

# Best practice pathway of care for people with diabetic foot problems. Part 3: The healing foot.

*A report from a roundtable discussion held on Sunday  
28 January 2007 in London. The meeting was supported  
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## Introduction

Over the first two roundtable discussions, published in *The Diabetic Foot Journal* (Roundtable Discussion, 2006a and 2006b), those present discussed and modified the original pathway of care for the person with diabetic foot problems at the at-risk and pre-ulcerated stages. They proposed a new diabetic foot risk classification system (*Appendix 1*). The roundtable attendees also devised a pathway of care that included specifying which healthcare professional should be involved in the care of the person with the diabetic foot, what they should be doing and when. This is echoed by the Foot in Diabetes UK (FDUK) group as the basis of its competency document (available from: Diabetes UK, 2006). This in turn has been adopted by various groups, including Diabetes UK, to form the basis of commissioning for diabetic foot services in England and Wales. In this, the third roundtable discussion, those present discussed:

- the basics of wound care
- wound assessment
- infection control
- off loading
- how to measure progress
- the non-healing wound and how to manage it.

Present at this roundtable discussion were:

- Paul Chadwick (Principal Podiatrist, Salford)
- Mike Edmonds (Consultant Physician, London)
- Joanne McCardle (Podiatrist, Edinburgh)
- Alistair McInnes (Senior Lecturer, Brighton; Editor of *The Diabetic Foot Journal*)
- Duncan Stang (Chief Podiatrist, Lanarkshire; Duncan has recently taken up the post of National Diabetes Foot Coordinator for Scotland)
- Stella Vig (Vascular Surgeon, London)
- Lynne Watret (Tissue Viability Nurse, Glasgow)
- Matthew Young (Consultant Physician, Edinburgh; Associate Editor of *The Diabetic Foot Journal*; and Chair of this session).

In order to progress the pathway of care, the roundtable attendees had next to discuss the details of the care of the ulcerated diabetic foot. In this session the meeting attendees considered the following details of diabetic foot management.

- Wound care basics.
- Wound assessment.
- Debridement.

- Infection control.
- Off-loading.
- Measuring progress.
- The non-healing wound and how to manage it.

### Wound care basics and assessment

The session began with the question: 'What needs to be done when someone presents with a diabetic foot ulcer?' The first things to consider

should be what has caused it and, more importantly, how to help heal it. Currently there are two fairly well-used wound management systems: TIME and Applied Wound Management.

### TIME

Developed by Smith & Nephew (Hull), TIME is a four-stage process that looks at wound bed preparation:

- **T** is for Tissue management;
- **I** is for Infection and/or inflammation
- **M** is for Moisture balance; and finally
- **E** is for Edges of wound - non-advancing or undermined. However, Stella Vig believes that perhaps the 'E' should be regarded as Evaluation of healing which reflects the actual care of the diabetic foot ulcer.

### Applied Wound Management

Applied Wound Management was developed by Johnson and Johnson Wound Management and consists of three continuums: wound healing; wound infection; and wound exudate.

As such management systems may be applied to a variety of ulcers and wounds there can be no consensus as to which is better for the diabetic foot ulcer. However, the roundtable attendees agreed that as long as data is recorded about the wound specifics (such as initial size, sizes throughout the healing process, depth, infection, ischaemia, and time to heal) for audit purposes it

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is not crucial which system is used. The reason being that if such data is recorded the healthcare professional is obviously aware of the wound characteristics and can attend to its, and the person with the wound's, specific needs.

It has been argued that anyone with a 'hole' in their foot should be referred to a specialist team as, for example, a community-based healthcare professional may not have enough knowledge or experience to offer appropriate care, have the tools to off-load the ulcer, or the access to diagnostic and support services to manage any osteomyelitis or ischaemia. Such professionals, in the opinion of those present, should ask themselves a series of questions about their knowledge and facilities in making this decision. Some of the key signs a healthcare professional should look out for when a person with diabetes presents with a foot ulcer include the presence of swelling, whether the wound is malodorous and whether the wound is painful. If any of these are observed the patient should be referred to a diabetes specialist team immediately. If they are not present but the practitioner cannot answer the questions in *Box 1*, a basic list, which will need to be refined, then they should let go of the patient and refer on. Such a questionnaire highlights the importance of saying "I don't know" and if the practitioner wishes to manage diabetic foot ulcer patients they should consider trying to obtain

further experience in this area. Many centres offer secondment or rotational appointments where this knowledge can be obtained.

## Ulcer classification

There are a variety of wound classification systems available for the healthcare professional to use. The Texas ulcer classification system (see *Table 1*; Armstrong et al, 1998) seems to be the most widely used at present, at least among the attendees. Other systems include the Wagner grading (Wagner, 1981). There are many others but a local consensus should be reached and then common referral guidelines can be used.

## Debridement

There are four types of debridement: physical; chemical; larval; and surgical.

Sharp scalpel debridement is usually regarded as the gold standard for diabetic foot ulceration. However, this raises the issue of:

*'Who should perform debridement?'*

**Box 1.** If there is no evidence that a diabetic foot wound is swollen, malodorous or painful the basic questions below should then be addressed.

If the answer is 'yes' or they are unable to ascertain the answer to any the patient should be referred onto the specialist diabetic foot team.

- Are there signs of infection in the wound?
- Does there appear to be vascular impairment?
- Is the ulcer large and/or deep?
- Do I have the skills to off-load?

The simple answer, as agreed by the panel, is:

*'Anyone who is suitably qualified to do so.'*

However, this raises further issues around competency and training. Training is absolutely essential before any kind of debridement is attempted. Although training courses for nurses exist they do not usually include foot anatomy in sufficient detail to allow those untrained in debridement to do so without risk. Conversely, it can be argued that healthcare professionals who carry out many debridement procedures a day and are

**Table 1.** The Texas ulcer classification system (from Armstrong et al, 1998).

|       |   | Grade  |  |  |                                    |
|-------|---|--|--|--|------------------------------------|
|       |   | 0  | I  | II                                     | III                                |
| Stage | A | Pre- or post-ulceration lesion completely epithelialised | Superficial wound, not involving tendon, capsule or bone | Wound penetrating to tendon or capsule | Wound penetrating to bone or joint |
|       | B | Infection  | Infection  | Infection                              | Infection                          |
|       | C | Ischaemia  | Ischaemia  | Ischaemia                              | Ischaemia                          |
|       | D | Infection and ischaemia                                  | Infection and ischaemia                                  | Infection and ischaemia                | Infection and ischaemia            |

*‘Debridement is a basic tenet of diabetic foot management: no one should be debriding the diabetic foot who is unable to look after all the other aspects of the diabetic foot.’*

deemed proficient to do so, but have no formal training, should be allowed to carry on debriding.

To end this debate the session chair stated that debridement is a basic tenet of diabetic foot management: no one should be debriding the diabetic foot who is unable to look after all the other aspects of the diabetic foot detailed below.

Tissue that should be debrided include slough, dead tissue and callus. The ulcer edge and base are areas to focus on. The ischaemic foot should only be debrided by those with extensive experience of diabetic foot management and usually to a lesser degree.

The panel members agreed that debridement should follow a cycle of debridement followed by a period of time after which the ulcer is reassessed, followed by further debridement if necessary, followed by further assessment, and so on until the ulcer has healed.

### **Infection control**

The gold standard for infection control is systemic antibiotic

therapy in the opinion of the panel but sadly the evidence for exactly which and for how long is not available. Local protocols will usually determine this together with the results of deep tissue or other cultures.

Those looking after the infected wound must be aware that a surface swab for microbiological analysis may not pick up bacterial or fungal colonies that live deep in the wound, therefore, deep swabs must be taken to get a fuller picture of the wound's infected nature (Nelson et al, 2006; O'Meara et al, 2006).

### **Off-loading an active ulcer**

There are a variety of options for the healthcare professional to offer the patient who requires off-loading. The final choice of device for off-loading should depend upon a compromise reached between the healthcare professional and the patient. For example, for people who lead relatively active lives a device that imposes total immobility can be more damaging than good: such as the young male builder who cannot afford to take too much time off work.

Felt padding, although not without its critics and lack of formal evidence, is very widely used. Such off-loading is suitable when, for example, resources are scarce so pricier footwear cannot be afforded. Another problem encountered is the lack of pressure measuring devices – these are still mainly found in the clinics of research podiatrists.

However, a panel member said that in his area a cast sandal is used as a minimum; they cost from approximately £5 to £7, so are relatively inexpensive.

For how long should off-loading footwear be used? 'As long as progress in ulcer healing is observed,' agreed all of the roundtable attendees.

Armstrong et al (2005) found that the use of irremovable cast walkers helped heal ulcers quicker than the use of similar removable walkers. Armstrong and colleagues advocate the use of the total contact cast, whereas Harding and colleagues say that patient mobility is very important, therefore the TCC is not the ideal (as ascertained from talks given at a variety of professional conferences). However, as mentioned previously, the decision should be made after an informed dialogue between the patient and the healthcare professional. Although sometimes it should be the healthcare professional's prerogative to, in as much as possible, 'over-rule' the patient and use a device that is more suitable to facilitate healing (if an individual has a badly broken leg, for example, there is no doubt that a cast will be used).

An approach that could be adopted includes a hierarchy of decisions for cast choice for ulceration: the gold standard for the ulcer should obviously be used or considered in the first instance; the economics of the choice then needs to be considered; and finally patient choice.



*From left to right: Joanne McCardle (Podiatrist, Edinburgh); Stella Vig (Vascular Surgeon, London); Lynne Watret (Tissue Viability Nurse, Glasgow).*

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All of the panel members agreed that if someone presents with Charcot foot, no compromise should be made and casting is the best and only acceptable treatment for such feet.

## Measuring progress

In order to tell whether a wound is healing or 'stuck' or indeed getting worse three obvious signs to look for include the depth, width and height of the wound (the approximate surface area of the wound is a relatively good measure of wound healing). If none of these are decreasing the wound is not healing.

If the wound is not healing the approach to its management needs to be addressed. The basic therapies of off-loading, debridement, infection control and dressing selection need to be reviewed. If these are optimised and yet there are still problems healing the ulcer then a change is required. The following section describes a relatively new evidence-based method of helping the non-healing wound to heal: topical

negative wound pressure (TNWP) therapy.

## Managing the non-healing wound

If excess fluid in the form of exudate is not removed from a non-healing wound the wound is less likely to heal successfully than one that has this fluid level controlled to maintain a 'moist' environment (Jones et al, 2007). The removal of this excess fluid by application of topical negative pressure, as opposed to invasive draining systems, has been shown to remove excess interstitial fluid without affecting any of the surrounding tissue and thus promote a reduction in wound size (Fox and Golden, 1976; Fay, 1987; Urschell et al, 1988).

Argenta and Morykwas first used TNWP therapy (also known as Vacuum Assisted Closure [VAC] therapy) in animal studies in 1997 (Argenta and Morykwas, 1997). Since that time there has been a surge in the uptake of this method for a variety of wounds, including non-healing diabetic foot ulcers.

VAC therapy is not the



*From left to right: Mike Edmonds (Consultant Physician, London), Claire Weston (Clinical Manager, KCI Medical Ltd); Duncan Stang (Podiatrist and National Diabetes Foot Co-ordinator for Scotland).*

answer for all exuding diabetic foot ulcers, however, in many it can have a significant impact on successful healing. The evidence for the success of VAC in diabetic wounds is mainly from work following partial foot amputations. The panel consensus was that VAC should be considered where a foot had had a partial amputation or where extensive debridement, including Versajet debridement, had produced a more acute wound but where exudate was still a major factor in impairing

## Appendix 1. Proposed new diabetic foot risk classification system.

| Risk status  | Risk definition   | Plan of care  |
|--|---|---|
| Low risk   | Diabetes but no evidence of established risk factors.   | Basic education and open access if problems.  |
| High risk, not yet ulcerated                               | Diabetes and established risk factors. No history of foot ulceration.                               | Structured care with regular review by appropriately skilled healthcare professionals.  |
| Active ulceration  | People with diabetes and with active foot problems, such as ulceration or Charcot neuroarthropathy. | Review and treatment by specialist diabetic footcare services.  |
| After-care of the person with a healed ulcer or amputation | People with diabetes with a healed ulcer or an amputation.  | To be determined at the fourth meeting of this roundtable in Spring 2007 and published in <i>The Diabetic Foot Journal</i> volume 10 issue 2. |



# Roundtable *DISCUSSION*

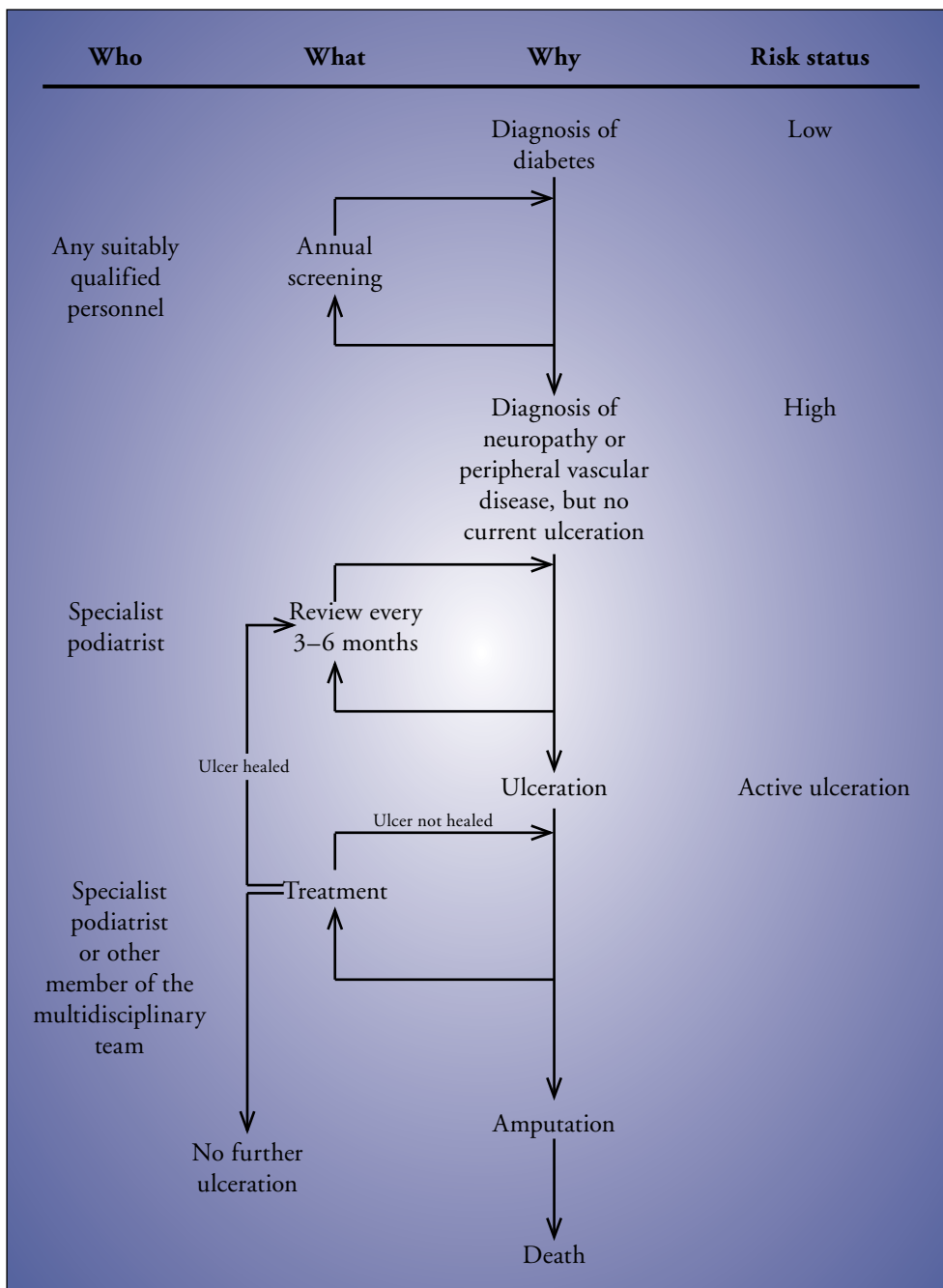
healing. Growing experience in this area might then suggest its use in more chronic wounds.

### Concluding remarks

These roundtable consensus meetings have prompted debate and interest in the

diabetic foot world. Due to the multifactorial nature of diabetic foot ulceration most guidelines have stopped at the point of foot ulceration or have given very broad statements on care. By gathering experts who, between them, have hundreds

of publications and thousands of patient-years of experience in this area this series hopes to offer practical guidance in this time of change for the NHS. The ulcerated foot needs a consistent approach to debridement, off-loading, infection control and management of ischaemia. New therapies are constantly being developed. VAC is widely used in other areas of wound management but is still in its infancy in diabetic feet in the United Kingdom. There appears to be some evidence for its use and this is likely to grow. ■



Appendix 2. Flow chart showing the progression of people with diabetic foot complications from diagnosis of diabetes to specific endpoints such as no further ulceration, amputation and death. Risk status is that proposed by the roundtable panellists. This flow chart will be amended based upon the following two roundtable discussions (this version reprinted from *The Diabetic Foot* 9: 147-52).

Argenta LC, Morykwas MJ (1997) Vacuum-assisted closure: a new method for wound control and treatment: clinical experience. *Annals of Plastic Surgery* **38**: 563-76

Armstrong DG, Lavery LA, Harkless LB (1998) Validation of a diabetic wound classification system. *Diabetes Care* **21**: 855-9

Armstrong DG, Lavery LA, Wu S, Boulton AJ (2005) Evaluation of removable and irremovable cast walkers in the healing of diabetic foot wounds: a randomized controlled trial. *Diabetes Care* **28**: 551-4

Fay MF (1987) Drainage systems. Their role in wound healing. *AORN Journal* **46**: 442-55

Foot in Diabetes UK, Diabetes UK, Association of British Clinical Diabetologists et al (2006) National Minimum Skills Framework for the commissioning of footcare services for people with diabetes. Available at: [http://www.diabetes.org.uk/Professionals/Education\\_and\\_skills/Competencies\\_-\\_Feet/](http://www.diabetes.org.uk/Professionals/Education_and_skills/Competencies_-_Feet/) (accessed 03.03.2007)

Fox JW 4th, Golden GT (1976) The use of drains in subcutaneous surgical procedures. *American Journal of Surgery* **132**: 673-4

Jones SM, Barwell PE, Shakespeare PG (2007) Advances in wound healing: topical negative pressure therapy. *Postgraduate Medical Journal* **81**: 353-7

Nelson EA, O'Meara S, Golder S et al (2006) Systematic review of antimicrobial treatments for diabetic foot ulcers. *Diabetic Medicine* **23**: 348-59

O'Meara S, Nelson EA, Golder S et al (2006) Systematic review of methods to diagnose infection in foot ulcers in diabetes. *Diabetic Medicine* **23**: 341-7

Roundtable discussion (2006a) Best practice pathway of care for people with diabetic foot problems. Part 1: The 'at-risk' foot. *The Diabetic Foot* **9**: 147-52

Roundtable discussion (2006b) Best practice pathway of care for people with diabetic foot problems. Part 2: The pre-ulcerated foot. *The Diabetic Foot* **9**: 197-202

Urschel JD, Scott PG, Williams HT (1988) The effect of mechanical stress on soft and hard tissue repair: a review. *British Journal of Plastic Surgery* **41**: 182-6

Wagner FW (1981) The dysvascular foot: a system for diagnosis and treatment. *Foot & Ankle* **2**: 64-122