

An audit of antimicrobial prescribing and microbiological sampling in a complex wound clinic

KEY WORDS

- ▶ Antimicrobials
- ▶ Chronic wounds
- ▶ Infection
- ▶ Swabbing

Infection is a major contributing factor to delayed healing in chronic wounds. The misuse of antimicrobials is common to all specialties, and recent publications have highlighted the importance of antimicrobial stewardship in wound care. In view of this, the authors audited the prescription of systemic and topical antimicrobials as well as microbiological sampling practices in a multidisciplinary complex wound clinic. Only 9.3% of patient encounters resulted in the use of systemic antibiotics, whereas topical antimicrobials were used more frequently. Microbiological sampling was rarely performed, and swabbing was done more often than tissue biopsy.

Infection perpetuates inflammation and is a major contributory factor to delayed healing in chronic wounds (Leaper et al, 2015). The International Wound Infection Institute (2016) has defined wound infection as “the presence of microbes in sufficient numbers or virulence to cause a host response locally and/or systemically”. The presence of infection is not as easy to diagnose in chronic wounds compared to acute wounds; the latter often exhibit the classic Celsian signs of redness, swelling, heat and pain. In chronic wounds, the host response to infection can be affected by the presence of underlying diseases such as diabetes, therefore signs of infection may be more subtle (Leaper et al, 2015). In addition, the identification of microbes in a chronic wound does not necessarily prove the presence of infection, and bioburden is described as a continuum (Table 1), from contamination, to colonisation, to localised and systemic infection (International Wound Infection Institute, 2016). The organisms present in chronic wounds are often polymicrobial and can form biofilms, which are notoriously difficult to recognise and treat.

Identifying wound infection early is important as it can progress to systemic infection, which can be life-threatening, and also acts as a barrier to healing. More localised infection may be easier to treat and may not require the use of systemic antibiotics. The diagnosis of infection is based on

clinical features and there is currently no reliable diagnostic test available that can be used to confirm or refute the diagnosis. Some of the more subtle signs of infection in chronic wounds are shown in Box 1; these were originally suggested for diagnosing infection in surgical wounds healing by secondary intention (Cutting and Harding, 1994). Whilst they are now widely accepted as signs of infection in chronic wounds, it is important to note that these signs can vary depending on the underlying pathogenesis (Cutting and White, 2004).

In 2016, the British Society for Antimicrobial Chemotherapy and the European Wound Management Association produced a position paper on antimicrobial stewardship in wound care (Lipsky et al, 2016). This paper highlights the growing global crisis of antimicrobial resistance, which is directly related to the level of antibiotic use. Whilst the inappropriate use of antimicrobials is common to all specialties, there are some problems that are specific to wound care:

- ▶ Infection can be difficult to diagnose in chronic wounds
- ▶ There is a lack of guidelines for the treatment of infected chronic wounds
- ▶ Clinicians may be unsure when to use antibiotics or concerned that failing to use them could result in a bad outcome
- ▶ Patients may demand unnecessary antibiotic therapy (Lipsky et al, 2016).

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Box 1. Subtle signs of wound infection (Cutting and Harding, 1994)

- Delayed healing
- Discolouration
- Friable granulation tissue that bleeds easily
- Unexpected pain/tenderness
- Pocketing/bridging at the wound base
- Abnormal smell
- Wound breakdown.

Table 1: The bioburden continuum (adapted from International Wound Infection Institute, 2016)

	Contamination	Colonisation	Localised infection	Spreading infection	Systemic infection
Definition	Microbes are present in the wound but do not multiply or persist	Microbes are present in the wound and are able to grow and proliferate but do not cause any damage to the host	Microbes are present in the wound and stimulate a host response. The infection is contained and the signs may be subtle	Microbes present in the wound invade the surrounding tissue causing signs and symptoms spreading beyond the wound itself	The invading microbes cause a systemic infection via the bloodstream or lymphatic system
Treatment	No treatment is required	No treatment is required	Topical antimicrobials may be sufficient	Systemic and topical antimicrobials required	Systemic and topical antimicrobials required

Lipsky et al (2016) recommend reserving antibiotic therapy for clinically infected wounds, using empirical treatment until culture results are available and revising accordingly. The authors also suggest that topical antimicrobials or antiseptics can be useful in locally infected chronic wounds, with the added advantages of avoiding systemic effects and allowing the use of agents that cannot be administered systemically (Lipsky et al, 2016).

Routine microbiological sampling of wounds is not recommended (International Wound Infection Institute, 2016). Once infection has been diagnosed clinically, microbiological sampling may be useful for guiding treatment. Lipsky et al (2016) recommend culturing all clinically infected wounds, ideally by tissue sampling (biopsy) rather than swabbing, in order to revise empirical antibiotic therapy. The International Wound Infection Institute (2016) suggest the following indications for wound specimen collection for microbiological analysis:

- ▶▶ Acute wounds with classic signs and symptoms of infection
- ▶▶ Chronic wounds with signs of spreading or systemic infection
- ▶▶ Infected wounds that have failed to respond to antimicrobial treatment
- ▶▶ Surveillance of drug-resistant microbial species (as per local protocols)
- ▶▶ Specific scenarios where the presence of particular species would exclude a surgical procedure (e.g. skin grafting).

Swabbing is the most widely used technique for wound sampling, but it cannot distinguish between colonisation and infection (Copeland-Halperin et al, 2016). Tissue biopsy allows species identification and quantification and demonstrates deep tissue rather than surface organisms. However, it is more expensive, time-consuming and requires a level of skill, as well as posing risks to the patient such as pain, bleeding and extension of infection (Copeland-Halperin, 2016). It is also important to note that neither method of tissue sampling is able to detect the presence of a biofilm (Leaper et al, 2015).

Given the recent publication of these position papers, audits were undertaken in a complex wound clinic to ascertain topical and systemic antimicrobial prescribing practices and also microbiological sampling rates and methods. The clinic is a multidisciplinary clinic involving doctors, specialist nurses and podiatrists seeing a large variety of chronic wound types.

METHODS

Data on systemic antibiotic prescribing were collected prospectively in the outpatient clinic between February and March 2018. The electronic records of those patients prescribed antibiotics by doctors in the clinic were then reviewed to find the outcome of treatment. Topical antimicrobial use was reviewed by prospective data collection between May and June 2018. A list of patients prescribed topical

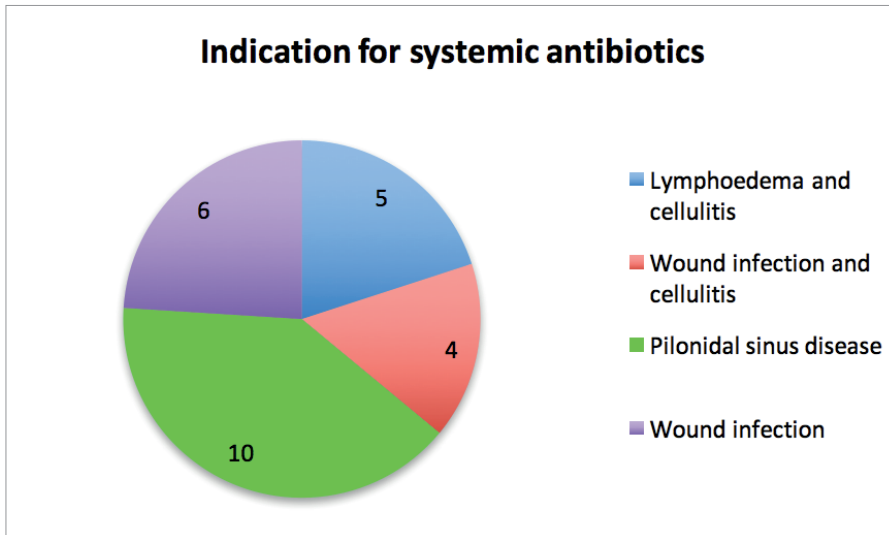


Figure 1. Indications for the prescription of systemic antibiotics

antimicrobials (dressings or topical preparations) was kept and the electronic records of patients were subsequently reviewed.

Microbiological sampling data were collected retrospectively covering a time period of three years (01/01/2015 to 31/12/2017). Patients were identified from the Public Health Wales microbiology laboratory, providing a list of all patients who had samples sent from the clinic. The electronic records of these patients were then reviewed for the necessary information surrounding each sample, including details of the microbiology report and clinical action taken.

Ethical approval was not required but permission was obtained from the hospital audit office to access patient records.

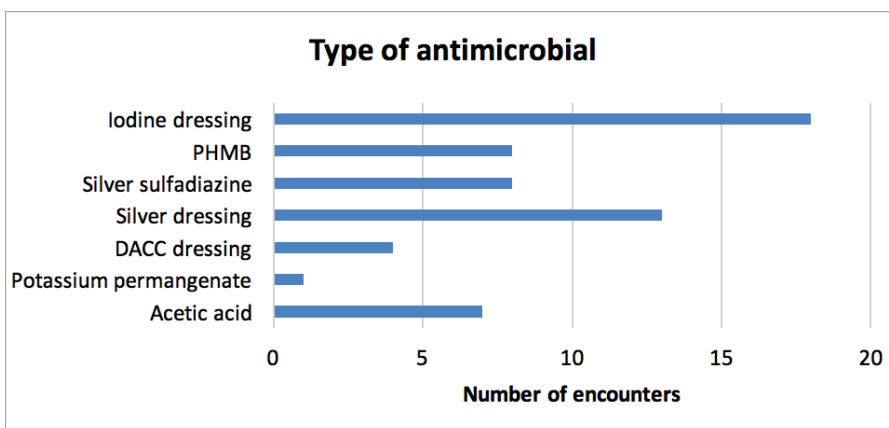


Figure 2. Types of topical antimicrobial used (PHMB = polyhexamethylene biguanide, DACC = dialkylcarbamoyl chloride)

RESULTS

Systemic antibiotics

During the data collection period, 16 patients were prescribed antibiotics. Of the 270 patient encounters in the audit period, 25 (9.3%) resulted in antibiotic prescriptions (4 patients required antibiotics on more than one occasion). The indications for prescribing antibiotics are shown in Figure 1. The duration of antibiotic therapy prescribed was varied, ranging from 1 week to long-term.

Nine patients showed good improvement with antibiotic treatment, and 5 patients improved but required a further course of antibiotics. In 1 patient, antibiotics were ineffective and they were referred for surgical treatment and 3 patients had not been followed up at the end of the audit period. Three patients had wound swabs sent for culture but the results did not affect treatment.

Topical antimicrobial use

During the time period, 36 patients were prescribed topical antimicrobials. Of the 151 patient encounters in the audit period, 50 (33%) resulted in the recommendation of topical antimicrobial use (some patients were prescribed antimicrobials in more than one visit). Of these 50 encounters, more than one antimicrobial was recommended (e.g. astringent soak followed by antimicrobial dressing) on 9 occasions. The wound types were leg ulcers (n=15), pilonidal wounds (n=7), pressure ulcers (n=2) and chronic surgical wounds (n=12). The types of topical agents used are shown in Figure 2.

The indications for topical antimicrobial use were localised infection (n=27), wound infection with cellulitis (n=2), preventative measure (n=6) and patient preference (n=1). Systemic antibiotics were also used in 11/36 patients (30%). None of the patients had samples sent for culture.

Microbiological sampling

During the three-year time period, 25 chronic wound samples were sent for microbiological analysis from 20 patients. In this same period, the authors conservatively estimated that approximately 5,000 consultations took place, based on an average of 140 per month. Therefore, microbiological sampling was estimated to take

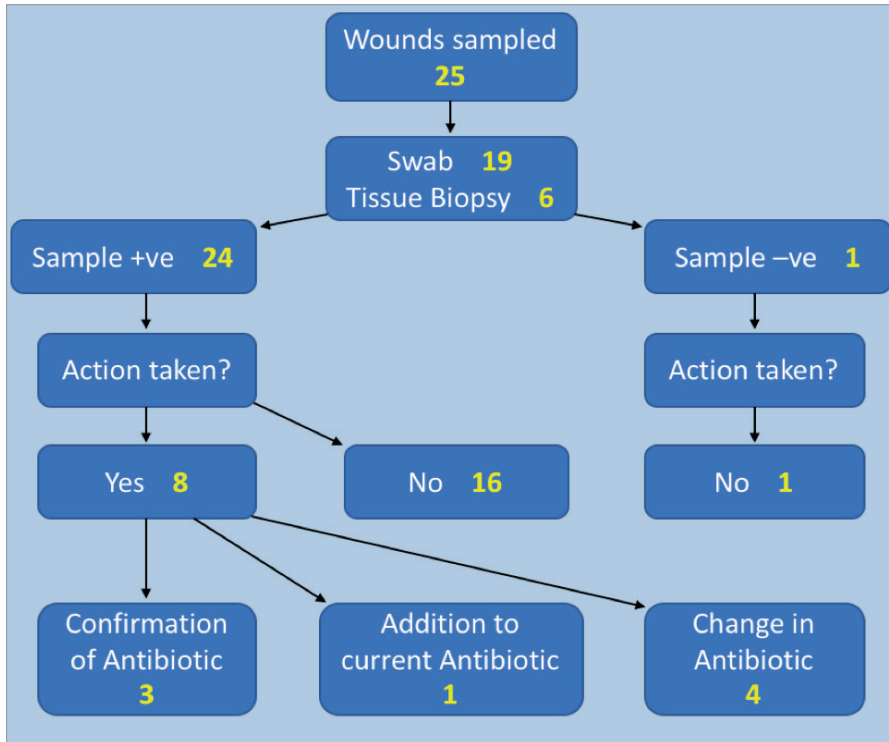


Figure 3. A summary of actions taken following microbiological sampling

place in 0.5% of consultations. The majority of samples were swabs (76%, 19/25), the remainder were tissue biopsies. Non-healing surgical wounds were the most commonly sampled wound type (13/25).

In total, 40 organisms were cultured from the samples, which reflected 19 different species. The most commonly cultured species were mixed anaerobes (n=6), *Streptococcus* species (non-haemolytic) (n=5), *Staphylococcus aureus* (n=4) and *Proteus* species (n=4), with these making up 48% of all organisms grown.

In 56% (14/25) of samples, patients were given empirical antibiotics at the time of sampling, and in 28% (7/25), patients were taking antibiotics before the sample was taken. The microbiology reports included antibiotic sensitivities in 36% (9/25) of samples, with resistant organisms reported in 3 of these. Neither sensitivities nor resistance were reported in the other 16 samples. For 32% (8/25) of samples, microbiological sampling affected patient management, for example, resulting in a change of antibiotic therapy. For the remaining 68% (17/25) of samples, the result had no impact on the patient's management (Figure 3).

DISCUSSION

Antimicrobial use

Overuse of antibiotics is a growing issue, and can be a particular problem in chronic wounds. Diagnosis of infection can be challenging and clinicians may be unsure when to treat infection and what treatment is most appropriate. There are often local guidelines available on how to treat certain skin and soft tissue infections, for example, cellulitis; however, these are rarely specific for patients with chronic wounds. Currently, there is no evidence to support the routine use of systemic antibiotics to promote healing in chronic wounds (O'Meara et al, 2014; Norman et al, 2016), and they should be reserved for clinically infected wounds. The use of topical antimicrobials is variable; some trusts limit their usage due to cost and lack of evidence. They are generally considered effective for localised infection and may be a useful alternative to systemic antibiotic treatment (Lipsky et al, 2016).

An audit of antimicrobial prescribing in a complex wound clinic demonstrated that the number of systemic antibiotic prescriptions provided during the time period was relatively low. This may be due to the greater use of topical preparations. Systemic antibiotics were only used for clinically infected wounds. For topical antimicrobials, the majority were used specifically to treat localised infection (75%) or wound infection with cellulitis in conjunction with systemic therapy (5.5%), which is appropriate. Deviation from this occurred in cases where patients were at high risk of infection (e.g. immunosuppressed or multiple previous infections).

Microbiological sampling

Microbiological sampling is recommended for clinically infected chronic wounds. Its purpose is to help guide antibiotic treatment, rather than diagnose infection. Swabbing is the most widely used method, however, it can be unreliable as it only demonstrates the presence of microbes in the wound, which could reflect colonisation rather than infection (Copeland-Halperin et al, 2016).

The number of microbiological samples sent from the clinic over a three-year time period was

found to be low (0.5%). Although some tissue biopsies were performed, the majority of samples were wound swabs. As discussed above, an audit of antimicrobial prescribing conducted in the same department found that 9.3% of consultations resulted in systemic antibiotic prescriptions, however, this was in a different time period. The authors, therefore, presume that the majority of patients did not have a sample sent for culture prior to starting antibiotics.

As discussed, swabbing can be inaccurate, but tissue biopsies have disadvantages as well. Swabbing is minimally invasive and easy to perform but techniques vary. Taking a biopsy requires a level of skill, is more invasive and can exacerbate infection. In addition, tissue samples need to be sent straight to the laboratory and therefore are not feasible in all cases, for example, if the clinic and laboratory are in different locations. In this audit, sensitivities were not provided for 64% of samples. Sampling provided information that directly influenced patients' treatment in 32% of cases, e.g. confirming correct antibiotic use or leading to a change in antibiotic. For the remainder, there was no action taken based on the swab result, however, this does not necessarily mean that no useful clinical information was obtained.

LIMITATIONS

The patient information was collected based on prescribing practices in the outpatient clinic, the authors did not include patients commenced on antimicrobials elsewhere, e.g. by their general practitioner. The low number of antimicrobial prescriptions also limited the size of the data available. Despite looking back at a three-year time period, the number of samples sent for microbiological analysis was low, limiting the size of the data set available for analysis.

CONCLUSIONS

Antimicrobial stewardship is extremely important for all specialties. It has received less attention in chronic wounds compared to other conditions where there are strict criteria for antibiotic use (e.g. tonsillitis). This may be due to the difficulties in diagnosing

infection. It is crucial that the use of systemic and topical antimicrobials is based on clinical judgement, rather than test results alone. Topical antimicrobials have less risk of resistance and therefore are particularly useful in treating wound infections where they can be applied locally, avoiding systemic side effects.

The authors found that the rate of microbiological sampling was low in a multidisciplinary complex wound clinic. This is a reflection of our practice in a specialist clinic and not a recommendation for other clinicians, as current guidelines recommend sampling, ideally by tissue biopsy, of clinically infected wounds prior to starting empirical antibiotic therapy. Nonetheless this is not always practical and may not contribute to patients' care. **WUK**

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