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P21 SCURVY DURING HOME PARENTERAL NUTRITION

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Introduction Degradation of ascorbic acid due to oxygen presence in parenteral nutrition (PN) is well documented.¹ Although patients on home parenteral nutrition (HPN) are routinely monitored for some vitamin deficiencies, plasma vitamin C is rarely measured in this population.

We report a case of clinical vitamin C deficiency in a patient with severe dysmotility for whom the only source of nutrition was parenteral nutrition with continuous infusion over 24 hours.

Methods A 6 years old girl with severe gastrointestinal dysmotility following a fundoplication tolerated no enteral feed and could not have time off PN due to hypoglycaemic episodes. She presented with gingival bleeding and epistaxis and also complaining of pain on her arms and shoulders. A clotting was requested which showed prolonged INR and she was treated with IV vitamin K. An x-ray of her wrist and shoulder showed osteopenia but no other abnormalities. Vitamin C measurement was requested.

Results Plasma vitamin C was low at 3.5 micromol/L (26.1–84.6) which confirmed the diagnosis of scurvy. She was treated with 3 doses of Pabrinex® over 3 days (providing total of 450 mg vitamin C). 100 mg of ascorbic acid were also added to her PN, providing double the baseline amount. Plasma vitamin C measured after two weeks had risen to normal at 45 micromol/L. Her bleeding and pains resolved over a few days. During the next year plasma vitamin C was measured every three months and remained within reference range. She remained clinically well with no recurrence of bleeding. Due to methodology limitations, the amount of vitamin C in the PN bag could not be tested. Therefore we decided to measure plasma vitamin C in two other patients that had PN as the only source of nutrition and given over 12 hours. In both cases the result was within the reference range at 58.7 and 38 micromol/L respectively. Published literature² suggests that temperature contributes to vitamin C degradation. The PN fluid would have been at room temperature for around 24 hours for the patient that developed scurvy, compared to half this time in the other two.

Conclusions This case highlights that there is a significant risk of vitamin C degradation due to the oxygen present within the PN bag. However, the fact that for the other 2 patient's plasma vitamin C was normal suggests that presence of oxygen alone might not be enough to cause vitamin C insufficiency. Temperature might be a contributing factor to vitamin C degradation, as has been shown with enteral feed.³ From these cases we concluded that measurement of vitamin C during HPN would be indicated not only if there were suggestive symptoms, but should also be added in to routine monitoring

in any patient with a 24 hour infusion time and extremely restricted enteral intake.

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P22 DEVELOPING A PHARMACOLOGY MODULE FOR THE PAEDIATRIC NON-MEDICAL PRESCRIBING COURSE

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Introduction Demand from local NHS stakeholders identified a gap for a taught education course tailored to the niche requirements of paediatric healthcare staff wishing to become non-medical prescribers. This was seen as an excellent opportunity to review and develop the pharmacology module within the Non-medical Prescribing (NMP) course by giving it a paediatric focus.

Aim To develop a pharmacology module with an emphasis on paediatric prescribing that meets the professional requirements of the General Pharmaceutical Council (GPhC), the Nursing and Midwifery Council (NMC) and the Health Care Professions Council (HCPC).

Method Knowledge of curriculum design and structure was utilised in developing the paediatric pharmacology module. This ensured that the underpinning theory of prescribing medicines safely for children was delivered at the right academic level. The content, delivery and learning outcomes were dictated by the Prescribing Competency Framework for All Prescribers (RPS, 2016).¹ But the cognitive teaching and learning methods arose from the rigid expectation to meet the regulatory requirements of each professional body. To ensure consistency across the whole NMP programme, the structure of the pharmacology module assessments (both formative and summative) was kept the same. The summative (final) assessments consisted of a multiple choice question (MCQ) paper requiring the students to answer a total of twenty MCQs, with the pass mark set by the regulatory bodies at 80%; a drug calculations paper consisting of five questions with a 100% pass mark; and a 5 minute information giving OSCE (objective structured clinical examination). The whole module was looked at a fresh from a paediatric perspective. The content and timetable were compiled and reviewed jointly by a paediatric pharmacist and a paediatric nurse. Both were experienced academics already teaching on the NMP course. While some of the lectures were delivered by in-house university academic staff, the majority of the sessions were delivered by specialist paediatric guest lecturers who were actively working in their respective clinical fields. This ensured that the knowledge imparted to students was practical, current and relevant to prescribing for children.

Results All students had to be practising in paediatrics for a minimum period of two years and have evidence of studying at level 6 (graduate level) or equivalent. The target audience consisted of allied healthcare professionals specialising in paediatrics, including nurses, pharmacists, optometrists,

physiotherapists, podiatrists, dieticians and therapeutic radiographers. However, the first cohort of 51 students comprised entirely of paediatric nurses. The majority of students passed each assessment first time. All students passed the 5-minute information giving OSCE, but 25% of the students had to re-sit the pharmacology MCQ paper and 17% had to re-sit the drug calculations paper. Following the resits the remaining students all passed except for one student who failed the course. **Conclusion** Overall, the course was well received, with positive feedback from most students and stakeholders. Valuable suggestions were also received for further improvements to the course and pharmacology module. These are currently being implemented with intake of students.

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P23

ACCELERATING AND DE-RISKING THE PRODUCTION OF PAEDIATRIC ORAL FORMULATIONS

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Background & Aim As part of the EU paediatric regulation, the paediatric use marketing authorisation (PUMA) was introduced, with an aim to stimulate research in existing compounds that are off-patent and/or to help transform known off-label use into authorised use.¹ However, success has been limited, with only a few products gaining a PUMA, such as Sialanar 320 micrograms/mL glycopyrronium (equivalent to 400 micrograms/mL glycopyrronium bromide). A distinct challenge to overcome in this area is the development of more 'age appropriate formulations', particularly with an excipient composition and load that is suitable for paediatric patients. This project aims to establish an excipient screening platform, supplemented with analytical characterisation of materials, which will act as a decision making tool to accelerate and de-risk the production of age appropriate paediatric medicines.

Method To develop this excipient screening platform, a list of drugs that require an age appropriate formulation was produced using the 'needs for paediatric medicines' documents provided by the European medicines agency (EMA),² whilst common problematic excipients in paediatrics were identified using an EMA reflection paper.³ Literature and prescribing data were also reviewed to ensure drugs selected would benefit from an age appropriate formulation. Differential scanning calorimetry (DSC) to determine compatibility of selected drugs with widely used excipients was carried out using a TA DSCQ200 instrument (TA Instruments, New Castle, DE) with TA Instruments Universal Analysis 2000 software. Data was collected under nitrogen atmosphere (50 mL min⁻¹) using pierced flat-bottomed TZero aluminium pans (sample mass about 2 mg) and heating rate of 10 °C min⁻¹ in the range from 50 to 400°C. For samples containing both the drug and an excipient, 1 mg of each was measured out and gently mixed with a spatula for one minute.

Results The most common class of drugs identified as requiring age appropriate formulations were related to cardiovascular disorders and neurology, whilst the majority of drugs

identified also exhibit poor aqueous solubilities. Some identified problematic excipients include ethanol, sodium benzoate and sorbitol; however, these excipients may still be used in paediatric formulations, as long as they are below certain concentrations (for example, ethanol concentration should not exceed 0.5% w/v for under 6 years old). Two drugs identified through the initial screening, carvedilol and nifedipine, were analysed by DSC, alone and then alongside starch from corn and starch 1500; the resulting DSC curves showed no changes in peak size, position (peak onset temperatures for nifedipine and carvedilol were observed at 173.2°C and 117.3°C, respectively) and shape, as well as no additional peaks, therefore suggesting compatibility between the tested samples.

Conclusion This first phase of the development of an excipient screening platform will continue to scan several different excipients with selected active pharmaceutical ingredients (APIs) in order to create compatibility profiles. The excipient screening platform generated will accelerate and de-risk the production of age appropriate formulations, as it would allow screening for potential incompatibilities and acceptability, alongside informing formulation of appropriate oral paediatric dosage forms.

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P24

DOES AN INTERDISCIPLINARY APPROACH TO TABLET/ CAPSULE SWALLOWING INCREASE THE UPTAKE OF OR TRANSITION TO SOLID ORAL DOSAGE FORMS IN PAEDIATRIC PATIENTS WITH ALL ACUTE LYMPHOBLASTIC LEUKAEMIA?

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Aim Most paediatric formulations produced for children are generally liquids or powders for reconstitution. Palatability of liquid formulations is often cited as a barrier to medication adherence.¹ An alternative to liquid formulations is the conventional solid oral dosage forms, such as tablets or capsules. However, another barrier faced by paediatric patients is the inability to swallow tablets.² This presents a number of challenges for children with ALL, as treatment contains a phase of extended 'maintenance' therapy to prevent relapse. This involves taking oral chemotherapy daily, ± monthly chemotherapy injections, over 2 years for girls and 3 years for boys. Prior to 2014, paediatric oncology pharmacists would work with children refusing to take or struggling with their liquid medicines. It was a simple approach, where 'tic-tacs®' were used and swallowinSg these was practiced together. Through education sessions and informal discussions with nursing, medical and play therapists, a culture evolved in 2014 whereby medicine taking was not just the responsibility of pharmacy but of the wider team. Nursing and medical staff were actively involved identifying families that needed support with