Antimicrobial dosing in Critical Care: a pragmatic dosing guideline

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Introduction

Optimising dosing of antimicrobials in critically ill patients requires an understanding of both the pharmacokinetic (PK) changes that occur in these patients, and the pharmacodynamics (PD) of the antimicrobial agent/s prescribed. Standard dosing of drugs derived from product information have limited application in critically ill patients given the PK/PD changes often seen in these patients relative to other groups in the hospital. (1)

Therapeutic drug monitoring (TDM) provides a novel method to individualise and optimise antimicrobial dosing. Despite the promise of TDM-based dosing, studies in critically ill patients highlighted that many patients still do not achieve the desired target concentration at steady state. (2-5) It remains to be clarified whether a guideline-based dosing strategy would impact the frequency of achieving target concentrations.

Aims

- To develop, implement and assess compliance of an antimicrobial dosing guideline for use in critically ill patients.
- To determine whether guideline based antibiotic dosing achieves a steady state trough concentration of 15-20 mg/L for vancomycin in critically ill patients.

Methods

Guideline compliance audit

Drug orders were assessed for compliance over a four-week period from May to June 2018. Patients admitted over the study period were retrospectively assessed and included if they received any of the guideline drugs.

Vancomycin TDM

All vancomycin TDM performed during the audit was collected and assessed. A vancomycin steady state trough concentration of 15-20 mg/L was considered therapeutic.

Results

Guideline development

The idea

To develop an evidence based guideline to increase the likelihood of antimicrobial target attainment in critically ill patients.

The review

An extensive literature review was conducted to establish the guideline, and data included was identified by searches of Medline, Embase, and references from relevant articles.

The team

The project was led by the ICU pharmacist who consulted and engaged with key stakeholders including ICU consultants and infectious diseases specialists.

The delivery

The draft guideline was presented to key stakeholders. Feedback was collated and the final version of the guideline was endorsed by the medico committee.

The use

ICU clinician education occurred prior to utilisation of the guideline in clinical practice. The guideline was then made accessible via the electronic medication management system and the procedural portal.

Guideline compliance audit

(100%) LD and MD compliant with guideline (n=2)
(68%) LD compliant and MD non-compliant with guideline (n=7)
(0%) LD and MD non-compliant with guideline (n=50)

Vancomycin TDM

Therapeutic levels (n=3)
(100%) LD compliant and MD non-compliant with guideline
(20%) LD non-compliant and MD compliant with guideline
(0%) LD and MD non-compliant with guideline

Conclusion

This pragmatic guideline offers clinicians evidence-based dosing recommendations for a selection of antimicrobial agents frequently prescribed to treat infections in critically ill patients. Overall, 68% (34/50) of orders were compliant with the guideline with individual results presented in Figures 2 and 3. Results should be interpreted with caution due to the small sample size. Interestingly, guideline-based dosing of vancomycin was more likely to achieve therapeutic trough concentrations.

Vancomycin TDM

To determine whether guideline based antibiotic dosing achieves a steady state trough concentration of 15-20 mg/L for vancomycin in critically ill patients.

References