Reducing drug resistance through antimicrobial stewardship strategies

Resistant to antimicrobial drugs is a major threat to patient safety and public health, but the development of resistant microorganisms can be slowed down by the appropriate use of antimicrobials and infection prevention and control (IPC) measures. Quality improvement strategies for the appropriate use of antimicrobials are collectively known as ‘antimicrobial stewardship’ (AMS). Nurses play a central role in AMS through a variety of tasks – from medicines management to guideline development – and integrating nurses into AMS programmes has benefits both for patients and health and care settings. This article explores how nurses can contribute to reducing drug resistance.

Drug resistance
Drug-resistant infections (DRIs) occur when microorganisms evolve and become less sensitive to antibiotics, which in turn become less effective (Davies and Davies, 2010). This is a natural phenomenon observed since the introduction of antibiotics in the 1930s (Davies, 2013), but is of great concern today, partly because the pace of discovering new antibiotics has significantly decreased (O’Neill, 2016).

Medical advances have led to an increase in complex, invasive procedures, and this has coincided with an increase in the use of antimicrobials. Although drug resistance (also referred to as antimicrobial resistance) is a biological phenomenon, its causes are multifactorial and include (Baur et al, 2017):

- The misuse of antimicrobials in human and animal health;
- A lack of investment in research on new antimicrobials;
- Poor IPC practices.

Assessing the burden of DRIs is fraught with difficulty. O’Neill (2014) estimates that every year around 50,000 deaths in Europe and the US could be attributed to antibiotic-resistant infections and up to 700,000 people worldwide die from causes related to drug resistance. Should resistance levels persist, O’Neill hypothesises that this will increase to 10 million a year by 2050 (O’Neill, 2016). However, uncertainties about the incidence of DRIs,
prevalence of resistance and attributable mortality – due in part to the lack of surveillance data from resource-limited countries – make it difficult to make accurate projections (de Kraker et al, 2016).

**Action plans**

In recent years, there have been a growing number of campaigns to raise awareness of the magnitude of drug resistance. In 2015, the UK launched a five-year strategy comprising seven key areas for action (Department of Health, 2015), three of which come under the umbrella of antimicrobial stewardship (AMS):

- Improving IPC practices in human and animal health;
- Optimising prescribing practice;
- Improving professional education, training and public engagement.

In 2015, as part of a continued effort to reduce drug resistance, the World Health Assembly adopted a global action plan on DRIs, calling on member states to implement national action plans in line with its plan (Bit.ly/WHO_AMRActionPlans).

Despite increased awareness and a significant reduction in antibiotic use in health and care settings in the UK, the number of people affected by multidrug-resistant infections (infections that are resistant to at least three different antibiotics) due to gram-negative bacteria has continued to rise, particularly in young and in older people (Public Health England, 2015a), resulting in excess mortality and healthcare costs (Wilson et al, 2016).

In response to O’Neill’s call to strengthen IPC (O’Neill, 2016), the Department of Health set the target of reducing, by 2020, both healthcare-associated gram-negative bloodstream infections and inappropriate antibiotic prescribing in England by 50% (DH, 2016).

**Antimicrobial stewardship**

AMS is the appropriate use of antimicrobials through strategies aimed at preventing their misuse and ensuring the best outcomes for people in health and care settings (MacDougall and Polk, 2005); it is an obligation for healthcare providers under the Health and Social Care Act 2008 (Bit.ly/HealthSocialCareAct2008). AMS strategies intend to promote high-quality care and reduce the transmission of resistant pathogens (PHE, 2015b); its overarching goals are illustrated in Fig 1.

AMS has been shown to be an effective strategy for preventing and controlling healthcare-associated infections (HCAIs) such as Clostridium difficile infections, infections caused by extended-spectrum beta-lactamase-producing organisms, and those caused by meticillin-resistant Staphylococcus aureus (Dancer et al, 2013). It can reduce inappropriate antibiotic prescribing, resulting in cost savings as well as decreased use (Malani et al, 2013). Hospital AMS programmes may include a committee or management team, ward-focused teams, an assessment of stewardship activities, audits, and education and training (Cooke et al, 2010). AMS committees ensure that:

- Evidence-based guidelines are available, regularly updated and audited;
- Antibiotic consumption in the organisation is reported;
- Actions to address suboptimal antibiotic prescribing are implemented (Owens et al, 2017).

Despite the acknowledged need for a multidisciplinary approach to AMS (Fig 2), nurses are often overlooked in AMS programmes (Ollans et al, 2016). Nurses have an important role to play in preventing the transmission of antibiotic-resistant pathogens in health and care settings – a role that encompasses advocacy, drug administration and IPC.

**A professional obligation**

The Nursing and Midwifery Council’s (NMC) (2015) Code of Practice requires nurses to preserve patient safety. Nurses are professionally accountable for how they:

- Advise on, prescribe, supply, dispense and administer medicines within the limits of their training and competences, the law, regulatory guidance (NMC, 2007) and other relevant policies, local guidelines and regulations;
- Ensure any potential harm is reduced as far as possible by adhering to recommended practice about IPC.

In this context, nurses have a professional obligation to participate in AMS. However, there are barriers to this, such as workload pressures (NHS Education for Scotland (NES), 2014) and interdisciplinary communication – particularly when evaluating the appropriateness of a medication before it is administered (Manning, 2016). Edwards et al (2011) describe the conflict between power and knowledge, and how it negatively affects the ability of frontline nurses to challenge medical colleagues about adherence to prescription guidelines, despite their knowledge of local procedures, policies and guidelines.

**A range of contributions**

Nurses’ ability to contribute to AMS programmes depends on their level of experience, expertise and knowledge. Their contributions can include clinical tasks such as timely administration of antimicrobials, monitoring adverse events, appropriate sampling for culture testing, and informing medical staff of test results. Nurses can also contribute by conducting audits and service evaluations; writing business cases; participating in surveillance; educating staff; developing guidelines and policies; undertaking research; commissioning; and influencing policy.

The timely audit of antibiotic prescribing will help identify areas for improvement. A proactive approach to AMS will have added benefits, such as reducing costs and freeing up nurses’ time to perform other tasks (Edwards et al, 2011). With adequate training and support, nurses can also be in a position to influence prescribing.

The extension of nursing roles mean increasing numbers of nurses are independent prescribers, and must carefully consider the appropriateness of antimicrobials prescribed, and educate patients on how to take them. In its quality standard on AMS, the National Institute for Health and Care Excellence (NICE) recommends prescribers use relevant guidelines, audit practice, and provide updates showing how their prescribing rates compare with those in other settings as well as regionally and nationally. It also recommends that prescribers have in-depth discussions with patients on whether antimicrobials are required, particularly in self-limiting illnesses and where appropriate alternative treatments are available (NICE, 2016).

**Hand hygiene**

At the basic level of IPC, the effective use of standard precautions reduces the risk of
pathogen transmission, so IPC and AMS are inextricably linked. All healthcare workers play a role in minimising the risk of cross-contamination, but the role of nurses in preventing the transmission of resistant pathogens is perhaps the most marked. Championing IPC measures such as good hand hygiene in health and care settings is crucial.

Thorough hand hygiene is the single most important factor preventing the transmission of infectious pathogens (WHO, 2009). A recent review investigating the effect of AMS programmes on the incidence of infection and colonisation with resistant bacteria found that the co-implementation of AMS and a hand hygiene programme was more effective than AMS alone; the authors found a 66% reduction in antibiotic resistance with co-implementation, versus 17% without (Baur et al, 2017).

Despite evidence of the benefits, ensuring healthcare workers comply with hand hygiene policies remains a challenge (Kingston et al, 2016), especially when it comes to changing behaviours. This highlights the need to understand human factors (Storr et al, 2013) when designing, implementing and evaluating programmes to improve hand hygiene. Nurses, who are often responsible for leading such programmes, should consider the multimodal strategies recommended by the WHO; key components of these strategies include training and education, evaluation and feedback, prompts and reminders, and system change and organisational climate (WHO, 2009).

**Public education**

Drug resistance is as much a social problem as it is a biological phenomenon (Smith, 2015). Perceptions of antimicrobials, how they should be used and how resistance develops are influenced by a multitude of factors, such as media reports or the experiences of relatives and friends (Rawson et al, 2016).

Misconceptions around drug resistance still exist – for example, some people believe resistance occurs in their bodies, or that they can stop taking a prescribed course of antibiotics as soon as they feel better (Bit.ly/WHO_AMRActionPlans). Changing public perceptions, attitudes and behaviours is difficult, as demonstrated by smoking cessation campaigns (Bauld et al, 2010).

Nurses often face the challenge of helping patients to understand complex medical information, and encouraging them to consider – and ultimately make – healthier choices. Involving members of the public in quality improvement programmes can help ensure the information provided is accessible, while involving them in research can help increase awareness of drug resistance and provide ways of influencing behaviours.

Nurses routinely advocate, deliver and evaluate health strategies aimed at preventing infections and thereby avoid the need for antibiotics. These strategies include vaccine promotion, sexual health promotion, and education on respiratory hygiene (NHS England, 2016). Enhancing public understanding is necessary to prevent DRIs (Micallef et al, 2017). When giving information to patients about antimicrobials, careful consideration should be given to a patient’s age, culture, language and level of understanding, and behavioural issues must be addressed (Rawson et al, 2016). Recognising and addressing patients’ concerns will hopefully improve their understanding of prescribed antimicrobials.

**Professional training**

Ensuring nursing staff have the right skills and training for their role in IPC and AMS is paramount. Opportunities for them to learn about drug resistance such as undergraduate training, short courses, online learning (NES, 2014), and educational interventions benefit healthcare organisations (Weddle et al, 2017). However, professional education on drug resistance is still inconsistent in the UK (Castro-Sánchez et al, 2016), with fragmentation across training programmes.

In Scotland, a survey by the Scottish Antimicrobial Prescribing Group assessing the knowledge of nurses and midwives revealed that 49% rated their knowledge of antibiotics as average, although only 22% had heard the term ‘antimicrobial stewardship’. The majority of respondents (74%) thought that education on AMS should begin before registration (NES, 2014). These gaps in education have prompted a call for the standardisation of drug resistance learning outcomes or competencies (Health Education England, 2016).
Leadership
Suboptimal leadership and organisational failures contribute to the development of HCAIs. Edwards et al (2012) and Saint et al (2010) found that leaders who successfully implemented strategies aimed at reducing HCAIs were:

- Focused on overcoming barriers of resistance from people, organisational issues around IPC, and processes that prevent effective HCAI management;
- Cultivating a culture of clinical excellence and effectively communicating it to staff;
- Thinking strategically while acting locally, forming partnerships across disciplines, using their personal reputation to move ideas forward, and influencing committees through politicking.

Clinical leaders must strengthen IPC policies and their implementation, promote a culture of compliance with the Health and Social Care Act Code of Practice on the Prevention and Control of Infections (DH, 2015); and work together to adopt the indicators. The code of practice encourages senior nurses to work with colleagues to evaluate existing AMS programmes in health care and settings, and then implement relevant local action plans, using tools such as:

- The ‘Start Smart then Focus’ AMR toolkit for English hospitals in secondary care (PHE, 2015c);

Informal leadership from staff who are considered capable of leading small changes - for example, through clinical champions - can also be useful in AMS. Along with participation of and endorsement from clinical leaders, support from informal leaders will help sustain success in the long term (Saint et al, 2010).

Conclusion
Drug resistance is a major challenge for the provision of safe and effective care. A mix of AMS strategies and IPC measures is needed to prevent infection, control resistant pathogens and slow down resistance. Appropriately using the few effective antimicrobials we have left will help slow down the progression of resistance. Education and training as well as support from nurse leaders will help improve the understanding of drug resistance and tackle public misconceptions. From hospital settings to primary care – registered nurses, nurse practitioners, nurse managers, nurse educators and nurse researchers must continue to strengthen their response to the growing problem of drug resistance through educating, learning and collaborating.

References
- Cutting levels of antimicrobial resistance
Bit.ly/NTCuAMR