Vancomycin dosing and therapeutic levels in neonates

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BACKGROUND

Vancomycin is an antibiotic prescribed for gram-positive infections such as severe skin infections and blood stream infections. To ensure adequate dosing and to avoid potential toxicity, therapeutic drug level monitoring (TDM) is required.

In our neonatal intensive care unit, dosing guidelines conform to the BNF-For-Children (BNF-C) (Table 1), which suggests a standard dose of 15mg/kg, with the dosing frequency dependant on the post-menstrual age (PMA).

Post-menstrual age	Frequency
<29 weeks	every 24 hours
29-35 weeks	every 12 hours
>35 weeks	every 8 hours

Table 1. Dosing intervals of vancomycin as per BNF-C and NMH guidelines (pre August 2022)

A vancomycin trough level is taken at the time of the fourth dose, and a target level of 10-15mg/L is recommended in most infections. Dose modifications will depend on result of drug levels with the dosing interval either being shortened or lengthened based on this result.

AIMS

The aim of the audit was to review all vancomycin levels that were collected on neonates from January 2018 to July 2022 (55 months), to establish the amount of vancomycin levels that are within therapeutic range and to establish if there is a need to change practice.

METHODS

A retrospective review of all neonates who had vancomycin trough levels taken from January 2018 to July 2022 was conducted by the microbiology registrar. Data was collected using MN-CMS and included the following parameters:

- Gestational age at birth
- Age at time of level
- Weight at time of dosing
- Dose administered
- Time of TDM level
- Result of TDM level
- Action taken based on TDM result

Data was then recorded and analysed using Microsoft Excel.

RESULTS

A total of 77 samples were obtained from 38 neonates. Allowing for a difference within 10% of the advised dose, 79% (n=30) of neonates were dosed correctly, 13% (n=5) were under dosed and 8% (n=3) were over dosed.

Trough levels were calculated at the correct time in 82% (n=31). Levels were taken too early for 3 babies, levels were taken too late for 3 babies and one baby was transferred to another hospital.

Overall, 58% (n=22) of neonates had sub-therapeutic levels (Table 2). In the <29 week PMA group, 86% (n=12) had sub-therapeutic levels, despite accurate dosing as per BNF-C. In the 29-35 week PMA group, 48% (n=10) had sub-therapeutic levels.

Post-menstrual age	<29 weeks	29-35 weeks	>35 weeks
Total	**14**	**21**	**3**
Sub-therapeutic (<10mg/L)	12	10	0
Therapeutic (10-20mg/L)	1	8	2
Supra-therapeutic (>20mg/L)	1	3	1

Table 2. TDM results based on post menstrual age

Conclusion

Optimisation of vancomycin therapy is crucial. Under-dosing contributes to ineffective therapy and resistance, and over-dosing is associated with toxicity. The biggest problem area observed was in the <29 weeks PMA where the majority had sub-therapeutic levels. Based on the results of our audit, and review of approved guidelines, we proposed a change for the dosing frequency of neonates with PMA <29 weeks from 24-hourly to 18-hourly. This was presented to the neonatal team and was accepted August 2022. The dose of vancomycin should remain at 15mg/kg, however intervals should be adjusted as per Table 3.

Post-menstrual age	Frequency
<29 weeks	18 hourly
29-35 weeks	12 hourly
>35 weeks	8 hourly

Table 3. Dosing intervals of vancomycin as per new NMH guidelines