# Management of Vancomycin in an Acute Hospital – Pharmacists' Impact on Therapeutic Drug Monitoring (VancMan)

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## Introduction

- Vancomycin (VAN), a glycopeptide antibiotic, is used to treat serious Gram-positive infections including methicillin resistant Staphylococcus aureus (MRSA).
- VAN is excreted primarily via renal elimination with dosing based on renal function and judicious use of serum concentration monitoring to optimise therapeutic effect and minimise toxicity.
- Published literature suggested a need for improved therapeutic drug monitoring (TDM) in Australian and New Zealand hospitals.
- Our study aimed to determine if the current procedure for VAN TDM at Peninsula Health is sufficient to maintain patients in the therapeutic range and minimise toxicity.

## Method

- Retrospective cohort study conducted at Frankston Hospital between April 2014 - April 2015, including all adult patients initiated on VAN and receiving >1 dose.
- Data collected from electronic health records and TDM forms completed by pharmacists, including demographics, renal function, VAN loading and maintenance dosing and frequencies, and pharmacists' notes.
- Primary endpoints assessed the following:
  - Adherence to the hospital guidelines recommended dosing and TDM.
  - Pharmacist involvement in optimising VAN dosing and TDM.
- Human Research Ethics Committee review exemption granted.
- Primary outcomes analysed via Chi squared and student t-test

## Results


Figure 1: Patient Selection

*Patients excluded from adherence to hospital guideline analysis if there was no weight or renal data available.

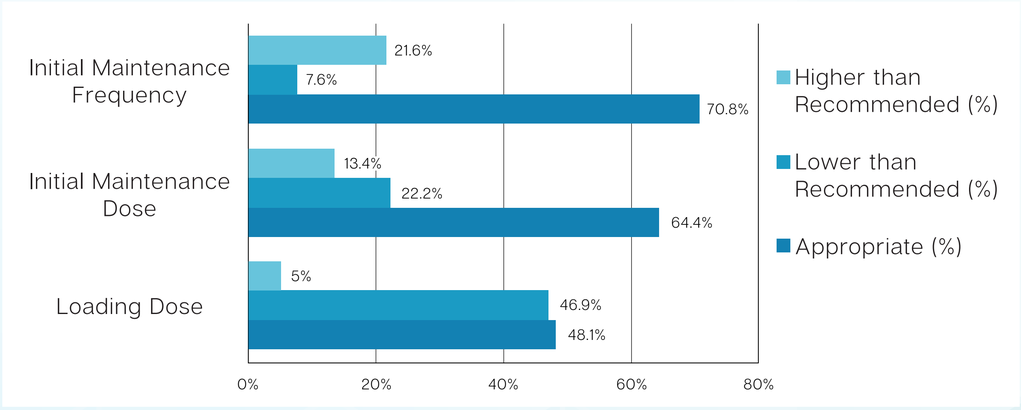
| Table 1: Patient Demographics | Number (525) |
|---|---|
| Gender<br>Females<br>Males | <br>220 (41.9%)<br>305 (58.1%) |
| Age (years; mean) | 63.6 (95%CI 62.0-65.2) |
| Weight (kg; mean) (n=328) | 81.9 (95%CI 79.2-84.7) |
| Initial SeCr* (µmol/L) | 119.8 (34-2162) |
| Intensive Care Unit Admission | 159 (30.3%) |

*SeCr = serum creatinine

- The most common indications for VAN were sepsis (29%) or skin infections (18%).
- Both loading dose and maintenance dosing errors were common in the study population.

## Results (continued)

Figure 2: Vancomycin Dosing Per Hospital Guidelines




- Pharmacists were most frequently involved in:
  - Addition of a trough level reminder (23%)
  - Dose adjustments (18%)
- 46.3% of patients had a pharmacist completed VAN TDM form.
- Patients who were prescribed longer courses of VAN were more likely to have a TDM form completed by a clinical pharmacist (4.2 days vs. 6.1 days, p<0.001).

| Table 2: Pharmacist Involvement with VAN TDM | | | | |
|---|---|---|---|---|
| | With Pharmacist Involvement | No Pharmacist Involvement | P-Value | Mean (number of levels) |
| Percentage Appropriate Trough Level | 77% | 41% | P<0.001 | 1.3 (0-14, 95%CI 1.1-1.4) |
| Average Number Of Levels In Therapeutic Range | 1.13 | 0.51 | P<0.001 | 0.8 (0-14, 95%CI 0.4-0.9) |

- Pharmacist involvement was associated with a higher rate of any appropriate level during VAN treatment 41% versus 77% (p<0.001).
- On average 0.8 (0-14) trough levels reached a therapeutic serum level during the course of VAN. Pharmacist involvement significantly increased the number of therapeutic levels achieved per patient (0.51 vs 1.13 [95%CI -0.91 to -0.37] p<0.001).

## Discussion

- This study demonstrated that hospital guidelines are not closely followed. Less than half of the patients had a loading dose prescribed appropriately and approximately a third of patients did not receive an appropriate initial maintenance dose.
- The results show similar results to previous research, with poor dosing decisions during clinical practice on initiation of VAN therapy.
- Under-dosing on initiation of therapy may lead to subtherapeutic levels and result in an extended duration of illness or hospital stay, contribute to adverse health outcomes and increase selection of resistant bacteria.
- Despite a low rate of return of VAN TDM forms, it was evident that pharmacist involvement significantly increased the number of appropriate levels and the number of therapeutic levels attained.
- Further research is required to increase guideline adherence to improve therapeutic outcomes and reduce risk of adverse effects.
- Future guidelines and antibiotic stewardship practices will need to be adjusted based upon these results.