

LAND OF THE LITTLE PEOPLE

If you end up working in the hospital sector, you may find that you would like to work in a particular specialty, like neonatal pharmacy. More premature babies, born at increasingly low gestational ages, are surviving and so neonatal pharmacy is a rapidly growing area of practice. In this article, Maiya Ahmed describes the role of a neonatal pharmacist

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Neonatal pharmacy practice is a rapidly developing area. The success of *in vitro* fertilisation has resulted in more multiple births, with premature babies being more likely to be born from such births. Advances in care mean that increasingly premature babies are surviving.

By definition, a neonate is a newborn baby up to the "corrected age" of one month. Corrected age is calculated by subtracting the number of weeks born before 40 weeks of gestation from the chronological age (the time elapsed since birth). This means that there can be four-month old babies who are still classed as neonates.

Approximately 12 per cent of births per year result in a baby needing some form of special care and approximately 2.5 per cent of births will require some form of neonatal intensive care.¹ This article describes the care given to such babies at St Mary's Hospital, London.

St Mary's Hospital

St Mary's Hospital is a tertiary centre for neonatal intensive care. This means it has frequent referrals from hospitals which do not have either the capacity to treat, or the staff who have the experience of treating, seriously premature babies or babies who have complex problems and need specialist care. The neonatal unit is a 26-bed unit with an intensive care unit (NICU), where severely premature babies, or babies born at term who require intensive care, are looked after. It also has a high dependency unit (HDU) and

a special care baby unit (SCBU), where babies who need minimal medical care but who, for example, are having difficulty feeding, are cared for.

Neonatal pharmacy practice

Although there are many similarities between neonates and paediatric patients, there are also some major differences. This means that the pharmaceutical care required can differ between the two groups of patients. For example, the clearance and excretion of drugs is particularly hindered in neonates, and their kidney and liver functions can fluctuate frequently. This means that blood levels, particularly trough levels, of certain antibiotics need to be closely monitored in neonates to determine whether the drug is accumulating or being effectively cleared.

Assessing the impact of painful procedures can also be especially difficult in neonates, because the severely premature baby may not have developed the relevant processes or features (for example, a high-pitched scream) that one looks for when assessing paediatric patients. Older children can also become involved in their own care and treatment, as recommended by the second National Service Framework for Children,² but this is not relevant for neonates (although it will be relevant for their parents).

Methods of drug delivery can also differ. For neonates, the oral route is often inappropriate, and so is the

peripheral route, because the friability of neonatal veins means that there is a high risk of extravasation. Instead, single-lumen long central lines are used. Compatibility is therefore a key issue — more than one drug will often be present in the same line and contact times can be long because drugs have to be infused slowly. For paediatric patients, drugs can generally be infused more quickly and double or triple lumen central lines can be used.

Pharmacist's role

The pharmacist's role on a neonatal ward is similar to the role of pharmacists on adult and paediatric intensive care wards; in all the patients are particularly vulnerable. The main aspects of the job are as follows:

- Providing a clinical pharmacy service
- Providing input into parenteral nutrition services
- Developing a formulary
- Educating staff and parents
- Being part of a multidisciplinary team
- Providing input into maternity services

Clinical pharmacy service Advising about drug choice is key to the role of a neonatal pharmacist. When considering medicine use, it is important to bear in mind the gestational age of a baby. As mentioned, the pharmacokinetics of drugs are different in neonates than in other patients and so adjustments of the dose or frequency of dosing, over and above those accounted for by reduced weight, may be necessary. Similarly, skin penetration of drugs is a key issue, with the skin of a neonate

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being particularly permeable. This means that some creams that are used on paediatric patients cannot be used on neonates. For those that can be used, there is a risk of systemic absorption. For example, if chloramphenicol ointment is used topically on a suture line the likely effects of the dose applied might need to be compared to the likely effects of giving that dose intravenously in order to assess risk. Systemic absorption from eye drops is also an issue in neonates.

Parenteral nutrition Most babies on the neonatal intensive care unit will require parenteral nutrition at some point during their stay. Considerable pharmaceutical input is required, both in terms of the prescribing and manufacture of parenteral nutrition. Factors that need to be considered include:

- Whether the baby has a long line or a peripheral access
- What the electrolyte levels are
- Whether the baby can tolerate lipids — lipids being contraindicated after gut surgery or if the baby has hyperbilirubinaemia (ie, jaundice), a condition that is fairly common in the newborn baby

Enteral feeds are encouraged and initiated as soon as possible to encourage development of the bowel and gut flora. The amount given is slowly titrated up. Increasing feeding too rapidly is associated with necrotising enterocolitis, a condition that is common in neonates and causes necrosis of the gut wall. Hyperglycaemia and hypoglycaemia are both fairly common in neonates, particularly those born to diabetic mothers. These conditions require appropriate changes in the glucose content of the parenteral nutrition, and glucose levels should be monitored regularly in these circumstances. Fluid balance is also particularly important when providing parenteral nutrition (and also intravenous infusions) to neonates. What might seem like a small volume of fluid to give a child or adult patient can have a huge impact on the fluid balance of a neonate.

Education Neonatal pharmacists play a significant role in educating junior doctors. Senior house officers practising in this field will usually be on a six-month placement and will have a

predominantly paediatric background and may not be aware of the differences between neonatal and paediatric patients. As well as explaining these differences, issues to cover include the importance of prescribing doses that can be given accurately, avoiding common prescribing errors such as prescribing in “mg” and not “ml” and avoiding leading zeros (eg, 0.01mg) by using micrograms.

To educate others, neonatal pharmacists need to keep up with recent developments in their field. Issues often include the availability of new medicines, developments in care and changes to licensing status of drugs. There are also drug dilemmas unique to neonatal medicine that pharmacists need to keep abreast of. For example, recent evidence suggests that giving dexamethasone (a corticosteroid) to premature babies might lead to cerebral palsy,³ but the drug is known to be highly effective in weaning babies from ventilators.⁴

Multidisciplinary team member At St Mary’s Hospital, there is a multidisciplinary ward round at the beginning of each week, where each baby’s condition, needs and development are discussed in depth. This is attended by neonatal doctors, charge nurses, the neonatal pharmacist and the dietitian. Babies’ medicines are often reviewed and discussed and so a pharmacist’s input is crucial.

Following on from this, a registrar-led ward round takes place twice daily and there is a microbiology ward round once weekly, led by the microbiology consultant. The neonatal pharmacist attends these as necessary.

Neonatal pharmacists are also called on to provide information and advice about the use of drugs during breastfeeding. Some medicines may be deemed safe in pregnancy but not in breastfeeding and vice versa. For mothers taking medicines during pregnancy, an advance plan can be made for their postnatal period.

At St Mary’s Hospital, a multidisciplinary nutritional group, that has recently been set up, provides a forum to discuss these issues, as well as other issues such as parenteral nutrition and enteral feeding.

Maternity role Being a neonatal pharmacist in many hospitals will involve having responsibilities not only for neonatal wards, but also for the maternity wards. At St Mary’s Hospital, the maternity wards are covered daily by a junior pharmacist on a three-month rotation. The neonatal pharmacist assists in the training of these pharmacists and is available to answer any queries that may arise. Frequent issues relate to the use of medicines in the third trimester of pregnancy and while breastfeeding. Using the British National Formulary or BNF for Children alone to check these is not usually adequate, and additional reference sources are regularly used, such as the Royal College of Obstetrics and Gynaecology website and books such as “Medications and mothers milk”⁵ and “Drugs in pregnancy and lactation”⁶

Career development

A career as a neonatal pharmacist is rewarding and challenging, with opportunities to work both in an intensive care background and in a “normal” ward setting (ie, SCBU). Although there are differences between paediatrics and neonatology, a paediatric background is invaluable because it gives experience of, for example, dose calculations, licensing issues and using various non-traditional sources for drug information. Working in an adult intensive care environment also provides useful skills.

Unfortunately, there is currently no formal pharmacy postgraduate education in neonatology, although there are various universities that offer modules in paediatrics and intensive care as part of their diploma courses in pharmacy practice. The Neonatal and Paediatric Pharmacy Group holds an annual weekend conference which is attended by neonatal and paediatric pharmacists from around the country and is structured into lectures and workshops. This event is a great way to learn more about the theory and practice of neonatology (as well as paediatrics) and also to network. Details of this group, together with other useful sources, are set out in the Panel.

Further developments

Pharmacist supplementary prescribing is not in place at the neonatal unit at St

Mary's Hospital, although neonatal pharmacists elsewhere in the UK are using this practice development.⁷ I can see the prescribing role expanding over the next few years, particularly as most neonates will need to stay in hospital for a number of weeks. ■

References

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Useful sources of neonatal pharmacy information

- Neonatal and Paediatric Pharmacy Group. The group's website (www.nppg.org.uk) includes a messageboard where members can post queries
- British Association of Perinatal Medicine (www.bapm.org)
- The Royal College of Paediatrics and Child Health. (www.rcpch.ac.uk)
- BLISS, the premature baby charity. (www.bliss.org.uk)
- Thames regional perinatal group (www.londonpaediatrics.org.uk/trpg/trpg.htm)

