Letter to the Editor

Analysis of hospital antimicrobial consumption to identify targets for antimicrobial stewardship

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To the Editor—Antimicrobial resistance (AMR) poses a significant threat to health and human development worldwide.1 Antibiotic consumption has been clearly shown to contribute to the selection and spread of drug-resistant microorganisms.2,3 In response to the growing threat of antibiotic resistance, the World Health Assembly adopted a global action plan (GAP) on antimicrobial resistance (AMR).4 Antimicrobial stewardship (AMS) represents a key strategy for promoting responsible antimicrobial use. Monitoring hospital antimicrobial consumption has a central role in guiding AMS activities, and it is an important step toward improving antibiotic management. The aim of the study was to explore the utility of hospital antimicrobial consumption in identifying AMS quality improvement targets.

The study was conducted at King Abdullah University Hospital (KAUH; 533 beds) in Jordan and at Pinderfields General Hospital (PGH; 770 beds) in the United Kingdom. Annual hospital antimicrobial consumption data were collected retrospectively for the year 2019 for adult wards only. Data on the annual antimicrobial consumption were converted into defined daily doses (DDD) expressed per 100 occupied bed days (OBD). The World Health organization (WHO) Access, Watch, and Reserve (AWaRe) classification was used.5 Approval of the institutional review boards (IRB) at the Jordan University of Science and Technology and KAUH were obtained for this study (IRB no. 490-2020). The study was registered as quality improvement project at PGH.

Analysis of hospital antimicrobial consumption showed different patterns of use between KAUH and PGH (Table 1). The total antibiotic consumption at KAUH was 71.7 DDD per 100 OBD, of which 9.2 DDD per 100 OBD represent oral use (12.8%). The total antibiotic consumption in PGH was 112.9 DDD per 100 OBD, of which 63.2 DDD per 100 OBD represent oral use (56%; Table 1). At KAUH, the most frequently used antibiotics, contributing to >50% of total antibiotic use were piperacillin/tazobactam (Watch; 18.2% of total use), cefazolin (Access; 14% of total use), ceftriaxone (Watch; 10.4% of total use), and teicoplanin (Watch; 8.9% of total use). At PGH, the most frequently used antibiotics, contributing to >50% of total antibiotic use were amoxicillin/clavulanic acid (Access; 20.6% of total use), flucloxacinil (Access; 11.7% of total use), amoxicillin (Access; 11.6% of total use), and clarithromycin (Watch; 9.7% of total use). According to the WHO AWaRe classification and at KAUH, the following percentages represent hospital antimicrobial consumption: 26.4% Access group, 71% Watch group, and 2.6% Reserve group. At PGH, the following percentages represent hospital antimicrobial consumption: 65.6% Access group, 33.7% Watch group, and 0.7% Reserve group.

Analysis of data showed that KAUH using more from the Watch group (71%) compared with the Access group (26.4%). In part, this antimicrobial consumption could be due to the requirement to use specific antibiotics, classified within the Watch group, to respond to the high prevalence rates of specific pathogens. Such uses include carbapenems against extended-spectrum β-lactamase–producing organisms, glycopeptides against methicillin-resistant Staphylococcus aureus, or piperacillin-tazobactam or carbapenems in combination regimens (usually with colistin) against multidrug-resistant Acinetobacter baumannii or multidrug-resistant Pseudomonas aeruginosa. This finding is supported by others who reported that in high-resistance settings, increased use of Watch and Reserve antibiotics might be appropriate.6 This finding is also consistent with other reports that rates of resistance can affect the choice of drug; thus, targets for consumption should take local resistance rates into consideration.6 The increased use of ceftriaxone is probably because it is considered the first-line treatment for common infections such as pneumonia and urinary tract infections.7,8 The need to treat high prevalence rates of pathogens was also reflected in the higher use of parenteral antibiotics compared with oral antibiotics in KAUH. For example, >45% of the total hospital antimicrobial consumption was attributable to piperacillin/tazobactam, glycopeptides (vancomycin and teicoplanin), and carbapenems, all of which require parenteral administration. The potential to increase the use of Access group antibiotics, optimize the use of third-generation cephalosporins, along with increasing the IV-to-oral switch, should be considered for quality improvement and AMS activities.

At PGH, the use of antibiotics from the Access group (65.6%) was higher than from the Watch group (33.7%). This finding is in line with national AMS initiatives in England. At PGH,
prevalence estimates of specific pathogens were much lower than at KAUH. This finding was also reflected their higher use of the oral route of administration. For example, >50% of the total hospital antimicrobial consumption at PGH was due to amoxicillin/clavulanic acid, flucloxacillin, amoxicillin, and clarithromycin. All of these antibiotics are available to be administered via oral and parenteral routes. The relatively higher use of Access group antibiotics, compared with those in the Watch group, and the balance between parenteral and oral administration, reflects good clinical practices. However, amoxicillin/clavulanic acid, classified as within the Access group and representing 20.6% of total use at PGH, has been linked with the development of AMR in several studies.2,3 Therefore, the high use of amoxicillin/clavulanic acid, and in general the higher total use of antibiotics, warrant further work to reduce unnecessary use, for example, long oral courses following IV-to-oral switch.

In conclusion, hospital antimicrobial consumption data facilitate deeper understanding of our antibiotic use, and they can help in identifying targets for quality improvement and antimicrobial stewardship. In addition, the availability of hospital antimicrobial consumption allows hospitals to compare their consumption with others, with the aim of adopting the best healthcare practices.9,10

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References

Infection prevention versus antimicrobial stewardship: Does nasal povidone-iodine interfere with methicillin-resistant Staphylococcus aureus (MRSA) screening?

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To the Editor—When healthcare-associated pneumonia (HAP) is suspected, broad-spectrum antibiotics, often including vancomycin, are recommended to include coverage for methicillin-resistant Staphylococcus aureus (MRSA).1 However, a primary goal of antimicrobial stewardship is to rapidly de-escalate these broad-spectrum antibiotics, based on culture results or other clinical data.2 A causative organism can be identified in some HAP cases and the antibiotics can be appropriately tailored, but in many cases no pathogen is identified, making de-escalation more challenging. To combat this situation, intranasal MRSA screening has been suggested as a stewardship tool because the absence of MRSA in the nares has been found to have a high negative predictive value for MRSA pneumonia.3

Universal decolonization by applying chlorhexidine gluconate (CHG) to skin and mupirocin to the nares has been shown in large multicenter studies to reduce MRSA and other bloodstream infections.4 Due to concerns that widespread use of mupirocin may lead to increasing resistance, many institutions have elected instead to use the antiseptic povidone-iodine (P-I) due to its antistaphyloccocal properties and similar outcomes.5,6

Although sensitivity of culture-based MRSA screening may decline in the setting of antimicrobial or antiseptic use, PCR can also detect nonviable bacteria.7 However, after our institution adopted universal nasal decolonization in addition to CHG bathing in our intensive care units (ICUs), staff raised concerns that MRSA nasal screening would no longer be accurate, and data were unable to be identified on this topic in the literature. The goal of this study was to determine whether nasal decolonization with P-I diminishes the utility of polymerase chain reaction (PCR)–based nasal MRSA screening.

Methods

We conducted a prospective cohort proof-of-concept study at our 1,200-bed community-based academic healthcare system from February to July 2019, with an enrollment goal of 20 participants for a convenience sample. Participants were eligible if they were aged ≥18 years, had been admitted to a medical ICU or stepdown unit, and had undergone baseline MRSA nasal screening by PCR (GeneXpert, Cepheid, Sunnyvale, CA) as ordered by their provider that was positive for MRSA. We excluded patients whose expected ICU or stepdown unit length of stay was <48 hours, those whose initial MRSA screen was performed after ≥2 doses of nasal P-I, and those who did not have nasal P-I decolonization performed for any reason (eg, allergy, patient refusal). Participants could only be enrolled once in the study. Verbal informed consent was obtained from each participant.

Intranasal P-I (Aplicare, 7.5%) was applied twice daily for 5 days or until ICU discharge, according to the protocol. Due to availability, Medline P-I (10%) was used from June 2019 until the end of the study. All positive PCR results underwent confirmatory testing via nonquantitative culture using MRSA-specific media (CHROMagar). All baseline PCR-positive results were