

Chapter 6. Medical conditions, interventions and progress of the sick or preterm infant

Parent educational material for app

1. Introduction to medical conditions in a neonate

A preterm baby is born prior to their normal time of delivery; hence their body as well as the vital organs such as skin, brain, heart, guts and kidney are premature and not yet ready to function in an external life. They are prone to various complications and these are summarised in this chapter of medical conditions in a neonate.

Aims for this chapter

We want you as a parent to:

- understand the basics of various conditions in a premature infant
- understand the basics of the setbacks that may happen and how we manage this as a team together
- what can you do to help prevent some of these conditions
- what can you do to help your Baby in those situations.

1.1 Background to medical conditions, setbacks, management and outcomes

Preterm babies are prone to develop various medical conditions during their stay in the neonatal unit due to the premature state of their body and organs. The most common complications related to prematurity are discussed in this chapter:

Premature babies can develop oxygen dependency for a prolonged period during their stay in the neonatal unit, this is a condition known as chronic lung disease.

Preterm neonatal skin is very fragile and can be a source of infection leading to major setbacks. Fortunately the majority of these conditions can be treated with antibiotics, antifungal medicines and topical treatments.

Because of prematurity of the blood vessels in the brain, any alteration of blood flow can lead to minor to catastrophic bleeds within the brain. These might have long-term consequences.

A premature baby's gut is not ready to absorb milk like that of a healthy term baby; they also do not have the healthy bacteria colonisation in the gut, hence sometimes they can develop swelling and infection of the gut known as necrotizing enterocolitis.

Premature babies who are treated with a high concentration of oxygen can develop abnormal blood vessels at the back of the eye leading to a condition known as retinopathy of prematurity.

Extremely premature babies and critically ill term babies often require blood transfusions with different blood products.

Jaundice is a common neonatal complication treated with blue light therapy.

Gastro-oesophageal reflux is also a common condition in preterm infants and may require medications to reduce discomfort and promote weight gain.

Hernia in the groin is common in preterm infants and needs surgical management nearer to the time of discharge.

1.1 Respiratory distress syndrome (RDS)

Breathing problems are very common in premature babies and helping to support their breathing is an important part of neonatal care. Respiratory distress syndrome (RDS) is caused by surfactant deficiency which is a common problem of prematurity. Surfactant is a substance produced by the lung cells from 20 weeks, which is responsible for keeping the lung open and stretchy. but premature babies will not have enough. A shortage can lead to lung collapse and breathing problems.

Mothers who are in premature labour or due to deliver prematurely are given steroid injections to help the baby produce more surfactant, which can protect the lungs from developing severe RDS. Babies who are born prematurely may be given one or a few doses of artificial surfactant through a breathing tube depending on the severity of RDS.

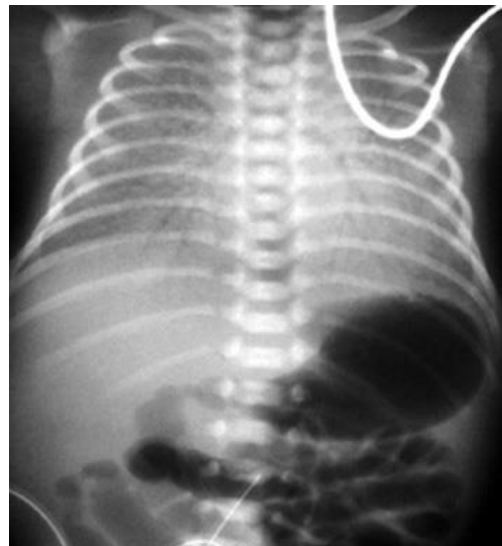


Figure 1. RDS with hazy ground-glass appearance of the lungs on chest X-ray

Preterm babies' lungs are very fragile and this can give rise to air leaks called pneumothorax, or air pockets within the lung called pulmonary interstitial emphysema (PIE). This can be seen on the chest x-ray and indicated by increasing oxygen requirement, fast heart or respiratory rate and worsening of blood gases. Sometimes pneumothoraces may need draining using a chest drain tube which is put inside the chest wall to re-inflate the lungs.

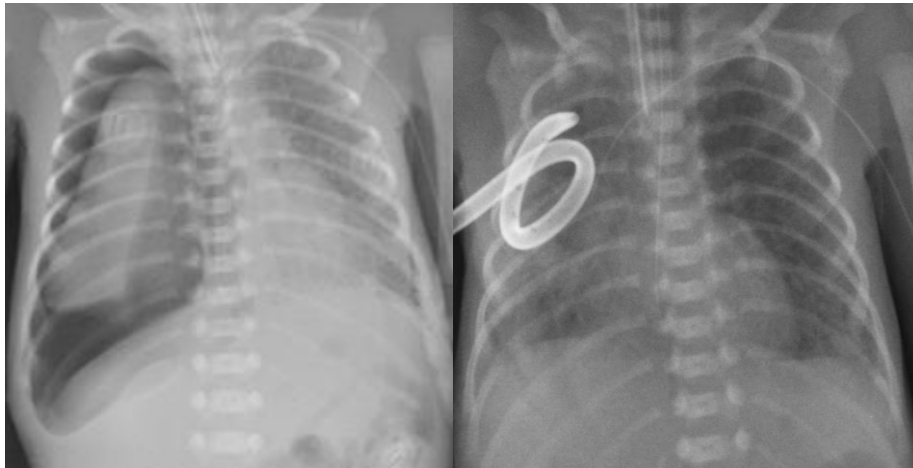


Figure 2. Chest X-rays showing right sided pneumothorax with collapsed lung and re-expansion of lung following chest drain insertion

Most neonatal units now have a non-invasive approach to respiratory care. This means that we try not ventilating invasively if a baby is able to maintain oxygen levels in the blood and breath spontaneously using more-gentle non-invasive ventilation called continuous positive airway pressure (CPAP) or high flow (you can read more about ventilation techniques in **Chapter 7 'Ventilation'**).

Sometimes this is not possible and babies may need to be re-intubated and ventilated invasively, for a short time or prolonged period. The medical team will guide this.

When babies are ventilated or on CPAP/high flow they are kept on their tummy in the incubator because this means it requires less effort for them to breathe.

With the help of nurses you can:

- observe your Baby's breathing effort
- number of desaturations and bradycardias over a time period
- carry out nasal and mouth cares for your Baby
- assist the nurses during suctioning of the mouth or endo-tracheal tube
- help with positioning of your Baby in the incubator
- help with maintaining the canopy cover to allow minimal light exposure
- speak to your Baby in a soft voice as they will recognise this from when they were inside the womb

1.2 Neonatal sepsis/infections

Preterm babies are more prone to develop infections because of their lack of protective immunity. Despite strict hand hygiene precautions and alertness of the nursing staff and the doctors, preterm babies can get an infection called sepsis. Sepsis is mainly treated with antibiotics and sometimes with antiviral or antifungal medicines as well.

The commonest bugs the babies are prone to be infected in a neonatal unit are Coagulase Negative Staphylococcus aureus (CONS), Group B Streptococcus (GBS) and E. coli.

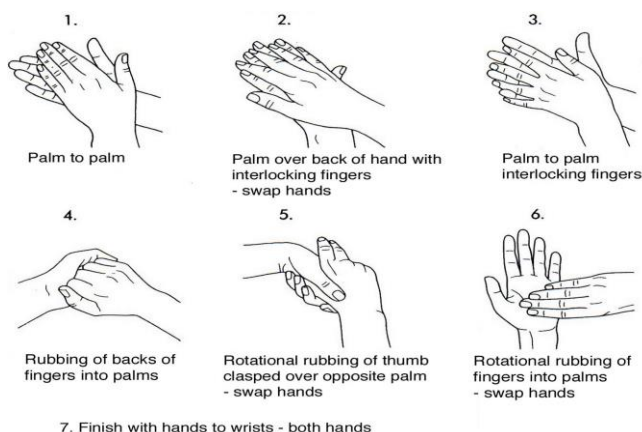


Figure 5. Hand hygiene within neonatal unit

The antibiotic regime used in our neonatal unit will treat the majority of the bugs known for infection in the neonatal units. For infections in the blood, depending on the bug involved the course of antibiotics could be between five and seven days. For infections in the covering of the brain (meningitis) which can be identified by lumbar puncture and by examining a small volume of fluid from the spine, the course of antibiotics could be around 14 days. We work closely with the microbiologists and the infectious diseases team and the course of antibiotics is determined by the medical team.

Their skin is thin and fragile and can get bruised very easily. Injured or bruised skin is a risk factor for sepsis, as bacteria can get into the baby's system via the broken skin. You should look after the skin carefully and make sure that there is no break in the skin. If there are breaks, you should inform nurses or doctors, who may use light dressing to prevent infection.

Another risk factor for sepsis is the presence of any intravascular device, as infections are sometimes caused by bacteria collecting on plastic devices. Your Baby may have umbilical catheters in the belly button for monitoring blood pressure or for giving intravenous feeds (TPN). These will be removed as soon as possible based on their medical condition. Sometimes your Baby may need antibiotics or other medications which are given through an intravenous cannula; this should be removed as soon as there is no requirement for additional intravenous medication.

Any intravenous catheter or cannula is a possible source of infection and should be removed as soon as it is not required. Any redness or swelling around the place where the cannula is can be an early sign of infection. The nurses will keep a very close eye on this.



Figure 4. Umbilical catheters, long line and intravenous cannula pictures

You can help us in detecting early signs of infection:

- your Baby may be quieter than usual, less active and lethargic
- they may look pale
- your Baby may be breathing very fast (more than 60 to 70 breaths per minute) or shallow
- they may be having multiple episodes of desaturation or bradycardias
- your Baby may be not able to tolerate feeds, vomiting milk or bile
- there may be increasing oxygen requirement on a ventilator, CPAP or high flow.

1.3 Intra-ventricular haemorrhage

Preterm babies have fragile blood vessels in the brain which are prone to bleed. This is called intra-ventricular haemorrhage or IVH. We monitor IVH in the brain using regular brain ultrasound scanning and IVH is graded in terms of its severity using ultrasound scan images.

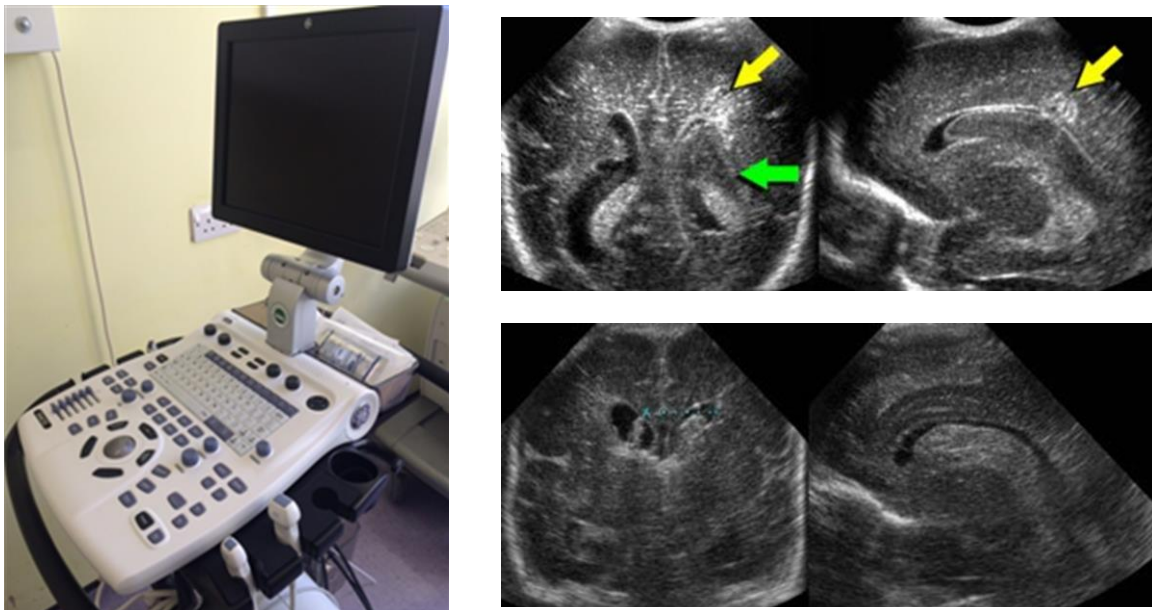


Figure 6. Ultrasound scanner in neonatal unit and major IVH

In minor bleeds (Grades I and II) there is no bleeding in the brain tissue, only in the fluid pockets, therefore they are unlikely to have any long-term consequences. Grades III and IV are the most severe and usually have some impact on babies' long-term neurological outcome. Severe bleeds can involve the brain tissue and can block the circulation of the fluid inside the brain, a condition known as hydrocephalus which will need surgery.

Preterm babies who have a major (Grade IV) bleed in the brain will have some form of long-term neurological condition, varying from minor problems in behaviour and cognitive function to major problems or disability such as cerebral palsy.

The majority of the bleeds happen in the first week of life in preterm infants, when they are most vulnerable. We try to prevent bleeds in a preterm brain by maintaining hydration, blood flow and pressure and minimising handling during the first 72 hours of life. Preterm babies who are transferred from different hospitals after delivery are more prone to bleeds in the brain. Sometimes the bleeds happen before they are born and this can be seen in the first brain ultrasound scan.

There is no treatment available for IVH and this can only be monitored.

1.4 Patent ductus arteriosus

Patent ductus arteriosus (PDA) is a common heart condition in preterm babies.

The ductus arteriosus (DA) is a connection between the two main blood vessels that come out from either side of the heart chambers, one of which pumps blood to the lungs to get oxygen and one which pumps blood to all the other organs of the body.

This connection is present while the baby is inside the womb. When babies are born at term this closes within 48–72 hours. However, in preterm babies this can remain open (patent) and this is known as PDA. PDA can be asymptomatic in the majority of cases, only a heart murmur will be noted, and the duct closes spontaneously in few weeks' time. However, sometimes the presence of PDA can lead to significant problems.

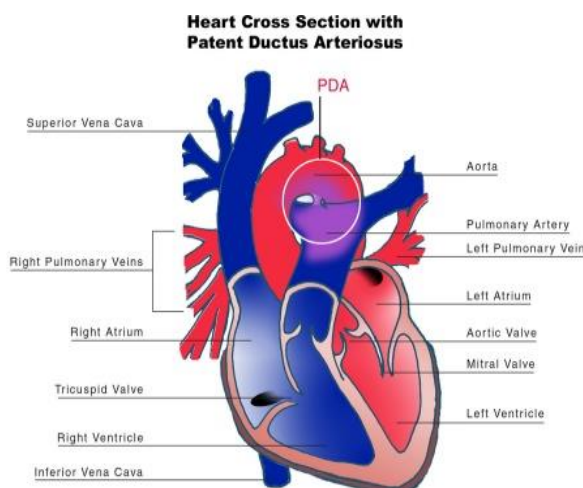


Figure 7. Schematic diagram of PDA

Doctors will do an echocardiography and together with the baby's general condition and symptoms of PDA will decide to treat this or not. In the majority of the cases this is treated medically with ibuprofen and may be treated more rarely with paracetamol. Sometimes PDA may need surgical management to close it if it is not responding to medical treatment.

For surgical closure of PDA, your Baby will be transferred to a regional paediatric cardiac centre with a neonatal or paediatric intensive care facility, to aid surgery and recovery. This is generally a day case procedure and your Baby will be transferred back on the same or following day, or within a few days, to our neonatal unit as soon as they are deemed medically stable.

1.6 Necrotising enterocolitis (NEC)

The premature gut is prone to infection and sometimes does not cope very well with feeding through nasogastric tube. Preterm babies do not have the protective, friendly bacterial colonisation in the gut which healthy term infants have soon after they are born, and are often colonised with hospital bugs. Maternal breast milk is an important factor in preventing necrotising enterocolitis.

Other risk factors such as maternal blood pressure during pregnancy can cause reduced blood flow in the placenta, leading to impaired blood circulation or growth of the gut. These babies are at higher risk of developing feed intolerance and NEC.

We are always cautious with increasing feed in premature babies. Despite strict regime and close observation, babies may develop feed intolerance and swelling and infection of the gut, resulting in an inflamed and dying gut wall, a condition known as necrotising enterocolitis (NEC). This process can be very rapid and the gut wall can weaken and split open. NEC is the main reason for surgery in preterm babies and unfortunately still has a high mortality. The etiology of NEC is not fully understood and we only can provide supportive treatment.



Figure 8. Nappy showing blood in stool

NEC is diagnosed clinically with tense, tender swelling of the abdomen, bile in the fluids aspirated from the nasogastric tube and blood in the stool. An abdominal x-ray can confirm the diagnosis. Minor NEC can be managed by resting the gut and giving antibiotics while major NEC may need surgical management.

If your Baby requires surgical management of NEC, they will need to be transferred to a paediatric surgical centre with tertiary neonatal care services. This will be generally within close proximity (within neonatal network); however, your Baby may be required to be transferred out of the network if there are no beds available in the network surgical centre.



Figure 9. Picture of NEC with swollen tense abdomen, swollen and oedematous gut

You can help your Baby by expressing breast milk, which is the first choice for enteral feeds for preterm babies; breast milk is known to protect against developing NEC.

In our unit we also use pooled donor-expressed breast milk from the first day of life (with your consent) while we await any expressed colostrum/milk from you.

You can help us in identifying early signs of NEC:

- feed intolerance



Figure 10. Picture of NEC X-ray and perforation

- abdominal swelling and tenderness
- other signs of infection and sepsis such as lethargy and being quiet.

1.7 Chronic lung disease or bronchopulmonary dysplasia

All babies born prematurely have premature lungs and suffer some degree of lung injury related to neonatal intensive care. Babies who are ventilated or required oxygen therapy for a long time may develop chronic lung disease (CLD), previously called bronchopulmonary dysplasia. By definition this diagnosis is used if they still require oxygen or some form of respiratory support when they reach 36 weeks of corrected gestational age. A chest x-ray will show whether a baby has chronic lung disease.

Babies with CLD may require oxygen support when they go home. They will be supported by community teams and followed up at home and at the outpatient clinic. Many babies discharged home with oxygen are weaned off by the time they reach six to nine months of corrected age (you can read more about home oxygen in [Chapter 15 'Discharge planning'](#)).

Babies with chronic lung disease are prone to develop virus infections of the lung in the winter months (even after discharge) and may qualify for a preventative vaccine. You can help by keeping them in a smoke-free environment when they go home as these infants are less prone to infection and cot death in such an environment. (Also see [Chapter 15: Discharge planning](#)).

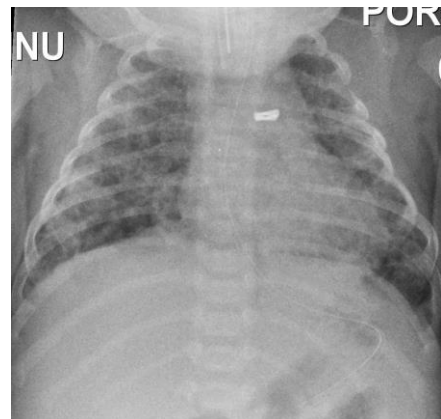


Figure 11. Picture of chest x-ray of BPD with white wooly opacities in both lung



Figure 12. Picture of baby on home oxygen in buggy

1.8 Retinopathy of prematurity

Preterm babies can develop abnormal blood vessels at the back of the eye called retinopathy of prematurity (ROP). In the past this condition led to blindness, but today we have effective therapies and advanced screening therefore blindness related to ROP is extremely rare. As per national guideline, we have an expert team of ophthalmologists that regularly screens every baby who is born at less than 31 weeks and 6 days of gestation, or weighs less than 1,500 grams at birth during the critical time period.

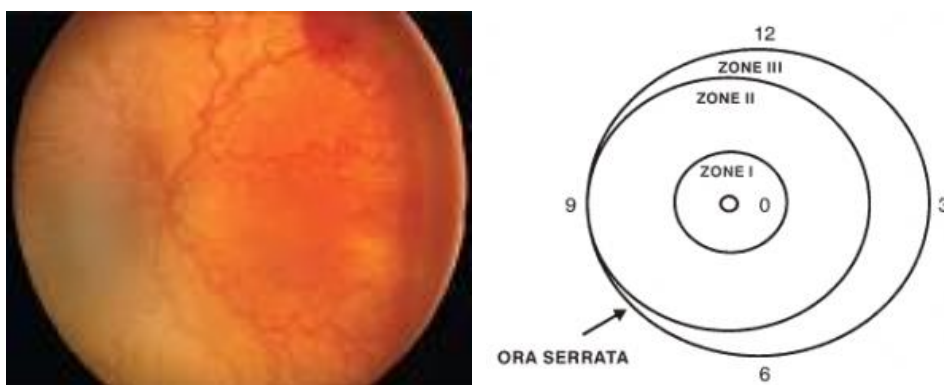


Figure 13. Picture of ROP and zones of retina

A national screening schedule is followed. If required, some of these babies are treated with laser therapy or medicines administered inside the eye to stop the abnormal development of blood vessels and prevent the detachment of the retina. Imperial College Healthcare NHS Trust's neonatal service provides an ROP laser service for the whole of the North West London Perinatal Network.

1.9 Jaundice

Jaundice is a common condition in preterm babies, caused by the buildup of bilirubin. This substance is released when red cells are breaking up in the blood as part of a natural process. Bilirubin causes the skin colour to change to yellow. Bilirubin levels are routinely monitored during the first weeks of life and charts are used to monitor treatment.

Treatment for jaundice is called phototherapy. Babies are placed under a special blue light which helps to metabolise (break down) the bilirubin.

There are other, rarer types of jaundice related to haematological or liver problems. Jaundice related to an intrinsic liver problem cannot be treated by



Figure 14. Phototherapy treatment

phototherapy.

1.10 Blood transfusion

Your Baby may need a blood transfusion if born prematurely or critically ill. There are different types of blood products used for various reasons. During a transfusion your Baby receives



Figure 15. Blood transfusion packs

donated blood cells or blood products via an intravenous line.

Most frequently, red cell transfusion is given, as premature babies' bone marrow cannot produce enough, especially as a significant volume of blood is taken for regular tests. An extremely premature baby may receive two to six top-up transfusions during their stay in the neonatal unit.

For babies with clotting problems, a platelet transfusion or fresh frozen plasma is used.

Usually your verbal consent is needed for the transfusion, however in emergencies the team may have to transfuse your Baby if they cannot contact you urgently as this is considered to be an emergency life saving treatment.

1.11 Gastro-oesophageal reflux

After a baby swallows milk, it goes down the food pipe (oesophagus) and then enters the stomach. Between the food pipe and the stomach there is a supporting mechanism which does not allow milk to come back to the oesophagus. This is called the lower oesophageal sphincter (LOS). In preterm infants this supporting mechanism is weak due to prematurity and hence some milk can come back to the food pipe and may cause some discomfort to your Baby. This is called gastro-oesophageal reflux.

This can be of varying intensity; for the majority of preterm infants this does not cause any discomfort or hindrance to their growth. In some preterm infants this can cause severe discomfort which can lead to respiratory distress, desaturation, bradycardia and apnoea. It can also be present in term infants and on some occasions this may need treatment. Babies with neurological or neuromuscular conditions, or those with surgical conditions such as oesophageal atresia with tracheo-oesophageal fistula can also present with severe reflux.

In the majority of cases, reflux is treated by raising the head end of the cot and putting the baby on an incline. There are certain tools available commercially to keep babies on an incline such as a reflux chair or an inclined edge. Another method is slow feeding and holding the feeding syringe at the same height as the baby's body to minimise the forces of gravity.



Figure 16. Picture of reflux chair and edge that can be used to manage reflux in a preterm baby

Sometimes babies are treated with antacids such as Gaviscon sachets dissolved in milk, or other medicines such as ranitidine or omeprazole. In some hospitals other medicines such as domperidone are used.

Preterm babies generally grow out of this as they get bigger. On rare occasions, babies may need long-term management until solids are started, especially if they have significant underlying medical problems. This will be monitored by the doctors in the outpatient clinic and medications can be prescribed by your GP.

1.12 Inguinal hernia

Preterm babies may have weak anterior abdominal wall muscles. They are therefore prone to develop hernias in their groin and umbilicus. Umbilical hernias do not require any management generally and it goes away slowly over the first year as babies get bigger and the abdominal wall gets stronger.

Inguinal (groin) hernias are a common condition in preterm infants and this can be of varying severity. The majority of them are small and can reduce by themselves or by gentle manipulation by a doctor. The hernia is caused by weakness of the abdominal wall, where part of the gut may be pushed out in a sack and can be felt in the groin. It has the potential to be obstructed, so the contents cannot be pushed back to the abdomen, and when this happens rarely the blood flow to the gut may be impaired (this is called a strangulated hernia). This is a surgical emergency and needs urgent surgical attention.

If your Baby is known to have a hernia it can always be observed while you are changing nappies. If you are worried that the hernia cannot be reduced you should always inform the nurses or doctors who can then examine.

Please let the medical team know that your Baby has a hernia while they examine during ward round.

Generally, inguinal hernias are repaired surgically before babies go home. For an elective surgical procedure your Baby will be transferred to a paediatric surgical centre which is likely to be within the neonatal network.

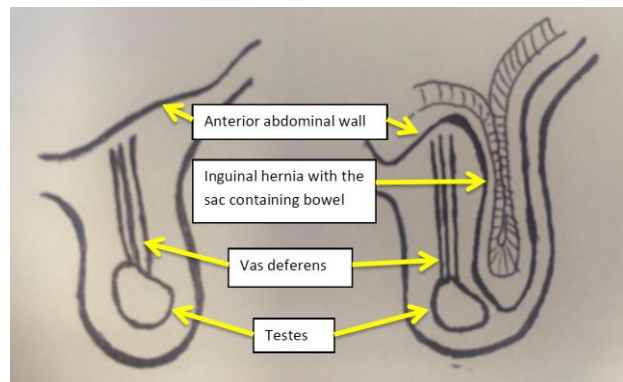


Figure 15. Schematic diagram of normal inguinal canal and inguinal hernia with hernia sac containing intestine

Key messages and reflection:

After this chapter you should be able to:

- understand the common medical conditions of prematurity
- understand how can you try and prevent some of the conditions
- understand how can you support your Baby and the team in early detection of these conditions
- understand how can you support your Baby and the team in managing these conditions.

Further learning in this topic

If you wish to know more:

- ask our neonatal team at any time
- ask for one to one support from one of our Integrated Family Delivered Care Project nurses
- use this app or your Parent Binder to record notes and questions
- Attend small group teaching in topic: **Common medical conditions of prematurity**

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Resources

Rennie J M (2005) Robertson's Textbook of Neonatology, Fourth Edition

Local Neonatal guidelines and Parent Information leaflets

Merenstein G B and Gardner S L (2011) Handbook of Neonatal Intensive Care, Mosby Elsevier