Development, Implementation, and Evaluation of Vancomycin AUC/MIC Therapeutic Drug Monitoring

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Background

- The ratio of the 24-hour area under the concentration-time curve to minimum inhibitory concentration (AUC/MIC) is the best predictor of vancomycin efficacy
- AUC/MIC ≥ 400 is associated with vancomycin efficacy for MRSA bacteremia and pneumonia
- Trough levels have traditionally been used as a surrogate for AUC/MIC
- Troughs ≥ 15 mg/L may not be needed to achieve an AUC/MIC of ≥ 400 and are associated with an increased risk of nephrotoxicity
- 2020 American Society of Health-System Pharmacists consensus guideline on vancomycin therapeutic drug monitoring (TDM) recommends targeting a calculated AUC/MIC of 400 to 600
- Sites that have implemented vancomycin AUC/MIC TDM have seen reduced vancomycin exposure, decreased rates of nephrotoxicity, and fewer dosage adjustments to reach target range compared to trough monitoring

Objectives

- Implement vancomycin AUC/MIC TDM at BC Children's and Women's Hospitals (C&W)
- Evaluate pharmacist knowledge and satisfaction regarding vancomycin TDM pre- and post-implementation

Methods

Design: Quality improvement project

Project Timeline:

Sept 2020
- Form working group
- Develop survey

Oct 2020
- Pre-implementation survey
- Develop educational material
- Stakeholding

Nov 2020-Apr 2021
- Education sessions
- In-services
- Develop/update guidelines and site resources

Apr 2021
Implementation

May 2021
- Post-implementation survey

Pharmacist Surveys:

- UBC Survey Tool (Qualtrics)
- Anonymous
- Distributed by email to all pharmacists at C&W (N=49)
- Surveys open for:
  - Pre-implementation: 19 d; reminders sent on days 10 and 16
  - Post-implementation: 9 d; reminders sent on days 8 and 9
- Questions regarding:
  - Vancomycin TDM practices
  - Knowledge and comfort regarding vancomycin AUC/MIC TDM
  - Satisfaction with implementation of AUC/MIC TDM
- Data analyzed using descriptive statistics

Results

Table 1: Resources developed for implementation

Resource	Details	Date Available
Resources for Pharmacists		
Didactic sessions	• Rationale for change, basic pharmacokinetics (PK), AUC calculation • Two virtual sessions + recording	Nov to Dec 2020
Case-based sessions	• Sample patient cases • Three virtual sessions; additional cases sent to pharmacists	Nov 2020 to Jan 2021
Vancomycin AUC/MIC One-pager	• Criteria for AUC/MIC TDM, monitoring parameters, step-by-step process for calculating AUC	Nov 2020
Vancomycin AUC Excel Calculator	• Calculates basic PK parameters, vancomycin AUC • Calculates new dose, predicted levels and AUC	Apr 2021
Site-wide Resources		
In-services	• Pharmacist-led in-services for prescribers and nurses	Dec 2020 to Apr 2021
Vancomycin AUC/MIC TDM Guideline	• Exclusion criteria, dosing, timing of levels, target AUC/MIC, monitoring • Available in BC Children's Hospital Drug Dosage Handbook	Apr 2021
Practice Update for Nurses	• New guideline recommendation for AUC/MIC TDM and rationale, exclusion criteria, practice changes, how to order vancomycin levels, timing of blood samples, who to contact for AUC calculation, resources for more information • Distributed by email	Mar to Apr 2021
FAQ for Prescribers		
Notice for non-pharmacy staff		

Table 2: Demographics of pharmacist survey respondents

	Pre-implementation (N=27)	Post-implementation (N=24)
Highest level of pharmacy education, n (%)		
BScPharm, BSP	17 (63)	14 (58)
E2P PharmD	3 (11)	3 (13)
Post-graduate PharmD	7 (26)	7 (29)
Accredited Canadian Pharmacy Resident, n (%)	21 (78)	18 (75)
Years practicing pharmacy, n (%)		
< 5	8 (30)	7 (29)
5-10	6 (22)	4 (17)
> 10	13 (48)	13 (54)
Area(s) of practice, n (%)†		
Clinical	24 (89)	20 (83)
Distribution	11 (41)	9 (38)
Administration	1 (4)	3 (13)
Research support	0	2 (8)

†Respondents could pick multiple options

Figure 1: Overall pharmacist satisfaction with vancomycin AUC/MIC TDM after implementation at C&W (N=24)

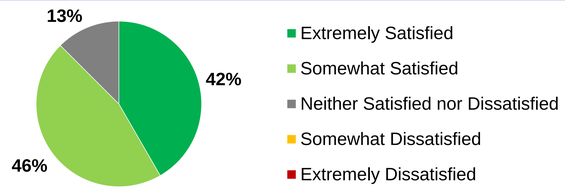
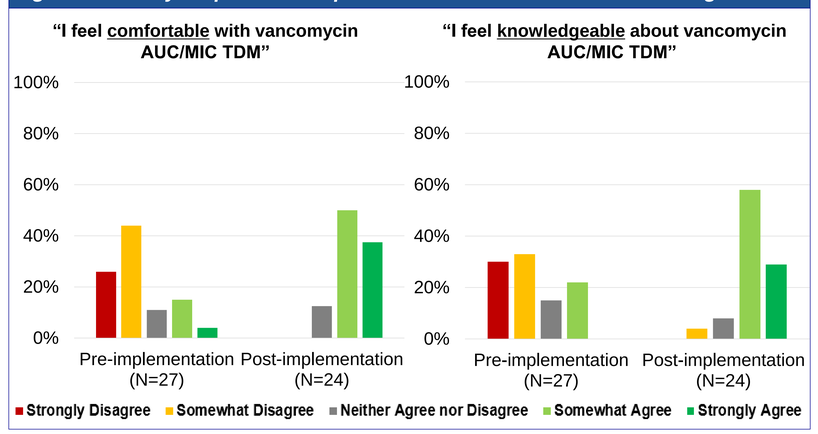


Table 3: Survey responses

Response	Pre-implementation (N=27)	Post-implementation (N=24)
"Vancomycin AUC/MIC TDM optimizes vancomycin efficacy"		
Strongly/somewhat agree, n (%)	18 (67)	19/22 (86)
Strongly/somewhat disagree, n (%)	0	1/22 (5)
"Vancomycin AUC/MIC TDM optimizes patient safety"		
Strongly/somewhat agree, n (%)	17 (63)	21/22 (95)
Strongly/somewhat disagree, n (%)	0	1/22 (5)
"Vancomycin AUC/MIC TDM requires more time than my previous practices"		
Strongly/somewhat agree, n (%)	13 (48)	5/13 (38)
Strongly/somewhat disagree, n (%)	12 (44)	4/13 (31)
"Vancomycin AUC/MIC TDM requires more drug levels to be drawn than my previous practices"		
Strongly/somewhat agree, n (%)	12 (44)	5/13 (38)
Strongly/somewhat disagree, n (%)	4 (15)	5/13 (38)

Figure 2: Survey responses for questions about comfort and knowledge



Conclusions

- Implementation of vancomycin AUC/MIC TDM at C&W:
  - Took 8 months
  - Required creation of a variety of resources for both pharmacists and other health care professionals
- Overall, most pharmacists were satisfied with the implementation
- Pharmacists had mixed thoughts about whether or not AUC/MIC TDM required more time or more drug levels than previous practice
- After implementation, more pharmacists felt comfortable and knowledgeable about vancomycin AUC/MIC TDM