

BACKGROUND

Intravenous (IV) vancomycin is a commonly prescribed antimicrobial targeting Gram positive bacteria, including methicillin resistant *Staphylococcus aureus* (MRSA). MRSA accounted for 21.6% of *S. aureus* isolates in a Canadian nationwide study from 2007-2016.¹

Vancomycin is associated with toxicity as well as additional resource utilization for therapeutic drug monitoring.

Antimicrobial stewardship programs (ASPs) have been associated with decreased mortality in patients prescribed IV vancomycin^{2,3}; however, there is limited literature assessing overall IV vancomycin appropriateness.

The objective of the study was to assess the appropriateness of IV vancomycin prescriptions in a Canadian acute care hospital using PAF.

METHODS

PAF was conducted on all new IV vancomycin prescriptions in hospitalized adults (age ≥18 years) at the University of Alberta Hospital in Edmonton, Alberta, Canada from January 17 to February 11, 2022. This ASP service was additive to pre-existing pharmacy services coverage of vancomycin therapeutic drug monitoring.

Audits were performed by a Medical Microbiology or Infectious Diseases (ID) subspecialty resident and reviewed with an ASP physician and/or pharmacist.

Exclusion criteria included single doses, patients discharged or prescriptions stopped prior to audit completion.

Appropriateness was assessed against institutional prescribing guidelines (Bugs & Drugs^{®4} and Alberta Health Services Formulary Prescribing Guidelines).

Real-time prospective verbal and written feedback were provided to the attending teams.

RESULTS

Table 1. Patient characteristics of the prescriptions assessed by prospective audit and feedback

Characteristic		Number (%)
Sex	Female	46 (42)
Age	18-39	20 (18)
	40-59	36 (33)
	60-79	37 (34)
	80-99	16 (15)
Attending service	Medicine	61 (60)
	Surgery	18 (17)
	Intensive care	26 (24)
	Family medicine	4 (4)
Acute kidney injury (AKI) ¹		21 (19)
MRSA colonized ²		32 (29)
Beta lactam allergy ²		21 (19)
ID consultation (IDC) ³		29 (27)
Total Prescriptions		109 (100)

¹ KDIGO definition

² As recorded in the chart at time of audit

³ ID had been consulted prior to audit

Table 2. Types of recommendations made during the study

Recommendation	Number (%)
Discontinue	24 (43)
Change duration	3 (5)
Change agent	15 (27)
Change frequency	1 (2)
Additional investigations	8 (14)
ID consult	12 (21)

A total of 63 unique recommendations were made in 56 prescriptions.

Figure 1. Percentage acceptance of PAF recommendations

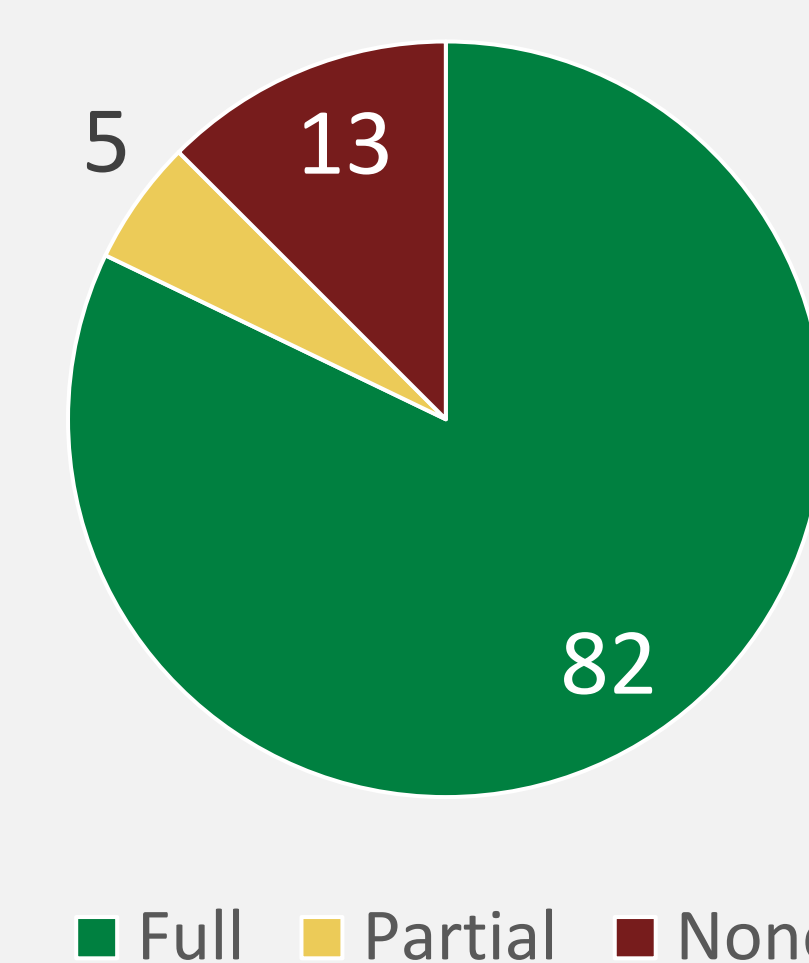


Table 3. Indications for IV vancomycin prescription and appropriateness

Indication ¹	Number of prescriptions (%)	Number (%) appropriate
Skin and soft tissue	26 (24)	18 (69)
Pulmonary	20 (18)	7 (35)
Bacteremia	19 (17)	13 (68)
Undifferentiated sepsis	14 (13)	7 (50)
Osteomyelitis	13 (12)	12 (92)
Urinary tract	9 (8)	2 (22)
CNS/eye	9 (8)	7 (78)
Cardiac/endovascular	4 (4)	2 (50)
Febrile neutropenia	4 (4)	2 (50)
Prosthetic joint	3 (3)	3 (100)
ENT	1 (1)	0 (0)
Genital/pelvic	1 (1)	1 (100)
GI/intra-abdominal	1 (1)	0 (0)
Other	1 (1)	0 (0)

¹If vancomycin was prescribed for multiple indications (e.g., bacteremia and osteomyelitis), all indications were recorded.

Overall, 39% (43/109) vancomycin prescriptions were not appropriate.

Table 4. Univariate and multivariate analysis of predictors of IV vancomycin appropriateness

Variable	Number (%)		p value	aOR (95% CI)	p value
	Appropriate	Inappropriate			
	66 (61)	43 (39)			
Female	31 (47)	15 (35)	0.212		
Mean age (Std dev.)	55 (17)	63 (18)	0.015	0.977 (0.952-1.002)	0.073
MRSA colonized	24 (36)	8 (19)	0.047	1.984 (0.724-5.437)	0.183
AKI	13 (20)	8 (19)	0.888	1.697 (0.566-5.091)	0.345
Beta lactam allergy	11 (17)	10 (23)	0.394		
IDC	24 (36)	5 (12)	0.004	4.271 (1.436-12.70)	0.009

Multivariate: adjusted for age, MRSA colonization, AKI and IDC

CONCLUSIONS

In our study, 39% of IV vancomycin prescriptions were suboptimal.

The three most common indications for vancomycin were skin and soft tissue, pulmonary, and bacteremia. Vancomycin prescriptions for urinary tract and pulmonary indications were least likely to be appropriate.

IDC prior to the prescription was associated with significantly greater appropriateness.

The majority (70%) of PAF recommendations were to change agent or to discontinue vancomycin.

Full or partial acceptance of PAF recommendations was achieved in 87% of cases, demonstrating good uptake.

A longitudinal IV vancomycin ASP intervention may be warranted at our center. This may be additive to pre-existing hospital-wide pharmacy services coverage.

REFERENCES

- Nichol KA, Adam HJ, Golding GR, et al. Characterization of MRSA in Canada from 2007 to 2016. *J Antimicrob Chemother.* 2019 Aug 1;74(Suppl 4):iv55-iv63.
- Conway EL, Sellick JA, Horey A, et al. Decreased mortality in patients prescribed vancomycin after implementation of antimicrobial stewardship program. *Am J Infect Control.* 2017;45(11):1194-1197.
- Rahbarimanesh A, Mojtahedi SY, Sadeghi P, et al. Antimicrobial stewardship program (ASP): An effective implementing technique for the therapy efficiency of meropenem and vancomycin antibiotics in Iranian pediatric patients. *Ann Clin Microbiol Antimicrob.* 2019;18(1).
- Alberta Health Services. Bugs and Drugs. Updated September 19, 2022. Accessed September 21, 2022. <https://www.bugsanddrugs.org/>

