Neonatal and Paediatric Pharmacists Group, 10th Annual Conference

The 10th Annual Conference of the NPPG was held in Newcastle upon Tyne in November 2004. There were over 200 delegates at the conference. There were six oral presentations and 19 poster presentations, 16 of which are listed below.

O1
Drug use evaluation of omeprazole and its associated problems with administering doses less than 10mg and/or administration via a feeding tube

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Objective: The aim of this audit was to do a baseline investigation of the administration of omeprazole to children at the hospital and to gauge the incidence of problems associated with administering doses less than 10mg and administering omeprazole down a feeding tube.

Methods: All inpatients and out-patients that were prescribed omeprazole over a thirteen week period were recorded during the audit by the hospital pharmacists. Data such as date of birth, weight, dose of omeprazole and whether it was administered via a feeding tube were retrieved. The type and size of tube was recorded if possible. What method used to administer the omeprazole was retrieved and the parents were interviewed to find out if they have had problems administering omeprazole in the past. The nurse taking care of the child was also quizzed to find out if he/she were aware of any problems associated with administration of omeprazole.

Results: 23 patients prescribed omeprazole were recorded during the allotted period. By the far the most common method of administration was by dispersing the tablet in water and a volume of the mixture given (60%). One patient had omeprazole dissolved in sodium bicarbonate solution and another had their dose by halving a tablet. Nearly 50% (n=11) had omeprazole administered via a feeding tube. Of these, five patients (45%) had previously had a blockage of the tube due to administration of omeprazole, with 2 patients requiring replacement of the tube. The sizes of the tubes that were blocked were in the range of Fr gauge 6–8. 30% (n=7) of patients audited had a dose less than 10mg. 6 of these patients had their dose administered by dispersing a tablet in water and using a 'proportional' volume of this mixture to give the dose and one patient had half a tablet administered. On questioning, only two nurses were aware of problems with settling and getting an accurate dose using the former method. Similarly, only two nurses interviewed were aware of the problems of tubes blocking with omeprazole administration.

Conclusion: With nearly 50% of patients reporting previous tube blockages after omeprazole administration, it is clear that it is a substantial problem among this group of patients. Administering doses less than 10mg occurs frequently in paediatric patients but there seems to be little appreciation by nursing staff of the problems associated with giving omeprazole in this way. The production of explicit guidelines, provision of appropriate training and consideration of lansoprazole as an alternative are needed to remedy these problems.

O2
Use of lepirudin to treat deep vein thrombosis (DVT) in a child with suspected heparin induced thrombocytopenia and severe renal impairment.

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Objective: To report the use of Lepirudin in a child with acute renal failure. There are limited case reports of Lepirudin in the paediatric population and to my knowledge no case reports in a critically ill child with concurrent renal failure.

Design: Case report

Setting: A tertiary paediatric intensive care unit (PICU)

Patient: A 20-month-old female with recurrent status epilepticus and global developmental delay was retrieved from a district general hospital following a prolonged seizure unresponsive to standard treatments. She was intubated and ventilated on PICU for 5 days where she was also treated for presumed sepsis. She developed multi-organ failure with hepatic and renal dysfunction. While on PICU she developed a coagulopathy with thrombocytopenia. She was noted to have a swollen left leg and ultrasound scan showed complete occlusion of the left external and common iliac vessels. The DVT was thought to be secondary to placement of a femoral line.

Interventions: Therapeutic treatment with Heparin was commenced. However, the platelet count continued to fall and there was concern that she may have developed Heparin-induced thrombocytopenia (HIT). She was commenced on an intravenous infusion of Lepirudin. This is an unlicensed treatment for children and was complicated by the fact that this drug is almost exclusively renally excreted and metabolised. Therefore, doses were calculated based on her estimated creatinine clearance and activated partial thromboplastin time (aPTT). Her platelet count increased. The swelling in her leg resolved. Subsequently, she tested negatively for Heparin- induced thrombocytopenia so therapy continued with subcutaneous low molecular weight heparin and warfarin therapy was initiated.

Conclusion: Lepirudin therapy has been used safely and effectively in a 20 month old child for the treatment of a DVT even in the presence of severe renal impairment.

O3
An investigation of cystic fibrosis prescribing issues in primary care within a United Kingdom specialist services commissioning region

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Objective: To review current prescribing practice and consider whether this met families needs with a view to developing an improved model for medication provision.

Methods: A semi-structured method was chosen to interview families and general practitioners. Invitations were sent to 110 general practitioners, 10 positive replies were received and seven have been interviewed. Nineteen parents and patients have been interviewed with three others refusing consent.

Results: Families were accepting of the current system but a lack of understanding by general practitioners, pharmacists and reception staff was problematic. This was especially true of medicines with variable usage such as Creon®. Some families felt it was a "constant battle" to obtain medicines. Repeat prescriptions were often not updated following changes made by the specialist team. This led to inaccurate labelling for directions and patients running out of medicines more frequently following dose or frequency increases. The process for obtaining medicines was time consuming, with medicines running out at different times due to variation in the quantities prescribed. Most patients received monthly prescriptions although several would have preferred to receive prescriptions for 3 month intervals. Many families admitted to stock piling because of delays between requesting and receiving medicines, some families had to wait up to 3 weeks. An ability to order the repeat prescriptions via the community pharmacist was greatly appreciated by families as this reduced the lag time in obtaining medicines. Almost all GPs admitted to poor disease knowledge and were unfamiliar with many of the medicines used or unsure of their indication. Despite this lack of knowledge they felt they were best placed to prescribe due to accessibility and availability. Some GPs had never engaged with the family abrogating responsibility for all care to the specialist team, excepting prescribing. Most GPs updated their patient's repeat prescription record themselves rather than delegating to a member of administrative staff. They rely on clear information about prescribing changes from the secondary care teams but this if often inconsistent or unclear. Many prescribed medicines for off-label use and felt uncomfortable taking this responsibility. Requests from secondary care for prescribing of medicines not available on the practice prescribing system caused significant problems in the community as GPs were unable to add these items to electronic repeat prescription requests. General practitioners sometimes had to contact the hospital for clarification about faxed acute prescription requests.

Conclusion: This study highlights the considerable difficulties many families have in obtaining medicines. Although GPs are prescribing routinely there are serious shortcomings with the current system. Improvements need to be made to the method in which prescribing changes are communicated to general practitioners. A member of the CF team should be given responsibility for supporting medicines management in these patients. Greater links should be made with the community pharmacists and encouragement given for more repeat request services to be made available.

O4
Benefits of a paediatric palivizumab administration clinic

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Objective: Respiratory synctial virus (RSV) accounts for up to 70% of bronchiolitis hospital admissions in children with an expected mortality of 2% [1,2,3]. A review was undertaken to assess the suitability of referred patients, compliance in attendance, safety and side effect profile of Palivizumab and drug expenditure savings over a 2 year period in a designated paediatric clinic.

Methods: All patients who attended the clinic were retrospectively assessed using the University College London Hospital (UCLH) Palivizumab guideline derived from the Joint Committee of Immunisation and Vaccination recommendations. Using the UCLH Palivizumab record form, attendance at clinic, adverse events and admissions to hospital were documented. The pharmacy computer system was used to identify the number of vials dispensed per month. The total monthly expenditure was compared to a theoretical model where each patient would have had the vials dispensed individually

Results: Over the 2 year period (2002–2004), 11 infants (4 months – 16 months) were treated at the UCLH paediatric out-patient clinic. Doses of palivizumab ranged from 47mg to 190mg per administration. All patients had chronic lung disease with 8 requiring oxygen throughout treatment. A total of 51 doses were administered. There was a 100% attendance rate at the clinic although two infants moved out of the area after the third dose and did not complete the course at this centre. During this period, three patients required hospital admission during the RSV season. One admission was due to a RSV positive episode. No patients demonstrated an adverse event following palivizumab administration. There was a total drug cost saving of approximately £11,000 using this clinic.

Conclusion: The implementation of a multidisciplinary paediatric palivizumab clinic provides a structured approach to the management of appropriate high risk infants. The formation and running of this clinic is associated with substantial cost savings.

References:

1. Meissner H, Rennels M, Pickering L, Hall C. Risk of severe respiratory synctial virus disease, identification of high risk infants and recommendations for prophylaxis with palivizumab. Pediatr Infect Dis J 2004; 23: 284-285.
2. Golombek SG, Berning F, Lagamma E. Compliance with prophylaxis for respiratory syncytial virus infection in a home setting. Pediatr Infect Dis 2004; 23: 318-322.
3. Centers for Disease Control and Prevention (CDC). Update: Respiratory Syncytial Virus activity – United States, 1997-98 season. MMWR Weekly 1998; 47: 1043-1045.

O5
Review of paediatric emergency drug boxes

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Objective: To rationalise the content of the paediatric emergency drug boxes and to update them in line with current guidelines. For many years at Chelsea & Westminster Healthcare NHS Trust drugs for use in paediatric emergencies were stored in white polystyrene trays containing loose ampoules. This had been causing many problems. The trays were sealed with a plastic wrap requiring scissors to open, not ideal in an emergency. The packaging of the trays often resulted in the ampoules moving around in the tray and sometimes they could not be found quickly. Over time a number of products had become unavailable, and some treatment guidelines had changed, therefore the boxes contained some unnecessary items but also did not contain some important items. The trays were rarely used but had a total value of £2000.

Methods: Paediatric emergency trays were located in all parts of the hospital where children are treated. The trays contained 16 different drugs for six different types of emergency. The content of the paediatric emergency drug boxes was compared to current APLS guidelines. The senior paediatric pharmacist met with consultants and ward/department managers for all areas involved. Suggestions were collated and consensus was achieved after second meetings with most staff.

Results: Initially some staff suggested separate boxes for each type of emergency; however this would have been expensive and time-consuming for pharmacy to fill the boxes. Also some items require refrigeration making this suggestion impractical. It was therefore suggested to have a Paediatric cardiac arrest box to hold only drugs required for cardiac arrest. NICU had slightly different requirements and so a NICU box was designed. The labour ward requested an obstetric box for their resuscitares. All other drugs required for the other emergency situations would be on stock lists of all areas affected by the change. Pharmacy would ensure that these emergency items would never be deleted from stock lists even if annual usage was zero. A company called Gard Plasticases packaged the required drugs in transportable foam padded boxes. The new boxes have a total value of £1000.

Conclusion: The emergency drug boxes for children and neonates have been rationalised and updated in line with current guidelines. This has resulted in an improved system with reduced risk and has resulted in a cost saving of £1000.

Reference:
Resuscitation council guidelines Dec 2000

O6
National study of extemporaneous preparations in English paediatric hospital pharmacies

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See full paper published in Paed Perinatal Drug Ther 2004; 6: 75-80

P1
Developing guidelines for recognising and managing neonatal drug withdrawal

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Objective: Due to the widespread increase in the use of drugs of addiction, including amongst pregnant women, the incidence of Neonatal Abstinence Syndrome (NAS) appears to be rising. Polydrug use is also noted in some cases. The need for guidelines for dealing with neonatal drug withdrawal and information regarding individual drugs was identified. This report describes the processes undertaken in developing guidelines for dealing with neonatal drug withdrawal and compiling individual monographs of the drugs associated with neonatal abstinence syndromes, enabling this information to be readily available 24hrs a day.

Method: A literature search was carried out including Pubmed, Medline, Cochrane databases and Medicines Information resources. Guidelines from other trusts and recommendations from the American Academy of Pediatrics were also reviewed.

The information was divided into two main sections. The first, guidelines for management of NAS, includes clinical presentation, investigations, scoring, treatment, breast feeding and discharge. The second section, individual drug monographs, is written in a consistent format under the headings; name, common street names, use, placental transfer, half life, antenatal and post natal problems, withdrawal symptoms, breast feeding and treatment. Drugs included are amphetamines, benzodiazepines, cannabis, cocaine, ecstasy, ethanol, opiates, SSRI and Tricyclic antidepressants and volatile substances.

A round table discussion at the NPPG conference in Cardiff provided a useful forum to obtain information from colleagues with experience in this area.

Areas where local policy questions remained were discussed by a multidisciplinary team of doctors, midwives, nurses and pharmacists. These discussions were incorporated into the document and a final copy produced for issue.

Results: A comprehensive document has been produced which should improve and standardise the recognition and treatment of neonatal abstinence syndrome. It is available on the neonatal unit, maternity wards and Pharmacy.

The guidelines will be reviewed and updated every two years, to include new drugs causing NAS and changes in treatment policy. We are planning to undertake an audit on the management of neonates with NAS.

Conclusion: The collation of a wide range of sources has resulted in the publication of local guidelines for recognising and managing Neonatal Abstinence Syndrome. This has standardised our recognition and management of such neonates. As far as we are aware it is the only NAS guideline written from a pharmacy and clinical perspective.

P2
Clinical trials are not providing children with the right medicine

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Objective: This study sought to ascertain how paediatric drug formulations were reported in recent published trials of oral medicines in children under 12.

Methods: We hypothesised that highly-cited journals would give full information on the drug formulation used. The five most cited journals (Citation Index, Thomson ISI, 2002) in 'Paediatric', and 'General and Internal Medicine' categories were chosen; journals excluded contained review articles or specialist areas of paediatrics. Included journals from the previous two years (July 2002 to June 2004) were hand searched and data independently extracted by two reviewers (ZK and JS) according to a protocol. Papers reporting oral medication studies in children under 12 years were extracted and the following data recorded: drug, formulation, manufacturer, and for tablets/capsules, whether there was an account of how the dose was administered. Discrepancies were resolved by both reviewers re-reading the papers and reaching a consensus. Reports were classified as containing adequate (formulation and manufacturer stated, where formulation was a tablet/capsule, an account of whether children were able to swallow the dose whole or how dose was administered given), some (formulation or manufacturer stated, where formulation was a tablet/capsule, no account of whether children were able to swallow the dose whole or how dose administered given) or no information (no mention of the formulation or manufacturer).

Result: Of the 3992 papers reviewed, 76 fulfilled the inclusion criteria. Only 28 (37%) papers gave adequate information for the study to be accurately reproduced and 20 (26%) did not state the formulation. Where the formulation was reported, only 37 (49%) used a paediatric formulation (liquid, chewable tablet, granules). Nineteen (25%) studies used tablets or capsules yet only five of these stated how the drug was administered. No paper which described tablet crushing gave pharmacokinetic data or references to show that drug absorption was adequate. No significant differences between paediatric and general medical journals were seen and no single journal consistently met the criteria for adequate information.

Conclusions: For dosing accuracy and patient compliance, the International Conference on Harmonisation (ICH) Steering Committee recommend appropriate formulations are used in paediatric clinical trials (ICH Steering Committee 2000). These guidelines were not followed in half of the papers studied. A quarter of studies used tablets or capsules yet many children under 12 years are unable to swallow them whole (Czyzewski 2000). Despite this, most tablet/capsule studies gave no details of how the dose was administered. This impairs the validity and reliability of the results as splitting tablets can cause dose inaccuracies (Breitkreutz 1999) and crushing tablets can impair drug absorption (Breitkreutz 1999, Notterman 1986). Highly-cited journals did not routinely give formulation information in paediatric clinical trials. One of the core principles in reporting scientific research is to provide enough information for the experiment to be repeated; when formulation details are omitted, the study's reliability and validity is questionable.

References:
Breitkreutz J, Wessel T, Boos J. Dosage forms for peroral drug administration to children. Paed Perinatal Drug Ther 1999: 25-33.
Czyzewski DI, Runyan DR, Lopez MA, Calles NR. Teaching and maintaining pill swallowing in HIV-infected children. AIDS Read 2000;10:88-94.
ICH Steering Committee. Clinical Investigation of Medicinal Products in the Paediatric Population E11. ICH Harmonised Tripartite Guideline, 20 July 2000.
Notterman DA, Nardi M, Saslow JG. Effect of dose formulation on isoniazid absorption in two young children. Pediatrics 1986;77:850-2.

P3
How many medicines does a paediatrician prescribe?

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The British National Formulary details hundreds of different medicines. Clinicians are able to prescribe them all. Should prescribing be limited to those agents where the prescriber is familiar with the particular medicine before they are allowed to prescribe? Paediatricians naturally prescribe from a smaller, more select group of medicines than other clinicians: but which ones do they "routinely" use? If we could identify which medicines are commonly prescribed for children, and how often they are prescribed, could this information be used to populate a prescribing pathway for children? If a clinician does not regularly prescribe a particular medicine, question can be raised about the currency of their knowledge to prescribe safely?

Objective: To collate a list of all medicines prescribed within a district general hospital for children over a 5 year period.

Methods: Wirral Hospital NHS Trust has an electronic prescribing system, PCIS, for in-patient and TTH prescriptions. Each medicine on the prescribing system is uniquely coded which allows interrogation of historical data. The hospital's Electronic Data Warehouse was interrogated to identify all medicines prescribed for children age less than 16 years.

Results: 169,668 prescriptions were written between 1998 and 2002. Free-type drug orders were written for 10,026 prescriptions. As such orders do not have an identification code detailed analysis was not possible and these were excluded from further study. Of the remaining 159,642 orders 1,236 different prescriptions were selected. The same medicine could be selected as different dosage forms or quantities: paracetamol could be prescribed as Paracetamol liq (120mg in 5ml) 120mg or Paracetamol 500mg tablet. All medicines were grouped together and the frequency with which they were prescribed is detailed in table 1. A total of 387 different medicines were prescribed.

Number of prescriptions	Number of drugs	Total scripts	Percentage of total
>1000	25	125524	79
500-1000	20	11146	7
100-499	67	16604	10.5
50-99	36	2500	1.6
<50	239	2881	1.8

The three most commonly prescribed medicines were paracetamol 42,297 scripts (24.9% of total), ibuprofen 21,023 scripts (12.4% of total) and prednisolone 7,321 (4.3% of total). Approximately 150 medicines account for 98.5% of prescriptions written for children.

Conclusion: Children are prescribed a small proportion of the total medicines currently available. We suggest that doctors who prescribe for children in our Trust should have access to only 150 medicines on the in-patient prescribing pathway. A medicine prescribed less than 50 times over 5 years equates with 10 prescriptions per year. Most prescribing within hospital is performed by junior doctors. Over each 12 months Wirral Hospital employs eight or nine junior paediatricians. We ask, does prescribing a medicine once a year imply clinical competency? We propose a model for future practice whereby if a clinician is not familiar with the medicinal product, access to prescribing could be denied until they prove competence?

P4
Thousands of children may be admitted to hospital because of wrong doses?

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Pyrexia is a common reason for presentation of children to hospital. Doses of antipyretics are listed on over the counter (OTC) medication by age, but prescribed for children in terms of weight. Could inappropriate dosing with antipyretics lead to hospital admission?

Objective: To assess the dose of paracetamol and ibuprofen used by children before admission to hospital with pyrexia and compare them with the doses used within hospital. The hypothesis tested was that inadequate dose leads to prolonged pyrexia and unnecessary hospital attendance.

Methods: A data collection form was completed for all acute paediatric referrals to Wirral Hospital NHS Trust. Data collected included age, gender, weight, temperature on admission, route and time of admission, provisional diagnosis and medication history. The correct dose of paracetamol was defined as 10–15mg/kg/dose. The correct dose of ibuprofen was defined as 5–10mg/kg/dose.

Results: Data was collected for 2 months (April–May 2004). 515 forms were completed from 858 admissions. The mean age of children was 4 years (SD4.4), 53% were male and mean weight 18kg (SD 14.9). Total number of children receiving antipyretics was 214 (25% of all admissions). Of 193 children admitted who had taken paracetamol 62% were using OTC preparations and 38% had been prescribed by a doctor. The doses for OTC paracetamol versus prescribed were correct in 40% vs 38%, incorrect in 45% vs 40% and unknown in 15% vs 22%. Of 72 children admitted who had taken ibuprofen 61% were using OTC preparations and 39% had been prescribed by a doctor. The doses for OTC ibuprofen versus prescribed were correct in 61% vs 71%, were incorrect in 7% vs 11% and were unknown in 32% vs 18%.

Conclusion: 43% of children admitted with pyrexia, and who were treated with paracetamol before admission were receiving inappropriate doses. 8% of children admitted with pyrexia, and who were treated with ibuprofen before admission, were receiving inappropriate doses. There was little difference in the appropriateness of dosing between OTC and prescribed medication. 89 children were admitted to Wirral Hospital over a 2 month period having received incorrect doses of paracetamol and ibuprofen. If this figure represents national practice, thousands of children may be admitted to hospital because of wrong doses. Further investigation is warranted.

P5
Prescribing errors in paediatric inpatients

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Background: Medication errors are not uncommon in paediatrics, particularly dosing errors [1]. There is no drug chart/case note review study of paediatric prescribing errors in the UK, all studies focused on analysis of incident reports.

Objective: To establish the feasibility of a multi-centre study investigating the incidence and nature of paediatric prescribing errors.

Methods: A review of the drug charts was undertaken for 2 weeks by the senior pharmacist for each of the paediatric intensive care unit (PICU), surgical, and medical wards at a large paediatric hospital. The researcher accompanied the senior pharmacists during their visits to these wards and recorded any prescribing errors identified. The pharmacists were given a list of events that might trigger an investigation into whether a prescribing error had occurred.

Results: The pharmacists for all three wards reviewed a total of 1066 medication orders. Various types of prescribing errors were identified. In the surgical, medical and PICU wards, 58, 34 and 70 errors were identified respectively; 51% of these errors involved the use of abbreviations. If these were excluded, the most common types were illegibility and incomplete prescriptions. The latter included not indicating the dose, route, frequency and duration of the drug, and not signing the prescription. Dosing errors were the second most frequent type and accounted for 5 (31%) and 2 (15%) of the errors in the surgical and medical wards respectively, and 6 (12%) of the errors in the PICU. There was one tenfold error in the PICU involving phenytoin, of which the first dose was given to the patient but no harm resulted. The prescribing error rates in the surgical, medical and PICU wards were 7.9, 8.0, and 7.6 per 100 medication orders respectively. The dosing error rates were 2.5, 1.2 and 0.9 per 100 medication orders in the surgical, medical and PICU wards respectively.

Conclusion: The results demonstrate that this data collection method is feasible, and can be used in a multi-centre study of prescribing errors in paediatrics. Various types of prescribing errors were identified, and their incidences were greater than those reported in similar studies in the USA [2-3], which ranged from 0.47 to 2.7 per 100 medication orders. There is a need to reduce medication errors in children, particularly dosing errors.

References:
1. Wong IC, Ghaleb MA, Franklin BD, et al. Incidence and nature of dosing errors in paediatric medications. Drug Saf 2004; 27: 661-670.
2. Blum KV, Abel SR, Urbanski CJ, *et al.* Medication error prevention by pharmacists. Am J Health Sys Pharm 1988; 45: 1902-1903.
3. Folli HL, Poole RL, Benitz WE, *et al.* Medication errors prevention by clinical pharmacists in two children's hospitals. Pediatrics 1987; 79: 718-722.

P6
Paediatrics: what constitutes a prescribing error?

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Background: A major problem with interpreting quantitative studies of prescribing errors in paediatrics is that definitions are either ambiguous or not given. This makes comparison very difficult. There is a general definition of a prescribing error developed in the UK using similar methods reported in this study[1]. However, the definition focuses on adults; paediatric is different to the adult setting.

Objective: To develop a practitioner-led definition of a prescribing error that can be applied to the paediatric setting.

Methods: A 50-member expert panel was assembled of health professionals working in the hospital setting, comprising 20 pharmacists, 17 doctors, eight nurses, four risk managers and one expert in medication error research. A two-stage Delphi technique[2] was used to determine the panel's extent of agreement with the previous developed definition of a prescribing error and its applicability to paediatrics, as well as their extent of agreement with 38 scenarios that might be classified as prescribing errors. Participants indicated their extent of agreement in a postal questionnaire; their scores were then summarised and included in a repeat version of the questionnaire so that each participants could reconsider their scores in view of the group's responses. Each participant's views were treated equally and each participant was anonymous to the remainder of the panel.

Results: Response rates were 84% (42) in the first Delphi round and 95% (40) in the second. Consensus was to accept the researchers' proposed general definition of a prescribing error in paediatrics. In addition, there was consensus that 25 of the 38 scenarios should be included as prescribing errors and that six should be excluded. For the remaining seven, it was equivocal as to whether or not they should be considered prescribing errors.

Failure to communicate essential information, transcription errors and the use of drugs, formulations, or doses inappropriate for the individual patient were considered to constitute prescribing errors. Deviations from policies or guidelines, use of unlicensed and off-label drugs, and omission of non-essential information were not considered prescribing errors. Our findings were similar to the general previously developed definition of a prescribing error[1].

Conclusion: A general definition of a prescribing error has been developed for specific use in paediatrics, together with more detailed guidance regarding the types of events that should be included. The work reported here will allow the more appropriate comparison of paediatric prescribing error rates among different hospitals, and is suitable for use in research of the incidence and nature of prescribing errors in paediatrics.

References:
1. Barber N. What constitutes good prescribing? BMJ 1995; 310:923-925.
2. Bowles N. The Delphi technique. Nurs Stand 1999; 13: 32-36.

P7
Withdrawal of sedation on PICU

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Objective: Withdrawal reactions have been reported to occur in up to 35% of children on paediatric intensive care units (PICU)[1]. In the UK, 55% of PICUs report problems weaning sedation and analgesia but only 32% have withdrawal guidelines[2]. Guidelines for the withdrawal of analgesia and sedation were originally developed at Alder Hey in 1999 but do not reflect current practice. Sedation withdrawal plans have been developed by pharmacists and are used for patients who receive sedation for more than 7 days. This project aimed to review the literature in this area, assess the quality of our current guidelines, review the use of sedation plans on PICU and undertake a prospective audit of practice. Duration of sedation and analgesia on PICU, whether sedation was weaned or stopped abruptly, whether sedation plans were used and whether any symptoms of withdrawal occurred were reviewed.

Methods:
1. A literature search was performed
2. Current guidelines were assessed using the Appraisal of Guidelines Research and Evaluation (AGREE) instrument[3]
3. All children on PICU during a 4 week period were included in the audit
4. Each child was reviewed daily until sedation stopped. Patients having >3 days sedation were followed up for a further 3 days on.
5. Data collected for each patient included demographics, sedative/analgesic agents used, maximum rate or total daily dose, symptoms of withdrawal and whether a sedation plan was used.

Results:
1. Current guidelines were found to be inadequate and areas for improvement were identified.
2. 94 patients were included in the audit. 8 excluded due to death within 2 days (3), transfer (2) or incomplete data (3).
3. 55 patients had up to 3 days sedation and no further follow-up was performed.
4. 14 patients had 4–6 days of sedation. 3 showed signs of withdrawal when sedation was stopped.
5. 3 patients had 7–10 days of sedation. 2 showed signs of withdrawal when sedation was stopped. (1 patient did not have a withdrawal plan, the other patient's treatment did not follow his plan).
6. 14 patients received sedation for more than 10 days. 8 patients developed symptoms of withdrawal during weaning (5 of whom did not follow their plan). Treatment for 6 patients followed their plan and no signs of withdrawal occurred.

Conclusion: This prospective audit identified that symptoms of withdrawal occur in approximately 15% of patients on PICU. The use of sedation withdrawal plans by pharmacists may reduce the number of patients experiencing these problems.

References:
1. Fonsmark L, Rasmussen YH, Carl P. Occurrence of withdrawal in critically ill sedated children. Crit Care Med 1999;27:196-199.
2. Neonatal and Paediatric Pharmacists Group, Paediatric Intesive Care Unit Pharmacists Group, 2003
3. The AGREE collaboration 2001. Appraisal of Guidelines for Research and Evaluation AGREE instrument [cited 21 Jan 2004]. Available from URL:http://www.agreecollaboration.org/

P8
Neonatal gentamicin dosing – a full audit cycle

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Objective: Gentamicin is a commonly used antibiotic on Special Care Baby Unit, and therapeutic drug monitoring is routinely carried out on neonates receiving more than three doses. One hour post-dose results were perceived as frequently being below desired levels, and the dosing regimen in place used lower doses than those in the standard reference text.[1] Formal assessment of the levels being obtained and the devising of a new regimen was desired.

Methods: Patient details were obtained from the admissions register, and the results of the first validated gentamicin assays for each neonate were recorded. Pharmacokinetic calculations were used to produce an improved dosing regimen, the expected results of which were calculated. Following implementation, a re-audit was carried out. Data collection was extended to neonates nursed on maternity wards for the re-audit.

Results: Data was collected for 83 neonates over 11 months. This was divided into three gestational age groups (<28 weeks, 28–37 weeks, >38 weeks). The number of high pre-dose levels (>2mg/L) in these groups were 0/3, 2/69, and 2/11 respectively. The number of low post-dose levels (<5mg/L) were 2/3, 49/69, and 5/11 respectively.

Re-audit data was collected for 15 months (n=116). The results of the re-audit were compared to the predicted results. The number of high pre-dose levels in the three groups were 0/7 (0 predicted), 6/74 (0 predicted), and 13/35 (6 predicted). The number of low post-dose levels were 3/7 (5 predicted), 8/74 (13 predicted), and 1/35 (3 predicted).

Conclusion: It was confirmed that the original dosing regimen was producing low post-dose gentamicin levels. A new regimen was devised which was predicted to produce better post-dose levels without increasing the number of high pre-dose levels.

The re-audit results were slightly higher than pharmacokinetic predictions, which is consistent with our previous perceptions. Other differences seen were attributed to the bias introduced by relatively small patient groups. Post-dose levels were improved by the introduction of the new regimen, with a small increase in the number of high pre-dose levels. Closer evaluation revealed that 4 of the 6 patients with high pre-dose levels in the 28–37 week gestation group were 28 week gestation neonates. Moving all 28 week gestation neonates to the lower doses used for <28 week neonates should improve their levels.

The pharmacokinetic data from both audits were combined to produce a database to aid prediction of the effect of dose changes. Increasing from 4mg/kg to 5mg/kg 36 hourly in the new <29 week gestation group should decrease the number of neonates with a low post-dose level from 5/18 to 3/18. Moving the 38 week gestation neonates into the 29–37 week group and decreasing the dose for the >39 week group from 3.5mg/kg to 3mg/kg 12 hourly should decrease the number of neonates with a high pre-dose level from 17/50 to 8/50.

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P9

A drug utilisation study of antidepressants in children and adolescents using the general practice research database

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Background: Antidepressants (ATDs) are not licensed for the treatment of depression in children and adolescents aged <16 years[1]. Selective serotonin reuptake inhibitors (SSRIs) have been used increasingly in children, despite few trials demonstrating efficacy and safety[2]. The efficacy of tricyclic antidepressants (TCAs) in this patient population has been questioned[3]. In 2003, the Committee on Safety of Medicines recommended the withdrawal of SSRIs (except fluoxetine) and venlafaxine from use in paediatric depression following concerns over their association with increased risk of suicide[4]. Psychotropic medication prescribing to children and adolescents has increased in Europe, the US and South America[5]. Little is known about ATD prescribing in UK general practice, particularly the extent of SSRI use.

Objective: To characterise prescribing patterns of ATDs by general practitioners to children and adolescents aged 18 years in the UK.

Methods: A drug utilisation study was conducted on the UK General Practice Research Database for the period between 1 January 1992 and 31 December 2001. The database contains anonymised primary care records for about 4% of the UK population. Subjects with less than 6 months data were excluded. Prescribing and morbidity patterns were evaluated and age and sex specific annual prevalence calculated. Time to switch or discontinuation of first ATD prescribed was investigated using Cox regression. The model was adjusted by age and sex.

Results: 24,976 subjects received 93,091 prescriptions. 51,868 (55.7%), 38,429 (41.3%), and 2,708 (2.9%) prescriptions were for tricyclics (TCAs), selective serotonin reuptake inhibitors (SSRIs), and other ATDs respectively. ATD prevalence increased 1.7-fold from 1992 to 2001. TCA prevalence decreased by 30% from 3.6 to 2.5 per 1,000; SSRI prevalence increased 10 times from 0.5 to 4.6 per 1,000. In new ATD users aged ≤10 years, the most common diagnosis associated with TCA use was nocturnal enuresis (75.1%); in those aged ?15 years, it was depression (45.8%). Depression was also associated with SSRI use (69.0%). For new users with depression, the median treatment durations for TCAs and SSRIs were 30 and 58 days respectively. TCA users were more likely to terminate treatment than SSRI users. (TCAs v fluoxetine: 1.40, 95% CI 1.32 to 1.47, P<0.001; Non-fluoxetine SSRIs v fluoxetine: 1.01, 95% CI 0.96 – 1.07, P=0.72). Boys were less likely to stop their first ATD earlier compared with girls (0.91, 95% CI 0.87 – 0.96). Also, older subjects were likely to stop treatment earlier (P<0.001).

Conclusion: SSRIs have gained popularity for the treatment of depression compared with TCAs. TCAs are still used despite their lack of efficacy in prepubertal depression and their moderate effect in adolescents. However, >50% of subjects discontinue treatment after 2 months, with TCA users stopping earlier than SSRI users.

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P10

Parents' need for information about the treatment of their chronically ill child

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Objectives: To explore parents' information needs about their child's long-term illness and medication, their evaluation of how these are addressed and their opinion of a potential role of ward pharmacists in this.

Methods: Before parents were approached, ethics approval was sought and obtained on 20 April 2004. Data collection started in May 2004. Participants were recruited at the paediatric department of a district general hospital in the West Midlands and invited to take part in a semi-structured interview. Twenty families were included. Children could be present at the interview if they wished, but all children over the age of 7 were required to indicate their assent. The interviews were recorded (with the parents' permission) and transcribed verbatim for content analysis. The results were presented as part of a MSc dissertation to Keele University (department of Medicines Management).

Results: Concordance reflects the aim of developing partnership between health professionals and (parents of) patients and treatment decisions should be based on a consensus, which relies on effective information exchange. This study showed

that parents' information needs regarding their child's illness and treatment were generally not adequately met by health professionals. Parents' information needs varied widely between individuals and over time. They were determined partly by the confidence parents acquired in dealing with their child's condition, their preferred level of involvement in care and their role of intermediary as information provider to their child. Parents of children with a diagnosis such as cystic fibrosis and cancer, requiring active and ongoing secondary care management, felt that they had received more information than they could cope with, particularly at the time of diagnosis. In contrast, parents of children with conditions such as asthma and epilepsy, which could routinely be managed in primary care, reported a lack of information about the illness and treatment. Parents consulted a wide range of verbal and non-verbal information sources but these often appeared to leave a deficit. Most parents considered that the presence of a hospital pharmacist on the ward could be reassuring and a useful source of information about many aspects of their child's treatment. Over time, parents often wished to increase their involvement in caring for their child. However, this wish was not always recognised or accommodated by professionals, leaving some parents feeling excluded and dissatisfied with the process of care.

Conclusion: This study has found little evidence that partnership between health professionals and parents is becoming a reality. This research has attempted to contribute to the understanding of the failure of concordance to be widely realised in paediatric care. It highlights the importance of eliciting parents' individual requirements and carefully and sensitively individualising the information provided to them. It has also suggested the value of ward-based pharmacists in this.

P11
Junior doctor induction to neonatal practice: an approach to good prescribing and reducing medication incidents

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Background: Due to the political agenda and the number of dosing errors in the Trust, it was decided to focus on the issue of calculations and prescribing habits on the neonatal unit as a means of educating doctors.

Aims and Objectives: The aim of this study was to construct a workbook encompassing previous prescribing errors and pharmacists' interventions as a means of educating new doctors on induction.

The objectives were:
- To retrieve Trust incident report forms, Pharmacy Near-miss Intervention Monitoring Scheme data and literature data
- To construct questions using the above sources
- To finally construct a neonatal specific workbook which will be given to neonatal doctors on induction

Methods: A survey was sent to neonatal pharmacists in the UK (in January 2004) to review the input from neonatal pharmacists at junior doctor induction. This identified that four units out of 27 gave their doctors some form of calculation test at induction. Three were obtained to examine the content, layout and style. All Trust incident forms were retrieved involving medication incidents on the neonatal unit (period January 2002 – September 2003). All neonatal incidents on the Pharmacy Near-miss Intervention Monitoring Scheme were also retrieved (October 2002 – January 2004). A literature search using several databases identified drug case reports describing dosage errors. These sources were used to construct calculation questions within the workbook. All calculation questions were based as closely around the incidents as possible and an attempt was made to make the scenarios as realistic as possible. The section on good prescribing habits was supported by the LTH Medicines Code and literature on the quality of prescribing. The pilot workbook and pilot answerbook was given to six pharmacists (three non-paediatric specialties and three paediatric specialties) and three doctors (one consultant, one registrar and one senior house officer, all in paediatrics). Each volunteer was asked to record the time taken to complete the exercise, comment on style of exercise, layout and questions included. Amendments were based on these comments.

Results: An eight paged double-sided booklet was produced containing sixteen calculation questions and four prescribing questions. The pilot revealed that the average time taken to complete the exercise was 40minutes.

Conclusion: This section has shown that previous medication errors and pharmacists' interventions can be used to construct a workbook specific to the neonatal unit. The researcher strongly believes that the development of such a workbook is an effective means to educate neonatal doctors on the errors they may encounter during their rotation. SHO training and patient care will benefit from an environment that allows doctors to learn constructively by discussing mistakes made through the workbook.

Implications/Recommendations: This method can be used to construct similar workbook for different areas of paediatrics e.g. paediatric oncology or paediatric intensive care. A similar exercise can also be used for nurses; perhaps concentrating on reconstitutions of drugs and rates of drug infusions.

P12
Is breastfeeding safe with azathioprine?

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Objective: To clinically monitor breastfed infants of mothers taking azathioprine for changes in haematological profiles

Methods: This was a prospective observational study involving seven mother-infant pairs. All mothers had taken azathioprine during pregnancy and /or postnatally and had chosen to breastfeed their infants. All mothers were counselled by a consultant obstetrician and obstetric pharmacist regarding the limited data and lack of long term follow up. Haematological profile monitoring of these infants was carried out at follow up visits. During the period of breastfeeding the infants were reviewed, together with their blood results, by a paediatrician.

Results: All the mothers were taking 75–100mg azathioprine daily. For the majority of occasions the total white cell and neutrophil counts remained within the normal reference ranges. Baby 1 at age six weeks showed a neutrophil count of 0.9 (normal range 1.0–8.5 x 10^9/L) which subsequently recovered. Other results showed neutrophil counts at the lower end of the range on some occasions. Total white cell counts were all in the normal range except for baby 6 at age 5 weeks who showed a total white cell count of 4.9 (6.0–17.5 $\times 10^9$/L). All infants remained clinically well during this period.

Conclusion: Our results confirm that there was no immediate adverse effect on the infants who were breastfed. The numbers are small and for definitive counselling of mothers taking azathioprine whilst breastfeeding larger numbers will be needed. However, based on the data it would seem safe to advise mothers taking azathioprine that they could breastfeed with clinical monitoring of the infants. Long term follow-up in these babies in terms of development and possible long term sequelae is needed.

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P13
Increased prescribing trends of paediatric psychotropic medications

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Background: Pharmacoepidemiological studies in the USA have shown that the use of psychotropic medications in the paediatric population has increased considerably in recent years[1]. A similar trend was reported in the UK[2]. However, there is little information

on prescribing trends in other countries; we do not know whether this is a global trend or a trend in English-speaking countries.

Objective: To examine psychotropic prescribing trends in children and adolescents <18 years of age in nine countries between the years 2000 and 2002.

Methods: IMS MIDAS Prescribing Insights contains prescribing data from eleven major countries; the database is an audit drawn from a representative sample of medical practitioners in each country. Paediatric prescribing data was obtained for the UK, and three other European countries with the largest markets for these medications (France, Germany, Spain), three South American countries with the largest markets for these medications (Argentina, Brazil, Mexico) and North America (Canada and the USA). The psychotropic medications investigated include antidepressants, stimulants, antipsychotics, benzodiazepines and other anxiolytics. The prescribing data of sampled doctors were adjusted according to specific stratifications (such as region, doctor specialty), and a projected national total of prescriptions per year with 95.5% confidence intervals were calculated for each country. The intra-country differences between years 2000 and 2002 were compared for significance.

Results: The number of psychotropic prescriptions for children and adolescents has risen in all nine countries, and seven countries (UK, France, Spain, USA, Argentina, Brazil and Mexico) have shown a significant increase. The UK has the highest percentage increase (68%); the lowest was Germany (13%).

Conclusion: The increase in psychotropic prescribing to children and adolescents is not only confined to the USA and UK but is also evident in other countries. The increase probably represents the improved recognition of paediatric psychopathology; drugs may also be replacing non-drug treatments. There is insufficient research to confirm or refute the above suggestions. In addition, there are limitations to the data, especially as there is no information on the average prescription duration by drug or frequency, which may differ between years due to changes in prescribing practice. However, the observed increase in so many countries is a concern, particularly as little research exists in the paediatric population to study the effects of most psychotropic medications. Therefore, the rationale for drug choice is probably based on evidence in adults rather than children. This is a global health issue, so further work is required to study how and why psychotropic medications are prescribed, and better designed clinical trials are required to investigate their efficacy and safety in children and adolescents.

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P14
Survey of administration of medicines to pupils in primary schools within the London area

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Objective: The objective of this survey was to examine the policy, administration and supervision of medicines administration in primary schools within the Greater London area (GLA).

Methods: The main items of the questionnaire were developed from a discussion amongst the members of the National Service Framework for Children (NSFC) Medicines Group and a literature review.

The questionnaire covered the following issues:

- Knowledge of the official policy document[1].
- Policy/procedure followed in caring for the medical needs of pupils.
- Staff involved in handling the medical needs of children and medicines administration.
- How information regarding administration of medicines to pupils is received and documented.
- Training issues.

The pilot questionnaire was sent to the head-teacher of one randomly selected school of each London borough (32 schools) for their comments in order to assess the face validity. A list of all the primary schools (total of 1565) in all boroughs in GLA was obtained from the website of the Department for Education and Skills and 172 schools were selected using a random table. The main questionnaire was sent to the head-teacher of each school. A reminder questionnaire was sent to non-responders after four weeks. At the time of the study, according to the UK Office of Central Ethics Committee's guidelines the study did not require ethics committee approval[2].

Results: 65% of head-teachers replied. Less than 50% of responding head-teachers had actually read the national guidelines 'Supporting Pupils with Medical Needs'[1] and only 30% of respondents were aware of other members of staff who had read the document. 95% of respondents followed a policy/procedure in caring for the medical needs of pupils. Over 80% of respondents had staff handling the pupils' medical needs, staff handling access to the stored medicines and prior arrangements for staff training. However, it is worrying that a quarter of the schools did not keep a written record of medicines given to children in schools. The majority of staff with responsibility for medicines administration in schools were support staff. The most encouraging findings were that for the majority of schools with children using Epipen® and rectal diazepam, there were trained staff to administer these medicines.

Conclusions: The majority of schools had a policy in place to deal with medicines administration, although further work should be conducted to analyse the content of such policies. It is very important that training is directed at staff responsible for medicines administration, not just teachers. Most schools were willing to administer rectal diazepam and Epipen® treatment in an emergency.

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P15
Long-term parenteral nutrition (PN) in children: dose of lipid emulsion (LIP) and hepatic complications

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Objective: Although lipids are required in PN-dependent patient, they are not free of risk. They contribute to PN-associated liver disease[1,2]. It is relatively well known for adult patient[2], but a few studies concerning children have been published[3]. The purpose of this retrospective study is to analyse the relationship between LIP and hepatic complications in our paediatric centre.

Patients and method: 13 of 21 patients receiving actually PN were eligible as they received two distinct one year periods of treatment: high (HD) and low (LD) LIP. General data concerning patients (age, sex and disease) were collected. PN prescriptions (LIP, NP duration, daily NP dextrose and protein intake), cytolysis factors (aspartate and alanine amino-transferases) and cholestasis factors (plasma bilirubin, Á-glutamyltransferase, alkaline phosphatase, and biliary acids) were recorded during HD and LD (every 3 months). Cytolysis was defined if both enzymes were over normal values (?2) and chronic cholestasis if 2/4 factors were above normal value during at least 3 months. Total hepatic events were reported. More specifically, cytolysis and chronic cholestasis, during HD and LD, were compared with paired series statistic tests.

Results: The patients (3 boys and 10 girls) were 7.1 ± 4.4 years old. They had been treated for 6 ± 4.4 years with PN. They suffered from short bowel syndrome (n=6), intractable diarrhea (n=3), and chronic intestinal pseudo-obstruction or Hirschprung disease (n=4). During both periods of treatment observed, mean daily PN dextrose and protein intakes were 14.9g/kg and 2.1g/kg respectively. LIP (Ivelip®, long chain triglyceride soy oil emulsion in all cases) was 1.5 ± 0.3 g/kg/d for HD and 0.9 ± 0.1 g/kg/d for LD period (P=0.0001). The 13 patients experienced a total of eight cholestasis and 23 cytolysis. Six episodes of cholestasis were reported in HD

and two in LD (ns, *P*= 0.15), 11 cytolysis events were reported in HD and 12 in LD (ns, *P*=0.81). Although the two periods of treatment present no statistical differences, cholestasis events seem to be more frequent in HD period. As NP duration contributes in large extent to PN-related liver disease[2], it should be pointed out that the LD period occurred after the HD period for 12 out of 13 patients.

Conclusion: This first result suggests a clinical benefit with a low dose of lipids (less than 1g/kg/d). Nevertheless, more patients are needed and other hepatic factors must be explored to conclude about LIP and PN-related liver disease.

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P16
Review of medication errors reported and assessment of current medication error reporting system in Yorkhill NHS Trust

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Objective: To determine the incidence of medication errors reported within a maternity and paediatric NHS Trust over a 5-year period and to assess the suitability of the current medication error reporting system.

Methods: A retrospective review of all medication error report forms received from January 1998 to December 2002 to establish the incidence of reported errors. The following data were collected from each report: type of error, route of administration, clinical area involved, class of drug, reason for occurrence, risk classification, age of patient affected, number of staff involved per error, type and grade of staff involved and type and grade of person reporting. A user survey of pharmacy, medical, nursing and midwifery staff to assess the suitability and effectiveness of the current medication error reporting system. The questionnaire aimed to ascertain if all medication errors that occur within the trust are reported and reasons for not reporting, if applicable. Users were asked if the current system could be improved.

Results: 246 medication errors were reported over the 5-year study period. 72% of the errors reported were minor. 35% of the reported errors occurred in medical wards and nursing staff were involved in 56%. The intravenous route and antibacterial drugs were most commonly implicated. 34% of responders did not report all errors that they were involved in. Reasons for not reporting included: patient came to no harm, follow-up deemed too severe for minor error, reported to patients consultant and reported via the trust's critical incident reporting system. Only 31% of users received feedback regarding all medication errors reported within the trust. 94% of those who did not receive feedback thought that that information would be useful. 10% of users thought that the current system could not be improved.

Conclusion: The overall error-reporting rate over the 5-year study period was low but there is evidence of under reporting of errors within the trust. In general, users of the system think that improvements could be made.

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