

Vancomycin Dosage Regimens for Pediatric Patients

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Intravenous vancomycin is often used to treat serious infections caused by Gram-positive bacteria including those resistant to beta-lactams.

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In the presence of normal renal function, the manufacturer recommends an initial intravenous dose of 15 mg/kg, followed by 10 mg/kg every 12 hours in neonates younger than one week of age and 10 mg/kg every 8 hours for infants one week to one month of age. For older children with normal renal function, the recommended dosage regimen is 10 mg/kg every 6 hours.¹

The manufacturer recommended vancomycin dosage of 40 mg/kg/day in divided doses for children has not changed for decades despite increasing bacterial resistance over the past decade.²⁻⁴ Thus, the article by Benner et al. correlating vancomycin dosing to serum concentrations in pediatric patients is timely.⁵ These authors concluded that vancomycin dosage regimens of 15 mg/kg every 6 to 8 hours produced peak and trough serum concentrations within their target range more frequently than 10 mg/kg every 6 to 8 hours.

Benner et al. have contributed to our knowledge about the relationship between dosage regimens and serum concentrations of vancomycin in pediatric patients.⁵ Three hundred seven patients received one of eight dosage regimens with the dose ranging from 30 mg/kg/day to 80 mg/kg/day. Patients ranged from 1 month

to 18 years in age and could have had any type of illness. The target ranges for peak and trough serum concentrations were 25-40 mg/L and 5-15 mg/L, respectively. The data were collected retrospectively from January to July 2004. The limitations of this study include retrospective design, heterogenous patient demographics, relatively small number of patients in some groups, and lack of documented clinical outcomes in terms of efficacy or toxicity.

Some authors have suggested that the target trough concentration in adults should be in the range of 10-20 mg/L.^{2, 6-9} Although Benner et al.⁵ used a target trough concentration of 5-15 mg/L, a specific target range based on clinical evidence in pediatric patients is unknown. This emphasizes the need to conduct prospective efficacy and safety studies in pediatric patients (premature infants to adolescents) for the treatment of various infections.

Benner et al.⁵ have raised concerns about the nephrotoxicity and ototoxicity associated with increasing doses of vancomycin in pediatric patients. Previous studies, however, have not established a direct link between recommended doses of vancomycin and toxicity.¹⁰⁻¹² The observed peak and trough serum concentrations of vancomycin ranged from 10-55 mg/L and 2-18 mg/L in one study,¹⁰ and the target ranges for peak and trough serum concentrations were 20-40 mg/L and 5-15 mg/L in another.¹¹ Nephrotoxicity was not observed in any patient,^{10,11} even with concurrent gentamicin therapy with its serum concentration within the therapeutic range.¹⁰ Infants with peak and trough serum concentrations as high as 49.7 and 39.4 mg/L, respectively, also did not develop nephrotoxicity.¹² Thus, the

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risk of toxicity associated with vancomycin has not clearly been established in the pediatric age groups with normal renal function.

In summary, intravenous vancomycin continues to be an essential antibiotic for the treatment of serious infections caused by Gram-positive bacteria. At higher doses needed to overcome increasing resistance, we have limited clinical data correlating vancomycin serum concentrations to its efficacy and safety in pediatric patients. Thus, it seems reasonable to selectively monitor its serum concentrations in this population. Implementing explicit criteria can decrease unnecessary vancomycin serum concentration monitoring and costs without adversely affecting health outcomes.¹¹

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