Improved patient experience and outcomes using the Dyna-Form™ Mercury Advance mattress

An initial audit took place to examine current systems and practices involving alternating mattresses as part of the SSKIN pressure ulcer prevention programme. Following this, the Trust introduced 125 Dyna-Form™ Mercury Advance mattresses (Direct Health Services) to six inpatient wards. The wards included particularly complex patients, all of whom historically had been a very high risk of Trust-acquired pressure ulcers, despite positive changes in culture towards zero tolerance of pressure ulcer. Ten patients on each ward were randomly selected for 2 consecutive months for skin assessment monitoring and asked about their experience using the mattresses, from the time of admission to time on the pilot wards. In addition, the data relating to Trust-acquired pressure ulcer incidence over 6 months were compared to the previous 12-month period on these wards. This study found a measurable difference in patient outcomes, with a 39% reduction in pressure ulcer incidence. In addition to this, substantial cost savings were made following the new approach to support surfaces.

KEY WORDS
- Audit
- Dyna-Form™ Mercury Advance mattress
- Mattress
- Pressure ulcer

Pressure ulcers are high on the political agenda, with many organisations initiating focussed programmes to reduce their number and severity. This is, in part, driven by the requirements of Domain 5 of the Outcomes Framework 2013/14 (Department of Health (DH), 2012a), which requires that organisations reduce the number of pressure ulcers occurring within their care in order to receive their Commissioning for Quality Improvement payments (DH, 2012b). There are many components to a successful prevention strategy (National Institute for Health and Care Excellence, 2014; National Pressure Ulcer Advisory Panel et al, 2014), but assessment of risk and the deployment of appropriate equipment in a timely manner would be considered by many to be one of the first steps in prevention.

THE USE OF ALTERNATING PRESSURE MATTRESSES

In 2013, Wolverhampton NHS Trust identified a growing demand for alternating pressure mattresses with, in some instances, inappropriate use leading to delays in provision. In addition to this, anecdotal evidence suggested there were frequent delays before patients were placed safely on their equipment, even when risk had been identified. An audit was performed to identify the key issues resulting in these delays.

Following identification of the steps required to obtain a mattress, data were captured over a 3-month period that showed the time taken to complete the process, from the identification of risk to the patient being on the mattress. This was broken down so that the average time for each of the steps could be seen and delays or blockages in the process identified. Statistical process control was used to identify the fluctuation from the norm in these times (*Box 1*).

Based on the local pressure ulcer prevention policy guidance (The Royal Wolverhampton Trust, 2012), during the 3 months of the audit, 1,602 patients were identified as being at some level of risk of pressure damage and as requiring

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Box 1. The statistical process control (SPC) approach.

Walter Shewhart began developing the use of the SPC in the 1920s. SPC is a practical statistical approach that enables systems to be more effectively understood. The technique accepts that variation is inherent in every process. It allows robust 'maths' to be applied to that variation, allowing the user to understand what is usual and what is not. SPC can be used as a predictor of future activity, and is often used to plan theatre capacity in the NHS. The Berwick Report (National Advisory Group on the Safety of Patients in England, 2013) suggests that the NHS should be using measurement for improvement, not judgement. SPC firmly sits in the measurement for improvement toolkit.

an alternating mattress. Full details of this audit were reported at the 2013 *Wounds UK* conference (Jones and Tite, 2013), but the outcomes are briefly summarised in *Figure 1*.

This led to discussion by the clinical team about how care could be streamlined to ensure that patients were receiving equipment in a timely fashion and how better use could be made of staff time. It is evident that a large proportion of the delay occurs once the mattress has arrived in the clinical area. This frequently relates to the need to have more than one member of staff to transfer the patient off the bed and back again during the mattress exchange process. In a busy ward environment this is not always a simple process.

THE DYNA-FORM™ MERCURY ADVANCE MATTRESS

The tissue viability nurses had recently been made aware of the Dyna-Form™ Mercury Advance mattress. This very high risk dynamic replacement mattress system combines the benefits of modern foam technology with the facility to 'step up' to a dynamic mattress when clinically required, simply by attaching a powered control box at the end. Similarly, the mattress's function can be downgraded as the patient's condition improves.

This all-in-one performance removes the need to order additional equipment or transfer the patient from one mattress to another. This has benefits in terms of time, but also patient comfort. The addition of the pump can be completed while the patient is still on the mattress. This is made possible by using the unique foam within the air cells — the mattress consists of a foam head cell and a series of 14 transverse air cells — combined with a choice of flexible pump settings (Direct Healthcare Services, 2014), see *Figures 2* and *3*.

Following approval by the governance department, the Dyna-Form™ Mercury Advance mattress was evaluated in practice over a 6-month period. The existing mattress stock on six wards was replaced by 125 Dyna-Form™ Mercury Advance mattresses. New guidance was issued regarding the level of risk at which the mattresses could be used up to. Alternating systems were still available for those patients at the very highest risk. Data were captured using standard evaluation forms on a daily basis and the Trust's IT system was used to track and trace mattresses on a real-time basis, as in the previous study (Jones and Tite, 2013).

RESULTS

After 6 months, based on average length of stay (4.05 days), approximately 9,609 patients used the Dyna-Form™ Mercury Advance mattresses. The point prevalence audit showed that 31 patients out of the 320 audited had a grade 2, 3 or 4 pressure ulcer on admission. The audit revealed that 50% of these patients' ulcers showed signs of healing or indeed healed following admission to the pilot wards. No pressure ulcer deteriorated and only one patient developed an unavoidable grade 2 ulcer. Of the audited patients, 86% were identified as at risk, having a Waterlow score greater than 10. The Waterlow scale was used as it gives an estimated

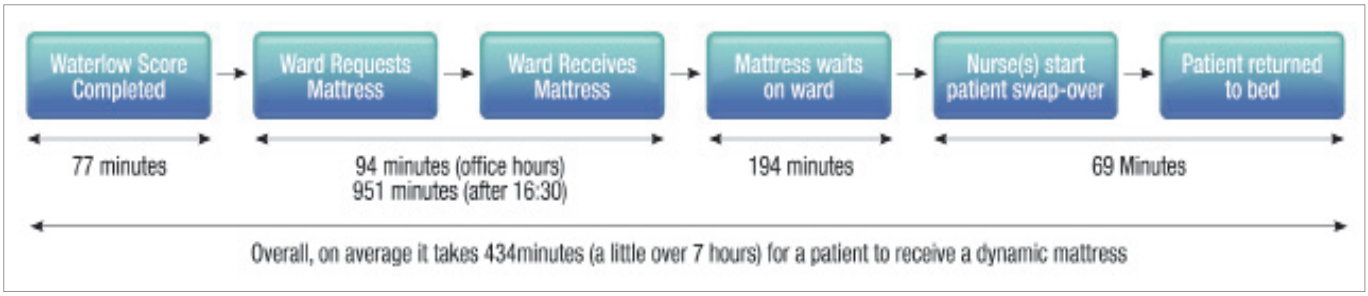

Figure 1. The process by which equipment was obtained and the average times taken at each step.

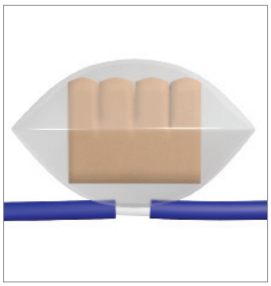

Figure 2. The mattress is comprised of a series of horizontal foam cells, each of which is encased in an air sac. The air sacs are attached via a manifold. In the static mode there is little air movement and the mattress functions as a high-quality replacement mattress. When the pump is attached, the air cells inflate to provide better support.

Table 1. Comparison of the number of pressure ulcers and level of damage during the period in which the Dyna-Form™ Mercury Advance mattress was used and during the same period in the preceding year.

Pressure ulcer grade*	January–12 June 2013	January–12 June 2014
2	306	205
3	114	50
4	5	4
Total number of pressure ulcers	425	259

* European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel, 2009, adapted by NHS, 2012

risk for the development of a pressure ulcer in a given patient.

Data on the number and category of pressure ulcers were compared to the same time period from the previous year. Both the number of pressure ulcers and the severity of damage was reduced (*Table 1*).

Prior to the introduction of the Dyna-Form™ Mercury Advance over the 6-month period, patients of this risk level would have been nursed on alternating pressure mattresses for a total of 11,884 days. Use of the new mattress resulted in an equipment cost saving of £71,280. In addition, the cost associated with the reduction in the development of pressure ulcers (there were 166 fewer ulcers in the evaluation period than in the same period the previous year, *Table 2*) generated significant cost savings based on data from the DH pressure ulcer productivity calculator (DH, 2010), *Table 3*.

Table 2. Cost savings related to the use of Dyna-Form™ Mercury Advance, generated using the Department of Health 2008/9 pressure ulcer productivity calculator at central estimate (DH, 2010).

Pressure ulcer grade*	Reduction in the number of pressure ulcers from 2013–2014	Cost saving based on a central estimate of the cost
2	101	£604,000
3	64	£636,000
4	1	£14,000
Total	166	£1,254,000

* European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel, 2009, adapted by NHS, 2012

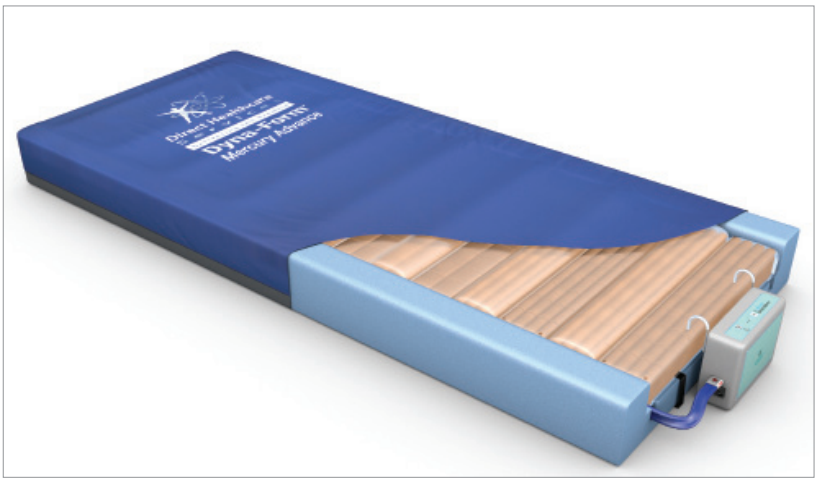

Figure 3. The mattress consists of horizontal cells. The pump is attached to the end. There is an easy deflate CPR connector and the option to select a pressure that is suitable for the patient's current status.

No patient had to wait for the provision of specialist equipment; the time between assessment of risk to connecting the pump and converting the mattress to a very high-risk specification was negligible. Use of the mattress reduced the amount of patient handling, as no transfer from one piece of equipment to another was required. This released nursing time for other activities. In addition to the real-time tracking, both staff and patients were given the opportunity to include comments on the evaluation form. Feedback from both groups was excellent, with comments made around ease of use, reduction in staff time needed and prevention of skin damage by staff, and specifically about comfort by patients. Examples of comments from the point prevalence audit can be seen in *Boxes 2* and *3*.

DISCUSSION

While the use of equipment is not all that a pressure ulcer prevention improvement programme entails, it plays a significant part in a busy acute ward. It was evident from the original audit (Jones and Tite, 2013) that assessment of risk occurred in a timely manner, in line with the local standard (within 4 hours of admission),

yet the time taken to provide equipment, particularly after 4.30 pm and at weekends, let down the overall excellent care delivery. The implementation of the new mattress system not only provides benefits to the patient, but also to the clinical staff by removing time-consuming steps from the process of providing appropriate care, as well as preventing the potential to do harm to patients' skin during transfer. A small percentage of patients will continue to require other specifications of mattress, and these remain available to staff based on clinical assessment and guidance from the pressure ulcer policy. Removing the need to transfer the patient impacts on many other risks, such as skin damage and falls. It is also less likely to result in discomfort for the patient.

CONCLUSION

Implementation of the new hybrid static air and foam mattresses has resulted in improved clinical outcomes and cost savings. While traditional approaches to care still have a role in the process of how care is delivered, the acuity of patients means that simpler and more immediate solutions can deliver significant benefits for patients and the NHS. Traditional approaches to equipment that rely on stepping up and stepping down patients as their risk changes have inherent flaws, as time and staff are precious resources. The identification of blockages in the process, backed up by the robust data produced from the statistical process control review, resulted in a simple solution that addressed the key issues in practice. WUK

Box 2. Staff comments.

- *"Stepping up and stepping down from static to alternating mode is easy and saves us time"*
- *"There is no negative impact on a deteriorating patient in the same way the current method of transferring the patient does have"*
- *"Need for patient transfer is almost eliminated, reducing risk to patients' skin from shear and friction forces"*
- *"Beds are easier to make and saves us more time"*

Box 3. Patient comments.

- *"I have been into hospital several times over the past year and always request a foam mattress instead of the air mattress provided. As I am an amputee staff say I should use the air mattress but find they really reduce my mobility ... with this new one, I find it really easy to move and reposition myself"*
- *"I find the mattress comfortable and easier to sleep"*
- *"It is far quieter than my old mattress"*
- *"At first I was reluctant to use this new mattress in alternating mode, but once I got used to it I found it comfortable. In fact, the sore on my bottom has now healed"*

Table 3. Estimated cost of pressure ulcer care in 2008/9, according to the Department of Health, rounded to the nearest £1,000 (DH, 2010).

Pressure ulcer grade	Central estimate	Lower range	Higher range
1	1,000	1,000	2,000
2	6,000	5,000	7,000
3	10.000	8,000	12,000
4	14,000	12,000	17,000
Total	31,000	26,000	38,000

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