Use of structured paediatric-prescribing screens to reduce the risk of medication errors in the care of children

KEYWORDS: ELECTRONIC PRESCRIBING AND MEDICINES ADMINISTRATION, CLINICAL DECISION SUPPORT, MEDICATION ERRORS, STRUCTURED PRESCRIBING PATHWAYS, PRESCRIBING IN PAEDIATRICS.

ABSTRACT

Prescribing for children is often more complex than prescribing for adults, as most doses need to be calculated from bodyweight. Most electronic prescribing systems are designed for treating adults, and paediatric doses are often given only cursory attention. In this article we report our experience of use of structured pathways for paediatric prescribing in a district general hospital.

A project team consisting of pharmacists, paediatricians and IT analysts was formed to review the existing pathways and to design and implement new prescription pathways for a series of drugs.

A before-and-after audit of prescribing errors in treatment of children demonstrated that the new pathways significantly reduced prescribing errors, from 26% to 4% in the case of paediatricians and from 76% to less than 7% in the case of non-paediatricians.

We conclude that structured pathways are an effective way of reducing errors in prescribing for children.

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Evidence of the difference a structured prescribing pathway can make in reducing prescribing errors is presented by **Keith Farrar** and **colleagues** from Wirral Hospital.

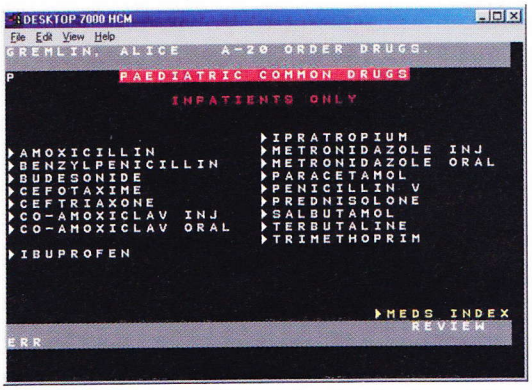
A report commissioned by the US Agency for Healthcare Research and Quality estimated that 770 000 Americans are injured or die from adverse drug events (ADEs) every year.[1] In a landmark study, Bates and colleagues found a rate of 6.5 actual and 5.5 potential ADEs per 100 hospital admissions.[2] They also found that 42% of the life-threatening or serious errors were preventable and that most of the preventable ADEs occurred during drug ordering (56%), or administration (34%). Kaushal and co-workers found that the rate of errors in paediatric prescribing was three times that found in adults.[3] Children are at particular risk from prescribing errors as almost all doses of drugs for children are based on bodyweight, creating opportunities for errors both in calculating doses and in performing dilutions.[4] Misplacing of a decimal point can cause 10, 100 or even 1000-fold errors, and there have been several reports of such errors resulting in morbidity and mortality.[5]

An analysis of 4032 prescription items for 275 children in our hospital found 246 prescribing errors, with higher rates of error amongst non-paediatrician prescribers (mainly surgeons and anaesthetists who operate on both adults and children, as is common in most district general hospitals). While many of these errors were of minor clinical significance, such as prescribing drugs to be given at inappropriate times of day — scheduling a dose for a child at 10pm, for example can cause difficulties and inconvenience for patients.

In order to reduce the potential for error in the prescription of medicines for children we decided to review and revise the electronic order pathways for

The development described in this article won third place in its category at the 2003 Healthcare IT Effectiveness Awards.

Pictured from left are: Brian Power, Dr James Robertson, Ann Slee and Keith Farrar.



Copy of main drug list at the beginning of the paediatric pathway

paediatric medicines. The study had shown that 86% of prescribing by non-paediatricians involved only 16 drugs, and this relatively small number meant that the work involved would not be excessive.

Tackling the issue

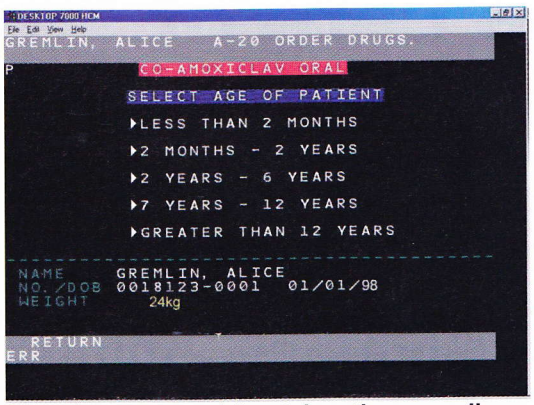
A project team consisting of pharmacists, paediatricians and IT analysts was formed to review the prescribing pathways and to design and implement changes for a series of agents. The proposed new pathways were reviewed by a small group of stakeholders before coding, and then extensively tested before introduction into clinical practice.

Determining problems and pathway design

Common prescribing problems were identified from an intervention database used to record interventions by pharmacists. The root causes of these problems were then discussed by the multidisciplinary team and suggestions made for better prescribing pathways to prevent such problems. After discussion of a number of pathway designs, a template was identified that covered many of the problems of dose calculation and could be applied to a variety of drugs. This had the advantage of minimising the training requirements (for prescribers) associated with the changes.

Standard dosing systems

We consulted standard paediatric textbooks for the dosages to be used, but these authorities all base doses on bodyweight, and one of the major problems we wished to overcome was the risk of possible miscalculations by busy medical and nursing staff. Consequently, it was clear that we should not continue to give doses in 'mg/kg' as usually done for children.



Selecting co-amoxiclav takes the prescriber to an age-branded screen

Doses calculated by clinicians, using this mg/kg basis formula, are also often unnecessarily precise, specifying a volume of drug that may be difficult to measure; moreover, the safety profile of common paediatric medicines does not require such accuracy. We therefore developed an alternative pathway that allows a prescriber to select an age or weight band which then guides them to an appropriate dose, without the need for any complex calculation. The dosage schedule is also tailored to reflect the normal waking and sleeping patterns of childhood.

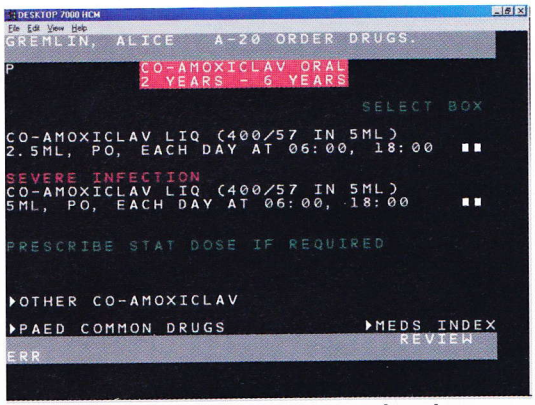
a before-and-after audit was used to measure differences

Identifying impact

To assess the impact of the changes in the prescribing pathways, a before-and-after audit was used to measure outcomes. For this a pharmacist reviewed prescriptions written for children to identify those that involved a prescribing error; those found were then also reviewed by a paediatrician.

Results

The impact of the new paediatric pathways on prescribing by non-paediatricians is shown in table 1. The error rate was reduced dramatically and although the sample audited was small, the difference is statistically significant ($P<0.05$, chi-squared test).



Selection of the appropriate age band identifies the required dose for selection

Table 1 Impact of paediatric screens on prescribing by non-paediatricians

	Correct	Incorrect	Error rate	P value
Main system	9	29	76%	
Revised paediatric system	29	4	12%	<0.05
Additional (non-coded) drugs	4	1	20%	

The impact of the new pathways on prescribing by paediatricians is shown in table 2, the difference again being significant ($P<0.05$).

Paediatricians, as might be expected, use a wider selection of drugs than their non-paediatric colleagues. During the study 16 drugs accounted for 58% of their prescriptions but with the addition of soluble prednisolone to the paediatric pathway, 17 drugs

Table 2 Impact of paediatric screens on prescribing by paediatricians

	Correct	Incorrect	Error rate	P value
Main system	48	17	26%	
Revised paediatric system	78	3	4%	<0.05
Prednisolone	9	4	31%	

would have accounted for 68% of their prescribing.

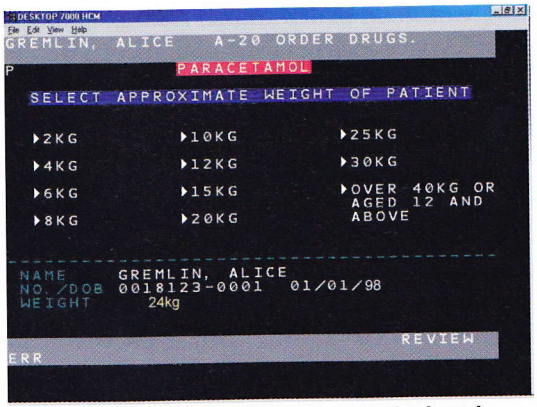
Discussion

Prescribing for paediatric patients presents particular challenges for medical staff and risks for patients, particularly when this is undertaken by non-paediatric specialists. Evidence from a number of studies has shown that electronic prescribing systems, particularly when associated with interactive clinical decision support can reduce these risks.[6,7,8] Similar findings have been seen in paediatric prescribing[9] but not using structured pathways for prescribing. Wirral Hospital has been using the TDS 7000 (Eclipsys) electronic prescribing module as part of its hospital information system for over 10 years. While this system is somewhat dated and does not have interactive 'rules-based' clinical decision support, it is extremely flexible, allowing a significant degree of local customisation, which has allowed us to build decision support into customised prescribing pathways. This process differs from standard decision support mechanisms in that instead of alerting the prescriber to an error, the system guides the prescriber to the appropriate drug or dose selection at the outset, thus minimising the opportunity for error.

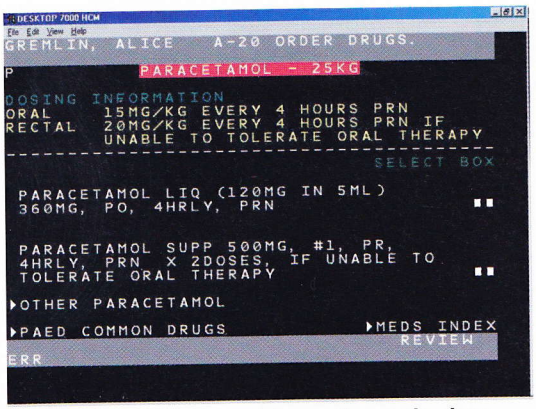
Many of the most successful hospital information systems seem to have this degree of flexibility allowing for local customisation of the prescribing pathways. This may be a significant factor in gaining clinician 'ownership' and, thus, use of an integrated clinical care system.

Conclusions

The risks associated with prescribing for paediatric patients can be significantly reduced by the use of structured prescribing pathways that guide prescribers to the appropriate drug and dosage choices. ■



Selection of the appropriate weight band identifies the required dose for selection



Choosing paracetamol from the main drug list takes the prescriber to a weight-branded screen

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