

Impact of clinical decision support guidelines on therapeutic drug monitoring of gentamicin in newborns

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Background: Our institution's gentamicin dosing and therapeutic drug monitoring (TDM) practices for newborns were suspected to be very heterogeneous. Once-daily dosing (ODD) or extended-interval dosing (EID) and trough concentration measurement were recommended. Clinical decision support guidelines were developed and implemented as clinical decision support in the computerized prescriber-order-entry (CPOE) system. Impact on dosing, TDM practices and blood sampling were evaluated.

Methods: A one-year retrospective historically controlled study before (04.2008-03.2009) and after the implementation of guidelines (01.2010-12.2010) for newborns (<30 days of life) receiving gentamicin. Blood concentrations (% of peak-concentrations sampled, % of patients with 0 or 1 concentration sampled, % of trough concentrations ≤ 1 mg/L), dose regimen (ODD/EID) were compared between groups. Factors potentially associated with gentamicin concentration were analysed (multivariate analysis).

Results: 132 (post-guidelines) vs 102 (pre-guidelines) patients were included (median gestational age: 34.3 vs 35.8 weeks, $p > 0.05$). After implementation of the guidelines, an ODD/EID regimen was almost exclusively used (97.7% vs 61.6%, $p < 0.001$), the percentage of peak concentrations (0.9% vs 17.2%, $p < 0.001$) and the number of blood samples per patient (87.1% having 0 or 1 concentration measured vs 48.0, $p < 0.001$) sharply reduced. A significantly higher percentage of trough concentrations were ≤ 1 mg/L (68.5% vs 33.0%, $p < 0.001$). The probability of a trough concentration ≤ 1 mg/L increased with an ODD/EID regimen (OR 7.23 [3.48; 15.0], $p < 0.001$) and in the post-guidelines group (OR 2.02, [1.01; 4.02], $p = 0.045$).

Conclusions: Guideline implementation generated a sharp reduction in blood sampling. Clinical benefits of better gentamicin dosing and TDM practices were evident. Cost-effectiveness and clinical benefit of reduced blood sampling should be evaluated.