Nurses' antimicrobial infusion practice under the spotlight

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A report on a study on antibiotic underdosing and disposal in NHS organisations in England, Scotland and Wales, raises the concern that practices by clinical nurses may contribute to antimicrobial resistance (AMR) (Fady and Bennett, 2023). The report was sent to Baroness Bennett of Manor Castle at the House of Lords to raise for comment by the Department of Health and Social Care (DHSC) (UK Parliament, 2023).

Although great advances have been made in antimicrobial stewardship (AMS) in the past two decades, with changes in prescriber behaviour and improved infection prevention and control (IPC), it is clear that AMR remains a challenge. Increases in drug-resistant infections, both bacterial and fungal, and the sparse pipeline of antimicrobial medicines to treat these, remains a constant challenge in healthcare in this century, with little reassurance that relief lies ahead.

Flushing and disposal

Many antibiotics and antifungal medications are best given by IV infusion. Fady and Bennett's report (2023) clearly highlights two main nursing practice concerns. The first is that these antimicrobial medicines are being delivered in such a manner that the patient does not receive the full prescribed dose. The lack of comprehensive 'flushing' guidelines within the NHS healthcare system (and elsewhere), results in a situation where nurses may not understand, or comply with, best practice. Further findings are that this nursing practice was generally unaudited. The second concern is the environmental contamination from discarded infusion items containing undelivered antimicrobial medicines. It must be recognised that both these practice issues may be drivers of AMR.

A further, even more concerning, issue is the veracity of data obtained from clinical trials of antimicrobial and other medicines that are administered by infusion in the absence of detailed guidance on infusion best practice. Infusions can be administered by gravity feed administration lines, volumetric infusion pumps, or smart pumps. Intermittent medication infusions can be delivered via primary or secondary sets. These all require different competences (Weinger and Kline, 2016; Guilaino and Blake, 2021). The assumption that nurses delivering these trialled drugs within the clinical environment are compliant with best practice, or are aware of best practice, should be interrogated in view of Fady and Bennett's (2023) findings. The oversight within a simulated laboratory trial is realistically not present at the patient's bedside, where nurses may not administer the full dose of the antimicrobial infusion. This is pertinent to both bedside nurses allocated to the care of patients receiving trialled antimicrobial drugs, and/or clinical research nurses collecting relevant data. Antimicrobial medicines within the development pipeline must be trialled with this in mind.

Administration errors

The Third Global Patient Safety Challenge issued by the World Health Organization (WHO) (2017) exhorts that medication is given to patients without harm (Donaldson et al, 2017; Sheikh et al, 2017). A systematic review of studies relating to IV medication errors conducted in the UK found that 50% of these related to administration (Sutherland et al, 2020). Clinical nurses must thus understand the consequences of non-delivery of the full dose of prescribed antimicrobial drugs to the patient. The most concerning of these being the exposure of bacterial pathogens to high concentrations of antibiotics for extended periods, which creates severe selection pressure and leads to higher levels of antibiotic-resistant pathogens (Alexander and Zomp, 2015; Cooper et al, 2018; Cousins, 2018; Thoele et al, 2018; Morgan, 2019; Rout et al, 2019, 2020; Bolla et al, 2020; Harding et al, 2020; van Huizen et al, 2020; Anderson, 2021; Dix, 2021; Gorski et al, 2021; Peyko, 2023).

The WHO's *Global Action Plan on Antimicrobial Resistance* gives an injunction that healthcare workers should be educated and trained to develop competences necessary for AMS (WHO, 2015). Following this, nursing bodies such as the American Nurses Association and the Centers for Disease Control and Prevention (2017), the Canadian Nurses Association (2017), the European Federation of Nurses Associations (2017), and the International Council of Nurses (2017) all issued guidelines for the inclusion of nurses within AMS. The divide between evidence and practice continues to impede progress in AMS (Sutherland et al, 2020; Kuitunen et al, 2021), necessitating integration of practice gaps into nurse AMS education (Courtenay et al, 2019). However, the provision of nursing AMS competencies may not yet underscore what is seen as

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'basic nursing knowledge'. The rights of medication administration taught at pre-registration level emphasises the importance of ensuring the 'right patient', the 'right drug', the 'right time', the 'right method of administration', and the 'right dose' (Wu, 2019). The Fady and Bennett report (2023) challenges the assumption that the right dose is being delivered to the patient during intermittent antimicrobial infusion administration.

Residual volume

The volume required to prime the IV administration line is the volume of medication left in the set (and drip chamber) after the medication container is empty (Morgan, 2019). This is known as the residual volume. The loss of antimicrobial dose, should the line not be flushed, increases with infusion administration lines of greater length (ie 235 cm in contrast to 180 cm) (Bolla et al, 2020).

A study by Cooper et al (2018), in the UK, found that flushing of intermittent medication infusions was not done in surgical wards (99.2%) and ICUs (79.8%). 'Oncology was the only area where flushing was standard practice for all infusions (P<0.001)' (Cooper et al, 2018: S4). In a later study, observers 'reported that the first giving set would usually be detached, the access device flushed and then a new giving set connected for the second drug' with subsequent medication loss (Blandford et al, 2020).

An urgent issue

Fady and Bennett's report (2023) supports the *UK 20-year Vision for Antimicrobial Resistance* (DHSC, 2019) where every possible effort should be made to effect change. The Royal College of Nursing (RCN) advocates 'dispensing antibiotics at the right time and under the optimal circumstances required to maintain therapeutic levels' (RCN, 2016). The need to address this at national level within the UK, is paramount (Furniss et al, 2018; Cooper et al, 2018; Bolla et al, 2020; Dix, 2021; Barton et al, 2021) and necessitates clear direction from nursing bodies such as the RCN (Fady and Bennett, 2023). **BJN**

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