

Pharmacists' Compliance with Monitoring for Aminoglycoside Renal Toxicity

Since July 1993, St. Paul's Hospital, Vancouver, British Columbia, has used once-daily dosing of aminoglycosides for patients not excluded by certain specific criteria (criteria for which there is inadequate evidence to verify the efficacy of this dosage regimen). Once-daily administration takes advantage of the enhanced ability of aminoglycoside antibiotics to eradicate bacteria, since bacterial kill is proportional to aminoglycoside concentration.^{1,2} In addition, the risk of drug toxicities, namely nephrotoxicity and ototoxicity, is not higher than with traditional multiple dosing.²⁻⁶ Once-daily dosing also promotes better use of hospital personnel resources, since routine measurement of serum aminoglycoside concentration is not needed; furthermore, fewer IV bags need to be prepared and administered, which results in an additional cost saving.

Determination of drug level is unnecessary with once-daily dosing, because there is no evidence to indicate that dosage adjustment to meet a certain desired serum concentration affects outcome (in terms of either efficacy or toxicity).² However, because pharmacokinetic assessment is unnecessary, an alternative method for detecting toxicity at an early stage is needed. An increase in the serum creatinine level can serve as an early sign of nephrotoxicity caused by the drug. For this method to be effective in detecting the early signs of renal toxicity, serum creatinine concentration must be measured frequently. The current recommendation at our institution is to measure serum creatinine at least twice weekly. Previous quality-assurance evaluations at St. Paul's Hospital have shown inadequacies in monitoring for renal toxicity with once-daily dosing. In an attempt to facilitate more comprehensive monitoring, pharmacists were given the authority to independently order serum creatinine measurements for patients receiving once-daily aminoglycosides, and an evaluation was performed to confirm that pharmacists were monitoring appropriately for aminoglycoside-induced

renal toxicity. The evaluation showed that 81 patients received a mean dose of 5.5 mg/kg daily over a mean period of 8 days for a variety of infections. No patients met the criteria for aminoglycoside-induced nephrotoxicity; however, for 16 (20%) of the 81 patients, pharmacist monitoring of renal function was inadequate. Although no patients were identified as suffering toxic effects from the aminoglycoside therapy (the outcome indicator), deficiencies in the pharmacists' monitoring (the process indicator) are placing patients at potential risk of toxic effects.

Quality care has been defined as having the following characteristics:⁷

- (i) provides the optimal improvement in a patient's health
- (ii) incorporates health promotion and disease prevention
- (iii) is timely
- (iv) involves informed patient cooperation and participation in the care process and decisions
- (v) is based on accepted scientific principles
- (vi) incorporates sensitivity and concern for the patient's welfare
- (vii) uses technology efficiently
- (viii) includes sufficient documentation to allow continuity of care and peer evaluation.

The prevention of aminoglycoside renal toxicity improves quality of care by incorporating the characteristics of points (ii), (v), (vi), and (vii). The development of guidelines for care has been recognized and approved as a method for improving the quality of patient care.⁷ The development of guidelines for aminoglycoside use and monitoring for toxicity would be considered a valuable step in improving quality of care. However, just developing guidelines for care is not adequate for assessing the quality of care. The identification and monitoring of indicators of care is recommended to ensure that quality care is actually



being provided.⁸ Indicators of care should use data that are readily available, are consistent across patients, and relate to the patient care process or outcome.⁹ Indicators of care should include outcome (How did the patient do?) and process (What care did the patient receive?).⁸ In this evaluation, the outcome would be the prevalence of nephrotoxicity, and the process would be compliance with the monitoring of serum creatinine. Other authors have described methods for assessing quality of care of pharmacists' activities with regard to clinical interventions¹⁰ and documentation.¹¹ Our evaluation would suggest that monitoring how well pharmacists comply with guidelines is a potentially valuable process indicator of quality care. Although no patients suffering detrimentally from the monitoring practice were identified, we feel that the deficiencies in monitoring put patients at risk. Ongoing use of this indicator and the associated outcome indicator of renal toxicity will determine if quality of care by the pharmacists has improved.

Since completion of this evaluation, efforts to ensure that the pharmacists are more diligent in monitoring serum creatinine at least twice weekly have included providing the results of this report to each pharmacist in the department and ensuring that all pharmacists are aware of their responsibility to adequately monitor serum creatinine during aminoglycoside therapy and their authority to order appropriate testing. The pharmacists also recommended a more precise recommendation that includes a baseline measurement at the start of therapy and a frequency of monitoring of at least once every 3 days after the fourth day of treatment.

Individual pharmacists and pharmacy administrators should consider selecting and evaluating outcome and process indicators of the quality of pharmacists' patient

care activities. Ongoing evaluation is required to ensure that patients are receiving the quality of care desired.

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References

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