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Cheltenham Hospital Trust undertook a process of audit and evaluation of mattresses prior to purchasing and found that cost effectiveness of mattresses did not relate to the cost of initial outlay. A mattress replacement programme introducing Thermo contour visco elastic mattresses led to cost savings for the trust.

Introduction

High quality service is an essential element within the modern Health Service, but budgetary constraints often reflect on the type of service that may be provided. However, in prevention of pressure ulcers, high quality need not have to equate with high cost, and raised financial outlay may well lead to a reduction in overall financial costs for the trust. More importantly for the patient, there is a reduced potential for the psychological and physical trauma created by the formation of a pressure ulcer.

In 1994-1995, the Department of Health Priorities and Planning Guidance¹ set targets for the NHS to reduce pressure ulcer incidence by 5% per year. Since then a plethora of air and foam mattresses have entered the market, offering a confusing choice for all practitioners and each manufacturer claiming to be the superior mattress.

Pressure ulcers occur when immobility creates high pressures between a surface and the patient's bony prominence if this pressure is sustained, or is exacerbated by shearing forces².

There are methods of reducing the potential for pressure ulcer formation such as repositioning in the 30° tilt³, or placing the patient on a pressure relieving or reducing mattress. However, repositioning takes a great deal of nursing time and can sometimes be missed on busy wards, and is often difficult in the community due to time and distance restraints. Purchase, decontamination and, particularly, maintenance of dynamic air mattresses can be expensive. Dealey⁴ noted "As staff become better educated, there is an increased awareness of the need to provide adequate pressure relief for vulnerable patients". Hampton⁵ also found that an increase in education, combined with the provision of air mattresses as required, actually increased the demand for air mattresses leading to a 'bottomless pit' of requests. This problem led the author, the Tissue Viability Sister (TVS), at Cheltenham Hospital, to seriously review patients

who were nursed on air mattresses - ensuring they were downgraded to static mattresses as their condition improved, thereby releasing mattresses for higher risk patients.

In 1997, Cheltenham owned 150 dynamic air mattress replacements and overlays. The only available static mattresses within Cheltenham Hospital were the contract standard NHS mattress, identified by Medical Devices Agency⁶ (MDA) as "representing a significant danger to 'at risk' patients". The MDA found that the lack of stretch in the covering material resulted in a hammocking effect, which contributed to the high pressures that were measured. There is also a potential for the mattress to allow 'strike through' (picture 1) and, therefore, an alternative, clinically effective pressure-reducing mattress needed to be found.



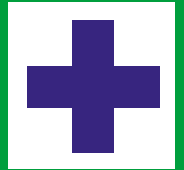
Picture 1

The process of a mattress replacement programme

Selecting a mattress according to research results is complex, as only a small proportion of product trials are randomised, and different methodologies make comparison difficult⁷. Therefore, the TVS had to be certain of any product prior to purchase.

Pressure redistributing mattresses, currently produced in the UK, have covers that are two-way stretch and vapour permeable. However there is, at present, a problem with delamination of some of the covers leading to a lowered confidence in the products. The problem of delamination is being considered by a Strike-Through Working Party from NHS Purchasing and Supply Agency, and this problem must also be considered prior to any purchase, as the potential for cross infection is enormous and worrying.

Given the lack of pertinent research information on mattresses, Tissue Viability Nurses require a process of information gathering, evaluation of mattresses and reproducible mattress audit, in order to determine the most suitable choice for their clinical environment. Cheltenham Hospital Trust began the process of mattress selection by undertaking



THE IMPORTANCE OF AUDIT IN MATTRESS SELECTION
The introduction of Thermo contour mattresses and resultant cost savings
 Julie Bryan, Tissue Viability Sister, Cheltenham District Hospital

an audit throughout the 450 bedded hospital. The audit revealed that 75% of the NHS standard contract mattress, which was the trusts main supply of mattresses, needed to be condemned. The age of each mattress could not be identified; standard NHS mattress can 'bottom out' after only six months⁸, and the existing mattresses had not been marked with a delivery date which would have given information on durability.

The TVS sent a report on the findings to the Trust Board, who recommended a mattress replacement initiative for the trust. The next step for the TVS was to review all types of mattresses, research and evaluation results, and to select a mattress supplier with whom she could instigate clinical evaluations.

The Thermo contour mattress (picture 2) offered the trust many advantages. It had a new type of cover incorporating increased lamination potential, and the advantage of thermo-elastic polymer. Thermo-elastic polymer is a foam that reacts to body heat and has a low memory of recovery (often called 'squidgy' foam). This means that, as the patient's body warms the foam, it moulds around the body contours, thereby redistributing pressure and consequently reducing forces over bony prominences. The pressure distribution therefore becomes more uniform, and blood-flow is not interrupted over bony prominences, as it would be on a firm surface.



Picture 2

Two Thermo contour mattresses were trialled on each of 3 high risk wards - vascular, medical and oncology wards; the mattresses performed well during the trial, patients reported a high degree of comfort, and many patients and carers enquired about private purchase. The durability of Thermo contour leads the manufacturer to offer an 8-year guarantee on the foam and a 3-year guarantee on the covers.

The nurses reported some difficulty with manual handling as they were used to sliding patients easily on the nylon covers of the standard NHS mattresses. This was not so easy on Thermo contour mattresses because of the moulding qualities of the foam. However, in accordance with current manual handling regulations and local guidelines, slide sheets were introduced and this overcame the problem and promoted high quality care.

At the end of the Thermo contour trial period the TVS reported her findings to the trust board, and was given funding for 500 Thermo contour mattresses. The manufacturer of Thermo contour supported the trust by introducing the 500 mattresses in a gradual programme of replacement. Mattresses were replaced on two wards every week until all old mattresses were removed, to try to alleviate the workload that would occur if all mattresses were replaced on the same day. As the mattresses were placed on the beds, they were dated, in order to ensure the life of the mattress could be recorded through audit. The staff on each ward were asked to report any concerns they had about the performance of the mattresses.

The process of auditing mattresses

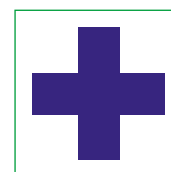
After the first six months an audit was undertaken, and it was noted that the Thermo contour mattresses were performing well. Cheltenham has Tissue Viability Link-Nurses (TVLN) as a resource on each ward. Each TVLN is educated six-monthly in the process of audit, pressure ulcer prevention and mattress assessment. The TVLNs then assist with the six-monthly mattress audit. Cheltenham trust has been very supportive with the mattress audit and replaces the TVLNs on the day of the audit, with another member of staff, to ensure that the audit runs smoothly.

The mattress audit commences after breakfast, on a Sunday, when the wards are likely to be less busy. The ward nurses assemble packs of linen at the base of each bed. The TVLN then checks each mattress using the 'fist test', where a clenched hand is pressed into the mattress, both at the point where the patient sits and along the edge of the mattress. This identifies whether the mattress 'bottoms out', i.e. if the foam sinks under the pressure of the fist until the bed base can be felt. This would indicate that the patient's bony prominence could be in contact with the metal bed base.

The foam of the mattress is inspected to ensure that 'strike through' is not occurring. 'Strike through' is common in NHS contract mattresses, and some of the new mattresses, where delamination has occurred. During the inspection, a colour sticker is placed on the mattress to denote the year.

As the TVLN completes the inspection, the care assistants / nurses follow and make the beds. The whole process is completed within five hours.

Pressure ulcer incidence at Cheltenham is recorded on a daily basis and prevalence is not undertaken. Incidence and prevalence offer very different results. Prevalence is a 'spot-check' which records every pressure ulcer on a particular day. This provides a trust a picture of how many patients with pressure ulcers are resident in hospital at a particular moment in time. Incidence measures new cases, generally on a daily basis, and is a sound



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measurement process. The TVS is provided with all the incidence results on each Sunday, and then records all patients' details and the position of each ulcer.

Quality and cost-saving considerations following purchase of the thermo contour mattress

Emaciated patients have reported that the visco-elastic foam is quite firm. This may be largely due to the fact that warmth from the body 'moulds' the foam, and very emaciated patients are likely to warm and compress a smaller area, thereby limiting contact with the mattress. However, generally the Thermo contour mattress has been very well accepted, and patients often report comfort, and request the company's address to purchase for themselves.

Thermo contour mattresses are manufactured in Denmark and, although deterioration of some mattress covers is of great concern to the NHS, de-lamination has not occurred in the Thermo contour mattress, as the company increased the lamination process on their covers in order to increase durability. Cheltenham have been using the new Thermo contour mattresses for 2 and half years, and have never had any problems with de-lamination of the cover.

Cheltenham trust has been supportive with the foam mattress replacement programme. This has assisted with reducing pressure ulcer incidence from 2.2% to 1.9%. One pressure ulcer costs £40,000 to treat⁹, and so in a hospital with 500 beds and 20 wards and the potential for this has a potential annual saving of £160,000 for the health authority. Potential cost-savings would be lost in the first year of the mattress replacement programme as all mattresses were replaced. Nevertheless, two issues are raised:

1. Fewer patients are developing pressure ulcers, which increases the quality of care.
2. Cheltenham will continue to save many thousands of pounds annually for some time, as Thermo contour mattresses are guaranteed for 8 years.

As use of the Thermo contour mattresses enabled staff to support higher risk patients on a static system, there was less need for dynamic air overlays. The TVS donated many of the air overlays to the local community service, as the performance of Thermo contour was found to be as effective as the air overlays. This initially presented the TVS with a problem, as the nurses were concerned that patients on the Thermo contour mattress were more at risk than if they were nursed on an air mattress. This problem was easily overcome, by firstly providing education to the nurses regarding the Thermo contour mattresses, and, subsequently, by the actual experience of the nurses themselves, as they gained increased confidence in using the Thermo contour and air mattresses appropriately, whilst observing a gradual fall in pressure ulcer incidence.

Replacing the air overlays can have an enormous influence on local budgets as:

1. Each air mattress requires maintenance at approximately £400 per mattress per year. If Thermo contour can replace 100-air overlays purchase or hire, this would represent a cost saving of £40,000 per year.
2. Many trusts decontaminate their dynamic air mattresses following MRSA (or similar) contamination, or on a six-monthly basis. This costs an average of £68 for cleaning and delivery. If a mattress requires cleaning twice yearly and, accounting for the possibility of 100 dynamic air overlays, this equates to a saving of £13,000 annually. In contrast, Thermo contour mattresses can be washed with soap and water. However, the policy of Cheltenham trust is to clean all mattresses with soap and water and, therefore, this was not an issue.
3. Replacement of air overlays may be required after 4 - 5 years. This would cost approximately £100,000 to £150,000 or £20,000 per year.

Therefore, total cost savings to trusts annually could potentially be £73,000. Linked with the cost-savings from the reduction of pressure ulcer formation, this is a potential of £233,000 annually for the trust.

The hidden cost savings are equally important with the potential reduction in repositioning requirements will save nursing time and reducing risk of back injury. Quantifying the figures for this cost saving could be the subject of a research project.

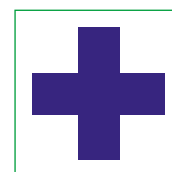
Rimmer¹⁰, added further large cost-savings through reduction in potential cross infection when mattresses covers remain intact. Santy⁸ established that outbreaks of various nosocomal infections were due to the poor condition of the hospital mattresses at that time. Thermo contour covers have never suffered from the problem of delamination which is the primary concern in cross infection.

Conclusion

The introduction of a mattress audit, the evaluation of Thermo contour mattresses, and a supportive Trust Board, led to a cost-effective method of reducing pressure ulcers within Cheltenham Trust. Equally important, it has increased the quality of care provided to patients.

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