Antimicrobial Dosing Dynamics and Drug Level Complexities

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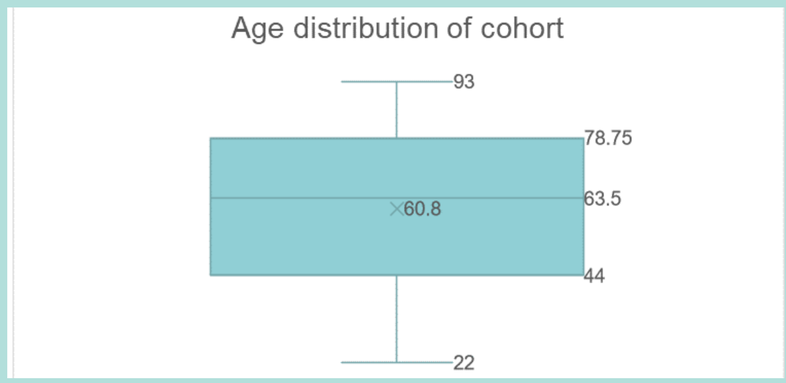
BACKGROUND

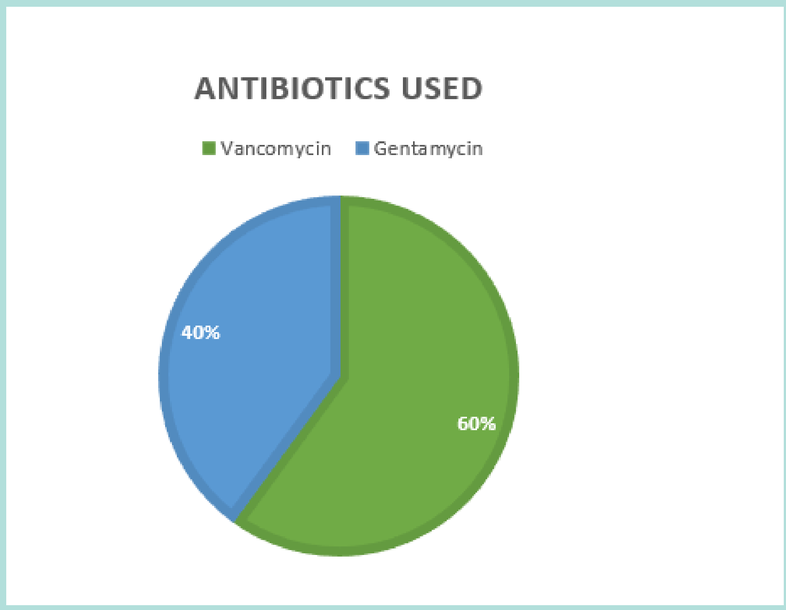
Aminoglycoside and glycopeptide antibiotics are vital for treating severe bacterial infections but face challenges in achieving therapeutic levels, especially in critically ill, obese, and elderly patients[1,2]. Aminoglycosides can lead to nephro-toxicity, with rates ranging from 5% to 25% and are influenced by factors like dosage and duration of administration[3]. Vancomycin trough levels are monitored to ensure adequate dosing and prevent treatment failure and toxicity-related complications[3]. Adjusting subtherapeutic levels is crucial for antimicrobial steward-ship to prevent antimicrobial resistance and hospital acquired infections[1].

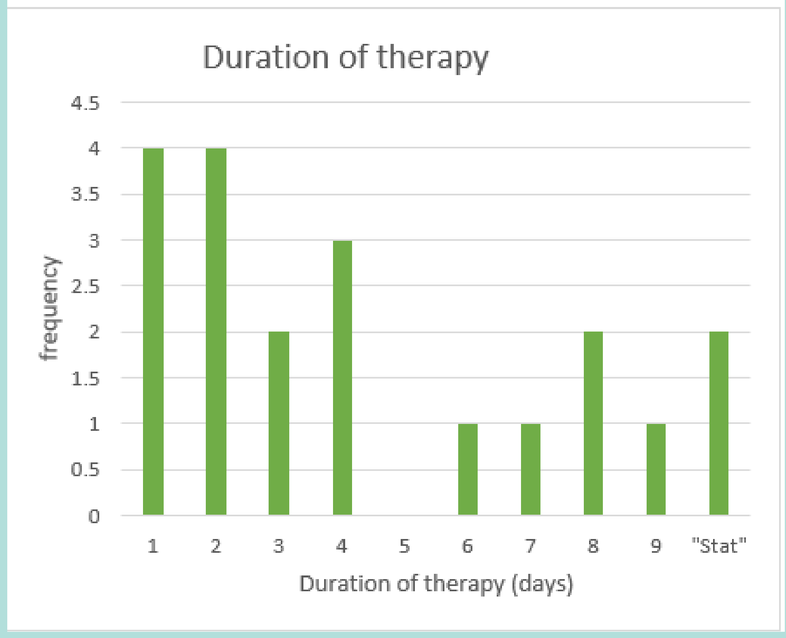
METHODS

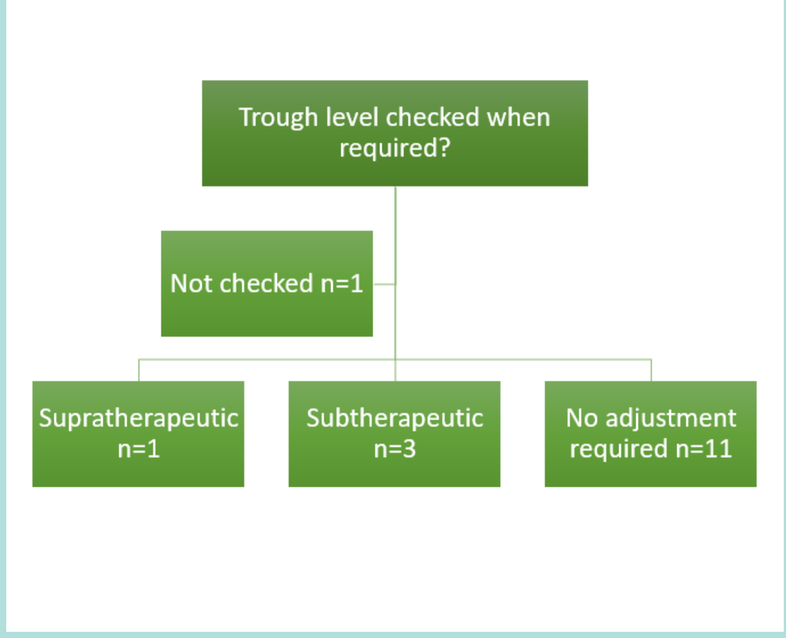
A review conducted on 31/07/2023 comprised a convenience sample of 20 currently admitted patients across medical, surgical, and gynaecology wards, who received vancomycin(IV), gentamicin, or amikacin during their stay. The review followed international guidelines for prescription and monitor-ing [3, 4]. Data, collected through an elec-tronic tool, included sex, weight, last weight date, antibiotic used, therapy duration, trough levels, creatinine levels, and dose adjustments. This data was used to calculate creatinine clearance using the Cockcroft- Gault formula, and referen-ced to confirm renal dosing adjust-ments had been made correctly. Trough levels were also collected, and com-pared to the recommended trough level.

RESULTS









There were 20 patients included in this review, 13 males. Ages ranged from 22 to 93 years (median = 63). Duration of therapy ranged between 1 and 9 days (median=2.5). Gentamycin was prescribed to 8 patients, vancomycin was prescribed to 12 patients, and no patient in this cohort was prescribed with amikacin. The antibiotic was adjusted in four cases, and was stopped prior to the collection date in seven cases. Three patients had a CrCl less than 50, requiring renal dosing, which was done correctly.

Trough levels were collected in 14 patients, and of the remaining six patients, five were treated for less than 48 hours. Four patients had trough levels requiring adjustments, one supratherapeutic and three below the targeted trough level. One case requiring adjustment based on trough level had no adjustment made, another had no trough level performed at 48 hours and therefore had no adjustment made. Most often, weight had not been repeated since starting the antibiotics (5 out of 20 cases), including in all three patients with CrCL <50.

DISCUSSION

There was good compliance with published prescription practices. Trough levels were collected appropriately in most cases and patients were weighed within the preceding two weeks prior to therapy, facilitating the calculation of CrCl. However, the case where a weight was not obtained after four days of therapy was a concern. Adjustments were made to antibiotics in only four cases. This may be due to the small sample size, and the kind of antibiotics prescribed in this cohort.

Similar findings were reported in a retrospective review of hospitalised patients in a Belgian tertiary hospital, where numerous dosing adjustments were required, and sub-therapeutic levels of vancomycin were found in 76% of patients treated with vancomycin[5]. This study's utility lies in the examination of multiple wards' current practices, spaced between multiple disciplines and teams. It generates a realistic cross section of day-to-day practice, and highlights the possible pitfalls when dealing with weight-based antibiotic dosing, requiring tight control for optimal therapeutic purposes.

The small sample size bears mentioning, however the findings suggest the need for increased attention to drug dosing adjustments based on CrCl and trough levels to optimize patient outcomes and avoid potential adverse effects associated with inappropriate antibiotic therapy. Further initiatives should be considered to ensure regular monitoring of patient weight and renal function, during the course of antibiotic treatment to improve patient safety and therapeutic efficacy.

REFERENCES

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