Vancomcyin Use for Haemodialysis Patients –Development of a New Dosing Protocol

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Background

- Staphylococcus aureus is a leading pathogen in bacteraemia within the haemodialysis population.
- Methicillin resistant staphylococcus aureus (MRSA) compounds healthcare costs and is associated with 3-5 times higher mortality relative to methicillin sensitive strains (MSSA).
- Vancomycin is an intravenous glycopeptide antibiotic used in the treatment of MRSA and in patients with MSSA who have anaphylaxis to penicillins or cephalosporin therapy.
- Vancomycin is primarily eliminated through renal excretion and is readily cleared by high-flux dialysers (up to 40% in a 4hr session), complex dose adjustments are required.
- Administration of vancomycin during the last period of haemodialysis facilitates outpatient treatment.
- Whilst an area under the curve/ minimum inhibitory concentration ratio (AUC/MIC) of 400-600mg*hr/L (for MIC 1mg/L) is now recommended for vancomycin efficacy and safety in other population groups. Due to a paucity of AUC data and logistical challenges in the intermittent haemodialysis population current international consensus guidelines recommend monitoring pre-dialysis levels with a target of 15-20mg/L as a reasonable surrogate.

Aims

- To develop a dosing and monitoring protocol to achieve therapeutic vancomycin levels in patients on intermittent haemodialysis.

Methods

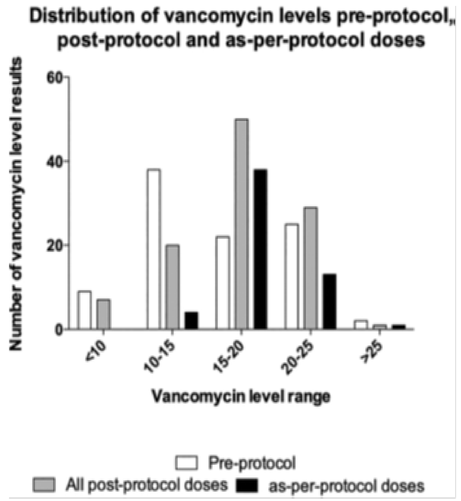
- We conducted a closed loop, single centre, retrospective observational audit before, and 4 months after implementation of a new protocol for vancomycin administration in intermittent haemodialysis.
- Patient demographic, biochemical and clinical parameters were gathered on consecutive vancomycin treatment courses prescribed for any indication at any of the Waitemata District haemodialysis units.
- We devised and implemented a new vancomycin protocol consisting of a weight based loading dose, then initial and subsequent maintenance dose titration according to same day measured pre-dialysis levels. Protocol design was by a multidisciplinary committee of medical, nursing, pharmacy and antimicrobial stewardship staff utilising key literature, existing protocols, medication safety and logistical considerations.

Protocol

- Click this text link for further information

Results

Figure 1:



62% of cases were administered as-per-protocol (black filled bars).

Figure 2:

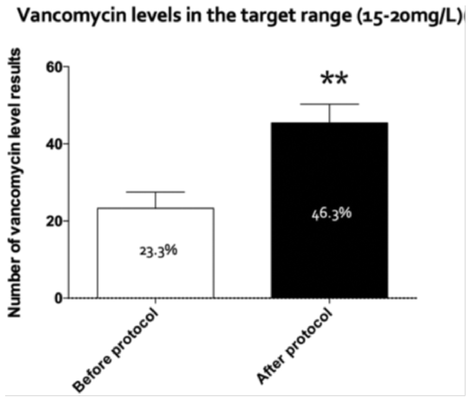
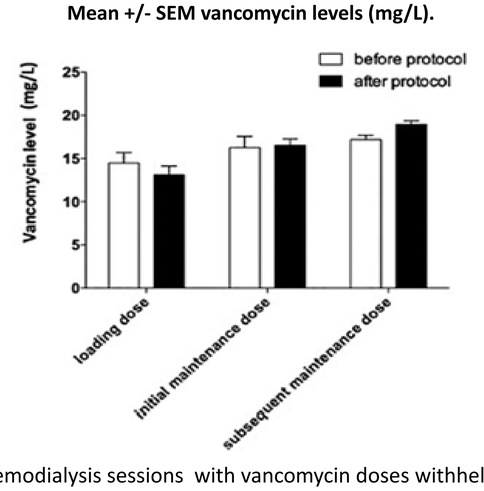


Figure 3:



Number of haemodialysis sessions with vancomycin doses withheld reduced from 19 out of 117 pre-protocol to 1 out of 118 post protocol.

	Before protocol	After Protocol
Treatment courses (n) -Clinically distinct episodes (n)[a]	15 13	16 14
Access-related indication -CLABSI -Cellulitis – access related -Complicated line exchange	**6 (46%)** 2 2 1	**4 (29%)** 2 2 0
Non-access- related indication -Cellulitis - non access related -Lower limb ulcer -Other	**7 (54%)** 3 3 1	**10 (71%)** 5 4 1
Average inpatient days per patient	**11.2**	**10.7**
New positive blood cultures on treatment	**2**	**1**
Access procedures -Average access procedures per CLABSI	**8** 2.67	**4** 2.9
Amputation	**1**	**1**

Table 1: Clinical outcomes pre and post protocol

Discussion

- Our audit revealed deficiencies in our clinical practice in the absence of a local vancomycin protocol for patients receiving intermittent haemodialysis.
- Following the implementation of our new protocol there was an improvement in therapeutic levels and fewer doses were withheld.
- Whilst we are unable to attribute causality on the effect of our protocol on hard clinical outcomes due to the small sample size, our raw data suggests a trend towards reduction in length of hospital stay, reduced number of positive blood cultures while on treatment, and reduced number of access procedures.

Next Steps Taken

- Protocol loading doses increased by 5mg/kg to address lower initial mean levels.
- Prescribing practice changed to stat doses, to facilitate pre-dialysis level review prior to prescribing and address the 62% protocol adherence rate.

Publication / References

Ho E, Gleeson S, Roberts S, Bondesio K, Salmon A. Vancomycin use for haemodialysis patients – Development of a new dosing protocol. *Nephrology.* 2023;28(4)227-233. Doi:10.1111/nep.14144

References: Scan me