



Shaping Tomorrow's Nephrology: Insight-Driven Kidney Care

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Population Pharmacokinetics of Teicoplanin in Critically Ill Patients Receiving Continuous Renal Replacement Therapy: A Model-Based Dosing Optimization

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Objectives : Teicoplanin is a glycopeptide antibiotic used for severe gram-positive infections. In critically ill patients receiving continuous renal replacement therapy (CRRT), drug clearance varies significantly depending on residual renal function and CRRT settings. However, pharmacokinetic (PK) data for teicoplanin in CRRT patients remain scarce. This study aimed to develop a population PK model and propose personalized dosing regimens based on patient- and machine-specific covariates.

Methods : Nine patients receiving intravenous teicoplanin during CRRT were included. Plasma concentrations and cumulative drug amounts in dialysate were collected. A population PK model was developed using MonolixSuite 2024R1 with the SAEM algorithm. Covariates including body weight, underlying disease status (AKI vs. ESKD), and dialysate flow rate were evaluated. Model performance was assessed using goodness-of-fit plots and visual predictive checks. Monte Carlo simulations were performed to evaluate steady-state trough concentrations targeting 15–40 µg/mL across various clinical scenarios.

Results : A one-compartment model with systemic clearance ($CL = 0.32$ L/h) and dialysis clearance ($CL_d = 0.34$ L/h) best fit the data. ESKD patients showed approximately 62.5% lower CL than AKI patients. Increasing dialysate flow rate from 800 to 1500 mL/h reduced trough concentrations by approximately 33%. Simulations revealed that AKI patients weighing ≥ 60 kg with dialysate flow rate ≥ 1200 mL/h required 600 mg to achieve target trough concentrations, while ESKD patients with low body weight (< 50 kg) and D of 800 mL/h required dose reduction to 200 mg to avoid toxicity.

Conclusions : Optimal teicoplanin dosing in CRRT patients should be individualized based on underlying renal disease status, body weight, and dialysate flow rate. The proposed personalized dosing regimen provides a practical framework for maintaining therapeutic concentrations while minimizing toxicity.