repositioning. The hybrid mattress plays a role in combination with these interventions to create a holistic approach to pressure ulcer prevention and treatment.

The questionnaire on user experience suggests that the system is easy to use and contributes to the saving of clinical time which can reduce unnecessary physical effort. These factors may play an important role as the Dutch healthcare system remains under pressure due to a shortage of 61,000 healthcare workers<sup>8</sup>, while 85% of healthcare workers report having suffered from musculoskeletal complaints at some time, and 38% of sick leave is due to complaints of

the musculoskeletal system<sup>9</sup>. The hybrid mattress can also provide additional simplification of working method through efficient selection in the type of mattress used.

There was an indication that the system produced too much noise. The basis for the differences in perception of sound may lie in the difference in sensitivity to stimuli. It can be noted here that the statements about sound related to the system did not affect the client's following of the therapy.

There are some limitations within this study. Data prior to the 12-week assessment was not available, so the hybrid system could not be compared with previous systems. However, it can be noted

that the hybrid system was clinically effective in both preventing and treating pressure ulcers. A more detailed assessment of the time saved by the hybrid system by eliminating the need to change mattresses would also be useful in order to get a more objective picture of the released nursing time.

Conclusion

The hybrid mattress system used in this study provides a clinically effective support surface that can ultimately contribute to cost savings by preventing pressure ulcers, freeing up more time for nursing, simplifying mattress selection and reducing unnecessary musculoskeletal strain on the caregiver.<sup>9</sup>

	Uitbundig	Goed	Gemiddeld	Onvoldoende	N.v.t.
<b>Gebruik van de matras</b>	5	4	3	2	1
Hoe gemakkelijk was het matras te plaatsen en te installeren op het bed?	1	5	1		
Hoe goed paste het matras op het bed?	1	3			
	1	3			
	1	2	1		
<b>Gebruik van de pomp</b>	5	4	3	2	1
Hoe gemakkelijk is de pomp aan en los te koppelen aan het matras?	1	3			
Hoe gemakkelijk is de pomp te tillen?	5	5			
Hoe gemakkelijk is de pomp aan het bed op te hangen?	1	3			
Hoe eenvoudig is de bediening van de pomp?					
			1		
			3		
	1	3			
<b>Preventie van het ontstaan van decubitus</b>	6	4	3	2	1
Hoe effectief is het matras zonder pomp in het voorkomen van decubitus?			4		
			3		
			1		
<b>Behandeling van bestaande decubitus</b>	6	4	3	2	1
In hoeverre is er sprake van een alternatieve therapie, zoals bij traditionele luchtweefmatras?	1				
Hoe effectief zijn de drukstellingen (high en low) bij het voorkomen/behandelen van decubitus?	5				
Hoe effectief is de 10 minuten cyclus bij het voorkomen/behandelen van decubitus?					
Hoe effectief was het matrasysteem bij de behandeling van bestaande decubitus?	1	5			
Hoe dichtbij is de multi-stretch hoestijk van het matras bij het voorkomen van schuifschaden op de huid van de patiënt?					
Hoe gemakkelijk zijn de transfers op de rand van het bed uit te voeren met dit matras met verstevigde zijranden in vergelijking tot een traditioneel luchtweefmatras?		3	1		
			1		
			1		
			1		
			1		
<b>Gebruik van de matras</b>	5	4	3	2	1
Hoe comfortabel vond de patiënt het matras?			4		
Hoe was de mobiliteit van de patiënt (indien van toepassing) op het matras?					
			1		
			1		
			1		
			1		
<b>Gebruik van de matras</b>	6	4	3	2	1
Hoe was de initiele instructie vanuit Direct Healthcare Group / United Care?			1		
Hoe was de verdere ondersteuning vanuit Direct Healthcare Group / United Care?			1		
			3		
			1		

Figure 3, result of the questionnaire

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