An Evaluation of Intraperitoneal Vancomycin Dosing for the Treatment of Peritoneal Dialysis-Associated Peritonitis at Vancouver General Hospital

Wui Ming Chang, B.Sc.(Pharm.); Elaine Cheng, Pharm.D.; Karen Shalansky, Pharm.D.; Suneet Singh, MD, FRCP(C)
Departments of Pharmaceutical Sciences and Nephrology, Vancouver General Hospital and University of British Columbia

Background

- Two common modalities of peritoneal dialysis (PD) are:
  1. Continuous Ambulatory Peritoneal Dialysis (CAPD) and
  2. Continuous Cycling Peritoneal Dialysis (CCPD)
- A serious complication of PD that can lead to treatment failure and/or death is PD-associated peritonitis
- The International Society of Peritoneal Dialysis (ISPD) 2016 guidelines recommend that either intraperitoneal (IP) cefazolin or IP vancomycin may be used for empiric Gram-positive coverage as well as tailored therapy in the treatment of PD-associated peritonitis
- At VGH, IP vancomycin is prescribed as empiric therapy if the patient has a cephalosporin allergy or known history of MRSA/MRSE
- ISPD IP vancomycin dosing guidelines: CAPD 15-30 mg/kg every 5-7 days; CCPD 30 mg/kg load, then 15 mg/kg every 3-5 days; maintain serum vancomycin level ≥ 15 mg/L (timing and frequency not specified)
- In June 2011, to simplify ordering and prevent under treatment, a more aggressive dosing regimen was initiated for IP vancomycin at VGH:
  - CAPD: 30 mg/kg every 5 days
  - CCPD: 30 mg/kg every 3 days
  - Serum vancomycin level prior to second dose; target level ≥ 15 mg/L

Objectives

Primary Outcome:

- To assess appropriateness of VGH IP vancomycin dosing based on serum vancomycin levels

Secondary Outcome:

- To assess clinical outcomes in patients receiving IP vancomycin for treatment of PD-associated peritonitis
- To determine patient factors that could influence serum vancomycin levels in PD patients

Methods

- **Design:**
  - Retrospective chart review of PD patients who received IP vancomycin for the treatment of PD-associated peritonitis at VGH
    - Episodes identified from BC Renal Patient Records and Outcome Management Information System (PROMIS) database
  - Timeframe: June 1, 2011 to July 1, 2019
- **Inclusion Criteria**
  - PD patients ≥ 18 years of age
  - Diagnosed with PD-associated peritonitis
  - Received minimum of one dose of IP vancomycin
  - Had minimum of one serum vancomycin level measured
- **Exclusion Criteria**
  - Non-intraperitoneal route of vancomycin administration
- **Analysis:**
  - Descriptive statistics

Results

Figure 1: Screening Process

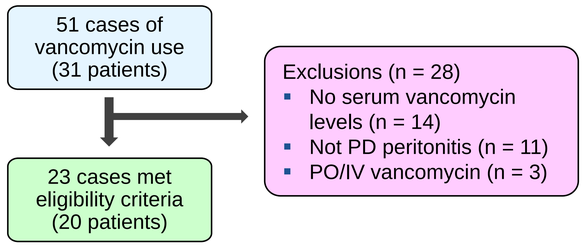


Table 1: Patient Characteristics

Characteristic	Total
Number of Patients	20
Age (years), mean ± SD	64.5 ± 11.0
Sex (male), n (%)	8 (40)
Weight (kg), mean ± SD	69.2 ± 16.7
Race (East Asian), n (%)	9 (45)
Race (Caucasian), n (%)	7 (35)
Primary Renal Disease, n (%)	
Diabetic Nephropathy	13 (65)
IgA Nephropathy	3 (15)
Comorbidities, n (%)	
Hypertension	18 (90)
Type 2 Diabetes	13 (65)
Baseline PD Modality, n (%)	
CCPD	15 (75)
CAPD	5 (25)
Exit Site Antibiotic, n (%)	
Gentamicin	10 (50)
Mupirocin	10 (50)
Residual Renal Function	557 ± 464
24-hr urine volume (mL), mean ± SD	(n = 18)
Vancomycin Initial Dose	29.3 ± 3.7
Dose (mg/kg), mean ± SD	(n = 23)

Figure 2: Organisms Isolated from Dialysate (n = 27)

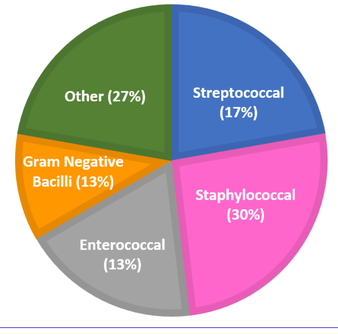


Table 2: Serum Vancomycin Levels[1,2]

Serum Vancomycin Levels (mg/L)						
PD Modality	**CAPD**			**CCPD**		
Vancomycin Level	**Level #1[3] (Day 5)**	**Level #2 (Day 10)**	**Level #4[4] (Day 20)**	**Level #1[3] (Day 3)**	**Level #2 (Day 6)**	**Level #3 (Day 9)**
Mean ± SD	15.0 ± 4.6 (n = 8)	20.8 ± 5.1 (n = 4)	18.1 (n = 1)	14.1 ± 3.7 (n = 7)	23.8 ± 3.5 (n = 7)	25.3 ± 3.9 (n = 3)
Range (mg/L)	9.4 - 23.2	15.7 - 25.8	18.1	8.6 - 19.7	20.4 - 29.7	21.9 - 29.6
Levels ≥ 15 mg/L	38%	100%	100%	43%	100%	100%

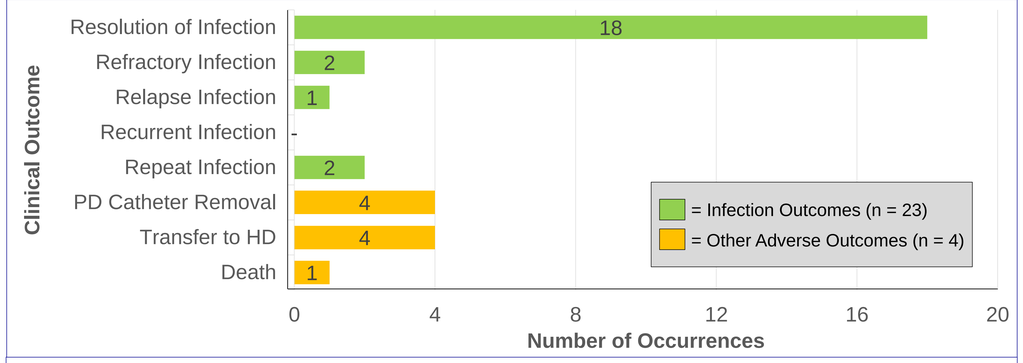
[1]Only levels drawn pre-dose included in analysis (65% for Level #1; 55% for Level #2)
- CAPD levels not drawn pre-dose often due to outpatient clinic follow-up every 3 days

[2]There appears to be no correlation between residual renal function and serum vancomycin levels

[3]Dose adjustment made only on 3 occasions based on the first serum vancomycin level

[4]There were no Day 15 (Level #3) levels for CAPD

Figure 3: Clinical Outcomes



- **Resolution of Infection:** resolution of signs and symptoms after 5 days of treatment
- **Refractory Infection:** failure to resolve infection after 5 days of treatment
- **Relapse Infection:** infection ≤ 4 weeks of completion of treatment with **same** organism
- **Recurrent Infection:** infection ≤ 4 weeks of completion of treatment with **different** organism
- **Repeat Infection:** Infection > 4 weeks after completion of therapy with **same** organism

Limitations

- Vancomycin use may be under-reported in the PROMIS Database
- Small sample size limited ability to determine patient factors that influence serum vancomycin level
- Documentation not comprehensive for all patients, especially if treated as an outpatient
- A portion of patients (15%) did not complete therapy with IP vancomycin for various reasons

Conclusion

- Majority of PD-associated peritonitis episodes (78%) had complete resolution
- Current IP vancomycin regimen at our hospital resulted in:
  - 60% sub-therapeutic serum vancomycin levels (< 15 mg/L) after first dose
  - 100% therapeutic serum vancomycin levels (≥ 15 mg/L) after second dose
- To standardize therapy and timing of serum levels, suggest altering regimen to:
  - CAPD 30 mg/kg IP initial dose, then 15 mg/kg every 3 days
  - CCPD 40 mg/kg IP initial dose, then 30 mg/kg every 3 days
  - Levels at Day 3 and Day 6, then reassess frequency

fraserhealth Better health. Best in health care.
Vancouver CoastalHealth Promoting wellness. Ensuring care.
Providence HEALTH CARE How you want to be treated.
Provincial Health Services Authority Province-wide solutions. Better health.