Pharmacist-led Vancomycin Therapeutic Drug Monitoring: An Evaluation of Practice in Haematology and Oncology Patients

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Background

Vancomycin is a drug with a narrow therapeutic window. Therapeutic drug monitoring (TDM) is required to ensure efficacy and minimise toxicities, including drug induced acute kidney injury (AKI). [1] The risk of AKI in the Haematology and Oncology cohort is high, with a prevalence between 12-26%. [2,3]

In 2012 pharmacist-led vancomycin TDM became standard clinical care at Alfred Health [4]. Doctors prescribe initial doses of vancomycin, with pharmacists responsible for all TDM and dose adjustments.

Aim

To evaluate the pharmacist-led TDM program across the Haematology and Oncology units and identify clinical parameters that may indicate an excessive incidence of AKI.

Methods

A retrospective review of all patients admitted under the Haematology and Oncology units prescribed vancomycin between Jan 2017 and Dec 2017 was undertaken.

Primary outcome: adherence to Alfred Health vancomycin dosing protocol for pharmacist-led TDM

Secondary outcome: incidence of AKI (per Kidney Disease Improving Global Outcomes criteria) [5] and factors associated with AKI

Patients who received multiple courses of vancomycin were analysed as separate patient vancomycin episodes (PVE). Electronic medical records were reviewed and information collated in Microsoft Excel®.

Patients were excluded if they:

- Did not have a vancomycin level taken
- Received <48 hours of treatment with vancomycin
- Were aged <18 years
- Were commenced on vancomycin at an external site, or under a different unit before being transferred to the Haematology or Oncology units.

Instances of dosing protocol non-compliance were reviewed by a senior pharmacist to assess clinical appropriateness.

Results

One hundred and fifty three patient vancomycin episodes were identified during the 12 month study period

Table 1: Baseline Characteristics

Median age (range)	60 (44-76)
Diagnosis n (%)	
AML	76 (49.7)
Lymphoma	22 (14.4)
Myeloma	19 (12.4)
Solid organ cancer	12 (7.8)
ALL	11 (7.2)
Other cancers	9 (5.9)
Melanoma	4 (2.6)
eGFR mL/min at baseline n (%)	
>90	101 (66.0)
50-90	42 (27.5)
20-49	8 (5.2)
<20	2 (1.3)
ICU admission n (%)	26 (17)
Received *any* other nephrotoxic drug while treated with vancomycin n (%)	144 (94.1)
IV contrast	67 (43.8)
Piperacillin/tazobactam	94 (61.4)
Frusemide	89 (58.2)
Chemotherapy	36 (23.5)
Other	55 (35.9)

Results

Table 2: Vancomycin treatment details

Median duration of treatment days (range)	4.7 (0.1-9.3)
Number of PVE with loading dose (%)	113 (74.4)
Indication for vancomycin n (%)	
Febrile neutropenia (FN)	88 (57.5)
Positive blood culture	33 (21.6)
Other infection (non-CNS)	16 (10.5)
FN followed by directed therapy	12 (7.8)
Other infection (CNS)	4 (2.6)
Therapeutic target n (%)	
15-20 mg/L	148 (96.7)
20-25 mg/L	5 (3.3)
Monitoring of therapeutic levels	
Number of interpretable levels	502
Patients achieving therapeutic level n (%)	115 (75.2)
Median number of doses to first therapeutic level (range)	6 (1-11)
Median days to first therapeutic level (range)	3 (1.4-4.6)
Patients with supra-therapeutic levels n (%)	70 (45.8)
20-24.9 mg/L	44 (28.8)†
25-29.9 mg/L	16 (10.5)
≥30 mg/L	10 (6.5)

†2 PVE targeting 20-25 mg/L

Table 3: Primary Outcome

PVE dosing as per protocol (APP) (%)	102 (66.7)
PVE with all dose adjustments APP (%)	123 (80.4)
Number of opportunities for pharmacist TDM	502
Number of opportunities with non-compliant TDM (%)	29 (5.7)

Secondary outcomes:

Thirty two patient episodes (20.9%) developed AKI. All were treated concurrently with at least one other nephrotoxic agent. Of the seven patients who developed Grade III AKI, all were deemed by a senior pharmacist to have had appropriate pharmacist-led TDM.

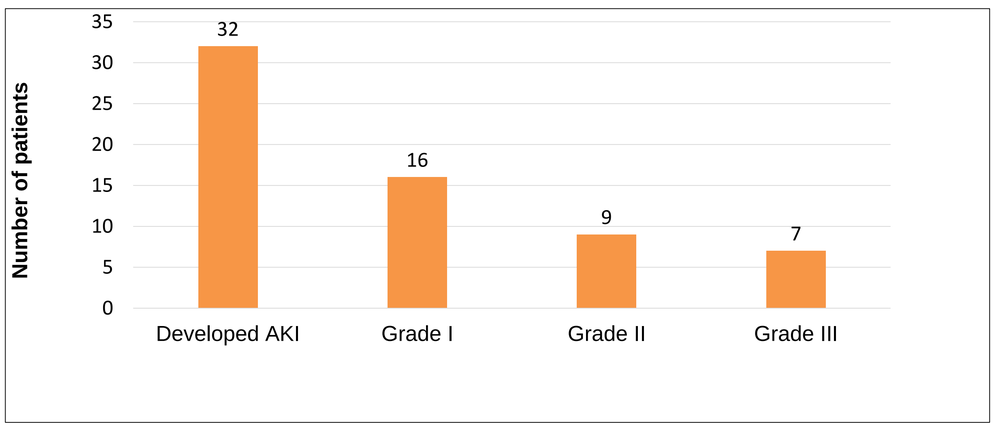

Figure 1: Incidence and grade of AKI

Conclusion

This study showed ongoing excellent pharmacist adherence to the Alfred Health institutional guideline for vancomycin therapeutic drug monitoring, consistent with our previous research [6].

Rates of AKI were similar to that observed in the literature for this cohort of complex patients [2,3]. The high frequency of concomitant use of multiple nephrotoxic agents reinforces the importance of appropriate therapeutic drug monitoring in this cohort.

References

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