

## Can paediatric junior hospital doctors prescribe competently?

L Menon<sup>1</sup>, Z Taylor<sup>2</sup>, D P Tuthill<sup>1</sup>

<sup>1</sup>Department of Child Health, Children's Hospital for Wales, Cardiff, Wales, UK

<sup>2</sup>Department of Pharmacy, Children's Hospital for Wales, Cardiff, Wales, UK

Corresponding author

Leena Menon, Specialist Registrar, Department of Child Health, Children's Hospital for Wales, Heath Park, Cardiff CF14 4XW, Wales, UK. Email: leenamenon@doctors.org.uk

**Introduction:** Medication errors have long been recognised as an iatrogenic cause of morbidity and mortality. Infants and children are especially vulnerable to such errors due to their physiological immaturity and small size. It is commonly assumed that experience and qualification are beneficial for safer prescribing.

**Aim:** To evaluate the prescribing ability of paediatric junior hospital doctors.

**Methods:** A standardised evaluation of junior hospital doctors' prescribing ability was conducted at the conclusion of a one hour interactive session. This consisted of four basic questions on prescribing common medications, focussing on issues particular to paediatrics, e.g. postnatal age and weight. Calculators, drug formularies and surface area charts were provided. Additional information on qualifying university, postgraduate qualifications

and paediatric experience was recorded.

**Results:** Thirty-two junior hospital doctors were evaluated. Around a third (10/32) answered all four questions correctly. Six of the 10 had no previous paediatric experience. The other 22 doctors answered at least one question or more incorrectly. Doctors with no previous paediatric experience were four times less likely to make a prescribing error (chi-squared test, 7.31,  $P < 0.01$ ). The presence of a paediatric postgraduate qualification had no effect on the risk of a prescribing error.

**Conclusions:** In optimal conditions, a substantial proportion of trainees make unforced errors in prescribing drugs for children. Previous paediatric experience or postgraduate qualification does not infer competence to prescribe.

Paed Perinat Drug Ther 2006; 7: 118–120

**Keywords:** prescribing errors – experience – postgraduate qualification – paediatrics

### Introduction

The duties of a doctor registered with the General Medical Council start with making the care of patients their first concern. This includes prescribing only the treatment, drugs, or

appliances that serve the patients' needs<sup>1</sup>. Thus all doctors should be able to prescribe wisely and accurately in the interests of patient safety.

When provided with appropriate prescribing texts such as the *Medicines for Children*<sup>2</sup> or the

*British National Formulary for Children*<sup>3</sup> and unhurried circumstances, prescriptions should ideally, always be correct. However, errors in prescribing medications are known to cause significant morbidity and mortality<sup>4</sup>. This can be especially important in infants and children due to their physiological immaturity, smaller size and different pharmacokinetics. Such errors may stem from multiple factors such as poor medical knowledge, workload, fatigue, calculation errors and incorrect use of dose information sources. While many of these errors are minor, those associated with morbidity and mortality cause major personal tragedy, increased healthcare costs and are a source of litigation<sup>5</sup>. Indeed, these medication errors form the second largest payouts for medical defence organisations in paediatric cases in the UK. Therefore it is vital that these errors are kept to a minimum.

We wished to explore whether paediatric junior hospital doctors (Senior House Officers, SHOs), given ideal circumstances would be able to prescribe correctly. We therefore studied the prescribing ability of paediatric SHOs through a prospective study conducted at the end of an interactive session during their induction programme in our district general hospital. It was hoped that all doctors would be able to prescribe accurately and correctly.

## Methods

Our study consisted of a standardised written test with four questions requesting the doctors to prescribe commonly used medications. This was conducted during an interactive session for paediatric SHOs in their induction. The session initially consisted of a formal lecture regarding prescribing practices among children and the specific differences and challenges faced in paediatric rather than adult practice. It then highlighted the use of *Medicines for Children* and concluded with a written test. The *Medicines for Children*, calculators and surface area charts were provided. This formulary gives clear indications, routes and doses for prescribing drugs in children. This study was conducted before the recent introduction of the *BNF for Children*.

The questions centred on issues such as weight, postnatal age and surface area (Table 1). Additional information was sought on year of graduation, any postgraduate qualifications and duration of any paediatric experience.

## Results

Thirty-two doctors from a group of 37 were evaluated over 24 months. There were three

**Table 1** The questions used in the standardised written test

### Question 1

Jake is a 13 month old boy who weighs 10 kg. He has been admitted with a high temperature. Prescribe as required paracetamol and ibuprofen orally for him.

### Question 2

Bella is a baby delivered at 31 weeks. She is now 12 weeks old. She has normal renal function and weighs 2.58 kg. Prescribe IV gentamicin for her (use the single daily dose regimen).

### Question 3

Milo is a 7 year old oncology child who weighs 24 kg. He is immunocompromised and has been admitted with chickenpox. Prescribe IV aciclovir for him.

### Question 4

Fizz is a 3 year old girl who weighs 15 kg. She needs to be started on sodium valproate which she has not had before. Prescribe the sodium valproate.

trainees in general practice. All the others were trainees in paediatrics who also rotated through a nearby University teaching hospital. Five were away on the day of the induction. 23 had at least six months paediatric postgraduate experience and 15 a paediatric postgraduate qualification.

Just 10 of the 32 (31%) answered all four questions correctly, of whom six had no prior paediatric experience. Twenty-two doctors made at least one prescribing error. Thirteen doctors made two errors and eight made three errors. One doctor got all four answers wrong! Six of the nine doctors with no previous paediatric experience answered all the questions correctly. In contrast, only four of the 23 doctors with previous paediatric experience answered all the questions correctly. The differences were statistically significant (chi-squared test, 7.31,  $P < 0.01$ ).

Doctors with no previous experience were four times less likely to make a prescribing error (RR 0.26, CI 0.09 – 0.71). The possession of a postgraduate qualification was not associated with a significantly different score. Five of the 15 doctors with no paediatric postgraduate qualification and five of the 17 doctors with paediatric postgraduate qualification answered all the questions correctly (chi-squared test, 0.057,  $P < 1$ ; RR 1.13, CI 0.40 – 3.16). All doctors continued to prescribe. The one individual who answered all four questions incorrectly was reassessed to ensure competency later.

## Discussion

Prescribing errors are common in everyday practice, but often are not reported. A study in a Scottish children's hospital noted only 0.15% of admissions reporting errors<sup>6</sup>. This figure, however, is not representative of the various other data in the literature with a much higher number of medication errors<sup>4</sup>. Our study suggests that neither experience nor postgraduate qualification help in minimising such errors.

A Canadian teaching hospital study explored whether trainees' errors in prescribing can be explained by impaired calculation skills<sup>7</sup>. This was performed in 1993 and 1995 by anonymous written tests which included calculation of doses similar to those performed at the bedside. The authors found that three of 34 residents in 1993 and four of 30 in 1995 committed 10-fold errors; all of whom were inexperienced and in their first two years of training. Overall the trainees who made 10-fold errors also made more errors than the others. Despite this the authors concluded that there was lack of correlation with length of training which suggested that clinical experience has little to do with making these mistakes, and that the necessary skills for appropriate calculations are obtained much earlier during one's education. Their results are different to our findings. In our study the experienced group made more errors. This may be because familiarity breeds contempt. It would be interesting to conduct the same study among more senior paediatric staff to see the results.

An American study evaluated 21 residents' skills in performing basic mathematical calculations used for prescribing medications to paediatric patients in intensive care<sup>8</sup>. The mean test score was less than 70%. About a third of them made ten fold dosing errors with one resident having made a 1000-fold error. There were no significant differences between the classes of residents or their PICU experience and their exam scores again in contrast to our findings.

In an attempt to try to minimise such errors and improve patient safety in the UK, the National Patient Safety Agency (NPSA) was formed in 2001. One of the methods suggested by the NPSA to reduce such errors is computerised prescribing which may decrease serious medication errors by 55%, although it is not without its faults. Our study illustrates that under optimal conditions a substantial proportion of trainees still make

unforced errors and demonstrates that paediatric experience does not infer competence to prescribe. It is important, however, to recognise that the numbers of doctors tested in this study was relatively small and one therefore needs to be cautious with interpreting the findings.

Following this project we have revised the induction session to focus on the basic prescribing for children with less emphasis on the differences between paediatric and adult practice. The importance of weight, postnatal age of the child, route of drug and indication of the drug are still emphasised. A national competency based assessment in prescribing drugs for children and neonates would sit well embedded in the postgraduate MRCPCH examinations. These processes would assist ensuring safe and accurate prescribing among this vulnerable group of individuals whilst electronic prescribing is not yet widespread.

## References

1. Good Medical Practice. General Medical Council. London, UK, 1998
2. Medicines for Children. RCPCH Publications. London, 2003
3. British National Formulary for Children. BMJ Publishing Group, RPSGB, RCPCH Publications. London, 2005
4. Kaushal R, Bates DW, Landrigan C et al. Medication errors and adverse drug events in pediatric inpatients. *JAMA* 2001;285:2114-2120
5. Cousins D, Clarkson A, Conroy S, Choonara I. Medication errors in children – an eight year review using press reports. *Paed Perinat Drug Ther* 2002;5:52-58
6. Ross LM, Wallace J, Paton JY. Medication errors in a paediatric teaching hospital in the UK. *Arch Dis Child* 2000;83:492-497
7. Rowe C, Koren T, Koren G. Errors by paediatric residents in calculating drug doses. *Arch Dis Child* 1998;79:56-58
8. Glover ML, Sussman JB. Assessing paediatric residents' mathematical skills for prescribing medication: a need for improved training. *Acad Med* 2002;77:1007-1010

CrossRefs are available in the online published version of this paper:  
<http://www.librapharm.com>  
Paper PPDT-0159\_3, Accepted for publication: 26 July 2006  
Published Online: 23 August 2006  
doi:10.1185/146300906X105168