

# Developing pathways to support clinical practice in the identification and management of wound infection

## KEY WORDS

- ▶ Audit
- ▶ Antimicrobial dressings
- ▶ Infection
- ▶ Pathway
- ▶ Prevention

Diagnosing infection in a wound can be difficult, particularly if classic signs of infection are not present. However, infection is most frequently cited as the reason for delayed wound healing, with patients experiencing increasing pain or new pain, increasing exudate and odour. This article explores the development and implementation of a local pathway for effective management of wound infection using antimicrobial wound dressings in an attempt to reduce spend and improve clinical outcomes by supporting clinical decision making.

The estimated annual cost of caring for wounds within the UK has been reported to be between £2.3 and £3.1 billion, equivalent to 3% of the total NHS budget during 2005 and 2006 (Posnett and Franks, 2008). It can reasonably be assumed that these figures are now higher and will continue to rise with inflation. As such, it is important for organisations to have appropriate guidelines in place to ensure they are able to demonstrate adequate standards of care and safety when identifying and managing wound infection, and to make the best use of available resources.

If a patient develops a wound infection it can have a significant impact on wound healing, causing pain, discomfort and increased risk of hospitalisation, contributing significantly to morbidity and escalating health care costs (Storm-Versloot et al, 2010). It is suggested that worldwide up to 10,000 people per million with an open wound will die as a result of microbial wound infection (Percival et al, 2012).

It is also recognised within the literature that there is a growing resistance to the available antibiotics to treat wound infection and associated complications (including methicillin-resistant *Staphylococcus aureus* and *Clostridium difficile* (Leaper et al, 2010). Therefore, other strategies including early identification of those at increased risk of wound infection and early intervention to manage local bacterial bioburden, may be useful in reducing the risk of a patient developing systemic infection.

The National Prescribing Centre (NPC; now

part of the National Institute for Health and Care Excellence [NICE] Medicines and Prescribing Centre) guidance for the prescribing of dressings, suggests that healthcare professionals must consider all the associated costs of managing a patient with a wound, including both unit cost of the product and the overall impact on the health economy (NPC, 2012).

Products selected should be initially based on the needs of the wound, including the type and stage of wound healing. However, wear time, ability of the patient to concord with treatment and the impact on clinical staff time should also be considered and continually evaluated (NPC, 2012).

A local audit of online, non-prescription ordering data during 2011/2012 found that the annual expenditure on antimicrobial dressings was in excess of £130,000. This equated to 10.83% of the total dressing's budget, suggesting that products are being used for longer than the recommended two to four weeks (Wounds UK, 2013). This prompted the authors of this article to develop and implement a local pathway for the effective management of wound infection, using antimicrobial wound dressings in an attempt to reduce spend and improve clinical outcomes by supporting clinical decision making.

## IDENTIFYING WOUND INFECTION

Early diagnosis of increasing bioburden is based on clinical judgement, holistic assessment, patient symptoms, clinical observations and the clinicians

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**Table 1. The infection continuum (adapted from Kingsley, 2001).**

Term	Definition
Contamination	Presence of non-multiplying bacteria in a wound
Colonisation	Presence of multiplying bacteria in the wound, but no immune response
Critical colonisation	The immune system has been compromised and the patient is no longer able to control the multiplying bacteria
Infection	The multiplying bacteria overwhelm the immune response, resulting in clinical signs and symptoms

ability to determine the predictability of wound infection (Tickle, 2013). However, diagnosing wound infection can be difficult, particularly where classic signs of infection are not present. For example, according to Edmonds and Foster (2006), up to 50% of infected diabetic foot ulcers do not present with typical signs (which may include, erythema, heat and pain due to neuropathy). It is, therefore, not surprising that many clinicians may find it challenging to diagnose wound infection accurately, particularly where symptoms may be subtle or absent (World Union of Wound Healing Societies [WUWHS], 2008).

According to the European Wound Management Association (EWMA), although all chronic wounds are potentially contaminated with a variety of bacteria (EWMA, 2006), not all wounds will go on to develop infection and will heal without complications (Edward-Jones and Flanagan, 2013).

Kingsley (2001) suggested that development of wound infection will depend on the host's response to microorganisms and discussed a continuum relating to the development of wound infection. This continuum uses descriptors including contaminated, colonised, critically colonised and spreading infection, suggesting possible presenting characteristics and symptoms associated with increasing bioburden (*Table 1*).

Infection is one of the reasons why a wound may not be healing. Other reasons include underlying disease processes, such as vascular disease, malnutrition, and other comorbidities (Dowsett, 2013). However, infection is often cited as the most frequent reason for delayed wound healing (Gotrupp et al, 2013).

Patients presenting with a wound infection may experience pain that gets worse, pain at dressing change or the occurrence of pain in a previously pain-free wound (Cutting et al, 2013). Patients with an infected wound may also experience increasing

odour and other associated unpleasant symptoms (Edward-Jones and Flanagan, 2013).

## LOCAL AUDIT DATA

Audit of clinical practice and respective outcomes should be viewed as a quality improvement process which facilitates reflection and serves as a measurement against standards of best practice (NICE, 2002).

The economic impact associated with wound care, prevalence and practice has been highlighted in studies that have presented results of wound care audits (Drew et al, 2007; Ousey et al, 2013). These authors identified that the majority of chronic wounds were cared for in the community and accounted for a significant proportion of community nursing workload. It was identified that between 6.5% and 12.8% of reported wounds showed clinical signs of infection, a major factor causing delayed healing (Drew et al, 2007; Ousey et al, 2013).

A local community wound audit in a population of approximately 400,000 identified 813 wounds being treated by community nursing teams. Of these, 29.4% were reported as having more than one sign of infection including increased malodour, increased exudate, increased pain and erythema (Central Essex Community Services, 2011). These signs align with European consensus criteria for identifying wound infection (EWMA, 2005). However, only 9.3% were recorded as being infected and only 19.6% were being treated with antimicrobial dressings. A total of 6.6% of all dressings used were antimicrobials including iodine, silver and honey products (Central Essex Community Services, 2011). This local audit highlights that there was a lack of consistency in woundcare practice for identifying wound infection and applying of appropriate treatment. Considering the rising costs of wound management, the economic impact of inaccurate diagnosis and use of dressing products can prove significant.

## DEVELOPING AND IMPLEMENTING A PATHWAY

Maintaining patient safety should be a high priority for all healthcare providers within the UK. Organisations need to demonstrate that they are proactive in preventing patients from avoidable harm and that care is delivered safely

and effectively (Care Quality Commission [CQC], 2010).

The local audit data described above show that staff knowledge regarding identification of infection and appropriate treatment is limited. This is not unusual. Brown (2006) stated that it is not uncommon for practitioners to become confused when diagnosing and treating wound infection using antimicrobial products.

Therefore, to equip practitioners with appropriate knowledge and guidance it was decided that a wound infection management pathway should be developed which would aim to embed clinical evidence into everyday clinical practice.

A simple, structured, colour-coded pathway for managing wound infection, based on best practice (EWMA, 2008; Wounds International, 2012) was developed by the authors of this article (*Figure 1*). Collaboration from prevention lead nurse and clinical educators from commercial companies, whose products were represented on the formulary, was also sought. The use of colour coding was decided on to assist healthcare practitioners with decision-making regarding the early recognition of signs of infection, appropriate use of antimicrobial dressing products and the knowledge to recognise when to discontinue their use.

The Tissue Viability team recognised that patients who presented with numerous infections and those who were vulnerable to repeated wound infection could be particularly challenging for clinicians and lead to an over-reliance on antimicrobial products.

With this in mind, part of the pathway was indicated for high-risk patients, where prolonged

use of products may be required beyond the recommended 2–4 week period. Additionally, the products may be used as a prophylactic measure in the prevention of wound infection.

During the development stage of the pathway, peer review was sought from experts in both Tissue Viability and Infection Prevention to ensure accuracy and allow for appropriate revision. The pathway was implemented across the organisation and supported by an additional educational programme so as to disseminate the information beyond the link practitioner group.

During the development of the pathway, it was identified that multiple factors may contribute to a patient being at increased risk of wound infection, including factors associated with both the patient and the wound (*Table 2*).

Considering the authors' clinical experience of managing patients with chronic wounds, particularly those with long-term conditions, an additional consideration was that patients presenting with repeated infections within the same wound (defined as more than two) would also be considered as high risk.

### MANAGING CHANGE

Nurses within a specialist role play an important part in supporting their organisations to ensure safe practice standards are observed and care delivered is evidence based. Clinical specialists should use their enhanced knowledge and skills to influence cost-effective, patient-centred care (Royal College of Nurses [RCN], 2010). The specialist nurse has a responsibility for interpreting national legislation,

**Table 2. Factors contributing to increased risk of wound infection (adapted from World Union of Wound Healing Societies, 2008)**

Patient factors	Wound factors
<ul style="list-style-type: none"> <li>• Impaired immune response</li> <li>• Comorbidities/disease affecting tissue perfusion</li> <li>• Malignancy</li> <li>• Obesity</li> <li>• Poor nutrition</li> <li>• Psychosocial factors/poor personal hygiene</li> </ul>	<p>Acute wounds:</p> <ul style="list-style-type: none"> <li>• Contaminated surgery</li> <li>• Lengthy operative procedures</li> <li>• Trauma with delayed treatment</li> <li>• Presence of necrotic tissue or foreign bodies</li> </ul> <p>Chronic wounds:</p> <ul style="list-style-type: none"> <li>• Presence of necrotic tissue or foreign bodies</li> <li>• Chronicity</li> <li>• Large in size and/or deep</li> <li>• Anatomical location at risk of contamination</li> </ul>

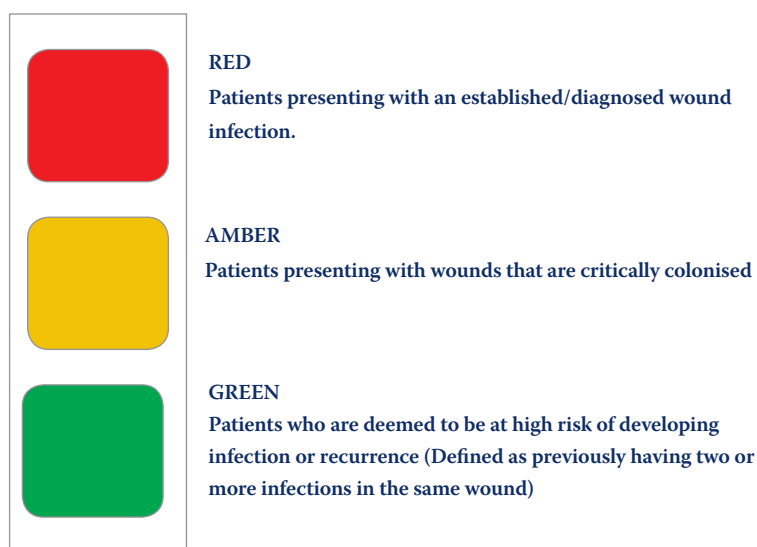


Figure 1. Colour codes used for identifying patients with an infection

policies and guidance relevant to the practice area which inform and guide clinical practice at a local level on behalf of their generalist colleagues (Flanagan, 1997).

It was recognised the author of this article needed to be reflective during the process of change to ensure that it was successful. As such, Kolb's (1984) experiential learning cycle was used. Using this theory, it was possible to develop training and education that encouraged reflection and participation in the change process.

#### **Concrete experience**

Initially, a meeting was held with the Tissue Viability link practitioners to inform them of the current spend on antimicrobial products for their individual work areas, present the new pathway and to update them on choice of dressings. The meeting was attended by 16 link practitioners representing community nursing, community hospitals, podiatry and children's community nursing. The meeting provided the opportunity to critique the pathway, question the evidence in relation to products chosen and their appropriate use, and also the usability of the pathway in practice.

This meeting encouraged nurses to reflect on their own experience of managing patients with wounds at risk of developing infection or already with an existing one.

#### **Reflective observation**

Initially, the link practitioners were asked to

identify patients currently on their caseload for who they thought the pathway would be appropriate. In addition, they were encouraged to apply the pathway and document their evaluation of its effectiveness; further follow-up training within the workplace was also offered. They were also asked to review patients currently being treated with antimicrobial products against the pathway criteria. The clinical specialist team were available to support the link practitioners on a day-to-day basis.

#### **PILOT AUDIT TO ESTABLISH EFFECTIVENESS**

The pilot audit was done to establish the effectiveness of the new pathway for managing wound infection. A total of 19 patients were included in the audit. Each patient was assessed and then reviewed at four weeks. This took place across three clinical areas within community nursing and Tissue Viability clinics. Of the 19 patients included, 11 were highlighted to be at high risk of developing infection. Over the subsequent 4-week period, none of these patients entered the red pathway, despite many already presenting with infection. The majority experienced improvement in symptoms, particularly pain, exudate levels and malodour (Grothier and Shields, 2012). The introduction of a polyhexamethylene biguanide (PHMB) irrigation cleanser for pre-treatment and the use of a DACC-coated bacterial binding dressing (Grothier, 2013) has proven to be cost-effective within this organisation by reducing the need for silver dressings and improving clinical outcomes. This has resulted in a cost reduction of 72% within the first six months of implementation. Therefore, it was felt appropriate to continue with a larger organisational audit.

#### **EDUCATION PROGRAMME**

During follow-up meetings, clinicians were presented with results of the pilot audit, which identified that by using the pathway, spend on antimicrobial dressings had been significantly reduced.

The expectation was that the link practitioners would champion the initiative during implementation within their local teams and become a first point of contact for those seeking support or further information.

Link practitioners provide individuals with the opportunity to enhance their own clinical knowledge

and possess the leadership attributes necessary when implementing change (Royal College of Nursing [RCN], 2012). This opportunity to engage with various clinicians improved communication across the disciplines, strengthened relationships and through peer support, the desire to improve patient outcomes.

Following the implementation of the pathway, feedback from the clinical teams highlighted some confusion and slight apprehension about using the suggested products. A quick reference guide was therefore developed with clinicians to accompany the pathway. This rationalises the products available and helps embed the change.

To ensure that evidence of clinical effectiveness is captured, an audit template was developed and implemented in the electronic patient record.

Antimicrobial product use will continue to be monitored monthly and reports shared with the relevant clinical teams. An authorisation process has also been implemented when ordering antimicrobial products to ensure visibility and promote ownership and responsibility for the team's expenditure.

The use of a structured reflective approach to implementation of the change and constant feedback from all involved, ensured that all staff were aware of the change and fully engaged.

## DISCUSSION

A lack of consistency and consensus when determining care for patients with a wound infection suggests clinical evidence is not always correctly interpreted or easily incorporated into clinical practice (Gottrup et al, 2013). It is important for Tissue Viability specialists to lead and take responsibility in the education of clinicians undertaking wound care, supporting them with appropriate information, systems and processes to aid clinical decision making.

Dowsett (2009) explored knowledge and assessment skills of community nurses in relation to wound care, and identified that following participation in an educational programme, accuracy of diagnosis of wound infection significantly improved among nurses. Although targeted and subject specific education can support timely improved knowledge of individuals, Draper and Clarke (2007) questioned if this had a sustainable effect on improving clinical practice or changes in wound management culture, as the effect of education on patient outcomes is rarely assessed.

Dowsett (2009) also acknowledged that it is important to continually evaluate the impact of education against best practice and also suggests that change is more likely to be successful if incorporated into existing structures. This is further supported by Lee (2011) who discussed that continual professional development (CPD) needs to be supported strategically by the organisation if change is to be sustained.

The aim of implementing a pathway for managing wound infection is to guide clinical decision making, standardise care and establish safe and effective practice for patients with, or at risk of, developing a wound infection. It was evident from the local audit data that there was a lack of consistency in the recognition of signs and symptoms of wound infection and an over dependence on antimicrobial products. It was therefore imperative that the introduction of a clinical pathway was supported with an educational programme to enhance and sustain the knowledge and skills of the clinicians using it. This project has helped to reduce confusion and guide confident clinical decision making. Appropriate dressing choices can lead to improved clinical outcomes and a reduction in overall wound care costs.

Preventing wound infection can prove difficult when patients often require the provision of healthcare across multiple settings including acute hospitals, clinics and community services, potentially increasing the risk of infection by cross contamination (Percival et al, 2012). It is the responsibility of all healthcare professionals caring for patients with open wounds to avoid or minimise potential infection and cross contamination risks, ensuring processes support a high standard of practice (Department of Health [DH], 2008). Indeed, the DH (2010) said it is not unreasonable for individuals to expect to have their care provided by skilled and knowledgeable health professionals who are engaged and work in partnership with the patient.

Furthermore, clinicians must ensure they possess the appropriate knowledge and skills to be confident in helping patients to make decisions about their care and to adopt prevention strategies to maintain good health (DH, 2012). Clinicians caring for patients with wounds have a professional obligation to improve their own understanding regarding development of wound infection and its potential effect on patients when making clinical decisions (Nursing and Midwifery Council [NMC], 2008).

## CONCLUSION

The aim of developing the pathway described in this article was to standardise care, establish safe practice for patients with, or at risk of, developing a wound infection. It was evident from the local audit data that there was a lack of consistency in the recognition of signs and symptoms of wound infection and an over dependence on antimicrobial products, increasing the financial burden on the organisation. It was, therefore, imperative that the introduction of a clinical pathway was supported with an educational programme to enhance the knowledge and skills of the clinicians using it.

A systematic colour coded pathway helps reduce confusion and guides confident clinical decision making. Appropriate, alternative dressing choices can lead to improved clinical outcomes and a reduction in wound care costs.

A reference guide, summary poster and hand-out of the *Pathway for Managing Wound Infection* is available. If you would like further information please contact the Provide marketing department: provide.marketing@nhs.net



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