

# Compliance with Local Surgical Antibiotic Prophylaxis Guidelines in the setting of a Critical Vancomycin Shortage

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## Introduction

At The Royal Melbourne Hospital (RMH), vancomycin is used in specific surgical antimicrobial prophylaxis indications. During the most recent vancomycin shortages, which reached critical levels mid-March 2017, teicoplanin was substituted for vancomycin for these surgical prophylaxis indications<sup>1</sup>. Though teicoplanin is more expensive than vancomycin, studies show it may be easier to utilise appropriately in the peri-operative setting without compromising antimicrobial coverage<sup>2,3,4</sup>.

## Aims

To retrospectively analyse if, in light of the nation-wide vancomycin shortage, surgical antibiotic prophylaxis with teicoplanin was more appropriately prescribed and administered compared to vancomycin.

## Methods

A retrospective analysis of all patients who received vancomycin in surgeries in the main theatres at RMH during a two-week period prior to the critical vancomycin shortage (13<sup>th</sup> to 26<sup>th</sup> February 2017), and patients who received teicoplanin during a two-week period during the critical vancomycin shortage (20<sup>th</sup> March to 2<sup>nd</sup> April 2017) was conducted.

Appropriateness of prescribing was assessed against the respective surgical prophylaxis protocols, detailed below<sup>5</sup>:

Appropriate Indications
Known or suspected Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) infection or colonisation pre-operation,
History of MRSA infection or colonisation
A re-operation (return to theatre or early revision) involving a prosthetic cardiac valve or joint, or a prosthesis in vascular surgery
Hospitalisation >5 days (this admission) prior to surgery
Hypersensitivity to penicillin

Table 1: Appropriate indications as per RMH Surgical Prophylaxis Protocol

Appropriate Doses	
Vancomycin	1.5g
Teicoplanin	400mg (<100kg)    800mg (>100kg)

Table 2: Appropriate doses of vancomycin and teicoplanin as per RMH Surgical Prophylaxis Protocol recommendations

Appropriate Administration	
Vancomycin	Infusion beginning 30-120 minutes prior to first incision
Teicoplanin	Bolus dose given within 30 minutes of first incision

Table 3: Appropriate administration of vancomycin and teicoplanin as per RMH Surgical Prophylaxis Protocol recommendations

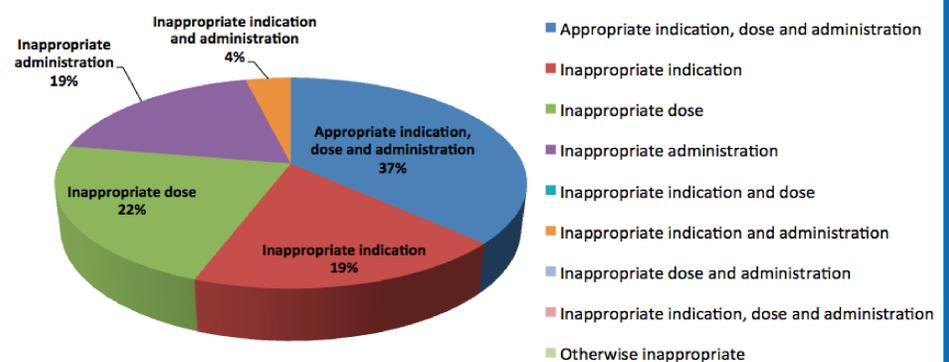
Graph 1 showed that 16 out of 21 (76%) cases of vancomycin administration was inappropriate. Vancomycin administration with more logistically challenging requirements for surgical prophylaxis, may be more difficult to adhere to. The audit highlighted that administration in relation to incision time was particularly poorly executed and/or documented.

The recorded "surgery start time" may not accurately correlate with the time of first incision and considering variable documentation practices of the anaesthetists, this data point may not be a reliable indication of the actual time difference between vancomycin infusion start time and surgery start time, potentially skewing results.

In practice, the surgical team may find it difficult to adhere to protocol recommendations for time of administration of vancomycin especially in emergency situations where surgery may have to commence immediately. As RMH is one of the major trauma referral centers in Victoria, administering antibiotics with sufficient time prior to surgery may be compromised if the surgery is an emergency. The results show 15 out of 21 (71%) of the vancomycin receiving surgeries were emergency compared to the 11 (39%) of the teicoplanin surgeries.

Four (19%) patients received vancomycin when it was not indicated and six (29%) patients received an inappropriately low vancomycin dose. Sub-therapeutic dosing may increase their susceptibility to surgical site infections or other more serious complications depending on their surgery.

## Analysis of appropriateness of teicoplanin use



Graph 2. Detailed analysis of appropriateness of teicoplanin use (n=27)

Ease of teicoplanin administration potentially contributed to the lower, five out of 27 (22%), surgeries where administration of teicoplanin was deemed inappropriate. Like the vancomycin audit, the time of administration in relation to the surgery start time was not always clearly documented. Overall appropriateness of teicoplanin administration was double that of the results for vancomycin administration.

Six out of the 27 (22%) patients who received teicoplanin did not require the glycopeptide as per the surgical prophylaxis guidelines. Considering the added expense of using teicoplanin over vancomycin, unnecessary use of the drug contributes to a financial deficit as well as promoting resistance.

Dose errors of teicoplanin affected six out of 27 (22%) patients. Five of these six patients weighed over 100kg but only received 400mg of teicoplanin. Under dosing in heavier patients could result in suboptimal tissue concentrations. Weight-based dosing for teicoplanin in surgical prophylaxis may have contributed to these errors. However, despite fixed-dose vancomycin in the protocol, six patients received the incorrect dose. It appeared that heavier patients seemed to be more likely to receive a dose non compliant with protocol.

Inappropriate prescribing was not more prevalent in particular surgeries or with particular surgeons. These aspects seemed to have little bearing on the use of the glycopeptides.

## Results and Discussion

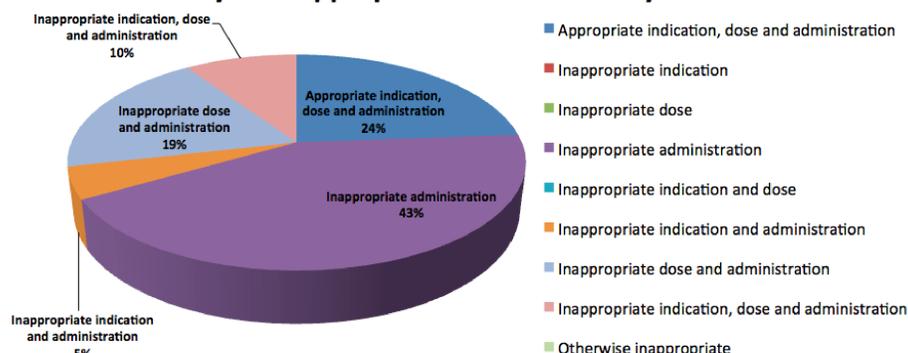
Overall the percentage of patients who received a vancomycin and teicoplanin in the respective periods was significantly lower than originally estimated. However, the data collection only looked at patients who actually received the two drugs. There may be patients who potentially required the drugs, but did not receive them, which was not covered in the scope of this study.

The proportion of surgical procedures where vancomycin was administered as surgical prophylaxis during the two-week period prior to the critical vancomycin shortage (13 <sup>th</sup> to 26 <sup>th</sup> February 2017)	21/649 (3%)
The proportion of surgical procedures where teicoplanin was administered as surgical prophylaxis during a two-week period during the critical vancomycin shortage (20 <sup>th</sup> March to 2 <sup>nd</sup> April 2017)	27/619 (4%)

Table 4. The overall proportion of patients who received vancomycin or teicoplanin over the respective time periods

However the results demonstrated some consistent themes with few outliers, and it was felt that reasonable conclusions could be drawn from this data. The results for both drugs are shown below.

## Analysis of appropriateness of vancomycin use



Graph 1. Detailed analysis of appropriateness of vancomycin use (n=21)

## Conclusion

This study provided insight into how the nation-wide shortage of vancomycin may have affected the use of glycopeptides in surgical prophylaxis protocols at RMH. Teicoplanin use was not more appropriate than vancomycin use for surgical prophylaxis in this study. Based on this conclusion, the added expense of teicoplanin would be difficult to justify outside the context of a vancomycin shortage, as it does not appear to provide any additional benefit to patients.

Re-familiarisation of the appropriate guidelines, which are available in theatres, by surgical staff may help to improve adherence and potentially result in better outcomes for patients requiring surgical prophylaxis.

## References

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