

Treating a non-healing diabetic foot ulcer using Acticoat Moisture Control and the Lean improvement technique

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Thomas (2006) suggests that the cost of treating diabetic foot ulceration in the UK is about £300m every year. In the difficult economic climate that we are currently experiencing, where NHS management encourages cost reductions and some healthcare professionals are facing redundancy, the burden of the cost of dressings is a major financial consideration.

The product we choose for any given wound is usually a matter of clinical judgement and experience. However, fully understanding how a particular dressing works will ensure that the right dressing is chosen for the right wound at the right time. Apelqvist (2007) states that although some wound products may be more expensive than others, the additional cost may be balanced by a quicker healing time or less frequent dressing changes.

Staffing costs are also an expensive NHS resource (Harding, 2000) so by reducing the time for a wound to heal, we not only minimise the ill effects on the patient's quality of life, but we also reduce the costs associated with dressing costs and time spent by clinicians. Harding (2000) also suggests that the time healthcare professionals spend with each patient is a limited resource that may be difficult to quantify.

A new approach to service provision is currently being introduced nationally throughout the NHS (Westwood and Silvester, 2006). Called Lean, the idea has been adopted from industry and manufacturing. The idea is to improve the flow of patients and information, to move the patient through the treatment process in the most efficient way possible and to eliminate waste from the process. The least wasteful process and patient journey will provide better, safer healthcare and will

therefore be the most efficient and have better outcomes.

Lean has been implemented in the health service in view of the fact that NHS funding will be reverting to a 3% increase per year from 2008, following a period where NHS spend increased from £47bn to £98bn over the past eight years. With limited future funding increases planned, it is essential to make better use of the resources available.

Lean was originally developed by Toyota and has been implemented for more than 60 years. The principal has allowed Toyota to produce more cars with fewer defects, using less employees. In this arena, Lean has been proved to provide the most efficient process while providing financial gains.

Applying the Lean process to the NHS, Westwood and Silvester (2006) suggest that it can improve the flow of patients through their patient journey or diagnostic tests through the laboratory, and helps the processes to be less wasteful and therefore more efficient. The Lean methodology can be broken down into the following five application guidelines:

- ▶▶ Specify value — what is important in the eyes of patients and staff?
- ▶▶ Understand demand — what is the type and frequency of demand?
- ▶▶ Flow — how will the patient and information flow through the patient journey, i.e. asking what is wrong with the current way of doing things — are there bottlenecks?
- ▶▶ Pull — how can we create pull in the patient journey, rather than pushing the patient and information around the journey, i.e. what needs to be done and what are we trying to achieve?
- ▶▶ Perfection — how can we optimise the patient journey?

The Lean model can be successfully applied to any NHS process and has provided results within a hospital pathology laboratory, where turnaround times were reduced by 40% in seven days following the implementation of Lean thinking.



Figure 1. 26 April 2006. Foot ulcer 14 days after initiating treatment with Acticoat Moisture Control.

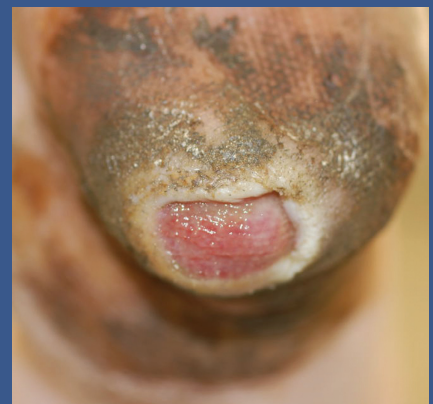


Figure 2. 10th May 2006. Ulcer after four weeks of treatment.



Figure 3. 24th May 2006. Ulcer after six weeks of treatment with Acticoat Moisture Control.

Lean can also be specifically applied to the process of wound care by assisting us in reducing patient healing times through appropriate choice of dressing, thereby reducing the associated cost of dressings and clinician time.

In this case report the Lean principle is retrospectively applied to a non-comparative case where a non-healing diabetic heel ulcer was dressed with Acticoat Moisture Control (Smith & Nephew Healthcare, Hull).

Case report

The patient was a 66-year-old woman with type 2 diabetes and complications including neuropathy and retinopathy. She had a history of poor concordance; her BMI was 46 and her HbA_{1c} was 9.0%. She lived on her own, administered her own insulin and her clinical comments suggested that she did not adhere to recommendations made by a dietician. She had palpable foot pulses.

The ulcer developed on her right heel during admission to hospital in late 2005 for a problem that was unrelated to diabetes. An area proximal to the ulceration was painful although the ulcer itself was not. Her diabetes-related neuropathy made it difficult to assess the ulcer pain accurately as she was also on gabapentin medication for peripheral diabetic neuropathic pain.

The ulcer measured 2.5cm x 2.0cm wide and was sited on the posterior aspect of the right heel. It had a grey centre with no granulation tissue present. She would not tolerate offloading with footwear or chiropody as it made her feel unsteady on her feet. The patient also refused to rest and elevate her legs while at home as she felt that she wanted to get out of her home each day.

The wound edges were undermining and macerated. A wound swab showed no significant growth of wound surface organisms, although there is currently some suggestion that superficial wound swabs may not identify any pathological organism within the deeper tissue (Health Protection Agency, 2006).

When X-rayed there was no evidence of bone changes suggestive of bone infection such as osteomyelitis, or any soft tissue abnormalities such as gas or an abscess. However, the wound bed showed some signs of critical colonisation (White et al, 2001) which were noted during examination. Critical colonisation occurs when host defences are unable to maintain a healthy balance of microbes within the wound and delayed wound healing is observed. In this state, White et al (2001) suggest the use of antimicrobial dressings to return the wound to a balanced colonised state.

Different types of dressing (hydrofibre, alginate, hydrogel and hydrocolloid) had been applied over several weeks, but none progressed the wound or reduced the pain experienced at dressing change, so she was referred to the district and general hospital on 21 December 2005.

Treatment

At first presentation, the patient tolerated peripheral debridement of the ulcer, once her vascular status had been ascertained as being sufficient through palpable foot pulses. The wound maceration suggested either increased exudate levels or insufficient dressing changes. Despite attending the specialist foot clinic weekly, the ulcer made little improvement and continued to give her some pain proximal to the ulcer. Due to the exudate levels and as the ulcer was assessed as critically colonised, a silver hydrofibre and foam combination dressing had been applied directly to the wound three times a week. The ulcer base turned slowly from an unhealthy grey colour to a dark red colour but did not progress to healthy pink granulation tissue as would be expected. The ulcer continued to give some intermittent pain. On 12 April 2006 there was still a lack of progression and the silver hydrofibre and foam combination dressings had failed to achieve wound healing. It was decided to try the recently available Acticoat Moisture Control.

Acticoat Moisture Control is a foam dressing containing nanocrystalline silver technology.

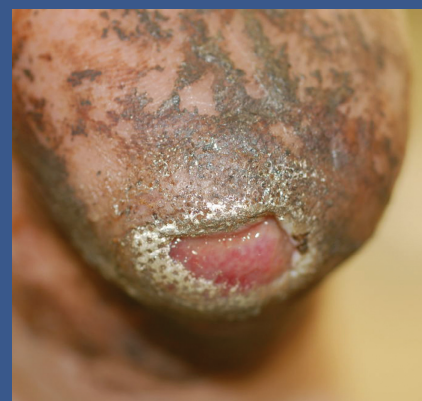


Figure 4. 7th June 2006. Foot ulcer 8 weeks after initiating treatment.

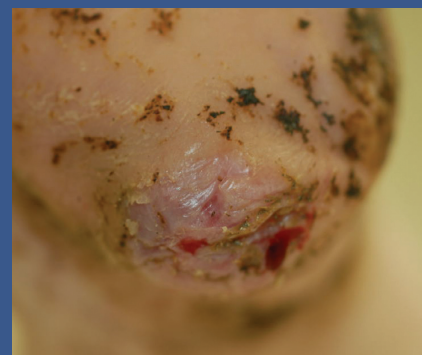


Figure 5. 21st June 2006. Ulcer after 10 weeks of treatment with Acticoat Moisture Control.

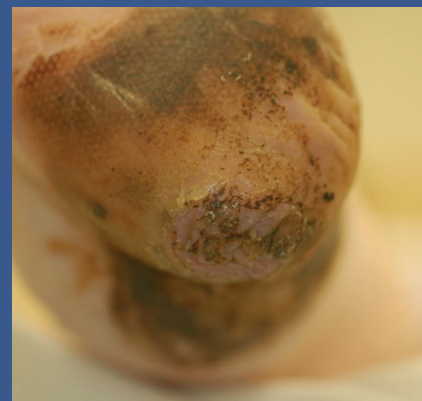


Figure 6. 12th July 2006. Ulcer after 13 weeks of treatment.

It is a highly absorbent foam dressing which gives a rapid and sustained release of nanocrystalline silver for up to seven days. This dressing provides a barrier to microbiological contamination, protecting the wound from invasive pathogenic organisms, thereby assisting faster healing. Nanocrystalline silver is also effective against micro-organisms present within the wound. When exudate is present, Acticoat Moisture Control will help maintain a moist wound healing environment and it absorbs exudate, even under compression (Smith & Nephew, 2006).

The patient attended the clinic once a week for debridement, clinical photography and re-dressing. She also attended the practice nurse for re-dressing between visits. Due to the initial excessive exudate levels, the Acticoat Moisture Control dressing was changed within seven days.

Regular attempts were made at each consultation to re-educate the patient regarding the benefits of improved blood glucose control, via her diet, to improve the wound healing potential. The retinopathy resulted in her eating processed or convenience foods, despite dietitian recommendations. She also confessed to having a sweet tooth and was not motivated to change despite advice, education and encouragement to do so.

Results

Within the first two weeks of treatment with Acticoat Moisture Control, the ulcer became less painful, and wound odour and exudate levels reduced. The pain reduction was most significant to the patient. This allowed her to feel that progress and wound healing was being achieved in the previously static ulcer. The ulcer started to develop a pink granulating base, suggesting that critical colonisation of bacteria within

the wound bed was reducing (White et al, 2001). Some black staining from the dressing occurred to the wound periphery but this was removable at the time of wound cleansing and did not interfere with wound healing or monitoring.

Conclusion

From the initial application of Acticoat Moisture Control on 12th April 2006 until 12th July 2006, the wound consistently improved at each visit (Figures 1–6). The pain from the wound stopped at week two and the ulcer base became a healthy pink colour, with wound contraction occurring. When this patient attended the hospital clinic on 24th July 2006, full healing had been achieved in this previously static, non-progressing diabetic heel ulcer. No other treatment parameters had changed from initial presentation, other than the application of Acticoat Moisture Control dressing. Choosing this dressing to suit this particular wound appears to have reduced costs by turning a non-healing wound into a healed one. By achieving wound healing the patient's quality of life improved, the Lean model was followed and the ongoing costs of redressing the foot were reduced.

We can apply the five Lean application guidelines to this particular case study. In this case, both the patient and the clinician want to achieve wound healing in the shortest possible period, to minimise the wound healing process, thereby reducing the risk of wound contamination and infection or re-infection. Another goal would be to reduce the pain caused by the non-healing wound and improve the patient's quality of life through faster wound healing. We need to fully assess the patient and the wound to decide what is needed to achieve quickest wound healing in terms of pressure relief, most appropriate

dressing and frequency of dressing change dependant on exudate levels. We need to consider why the wound may not be healing in the way we would want, if the dressing may not be matched to the wound type or exudate levels or where the wound healing process is going wrong. We can then re-evaluate what needs to be done to improve the situation (i.e. change the dressing type or frequency of dressing changes, increase pressure relief, re-educate the patient or re-screen for an undiagnosed infection). Finally, we want to sustain any improvements to the wound healing process, through continued reassessment and re-evaluation.

Using a clinically proven dressing such as Acticoat Moisture Control can improve healing outcomes, and fits the Lean philosophy of the least wasteful process, better efficiency and better outcomes. In this case, the result was faster wound healing time and a cost reduction in terms of dressing cost and clinician time. **WUK**

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