ABSTRACT

Aim
To describe a system of regular intervention monitoring among paediatric patients and how the information is used to inform the content of different strategies aimed at improving prescribing practice.

Design
Pharmacist interventions were recorded using an intervention form. The design was based on the 2006 Pharmaceutical Care Network Europe (PCNE) classification scheme. Subcategories for paediatric pharmacy use were developed and all interventions reviewed by a second pharmacist to ensure the validity of the results. A Microsoft Access database was developed for data collection and analysis.

Subjects and setting
All paediatric inpatients at the Royal London Children’s Hospital were included. The hospital has 130 beds covering a wide range of tertiary specialties.

Results
In total 377 interventions were recorded over a six-month period. Most interventions (58 per cent) were due to dosing problems, where patients were dosed incorrectly for weight, age and indication. Errors in drug choice triggered 25 per cent of interventions and drug use 13 per cent. Within the latter two categories 41 per cent were caused by incorrect drug history reconciliation. Most interventions were deemed minor in severity, with 38 per cent classed as moderate and less than 1 per cent as major errors.

The data collected informed the content of different strategies to improve prescribing practice, including intervention bulletins, tailoring of doctor induction and a prescribing test and training for pharmacy staff.

Conclusion
The intervention form is a tool that is easy to use, which can provide valuable data to guide educational strategies and increase awareness of a variety of prescribing errors.
A user guide was written, including any definitions of significance. The definitions of significance were in line with the trust incident-reporting system (Datix) definitions available at the time of development. The intervention-recording system was introduced and the user guide circulated to all team members and any new members joining the team.

A database using Microsoft Access was developed in-house to allow easy data collection and analysis. The data were input using dropdown menus that increase the validity of data entry. These also enable ease of analysis of the data captured since the data could easily be manipulated to show various results.

The intervention form is reviewed by the paediatric pharmacy team at least once a year to fine-tune the subcategories and any other recommendations to the latest version 3. The significance of interventions made has always been contentious. On reviewing the intervention form at the beginning of 2012 a modification was made to divide the significance into “actual harm” and “potential harm”.

Pharmacists were finding it difficult to differentiate the significance of the intervention. For example, an overdose of paracetamol for one dose is categorised as “no harm” or “low harm”, but if the dose were continued in the long term it could cause hepatic damage, which is major harm. With the new actual and potential harm categorisation the overdose can be classified as “no actual harm, but potential moderate harm”.

All interventions were reviewed by a second pharmacist to increase the validity of the results. This pharmacist was one of the senior pharmacists who have been involved in the development of the intervention-recording project. He or she checked the categorisation of harm to ensure they agreed with the assessment of level of harm.

If the second pharmacist did not agree with the categorisation of harm the intervention was discussed with the pharmacist who recorded the intervention. A third opinion was sought when agreement cannot be reached.

The paediatric team recorded all interventions daily, including those for prescriptions to take home (TTAs). The pharmacy department carried out annual intervention audits on interventions made one day a year.

Since the paediatric team launched the intervention-recording project, other teams have been inspired to collect daily interventions. The paediatric team helped redesign the intervention forms and individualised databases.

### Results

From October 2011 to April 2012, six months’ data were analysed. February data have been omitted from this data set because paediatric wards were moved from the old hospital building to a new building and the low incident reporting and reduced clinical workload deviates significantly from the expected results.

A total of 377 interventions were recorded over the six-month period by five or six pharmacists per month, depending on rotational numbers (Table 1).

Most interventions were problems associated with dosing, which presented itself on 217 occasions (25 per cent) as problems with drug use process (Table 2). Within drug choice and drug use (143 interventions), 58 (41 per cent) were caused by incorrect drug history reconciliation with 23 (16 per cent) caused by missing transcriptions from the drug chart (Table 3).

Within dosing problems, 27 per cent of 217 were dosed incorrectly for weight, 22 per cent for age and 21 per cent for the wrong indication (Table 4).

Sixty-two per cent of interventions were deemed minor in severity, with 38 per cent classified as moderate and less than 1 per cent as major errors and reported as an incident as defined by trust guidelines (minor — small improvement of patient care, moderate — significant improvement in patient outcome, major — life saving/prevents patient morbidity) (Table 5).

There were 142 major and three moderate interventions over the six-month period.

Two out of three major interventions were dosing problems. Of the 142 moderately significant problems 81 (57 per cent) were dosing problems, 32 (23 per cent) were drug choice problems and 22 (15 per cent) were drug-use problems (Table 6).

Most interventions (158; 97 per cent) were completely solved, while the remainder were partially solved or the outcome was unknown. There were only three incidences where the problems were not solved by the pharmacist’s intervention.

Most interventions (316; 84 per cent) occurred on inpatient drug charts. The remainder were on discharge prescriptions.

### Discussion

The number of interventions was not consistent over six months, ranging from 42 in one month to 88 in another, and the total number of interventions reported per person over the six-month period ranged from 27 to 120.

### Benefits

The data collected were used to inform the content of different strategies to increase awareness among doctors, nurses and pharmacists around prescribing errors and to guide education and prescribing training. Different strategies were chosen based on practicability and affordability, with the aim of

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**TABLE 1: INTERVENTIONS**

<table>
<thead>
<tr>
<th>Month</th>
<th>November 2011</th>
<th>December 2011</th>
<th>January 2012</th>
<th>February 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>45</td>
<td>88</td>
<td>76</td>
<td>42</td>
</tr>
<tr>
<td>November</td>
<td>88</td>
<td>76</td>
<td>42</td>
<td>84</td>
</tr>
<tr>
<td>December</td>
<td>31</td>
<td>42</td>
<td>2</td>
<td>21</td>
</tr>
</tbody>
</table>

**TABLE 2: TYPE OF PROBLEM**

<table>
<thead>
<tr>
<th>Type of problem</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>March</th>
<th>April</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse reaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug choice</td>
<td>10</td>
<td>27</td>
<td>23</td>
<td>9</td>
<td>14</td>
<td>11</td>
<td>94</td>
</tr>
<tr>
<td>Dosing</td>
<td>26</td>
<td>47</td>
<td>44</td>
<td>23</td>
<td>53</td>
<td>24</td>
<td>217</td>
</tr>
<tr>
<td>Drug use</td>
<td>8</td>
<td>12</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Interactions</td>
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<td>2</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Other</td>
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<td>1</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

**TABLE 3: BREAKDOWN OF DRUG CHOICE AND DRUG USE PROBLEMS**

<table>
<thead>
<tr>
<th>Drug selection: deterioration/improvement of disease state</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>March</th>
<th>April</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug selection: drug history reconciliation</td>
<td>7</td>
<td>12</td>
<td>11</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td>53</td>
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<tr>
<td>Drug selection: missing transcription</td>
<td>2</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>18</td>
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<tr>
<td>Drug use process: TDM monitoring/advice</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>14</td>
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<td>Drug use process: timing of administration</td>
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<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Drug use process: under/overuse</td>
<td>6</td>
<td>14</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>31</td>
</tr>
</tbody>
</table>

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Involving all the different healthcare professionals.

**Intervention bulletins** Monthly intervention bulletins are sent out to all paediatric consultants and ward sisters for dissemination to their teams to increase awareness around prescribing issues. Initially this was done as a summary document for the whole of paediatrics, outlining how many errors occurred due to, for example, wrong dosing, inappropriate choice of drug, interactions or therapeutic drug monitoring as well as giving examples of particularly common or severe errors. Recent changes in data collection now enable the error rate to be traced to specialty level, thus enabling consultants to understand problems in their specific area better and guide their junior colleagues.

The dissemination of the information on pharmacists’ input to patient care also highlights their valuable contribution in reducing medication errors. Although no cost-avoidance data were collected, recognition of the pharmacist input into the care of the patient seems pertinent in times of increased pressure to cut staff.

Junior doctor induction and prescribing tests

In past years the time dedicated to prescribing training for new doctors at the Royal London Children’s Hospital has increased. The intervention data have informed which areas to focus on during the initial training and particular attention is given to drugs with which we see the highest error rates. Based on the data, a prescribing test has also been developed and incorporated in the new doctor induction programme. This is not the Royal College of Paediatric and Child Health test but the scenarios are similar.

Education and training of pharmacy staff

Interventions are discussed monthly in the paediatric pharmacy team meetings and particularly interesting interventions are highlighted. This often stimulates lively discussions and enables more junior staff to learn from the experience of others.

Pharmacists studying for a diploma find the intervention form a tool that is easy to use that can provide valuable data to guide educational strategies and increase awareness of types of prescribing errors. Different strategies have been used to improve prescribing based on the intervention data. From the data collected so far, it is not possible to ascertain the impact these different strategies had on reducing error rates. That will be the focus of future research.

Currently, no economic data are available to align the interventions we make with health economic worth.

**Conclusion**

In conclusion, the intervention form is a tool that is easy to use that can provide valuable data to guide educational strategies and increase awareness of types of prescribing errors.

**References**


