Neonatal and Paediatric Pharmacists Group, 11th Annual Conference

The 11th Annual Conference of the NPPG was held in Belfast in October 2005. There were six oral presentations and eight poster presentations, seven of which are listed below.

O1
Successful use of mifepristone for termination of pregnancy in a 12 year old

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Objective: To illustrate a case of safe and effective medical termination in a child under 14 years using a standard adult protocol.

Method: A 12 year old girl presented to the Emergency Department at Newham University Hospital with a GP diagnosis of dysmenorrhoea ca. 5 months. The child was clearly pregnant, proven with positive HCG-2 test (Clearview®) x 3. The girl was average for her age in all respects with no relevant medical or social history. USS showed a healthy female fetus of approximately 22 weeks gestation. Obstetricians recommended a medical termination. Doses were reduced from the adult protocol (600 mg mifepristone po) to the following[1]:

- Mifepristone PO 200 mg stat
- Misoprostol 800 microgram PV daily from 48 h post mifepristone until birth
- Doxycycline 100 mg BD 5/7 post partum
- Metronidazole 400 mg TDS 5/7 post partum

Results: Mifepristone was administered before bedtime on Friday night (Day 0) and resident midwives performed all observations four-hourly. At 2200 on Sunday night (Day 2) misoprostol was administered by the patient, witnessed by a midwife. Sedation (midazolam) and analgesia (morphine) were prescribed. At midnight the child complained of abdominal pain, and was pyrexial 39.2°C. A CTG demonstrated that labour had begun. Approximately half an hour later the child was having rigors and continued to be pyrexial. Abdominal pain continued with pain scores of 9 and 10. At 0200 the child was moved to the delivery suite. Morphine continuous infusion was started at 20 mcg/kg/h. Midazolam was withheld. At 0400 a 450 g female fetus was delivered. On discharge there were no medical or obstetric concerns. Further medical follow up was not possible.

Conclusions: A search of the literature yielded no case reports or evidence of use of mifepristone in a child of this age. Discussion with colleagues nationally through the NPPG e-mail database and direct approaches also yielded no experience. Rigors and pyrexia are an accepted side effect of misoprostol, and was also attributed in part to the normal immunological response to *in utero* death. Mifepristone and misoprostol were administered at the adult doses safely and without unexpected adverse effects. Labour progressed faster than was expected, however labour is variable between women, so was not thought to be directly attributable to the dose of mifepristone or misoprostol used. Mifepristone at the dose of 200 mg as a single dose was safe in this 12 year old girl.

Reference

1. Phelps RH, Schaff A, Fielding SL. Mifepristone abortion in minors. Contraception 2001;64:339-343

O2
Tablet splitting – how accurate does the dose get?

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Objective: Divided tablets are often used in clinical practice. Most oral drugs are not available as oral solutions or tablets in various strengths suitable for use in children. Hence, there is a need to split tablets for use in paediatric medicine.

Methods: We carried out a survey of nurses at the Children's Hospital and asked what tablets they normally split to administer to children. We also asked whether they normally used a splitting device (which can be ordered from the pharmacy) or their hands. Splitting of the following tablets was studied: Alvedon (paracetamol), Hydrocortone (hydrocortisone), Catapresan (clonidine), Tavegyl (clemastine) and Prednisolon (prednisolone). All the tablets selected had a score and one of them (Hydrocortone) even had a crossed score. Four of the tablets were halved both manually and by the use of a tablet splitter. We were not able to split Tavegyl tablets by hand. The tablet splitter used was made by LGS Corp. The tablets were weighed both before and after splitting and the results were compared using statistical methods. The study was conducted at the Karolinska Pharmacy, Stockholm, Sweden.

Results: The tablets were weighed before splitting. After splitting the resulting halves and quarters were weighed and the difference between the added halves/quarters and the whole tablet was calculated to give the loss. The results are presented individually for the five brands of tablets in figures. Our results show that splitting of tablets result in large variability of the doses administered. This could be of clinical importance, especially for children. The results indicate that the accuracy in weight of the divided tablets does not fulfil the criteria set by pharmacopoeia requirements for intact tablets. There is a wide variation in tablet weight for split tablets, and the variation is greater for quarters of a tablet for all the five brands tested. The variation is also wider for tablets divided manually. There is no correlation between variation in percentage of expected weight and original tablet weight.

Conclusion: Splitting of tablets for paediatric dosing should be avoided due to lack of dosing accuracy. Tablets containing antineoplastics or antibiotics must not be divided due to risk of exposure to harmful compounds. Pharmacy prepared extemporaneous products should substitute the use of divided tablets in paediatric practice.

O3
Safer prescribing – does paediatric experience or a paediatric postgraduate qualification make a difference?

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Objective: Infants and children are especially vulnerable to medication errors due to their physiological immaturity and small size. These form the second largest awards in paediatric litigation cases. It is commonly assumed that paediatric experience and postgraduate qualification are beneficial for safer prescribing. Our objective was to see if this assumption was correct by evaluating the prescribing ability of Paediatric Senior House Officers (SHOs) in relation to experience and post graduate qualifications.

Methods: A standardised evaluation of SHO prescribing ability was conducted during their induction for four successive SHO intakes in a Teaching District General Hospital over a two year period between 2002 and 2004. The evaluation consisted of four basic questions on dose calculations for drugs commonly used in everyday situations, focussing on issues particular to paediatrics, e.g. postnatal age and weight. Examples of the questions include prescribing paracetamol and ibuprofen for a 13 month old child and prescribing gentamicin for a baby. Calculators, Medicines for Children (RCPCH/NPPG publication) and surface area charts were provided. Additional information on qualifying university, postgraduate qualifications and paediatric experience was recorded.

Results: Thirty two SHOs were evaluated. Around a third (10) answered all four questions correctly; of these, six had no previous experience in paediatrics. The other 22 doctors answered at least one question or more incorrectly. Chi squared analysis was performed to explore the effect of experience and qualification on scoring.

	All correct (n=10)	1 or more wrong (n=22)	OR	95% CI for OR
Experience	4	19	0.105	0.011–0.609
No experience	6	3		
Postgraduate qualification	5	10		
No postgraduate qualification	5	12	1.2	0.26–5.36

Conclusion: In optimal conditions, a substantial proportion of SHOs made errors in prescribing commonly used drugs for children. Despite the assumption that previous paediatric experience or a postgraduate qualification may make a "better doctor", previous paediatric experience or postgraduate qualification does not infer competence to prescribe.

O4
Evaluation of use and knowledge of unlicensed medication at Children's Hospital, Leicester Royal Infirmary

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Objectives: To encourage good clinical practice and enhance patient safety all new Children's Hospital (CH) SHOs undergo a formal induction including training and assessment on paediatric prescribing. Issues around licensing are raised briefly, but since November 2004 when UHL NHS Trust published its policy on the use of unlicensed medication, requests for further information have increased. Anecdotal data exist on the frequency of unlicensed medication use, but there is no information regarding the level of understanding of those involved in paediatric medication as to their individual and corporate responsibilities.

- Identify and quantify the licensed status of drugs used within the hospital.
- Evaluate staff knowledge of the licensing issues of medications used in everyday practice.

Methods: Over 3 days in July 2005 a snapshot of all medication prescribed for all in-patients was taken by the study team using information from drug kardexes and patient notes. Data collected included patient age, weight, drug order details, indication and prescriber grade.

Subsequently all CH prescribers, nurses and pharmacists were sent a copy of a questionnaire designed to assess their understanding of issues involved in the prescribing, ordering and administration of medication to children. Each person was asked to complete the form without using information sources. The questionnaire was split into 3 sections.

- Data of their professional status, grade, activity and experience.
- Assessment of their understanding of the unlicensed medication terminology, information sources and responsibilities.
- Six examples of prescription cards for inpatients where candidates were asked to indicate the licensed status of the drugs prescribed, with a brief explanation for their decision.

Results: Data is in the final stages of collection and initial stages of analysis, but initial review indicates that there is high usage of unlicensed and off-label medication but those involved in the medication process are unfamiliar with terminology and their responsibilities.

Conclusion: Anecdotally the level of knowledge amongst staff providing medication to children was not as high as hoped indicating training is required to ensure paediatric practitioners and patients are further protected when using medication. It is becoming apparent that training on the risks and responsibilities of using unlicensed medication should be included in induction for all staff involved in paediatric drug therapy. However further work is needed to evaluate any programme to ensure it meets both the required information needs of staff and demonstrates enhanced patient care.

O5
Adverse effects of excipients: implications for their use in children

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Objective: The National Service Framework for Children[1] states that hospitals should have policies and procedures for safe medicine practice in paediatrics. This includes ensuring that the drug formulations used are appropriate to the age and ability of the child, although there are currently no national guidelines to aid formulation choices in children. Whilst toxicity from excipients is uncommon, the risk would appear to be greater in children who are often exposed to higher mg/kg doses than adults. The aim of this project was to investigate the adverse effects of some commonly used excipients, especially those reported in children.

Methods: The investigation was performed as a literature search. The excipients investigated were the hydroxybenzoate preservatives, benzoates (benzyl alcohol, sodium benzoate and benzoic acid), propylene glycol, ethanol, benzalkonium chloride, chloroform, aspartame, saccharin, lactose and sorbitol. Each excipient was searched with "toxicity or safety," "adverse effect" and "side effect" in Pharmline, Micromedex, Meyler's Side Effects of Drugs, Ovid, Embase, Medline and Google. Data on the adverse effects reported, the threshold or acceptable dose and any issues relevant to children were recorded for each. This information was then made into a summary table.

Results: Information on the adverse effects and acceptable intakes of the chosen excipients was collected. There was a vast amount of information available, much of which was contradictory highlighting that there is still much research required in this area. Interestingly, some excipients with reported adverse effects in children are in products currently used, mostly due to the lack of a suitable alternative. For example, benzyl alcohol in intravenous clindamycin may cause "gasping syndrome" in neonates. The data were condensed into a summary table showing

any age related concerns with the excipient, the threshold or acceptable doses where available and the potential adverse effects reported with indication of the reliability of the report where applicable.

Conclusion: The literature on the adverse effects of some common excipients, their acceptable levels in formulations and their impact on children were investigated. We anticipate that the summary table produced will be used by both the paediatric pharmacists as a reference on the effects of excipients in children as well as the purchasing team as part of their criteria for selecting formulations to stock within the trust. We propose to monitor the use of this information and assess the impact it makes on formulation choices. In the future, we also plan to expand the project to include more excipients such as dyes and colours. Hopefully the project will be a step towards ensuring that appropriate drug formulations are given to our paediatric patients.

References

1. Getting the right start: National Service Framework for Children. Part 1: Standard for Hospital Services. Department of Health. April 2003.

O6
An audit project to evaluate the effectiveness of using the pre-packed medications for discharge prescriptions on a general paediatric ward

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Objective: The A & E Children's unit used to have difficulties achieving the national target of 4 hour waiting time. The multidisciplinary team decided to commence a pre-packed medication service on the paediatric ward in November 2004.

- To see if the pre-packed services helped to reduce the waiting time to transfer patients from A & E to the ward.
- To identify if the pre-packed service helped to reduce the waiting time for discharging patients on the ward.

Design: Liaised with the Head of Nursing in A & E to obtain the waiting time figures from September to December 2004. Compared waiting times before and after the introduction of the pre-packed services. Used the pharmacy database to determine the duration for the discharged medications to be sent from dispensary to the ward. Used a structured questionnaire to obtain feedback on the pre-packed services from the ward staff. The main outcome measures were waiting time from A&E to the ward, number of admissions from A&E to the ward, number of discharged prescriptions completed on the ward and in the dispensary, average waiting time for the discharged medications to be sent up from pharmacy to the ward, and feedback from the ward staff on the pre-pack service, and any suggestions for future improvement.

Results: The average duration for the discharged medications to be sent up from dispensary to the ward was 2.5 hours. On the ward, it took an average of 10 minutes to dispense one prescription using pre-pack. The number of admissions from A&E to the paediatric ward was 97 (September), 102 (October), 72 (November) and 97 (December). Seven admissions in September and 15 admissions in October exceeded the 4 hour waiting time target. In November and December, all the admissions from A&E were within the 4 hour waiting time. 79 prescriptions were dispensed in pharmacy in September, 75 in October, 71 in November (plus 10 on the ward), 48 in December (plus 18 on the ward). 16 questionnaires were completed, 10 mentioned that the service improved the overall patient care. 12 mentioned that it helped to reduce the patient's complaints of discharge delays on the ward. 14 mentioned that the procedure and training provided by the pharmacist was helpful.

The suggestion was to have pharmacy technician to dispense the pre-packed medications, and to extend the service to other paediatric wards.

Conclusions: The pre-packed medication service proved to be effective in helping to achieve the national target of 4 hour waiting tie in A&E. The waiting time was reduced in both A&E and on the ward. A ward based technician was suggested to ease nursing staff workload.

P1
Paediatric pharmaceutical care a collaborative approach to developing a distance learning course

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Background: The pharmaceutical care of children presents its own special and unique challenges. Lack of evidence on the use of medicines in children leads to uncertainty in dosing. Many of the medicines that are given to children are unlicensed for this use or are used outside their licence (off label use). Evidence suggests that medication safety needs to be improved, particularly in babies and young children. The conception of this distance learning package was the result of governmental direction within 'The Right Medicine: A Strategy for Pharmaceutical Care in Scotland' (2002) for all paediatric pharmacists in Scotland to work towards accreditation.

Methods: The developmental process used with this educational resource was radically different from traditional methods of preparing a distance learning resource. It illustrated the importance of incorporating the following elements:

- cross-boundary collaboration between NES pharmacy, specialist paediatric pharmacists in Great Britain and representatives from the Scottish Executive Health Department.
- a robust peer review system to ensure accuracy of content.
- a pilot exercise to "road test" the learning package; pharmacists from a variety of practice bases.
- educational and editorial expertise in distance learning from NES Pharmacy.
- professional graphic design input from an early stage.
- project management by NES Pharmacy.

Results: This package is the product of collaborative work between paediatric pharmacists throughout Great Britain and NES Pharmacy, the national provider of post qualification education and training in Scotland. It contains two notable features which are a Separate Workbook and a CDROM. This package meets educational and training needs for pharmacists and other healthcare professionals, on a number of different levels.

1. It provides continuing education for all pharmacists, offering pharmaceutical care of paediatric patients, as an integral part of their CPD.
2. Pharmacists can now access a knowledge base which underpins the first level of competencies derived nationally, by the College of Pharmacy Practice Faculty of Neonatal and Paediatric Pharmacy.
3. It offers knowledge and skills to other healthcare professionals involved in the use of medicines in the very young, by introducing concepts of pharmaceutical care.
4. The package represents the first step in the development of an accreditation scheme for paediatric pharmacists.

P2
The introduction and evaluation of a medicines management service in a paediatric cardiology ward

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Objective: To introduce a patient focused medicines management service and evaluate the impact of the new service on patient care. To determine user satisfaction with the new service.

Method: The study was conducted in Ward 5A, The Royal Hospital for Sick Children, Glasgow. The study compared data before and after the implementation of a new pharmacy led medicines management service and determined user satisfaction with the new service. Data were collected on a total of 52 patients before the implementation of the new service and 54 patients following implementation.

The study evaluated:

- Patient waiting times for a supply of discharge medication.

- Nursing time spent on non-parenteral drug administration rounds.
- Availability of drugs on non-parenteral drug administration rounds.
- Number of delayed/missed doses of non-parenteral drugs.
- Number of pharmacy requisitions written by nursing staff.
- Nursing satisfaction with the new medicines management service.

Results: Prior to the introduction of the new service, patients waited an average of 187.5 minutes for a supply of discharge medication. This decreased to 26 minutes following the introduction of the medicines management service. This is a difference of 161.5 minutes (P<0.0001). A statistically significant decrease was also found for the nursing time spent on non-parenteral drug administration rounds. A total of 1.28 minutes of nursing time was saved per patient (P < 0.0001). The study found medicines to be more readily available in the new bedside lockers than the drug trolley (P=0.003). The technicians were responsible for organising a supply of medication for each patient at the point of their admission.

Prior to medicines management, medicines were available in the drug trolley on 65% of drug rounds. Post medicines management, medicines were available in the bedside lockers on 86% of drug rounds. The number of missed doses of non-parenteral drugs was reduced from 8 to 1 following the introduction of the medicines management service (P = 0.021). Nursing staff ordered 43 items on pharmacy requisitions prior to the medicines management service. As a result of the pharmacy technicians being in control of the medicine supply, the number of items ordered by nursing staff was reduced to 2. The new service was well received by nursing staff.

Conclusions: The introduction of the new patient focused medicines management service proved to be successful. The results suggest redesigning pharmacy services to provide more patient focused services will provide benefits to patient care and bed management.

P3
Application of allometric scaling to dose prediction in children

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Introduction and objective: The use of unlicensed medicines in children is a widespread problem and in many instances proper dose optimisation studies have not been performed in the paediatric age range. Consequently, initial doses for children have often been derived by scaling from the adult dosage and then titrating according to clinical response. The aim of the current study was to compare the performance of the three scaling models to predict maintenance doses in paediatric subjects from the standard adult doses for a range of diverse drugs and to compare them with the doses given in 'Medicines for Children'.

Methods: Twenty drugs commonly used in children were selected for this study. For equivalent indications adult doses were recorded from the 49th edition of the BNF. Three scaling models based on body weight (BW) or body surface area (BSA) were then used to estimate doses (Equation 1, 2 and 3) across the paediatric age range (1 month, 1 year, 7 years and 12 years). Equation 3 is a commonly used allometric model (ALL).

$$Dose_P = Dose_A * \frac{BW_P}{BW_A} \quad \text{Equation 1}$$

$$Dose_P = Dose_A * \frac{BSA_P}{BSA_A} \quad \text{Equation 2}$$

$$Dose_P = Dose_A * \left(\frac{BW_P}{BW_A}\right)^{0.75} \quad \text{Equation 3}$$

The predicted doses from allometric scaling were compared at each age to doses derived from Medicines for Children 2nd edition (MfC). Mean squared prediction error and mean prediction error were used as measures of precision and bias respectively. The number of predicted doses within 2-fold of the actual doses were also recorded.

Results: In the 1 month and 1 year age groups, BW<ALL<BSA for bias and BW>ALL>BSA for precision. In neonates, predicted doses were within 2-fold of MfC in 18/20, 17/20 and 13/20 cases respectively for BW, ALL and BSA. The latter method predicted doses up to 3-fold higher than the MfC recommendations. In the 7 and 12 year age groups ALL<BSA<BW for bias and ALL>BSA>BW for precision. In both groups 19/20 predicted doses were within 2-fold of the MfC recommendations across all three scaling methods, none were more than 1.5-fold higher.

Conclusions: The BNF (49th edition) suggests that "children's doses may be calculated from adult doses by using age, body weight or body surface area or by a combination of these factors". Results from the current study indicate that while this approach may be acceptable in older children, some of the scaling methods (BSA, ALL) have the potential to generate toxic doses in subjects less than 1 year. The new BNF for children has replaced the scaling advice with a recommendation to use a medicines information centre. Internet and e-mail discussion groups have made it easier to source paediatric dosage information. The forthcoming EU legislation towards more testing of new drugs in children will also ultimately reduce the clinical need to scale doses.

P4
Drugs and enteral feeds in children with chronic kidney disease

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Objective: The objective was to review the information currently available on drugs and enteral feeds by carrying out a literature search with a view to developing a Renal Unit policy and individual patient information. Current practice within the Renal Unit on administration of medicines with enteral feeds was audited against the British Association of Enteral & Parental Nutrition guidelines[1].

Methods: A questionnaire was given to parents/carers of children on enteral feeds to assess current practice of administration of medicines with the enteral feed. A separate questionnaire was given to nursing staff to assess renal unit practice.

Results: 29/37 (78%) of patients on enteral feeds completed the questionnaire. 15/29 (52%) patients added medicines to enteral feeds, 5/15 (33%) of which mixed medicines together before adding to feeds and 10/15 (66%) added individual medicines direct to feeds. 14/29 (48%) patients did not add medicines to feeds, 6/14 (43%) however mixed medicines together before administration. 24/29 (83%) of patients flushed feeding tube after feeds, 18/23 (78%) flushed feeding tube after medicines of which 8/18 (44%) also flushed between medicines. The return rate for the nursing questionnaire was 81%, 13/16 returns. 2/13 (15%) mixed medicines together with 8/13 (61%) adding medicines to feeds. 100% of nursing staff flushed feeding tube after administration of medicines.

Conclusions: Limited information is available on drugs commonly used in nephrology and enteral feeds. The outcome of this study is to change practice within our patient group to ensure medicines are delivered in the most effective way. Current practice does not comply with the BAPEN guidelines or drug licensing regulations. In order to address this best practice guidelines are to be introduced for the renal unit based on the complex nutritional, medical and pharmaceutical needs.

Reference

1. BAPEN. Administering drugs via enteral feeding tubes. A practical guide www.bpng.co.uk

P5
Development and evaluation of patient information leaflets and a community pharmacy discharge document to facilitate the discharge of paediatric cardiology patients

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Objective: The overall aim of the study was to develop and evaluate Patient/Carer Information Leaflets (PILs) and a Community Pharmacy Immediate Discharge Document (CPIDD) to facilitate the discharge of paediatric cardiology patients from Yorkhill Hospital. The main objectives were to examine communication issues between primary and secondary care and to identify problems patients experience on discharge from hospital, to investigate a method of facilitating seamless care and reduce the number of medication supply problems through the development of a CPIDD and to improve patient/carer knowledge of cardiology medicines by designing PILs.

Methods: The study was a descriptive, cross-sectional survey using postal questionnaires and was based at the paediatric cardiology ward of the Royal Hospital for Sick Children (Yorkhill), Glasgow. A literature review was undertaken to examine communication issues between primary and secondary care, to identify problems that paediatric cardiology patients experience on discharge from hospital and to assess patients' satisfaction with information they receive about medicines. Thirty-one patients/carers were recruited into the study. A CPIDD was developed as the method to communicate pharmaceutical information to community pharmacists on patient discharge. PILs were developed and supplied to the sample of recruited patients/carers. Semi-structured questionnaires were used to evaluate the impact of the CPIDD and PILs on medication supply problems and patient knowledge respectively.

Results: 21% of participating patients/carers experienced problems obtaining cardiology medicines from their community pharmacy following implementation of the CPIDD but only 7% of the participating patients/carers required an emergency supply of medicines. The results showed that prior to implementation of the CPIDD, 43% of the participating patients/carers experienced problems obtaining cardiology medicines from their community pharmacy and 29% required an emergency supply of medicines. Similarly, in a previous study, 52% of patients had problems obtaining a repeat prescription from their community pharmacy and 25% of patients required an emergency supply of medicines[1]. All community pharmacists felt that the CPIDD would be of benefit to both the patient and themselves and 95% said they would like to receive a CPIDD for all Yorkhill paediatric cardiology patients in the future. 77% of patients/carers felt that the PILs increased their knowledge of cardiology medicine(s).

Conclusions: The CPIDD helped to reduce the number of medication supply problems experienced by patients and the PILs increased patient/carer knowledge of medicines as intended. The achievement of these two objectives has helped to facilitate the discharge of paediatric cardiology patients from Yorkhill Hospital.

Reference

1. Parke A. The Review and Development of a Pharmacy Discharge Process for Paediatric Cardiology Patients, Clinical Pharmacy MSc, University of Strathclyde, Glasgow Nov. 1998.

P6
'In use' stability testing of paediatric civas morphine

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Objective: Morphine is a widely used analgesic for the treatment of severe pain. The commercially available preparations require dilution before administration as an infusion. Manipulation at ward level adds risk to the system as do the associated calculations in paediatrics. The aim of this work was to investigate the 'in use' stability of paediatric morphine sulphate dilutions frequently used on ICU. Although there is some literature on the stability of morphine under various conditions[1], the stability protocol required locally in this collaborative work was different. For local CIVAS production and standardisation purposes, the aforementioned dilutions stored in plastic syringes were tested for their stability up to 2 weeks in the fridge (4°C) and subsequently used 2 days on the ward, unprotected from light.

Methods: The following dilutions of morphine sulphate were prepared by the ICU CIVAS unit: (1) 0.02 and 2mg/ml in glucose 5 and 10%; (2) 2mg/ml in glucose 10%. After 0, 1, 2, 3, 4, 5, 6, 7 and 14 days of storage in the fridge, 3 syringes of each dilution were sampled and tested for morphine content straight away and after 24 hours and 48 hours left at room temperature unprotected from light.

The HPLC method was as follows:

Column: Luna 3micron Phenyl-Hexyl 10, 100 x 4.60 mm, (Phenomenex, Macclesfield, England)

Mobile phase: acetonitril 10%, triethylamine 0.1% and phosphate buffer 89.9% (20mM K_2PO_4 adjusted with H_3PO_4 to pH 6.5).

Flow rate: 1ml/min

Injection volume: 20 µl

UV Detection wavelength: 254 nm.

Retention time: 4.5 minutes

Results were expressed as the % of morphine remaining in the syringe.

Results: No discolouration of solutions was noticed during the study and no precipitation occurred when stored at 4°C. No degradation of morphine over the 2 weeks when the samples were stored in the fridge followed by up to 2 days at room temperature was detected by the HPLC method used. Flat curves showing 100+/-10 % of drug recovery were obtained.

Conclusion: Under those circumstances, sulphate morphine (0.02 and 2mg/ml in glucose 5 and 10%, 2mg/ml in glucose 10%) can be kept up to 2 weeks in the fridge and used up to 2 days on the ward.

Reference

1. Vermeire A, Remon JP. Stability and compatibility of morphine. Int J Pharm 1999; 187: 17-51.

P7
Stability study of a sugar-free sildenafil suspension under simulated user conditions

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Objective: Sildenafil has been successfully used for the treatment of paediatric pulmonary hypertension. An extemporaneously prepared suspension has to be used as there is no liquid dosage form available for children. We have demonstrated before that an extemporaneous suspension containing 2mg/ml was stable for up to 6 months[1]. As there are concerns with the use of sugars in paediatric medicines, including the formation of dental caries and control of diabetes, the objective of this work was to study the stability of a sugar-free sildenafil suspension.

Methods: The suspension containing sildenafil 2 mg/ml in Ora Plus :Ora sweet SF (Sugar Free) in a 1: 1 ratio was prepared using a mortar and a pestle. The suspensions were opened twice a day and each time, a 1ml sample was removed, simulating the use of a patient. Chemical stability was investigated by measuring the drug contents using an HPLC method weekly for 4 weeks. Particle size was measured using a Malvern MasterSizer based on laser diffraction. Rheological properties were measured using a Cari Med Rheometer. The suspension was also examined under a light microscope coupled with polarisers at x40, x100 and x400 magnifications.

Results: The percentage drug concentrations against the concentration at time 0 and the mean particle sizes did not change. No rheological change was detected either.

Table 1 Particle size and drug contents at different storage time (mean . ±s.d., *n*=3 batches)

Time (week)	0	1	2	3	4
Mean particle size ± s.d. (μm)	50.5 ±1.4	50.0 ±0.8	50.2 ±1.2	50.8 ±1.0	49.6 ±0.8
C/C_0 ± s.d. (%)	100.0 ±0.02	100.5 ±0.02	99.5 ±0.02	97.9 ±0.02	100.3 ±0.01

However, some non crystalline objects were observed under microscope but were not be characterised.

Conclusion: Although the suspension was stable in terms of drug content, mean particle size and rheological properties, newly formed undefined objects were detected during the study period, which warrants more detailed further study.

Reference

1. Tuleu C, Long P, Wong I, Cope J, Haworth SG. Safe use of extemporaneous preparations of Sildenafil (Viagra®) for Children with Pulmonary Hypertension. Man Med 2003 Research Award Winner Presentation, 10th NPPG Conference 2004, Newcastle. (http://www.nppg.org.uk/)

Paediatric and Perinatal Drug Therapy

Instructions to Authors

1. All manuscripts should be in the English language. They should be submitted to Imti Choonara, Academic Division of Child Health, (University of Nottingham) The Medical School, Derbyshire Children's Hospital, Uttoxeter Road, Derby DE22 3DT, UK (Email: imti.choonara@nottingham.ac.uk). Manuscripts from North America should be submitted to Professor Greg Kearns, Children's Mercy Hospital, 2401 Gilham Road, Kansas City, Missouri 64108, USA (Email: gkearns@cmh.edu). *Paediatric and Perinatal Drug Therapy* is published, produced and distributed by LibraPharm Limited, Gemini House, 162 Craven Road, NEWBURY, Berkshire RG14 5NR, UK. Tel: (0)1635–522651; Fax: (0)1635–36294; email: journals@librapharm.com
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