

LETTER

**Prescribing liquid medication:
 can the dose be accurately
 given?**

Dosing errors and children are uncomfortable bedfellows but will they ever be separated? Published research indicates that dosing errors are the most common type of errors.^{1 2} An audit was undertaken of liquid medications prescribed to paediatric and neonatal inpatients at two hospitals in North West England over a 5-week period in January–February 2011. The aim of the audit was to explore the measurable proportion of prescribed doses of liquid medication for children and neonates.

Anonymised patient and drug details including name, strength, prescribed dose of drug, volume to be administered and whether the dose was measurable in a single syringe using the graduations marked on the syringe were collected. Of the 1599 liquid doses for 431 patients reviewed, 196 doses (12.3%) were not measurable. ‘Not measurable’ doses were categorised according to their British National Formulary classification. Medicines that were deemed not measurable included those for infection 34% (67), analgesia 25% (49), antiepileptics 4% (7), corticosteroids 11% (21), gastrointestinal medicines 9% (18) and sedatives 5%

(10). Table 1 indicates a sample of ‘not measurable’ doses.

The study found that one in eight prescribed doses of liquid medicine for children and neonates cannot be accurately measured in a single syringe. This must be addressed. Ideally, the measurability of prescribed doses of medicine should be considered at the time of prescribing or be reviewed by the pharmacist prior to administering the first dose.

Analgesics and antibiotics are among the most common drugs prescribed for children yet over 25% of doses are not measurable in hospital. It raises the question of what happens in the home environment. Interestingly, those drugs with a narrow therapeutic window, for example, antiepileptics were less commonly ‘not measurable’ with 69% of prescribed doses being measurable. Is this due to prescriber’s clinician awareness of the therapeutic index of the drug and/or that they are more familiar with these drugs and purposively round doses to measurable amounts?

What variation is permitted around the prescriber’s expressed instruction opens an interesting philosophical and legislative debate. If a prescribed dose cannot be measured and an ‘almost dose’ is given would this represent a prescribing or administration error? One school of thought is that if the prescribed dose is accurate and correct, that is, the appropriate mg/kg dose, but the dose cannot

readily be administered using the dosage form available, it is an administration rather than prescribing error.³ However, what if the dose is physically impossible to administer? Is that a prescribing error?

Improving the accuracy of measuring doses of liquid medicines is complicated by the fact that concentrations of medicines vary widely and syringes have different graduations. A simple rule to round to the nearest 0.2 mL therefore does not work, and should be influenced by the total dose volume and graduations on the syringe. Further research to explore whether there are clinical implications related to inaccurate dosing of liquid medicines should be undertaken, and education/supervision is required to ensure safe practice occurs.

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Table 1 Examples of ‘not measurable’ doses

Prescribed drug	Administration route	Concentration of drug available on ward	Prescribed dose	Calculated volume to be given/taken	Syringe available on the ward
Chloral hydrate	Oral	500 mg/5 mL	50 mg	0.5 mL	2.5 mL
Cefotaxime	Intravenous	250 mg/mL	580 mg	2.32 mL	2.5 mL
Dexamethasone	Intravenous	3.3 mg/mL	1.4 mg	0.424 mL	1 mL
Gentamicin	Intravenous	80 mg/2 mL	66.5 mg	1.663 mL	2.5 mL
Hydrocortisone	Intravenous	50 mg/mL	1.6 mg	0.032 mL	1 mL
Metronidazole	Oral	200 mg/5 mL	175 mg	4.375 mL	5 mL
Morphine	Oral	10 mg/5 mL	1.48 mg	0.74 mL	1 mL
Phenobarbitone	Intravenous	60 mg/mL	5 mg	0.0833 mL	1 mL
Phenytoin	Oral	30 mg/5 mL	5 mg	0.8333 mL	1 mL
Vancomycin	Intravenous	50 mg/mL	88 mg	1.76 mL	2.5 mL



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