

Impact and review of an improved vancomycin dosing regimen and new prescribing pathway & monitoring chart

Ryan Hamilton^a, Emma Cramp^a, Hamid Hashemi^b, Natasha Lander^b, and Andrew Swann^b

^a Pharmacy Department, University Hospitals of Leicester NHS Trust, UK

^b Department of Microbiology, University Hospitals of Leicester NHS Trust, UK

Contact: ryan.a.hamilton@uhl-tr.nhs.uk

Introduction

Intravenous vancomycin is used for a wide range of infections caused by Gram positive bacteria. However, it has a narrow therapeutic index whereby low serum concentrations result in treatment failure and promotes resistance, yet high concentrations can result in toxicity^[1]. An audit within East Midlands (n=300) showed only 40.7% of patients achieved the desired serum concentration of 10–20 mg/L (54.7% under 10 mg/L, 30.0% 10–15 mg/L, 10.7% 15–20 mg/L, 4.7% greater than 20 mg/L) by the third or fourth dose^[2]. Indeed, a significant proportion of these patients did not achieve the desired serum concentration throughout treatment. Appropriate prescribing, monitoring and adjustment of antibacterial therapy is a key component of antimicrobial stewardship^[3]. Therefore, improving the use of vancomycin within University Hospitals of Leicester NHS Trust was seen as a priority for the antimicrobial stewardship team.

This quality improvement project aimed to improve vancomycin prescribing and monitoring through implementation of an updated vancomycin dosing regimen with supporting prescribing pathway and chart.

Method

The vancomycin regimen developed by Thomson, *et al.*^[4] was adopted into a decision pathway with prescription and monitoring chart. To determine the impact of this new pathway and chart an audit was undertaken in adult patients across Leicester Royal Infirmary between 2nd September and 12th October 2016. The primary measure was the proportion of therapeutic vancomycin assays achieved by the third or fourth dose, compared to the East Midlands audit (see above). Secondary measures assessed appropriateness of loading dose, maintenance doses, serum sample, and interpretation of levels. Data was analysed on Microsoft Excel[®]. Ethics approval was not required.

Results & Discussion

Forty-patients were audited. Of patients remaining on vancomycin longer than 24-hours (requiring a level) 67.7% achieved serum concentrations between 10–20mg/L before the third or fourth dose (figure 1). This is an improvement of 37.1% on the previous dosing regimen and prescribing method. Following on from this, 71% of patients requiring a second level achieved concentrations between 10–20mg/L, and 73.3% of patients requiring a third level achieved the desired concentrations.

Regarding the secondary outcomes (figure 2), 92% of patients received the correct loading dose. Two patients were not prescribed a loading dose, which may be the result of prescribers not using the new chart and initiating treatment in-line with the previous regimen. 82% of patients received the correct initial maintenance dose at the time of treatment initiation. The sole cause of inappropriate initial maintenance doses was incorrect calculation of creatinine clearance. This highlights that prescribers need more guidance on calculating creatinine clearance, which may be achieved through review of the prescribing pathway and chart.

Of those patients requiring a serum assay, 67.7% had a sample taken before the 3rd or 4th dose. 9.7% had samples taken before the 2nd dose and 22.6% had samples taken before the 5th dose. Alongside this, only 35.5% of samples were taken within 1-hour of the next dose, which risks serum concentrations appearing to be too high resulting in misinterpretation of the level. It was found that 40% of levels were interpreted incorrectly, which resulted in dosing regimens not being escalated when necessary (50%) and inadvertent dose adjustment (33.3%). Amending the current prescribing pathway and chart may improve prescribing and monitoring of vancomycin. However, it is likely that training for prescribers, nurses, and pharmacists on the use of vancomycin will be needed to drive further improvements.

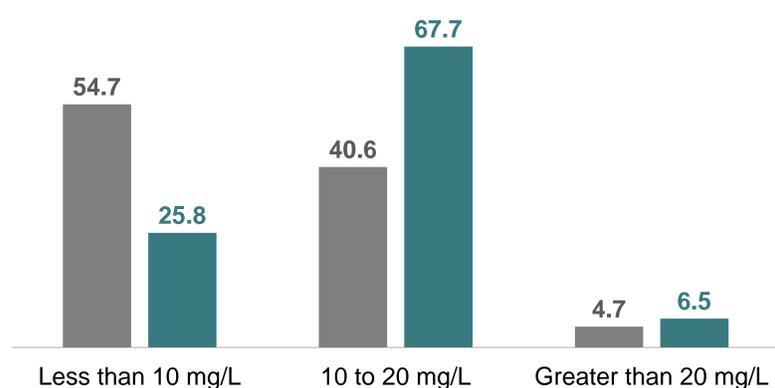


Fig 1. Proportion (%) of pre-3rd or 4th dose vancomycin assays reported as below, within, or above the desired therapeutic range. Grey values are from the East Midlands audit of the previous regimen, and the teal values relate to the local audit of the new regimen and chart

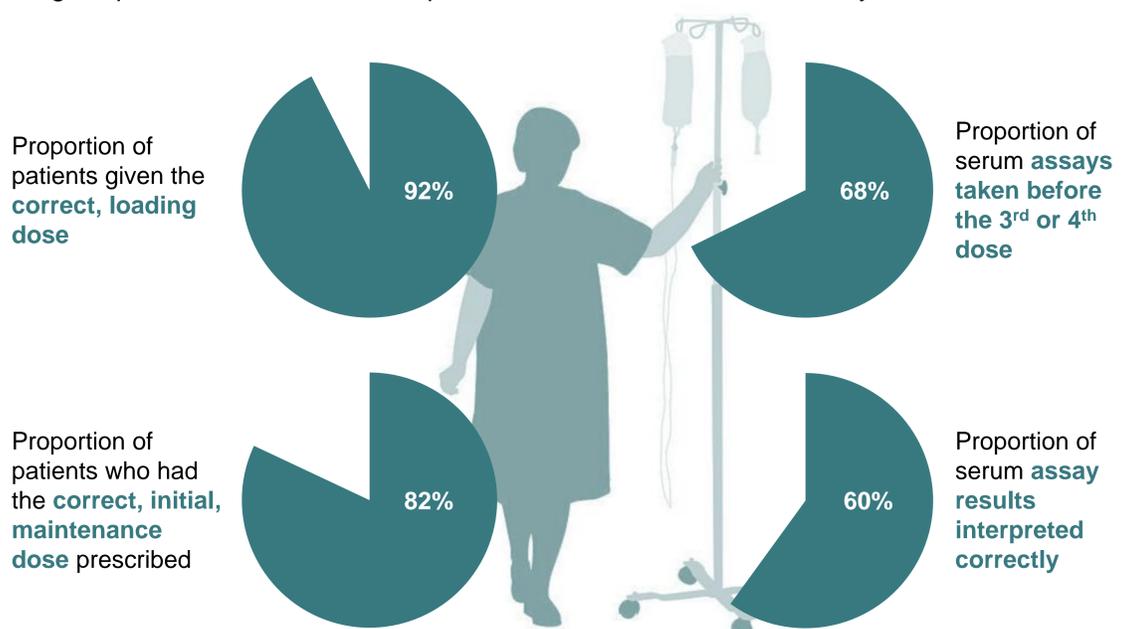


Fig 2. Results of the secondary measures of appropriate prescribing and management of vancomycin

Conclusions

The pathway and chart resulted in a greater proportion of patients achieving and sustaining therapeutic vancomycin levels and also resulted in the majority of patients receiving correct loading and maintenance doses. Further amendments to the prescribing pathway and chart are currently being finalised to drive improvements in prescribing of maintenance doses and the timings and interpretation of serum concentrations. The impacts of these changes will be evaluated once the new paperwork has been established in practice.

References

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