

Infection control in diabetic foot disease

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ARTICLE POINTS

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2 Infection control measures are particularly meaningful to the podiatry, nursing and vascular surgery departments.

3 Increasingly, podiatrists and wound care nurses working in diabetic foot clinics will find themselves in a central position in regard to wound management.

4 Handwashing is the most important procedure in preventing the spread of infection.

5 Adopting better practice may mean that the number of patients treated has to be reduced.

KEY WORDS

- Infection control
- MRSA
- Healthcare associated infection
- Hand washing
- Resources

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Introduction

Diabetic foot disease is a problem that requires multidisciplinary management. In its most developed form the diabetic team is one of the best examples of multiprofessional working to be found in the health service (Young, 2003). The control of infection in diabetic foot disease is an important consideration for the whole diabetic foot care team. Diabetes, arterial insufficiency and renal failure all make infection more likely and increase the risk of developing ulceration (International Working Group, 2003). This article outlines the continuing problem of hospital-acquired infections and suggests avoidance and protective action that can be taken by the multidisciplinary team.

Hospital-acquired infections are infections that are neither present nor incubating when a patient enters hospital. About 9% of patients have a hospital-acquired infection at any one time. This is equivalent to at least 100 000 infections a year (National Audit Office, 2000). A small proportion of patient deaths each year are attributable to hospital-acquired infections. The cost of treating hospital-acquired infections, including extended length of stay are difficult to measure but may be as much as £1000 million each year (National Audit Office, 2000). Hospital-acquired infections could be reduced by 15% by better application of existing knowledge and realistic infection control practices (National Audit Office, 2000).

A hospital-acquired infection accurately describes a process of infection transmission in hospital, which is as relevant to practice in the community as in a hospital setting. Many practitioners view infection control matters as relevant only to hospital practice and essentially as a matter for large and involved wounds. They may not see the importance of these measures in their own work. A small sinus in a person with diabetes has the same potential for developing into a cellulitic episodes that can prove limb threatening as a large wound.

The term 'hospital-acquired infection' is beginning to be replaced by the term 'healthcare associated infection', which may

be more comprehensive in describing the process of infection transmission in community settings.

Although methicillin resistant *Staphylococcus aureus* (MRSA) has been known about since the 1960s, it was not until the 1990s that it became a matter of concern in the UK. Reports to the Central Public Health Laboratory have shown that as a proportion of all *S. aureus* causing blood stream infections, MRSA has risen from about 2% in 1990 to over 40% in 2000 (DoH, 2002).

An increasing problem of MRSA in a diabetic foot clinic has been reported by Tentolouris (1999). This research reported that *S. aureus* was the most frequent Gram positive aerobe isolated from foot wounds, and that 40% of these were resistant to methicillin. The same research reported that wounds that were infected by MRSA took longer to heal.

The role of foot infection in diabetic foot ulceration is well documented. Increased mortality associated with diabetic foot ulcers was reported by Boyko et al (1996). The importance of infection from foot ulcers causing further infection was highlighted in a case of spinal abscess that developed as a result of diabetic foot infection (Rizvi and Harvey, 1999). The increasing prevalence of severe necrotising infections caused by non-group A streptococci following trauma to diabetic feet was highlighted by Reyzelman (1999). The increasing number of at-risk patients colonised with antibiotic-resistant

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2 It is now strongly recommended that all instruments used for podiatric procedures where skin integrity is lost (or where there is potential for loss of skin integrity) should be sterilised.

3 For many procedures in diabetic foot disease, sterilisation by the central sterile supplies department is the desirable option.

4 An ischaemic patient with bone exposed may entail a much higher risk than a young healthy adult undergoing minor skin surgery.

organisms with the potential of causing foot infections makes attention to infection control even more important.

Infection-control measures are particularly meaningful to the podiatry, nursing and vascular surgery departments. The principles of wound care apply to any opening that may provide a portal of infection. By virtue of the type of tasks that many podiatrists will be involved in (that is wound care and sharp debridement) the ranking of risk must be high, akin to minor surgical procedures involving the type of patient that is most at risk from infection. See *Figure 1* for a typical wound the diabetic foot care team come across.

In many instances, podiatrists will already be working with local infection-control professionals and will have developed joint policies. The type of wound and the complexity of clinical problems being managed on an outpatients basis by podiatrists today would have been managed in theatre in the recent past. The implications for infection control may not always be appreciated.

It may be useful to consider aspects of infection control under a number of headings:

- Instruments and sterilisation.
- Physical environment.
- Wound culture.
- Communication.
- Dressing management.
- Handwashing.
- Central venous lines.
- Resource implications.

Instruments and sterilisation

Historically, podiatrists did not sterilise all instruments used for the management of ulceration. It is now strongly recommended that all instruments used for podiatric procedures where skin integrity is lost (or

where there is potential for loss) should be sterilised. Obviously, for any podiatric procedure instruments need to be sterile.

In many instances instruments are sterilised in an autoclave located in the surgery. Instruments may still be cleansed by hand in the clinical area, adding to the risk of environmental contamination. In some cases ultrasonic cleansers are not available. Hand cleansing and instrument washing should never take place in the same sink. At present, in relation to clinic sterilisers it is essential that autoclaves located in the surgery are adequately calibrated, maintained and are subject to a rigorous ongoing process of monitoring as described by the manufacturer and in accordance with the medical devices agency.

For many procedures in diabetic foot disease, sterilisation by the central sterile supplies department (CSSD) is the desirable option. Guidance issued by the Department of Health in Northern Ireland states that 'centralisation of instrument reprocessing in departments meeting all current decontamination best practice and standards is the preferred model, with local reprocessing the exception rather than the norm' (Department of Health Northern Ireland, 2001).

In the past, podiatrists may not have placed the same degree of emphasis on the sterilisation of instruments for the management of ulceration, as for procedures classified as minor surgery. Detailed analysis of the tasks performed in the management of ulceration, and the type of patient being managed may lead to the conclusion that an ischaemic patient with bone exposed may entail a much higher risk than a young healthy adult undergoing minor skin surgery.

Physical environment

The principal aim should be to ensure as little potential for cross-infection as possible. It is desirable for surgeries to be as bare as possible with plain washable surfaces and washable furnishings.

Cleaning should occur as often as possible; in reality this often means between sessions. The patient's chair should be covered with disposable paper which can be discarded after use. Between patients, the chair should be cleaned with an



Figure 1. Uncovering diabetic foot ulceration.

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1 All wounds with any evidence of clinical infection should have a swab taken and sent to bacteriology for culture.

2 A wound swab from a dry eschar and a wound swab taken from a wound that is covered in slough will be less meaningful than a swab taken from the base of the wound following sharp debridement.

3 Effective multidisciplinary interaction is always required and it is often necessary to highlight aspects of infection control.

4 It is important that samples that carry a risk of blood borne infection should be labelled with a category 3 pathogen; this provides a confidential mechanism of highlighting risk to laboratory staff whilst not identifying any condition.

5 An occlusive dressing may provide good protection in events of incontinence or in situations of poor hygiene.



Figure 2. A range of antiseptics used in infection control

alcohol-based disinfectant. The trolley used for dressing packs should also be cleaned in this way, as should a debris tray if this had been used. See *Figure 2* for a range of antiseptics that are used in infection control.

Ideally, any patient who is being cared for in hospital in isolation on the advice of infection control should be seen at the end of a clinical session. However, with current numbers of patients with MRSA this often proves impossible, and the importance of best infection-control policy is even more relevant.

Wound culture

All wounds with any evidence of clinical infection should have a swab taken and sent to bacteriology for culture. If bone in an ulcer has become infected and a sequestrum loosens and is found in an ulcer, this should be sent to bacteriology in a sterile sample jar. Obviously, any swab that is taken from a wound should be taken from as deep a level as possible. A more meaningful wound analysis will allow prescription of the most appropriate antibiotics, facilitate better wound management and contribute to control of infection.

Any interpretation of a wound culture needs to be made within the context of the wound. A wound swab from a dry eschar and a wound swab taken from a wound that is covered in slough will be less meaningful than a swab taken from the base of the wound following sharp debridement.

Communication

Increasingly, podiatrists and wound care nurses working in diabetic foot clinics will find themselves in a central position in regard to wound management. Often other professionals will be seeking their advice

and guidance. Effective multidisciplinary interaction is always required and it is often necessary to highlight aspects of infection control. Nursing staff should be informed of any significant risk discovered and vice-versa. The podiatrist should be informed of significant infection risk or complications.

When completing bacteriology requests it is always advisable to provide as much relevant clinical information as possible. Information needs to be communicated quickly and the advice of the microbiologist and infection control nurse should always be sought. Good communication ensures effective management and treatment. It is important that samples that carry a risk of blood borne infection should be labelled with a category 3 pathogen sticker; this provides a confidential mechanism of highlighting risk to laboratory staff whilst maintaining patient confidentiality.

Dressing management

The nature and frequency of dressings may have a direct impact on infection control. The type of dressing and frequency of dressing change should not allow 'strike-through' (a situation where exudate has made it to the surface of the dressing and the interface of the dressing and external environment is moist). If the interface is moist it is more likely to provide a conduit for infecting micro-organisms. No wound should be allowed to become macerated by exudate. If exudate is marked, an absorbent dressing may need to be considered. An occlusive dressing may provide good protection in events of incontinence or in situations of poor hygiene.

Dressing packs

An individual dressing pack should be used for each dressing. This should be done routinely, either in the hospital or community.

Protective clothing

The correct and appropriate use of protective clothing has taken on considerable importance in recent years, with greater awareness of the risks posed by infectious patients to healthcare workers, and the need to reduce transmission between patients (Clarke et al, 2002). Staff should use gloves and a plastic apron for all purposes in wound management without exception. These should be changed between each patient. In

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2 Increasingly, alcohol gels are being used for skin disinfection; this is recommended where no soiling of skin has occurred.

3 Careful consideration needs to be given to any staff member with a skin condition that could have an effect on their own health or the health of patients from a cross-infection viewpoint.

4 Patients undergoing dialysis or any other procedure with a venous line, need protection from any potential infection.

5 Adopting better practice may mean that the number of patients treated has to be reduced.

events where pus is likely to be under pressure, goggles and masks are advisable to protect the clinician from splashes. Uniforms should be changed daily and ideally laundered in health service facilities to limit the spread of infection. Indirect contact with staff clothing was found to be a route for cross-infection in the clinical setting by Hedin (1993). The presence of large numbers of MRSA organisms on uniforms worn by staff for more than 1 day would suggest that levels of contamination increase with extended use (Perry et al, 2001).

Handwashing

Handwashing is the single most important procedure in preventing the spread of infection (Infection Control Nurses Association, 2000; Gould, 1994). As early as 1847, Ignaz Semmelweiss (a Hungarian obstetrician) observed that handwashing by medical students between postmortem examination and contact with women in labour brought about a dramatic reduction in the deaths of mothers from puerperal fever (Semmelweiss, 1983). Thorough handwashing should take place at the beginning and end of each session with a chlorhexidine gluconate or povidone-iodine based solution. Increasingly, alcohol gels are being used for skin disinfection; this is recommended where no soiling of skin has occurred.

The appropriate emollient should be used at the end of each session to ensure protection of the clinician. Careful consideration needs to be given to any staff member with a skin condition that could have an effect on their own health or the health of patients from a cross-infection viewpoint.

Central venous lines

Patients undergoing dialysis or any other procedure with a venous line, need protection from any potential infection. Incidents of central lines becoming infected from foot wounds have been reported and the implications for the patients general wellbeing of having a central line removed are considerable.

Resource implications of infection control

Many of the concepts discussed above have resource implications. Adopting better

practice may mean that the number of patients treated has to be reduced. Timetabling arrangements may prove difficult when wounds are managed in a situation where other clinical tasks are carried out. The implications of a patient contracting an infection whilst receiving treatment raises many ethical issues.

Conclusion

Any clinician involved in the management of wounds is accustomed to thinking of the wider picture of the patient's general health. Infection control must always be part of that consideration. The steadily rising incidence of MRSA in the UK is hard to reconcile with effective control in the past (Wiggins, 2000). The management of diabetic foot disease raises many challenges; the control of cross-infection is yet another. ■

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