Inappropriate Gentamicin Prescribing: Is it safe to adopt gentamicin / narrow spectrum combination empirical treatment approach to spare broad spectrum antibiotics?

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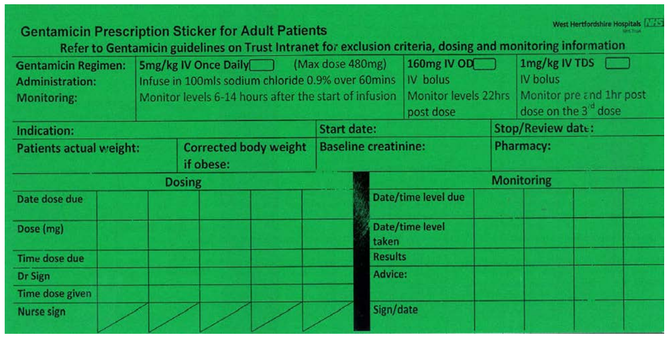
Introduction

Increasing rates of resistance has led many clinicians to empirically treat patients with multiple broad-spectrum antibiotics, potentially perpetuating the cycle of increasing resistance and creating an economic burden. Using narrower spectrum antibiotics in combination with aminoglycosides is increasingly being adopted by Microbiology departments to empirically treat septic patients, thus sparing broader spectrum antibiotics. Aminoglycosides have a narrow therapeutic index and their appropriate use poses challenge to clinicians as they require careful consideration of multiple factors. Previous studies evaluating antibiotic use in hospitals have shown that up to 50% of prescriptions can be inappropriate (Zahar et al., 2006). The aim of this study was to prospectively assess the appropriateness of gentamicin prescribing at our hospital and to implement neccessary measures to ensure safe prescribing prior to incorporating it in common treatment algorithms.

Methods

Data on patients who had samples taken for Gentamicin therapeutic drug monitoring were sent daily to the investigator by the pharmacist. Data on the regimen of gentamicin prescribed, dose, actual body weight, height, corrected body weight, creatinine level, indication, timing of monitoring, re-dosing advice and clinical indication were collected from the patients' medical notes, drug chart (gentamicin sticker) and nursing notes. The investigator assessed the appropriateness of use based on correct dosing, monitoring and re-dosing interval and documentation of creatinine level and clinical indication.



Gentamicin Prescription Sticker for Adult Patients

West Hertfordshire Hospitals NHS

Refer to Gentamicin guidelines on Trust Intranet for exclusion criteria, dosing and monitoring information

Gentamicin Regimen:	5mg/kg IV Once Daily ☐ (Max dose 480mg)	160mg IV OD ☐	1mg/kg IV TDS ☐
Administration:	Infuse in 100mls sodium chloride 0.9% over 60mins	IV bolus	IV bolus
Monitoring:	Monitor levels 6-14 hours after the start of infusion	Monitor levels 22hrs post dose	Monitor pre and 1hr post dose on the 3rd dose

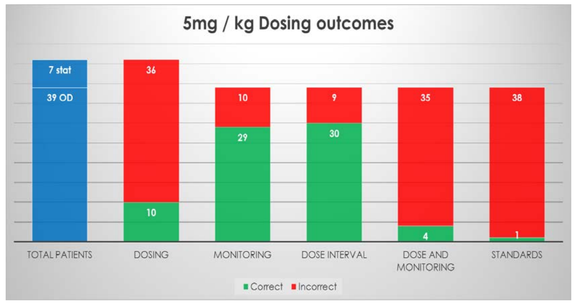
Indication:		Start date:	Stop/Review date:
Patients actual weight:	Corrected body weight if obese:	Baseline creatinine:	Pharmacy:

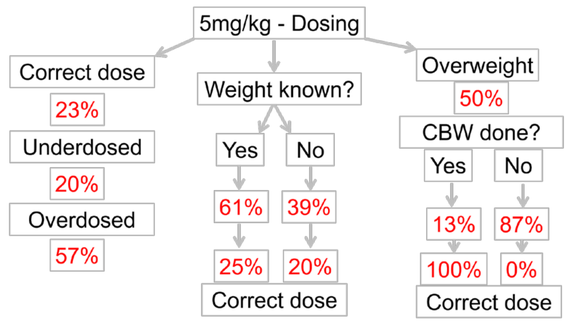
Dosing						Monitoring					
Date dose due						Date/time level due					
Dose (mg)						Date/time level taken					
Time dose due						Results					
Dr Sign						Advice:					
Time dose given											
Nurse sign						Sign/date					

Results

46 patients were included: 5mg/kg OD (n=39), stat 5mg/kg (n=7). Figure 1 illustrates findings on safety of Gentamicin prescribing. 54.3% received a higher than expected dose and 19.6% received a lower than expected dose.

It was also found that prescribers did not use weight and height updated regularly in nursing documentation and instead used either no weight (28.2%) or an out of date weight (46.2%) from the drug chart. Patients not weighed prior to dosing received the wrong dose 82.7% of the time. Patients who required correction of their body weight (47.8%) received the wrong dose 100% of the time if that correction had not been documented and correct 100% of the time if documented (6.5%). This was secondary to only 8.7% of patients having height documented. 10.3% met criteria for minimum safe administration (dose, monitoring and re-dosing interval correct). All standards set were met by only 2.6% of prescriptions.





Discussion

Gentamicin was used exclusively in combination therapy to treat infections in the sample studied, and prescribing was considerably substandard and potentially unsafe. Data collected suggests this was likely in part due to insufficient diligence in obtaining patient weight and height and calculating corrected body weight. While initial dose of Gentamicin should be given according to actual body weight, the follow-on doses were not corrected as necessary in all of the studied data. Although monitoring methodology was pre-printed on stickers, incorrect monitoring intervals were used or levels not checked versus the Craig-Urban normogram. While Craig-Urban have validated their data at 7mg/kg once daily dosing, the local Trust opted for 5mg/kg dosing with a cap at 480mg to reduce complications, but retain effectiveness as discussed with Craig and Nicolau. Nevertheless, it is notable that errors in prescribing can carry considerable risk of harm from toxicity as well as financial costs of increased hospital stay and litigation and will require further investigation and intervention to reduce.

Conclusion

Further training and redesign of stickers is recommended prior to more widely incorporating Gentamicin into narrow spectrum treatment approaches. Use of decision support tools may also aid clinicians in correctly prescribing Gentamicin. Further studies on appropriateness of indication, culture results and duration of treatment are needed to prevent incorrect use of Gentamicin.

Zahar JR, Rioux C, Girou E, Hulin A, Sauve C, Bernier-Combes A, Brun-Buisson C, Lesprit P (2006) Inappropriate prescribing of aminoglycosides: risk factors and impact of an antibiotic control team. *J Antimicrob Chemother*. 58, 651-6.

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