

Understanding antimicrobial resistance and antimicrobial stewardship in wound management

KEY WORDS

- ▶ Antimicrobial resistance
- ▶ AMR
- ▶ Antimicrobial stewardship
- ▶ AMS
- ▶ Wound management

Antimicrobial resistance (AMR) is a major global concern in healthcare, facilitated by a lack of newly developed antibiotics and an overreliance on those that are readily available to treat and manage infections. The appropriate use of antibiotics is vital to preventing AMR and antimicrobial stewardship (AMS) is central to ensuing clinicians have the knowledge to understand when to use antibiotics appropriately. This is particularly important in wound care, where multidisciplinary working is common, necessitated by variations in the complexity and variation of wound care. Whilst healthcare organisations may work in isolation, shared education, training and understanding, as well as shared decision making around AMR policies and procedures is fundamental to ensuring the impact of antimicrobial resistance is reduced and to understand the most appropriate and sustainable method of appropriate wound management.

The rise and spread of antimicrobial resistance (AMR) is creating a new generation of 'superbugs' that cannot be treated with existing medicines (HM Government, 2019). According to the World Health Organization (WHO) this could well be a global catastrophe, leaving many people incapacitated or dying from simple infections that have become complicated (WHO, 2017). The impacts of leaving AMR unchecked are wide-ranging and costly, not only financially, but also in terms of global health, food sustainability and security, environmental wellbeing, and socio-economic development (HM Government, 2019). AMR happens when microorganisms (such as bacteria, fungi, viruses, and parasites) undergo genetic modifications when they are exposed to antimicrobial drugs, such as antibiotics, antifungals, antivirals, antimalarials, and anti-helminthics (WHO, 2018). The resulting microorganisms that develop AMR are subsequently resistant to medications, thus are easily transferred from person to person through poor sanitary conditions and inadequate infection control (WHO, 2018). The risk of an increasing amount of microorganisms becoming resistant is not a new phenomenon, having previously been reported by the National Institute of Health and

Care Excellence (NICE) in the document *Infection: Prevention and Control of Healthcare-Associated Infections in Primary and Community Care* (NICE, 2012). However, whereas historically the resistant microorganisms were mainly hospital-acquired, more recently they have been more commonly acquired in the community setting, resulting in many medicines becoming ineffective to infection and increasing the risk of spread to others (WHO, 2018).

More than 50,000 people die each year in Europe and the US because bacteria are becoming resistant to medications and treatment that are necessary to ensure people recover from global diseases. Indeed, AMR infections are estimated to cause 700,000 deaths each year globally (O'Neill, 2014). In the publication *Review on Antimicrobial Resistance*, O'Neill (2016) states that due to the rising drug resistance for pathogens it is estimated that the burden of deaths from AMR could balloon to 10 million lives each year by 2050. O'Neill (2016) claims that on this basis, by 2050, the death toll could be one person every three seconds. The increasing threat of AMR is also evident in many of the Sustainable Development Goals. The World Bank estimates that an extra 28 million people could be forced into extreme

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poverty by 2050 unless AMR is contained (WHO, 2018), demonstrating the significance of understanding the cause and threat of AMR worldwide.

The spread of healthcare-associated infections (HCAIs), including wound infections, has been discussed for many years, with infection prevention and tissue viability teams constantly encouraging and educating people on how to implement effective infection prevention measures. Despite this, HCAIs prevalence is recorded as 6.4% (Health Protection Agency, 2012). In an attempt to prevent and manage infection, antibiotics and antimicrobial use have become commonplace, yet approximately 20% of antibiotics are inappropriately prescribed in UK primary care (Smieszek et al, 2019), with this prescribing rate being twice as high as parts of Scandinavia and the Netherlands (HM Government, 2019). Globally there has been an increase in AMR. AMR has become a crisis impacting all countries, crossing borders, affecting all ages, genders, regardless of wealth or status, meaning there is an urgent need for a coordinated national and international action across all stakeholders to tackle the problem of AMR, including governments, international organisations, private businesses, investors, civil society, academia and philanthropy (HM Government, 2019; WHO, 2018). Internationally there has been a unified effort to highlight AMR and offer clear guidance as to how this crisis can be either reversed or slowed down. Member States of the WHO, Food and Agriculture Organization (FAO) and World Organisation for Animal Health (OIE) have endorsed a Global Action Plan on Antimicrobial Resistance (GAP) in 2015, presenting five strategic objectives to combat AMR over the following decade. The following year, 2016, GAP was confirmed as the world's blueprint for tackling AMR globally focusing on appropriate antibiotic use (WHO, 2017).

ANTIMICROBIAL STEWARDSHIP (AMS)

To address the increasing problem of AMR, there are several global initiatives where the aim is to reduce the level of antibiotics and reduce AMR. These include the Transatlantic Taskforce on Antimicrobial Resistance (TATFAR), the Global Antibiotic Resistance Partnership (GARP), the

Global Health Security Agenda (GHSA), the Joint Programming Initiative on Antimicrobial Resistance (JPIAMR), Member States of the World Health Organization (WHO), Food and Agriculture Organization (FAO) and World Organisation for Animal Health (OIE) who have endorsed a Global Action Plan on Antimicrobial Resistance (GAP) (HM Government, 2019). AMS is becoming essential across all healthcare areas including the specialist area of wound management. The five-year AMS strategy published by the Department of Health (2013) identified seven priority areas for action:

- ▶▶ Improving infection prevention and control practices through enhanced dissemination and implementation of best practice and better use of data and diagnostics
- ▶▶ Optimising prescribing practice through AMS programmes that promote rational prescribing and better use of existing and new rapid diagnostics
- ▶▶ Improving professional education, training and public engagement to enhance clinical practice and promote a wider understanding of the need for more sustainable use of antibiotics
- ▶▶ Developing new drugs, treatments and diagnostics through better collaboration
- ▶▶ Better access to and use of surveillance data in human and animal sectors
- ▶▶ Better identification and prioritisation of research
- ▶▶ Strengthened international collaboration, working with a wide range of governmental and non-governmental organisations, international regulatory bodies and others.

The updated five-year national action plan *Tackling Antimicrobial Resistance 2019–2024* presents a national action plan to tackle AMR within and beyond the UK, focusing on three key ways of tackling AMR: reducing the need for, and unintentional exposure to, antimicrobials; optimising use of antimicrobials; and investing in innovation, supply and access. This is a part of a 20-year vision the UK aiming to:

- ▶▶ Halve healthcare-associated Gram-negative bloodstream infections
- ▶▶ Reduce the number of specific drug-resistant infections in people by 10% by 2025
- ▶▶ Reduce UK antimicrobial use in humans by 15% by 2024

Table 1. Signs and symptoms of wound infection

Overt signs	Covert signs	Spreading infection
Erythema	Hypergranulation (excessive ‘vascular’ tissue)	Extending in duration +/- erythema
Local warmth	Bleeding, friable granulation	Lymphangitis
Swelling	Epithelial bridging and pocketing in granulation tissue	Crepitus
Purulent discharge	Wound breakdown and enlargement	Malaise/lethargy or nonspecific general deterioration
Delayed wound healing beyond expectations	Delayed wound healing beyond expectations	Loss of appetite
New or increasing pain		Inflammation, swelling of lymph glands
Increasing malodour		Wound breakdown/dehiscence with or without satellite lesions

- ▶▶ Reduce UK antibiotic use in food-producing animals by 25% between 2016 and 2020 and define new objectives by 2021 for 2025
- ▶▶ Be able to report on the percentage of prescriptions supported by a diagnostic test or decision support tool by 2024 (HM Government, 2019).

WHAT CAN BE DONE?

AMS is defined as *‘an inter-professional effort across the continuum of a patient’s care that involves the timely and optimal selection of antimicrobial agents, their doses and the duration of their use’*; the aim is to achieve the best clinical outcome with minimal toxicity to the patient and the environment (Lipsky et al, 2016). Numerous studies — e.g. Wise et al, 1998, Nicolle, 2014 — have revealed approximately 80% of antibiotic courses, and 20% of all antibiotics administered, are prescribed in the outpatient and inpatient settings with approximately 50% of these treatment courses being regarded unnecessary or inappropriate. The British Society for Antimicrobial Chemotherapy (BSAC) and European Wound Management Association (EWMA) position paper highlights AMS as being central to the appropriate use of antimicrobials, including antibiotics in decreasing the spread of infections caused by multidrug-resistant organisms (Lipsky et al, 2016). AMS is the responsibility of all healthcare professionals, any person involved in health care — e.g. cleaning services, portering services,

catering, carers — and patients and relatives. Education programmes that facilitate knowledge and understanding of AMS should be accessible to all and should be available as face to face sessions and/or online supported by up to date policies and guidelines. Within the position paper, Lipsky et al (2016) recognise that it is not possible for the same clinicians to see patients daily and as such, wound care teams must devise a method (preferably electronic, with standardized measurements and photographs) to document the wound’s status and the team’s plan of care.

Correct and timely diagnosis of wound infection is essential to allow for effective management strategies to be devised, primarily diagnosed by clinical findings, usually supported by microbiological data; culturing clinically infected wounds can be useful in identifying pathogens but antibiotics should not be prescribed just because organisms grow from a wound culture, as all open wounds become colonised (Lipsky et al, 2016). According to the International Wound Infection Institute (2016), signs and symptoms of a wound infection include both covert and overt signs (Table 1). Integral to wound infection management is the ethos of encouraging patient-centred care to accommodate interaction between the individual and the infecting pathogen in favour of the individual by:

- ▶▶ Optimising the host response
 - ▶▶ Reducing the number or virulence of microorganisms in the wound
 - ▶▶ Optimising the wound healing environment.
- The position papers (Dryden et al, 2011; Lipsky et al, 2016) explain the principles of an effective AMS programme should encompass:
- ▶▶ Avoiding prescribing antimicrobials when they are not indicated, e.g. a non-infectious problem or a non-bacterial infection
 - ▶▶ Prescribing an appropriate regimen when antimicrobial therapy is indicated, i.e. the narrowest spectrum for the likely or proven pathogen(s)
 - ▶▶ Ordering therapy for the correct duration, i.e. just long enough to achieve resolution of the signs and symptoms used to diagnose infection, at the optimal dose and by the appropriate route
 - ▶▶ Using an agent that has the least risk for adverse effects for the patient and the community.

IMPLEMENTING INTO CLINICAL PRACTICE

It is everyone's responsibility to be aware of AMR and to undertake AMS. Education is key, alongside local quality improvement programmes that assess key components of wound assessment and management of wounds; these should include regular review, clear documentation and measurement of clinical outcomes, in most cases wound healing. Healthcare areas should have clear procedures for reporting on the appropriateness of both outpatient and inpatient use of antibiotics, with sites attempting to compare their results against their previous performance, as well as against other similar sites (Lipsky et al, 2016) to facilitate shared good practice and organisational learning. Local areas may wish to develop information-sharing sessions through posters, study days, seminars and identifying champions which can all support the dissemination of AMS. Standardised toolkits of resources that all sectors and areas could use or adapt, including simple video and written resources for waiting rooms, encouraging patients to wash their hands or highlighting that antibiotics may not be needed, have all been suggested by Health Education England (2016) and Public Health England (2017) as ways of improving practice and clinical outcomes.

SUMMARY

The impact of AMR is significant and the effect on the healthcare system and risk to population

health are evidenced through several worldwide government strategies and initiatives designed to manage and prevent the escalation of the potentially devastating effect that AMR could have on health care globally. The UK Government aims to have a lower burden of infection, have optimal use of antimicrobials and good stewardship across all sectors by 2024, as well as advancements in new diagnostics, therapies, vaccines and interventions in use that can prevent AMR (HM Government, 2019). AMS is crucial in ensuring healthcare practitioners are equipped with the knowledge and understanding of the appropriate use of antimicrobials and antibiotics in decreasing the spread of infections caused by multidrug-resistant organisms. An online module for AMS, supported by BSAC and EWMA and hosted on the Future Learn platform, has been designed to support healthcare professionals in developing an understanding of AMR, how to treat and manage patients with wounds and how to recognise and diagnose wound infections and translate this knowledge into practice (FutureLearn, 2020). The development of policies and procedures determining the appropriateness of antibiotics, shared decision-making with healthcare organisations and ensuring individuals take ownership of facilitating their own understanding of AMS and the risks of AMR are crucial to appropriate prescribing of antibiotics and limiting the potentially devastating implications of continued AMR in wound management.

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