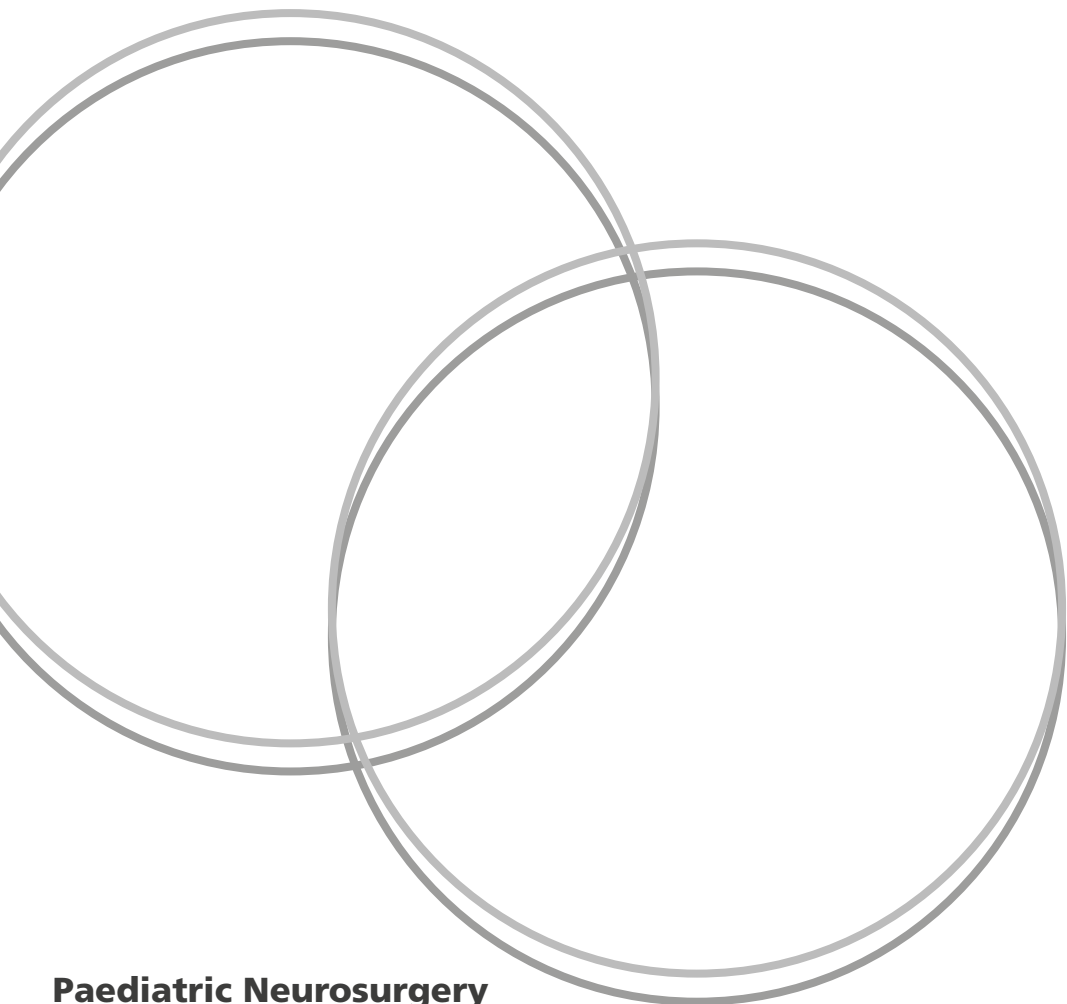




Oxford University Hospitals
NHS Foundation Trust

Intracranial Pressure (ICP) Monitoring

Information for parents and carers



Paediatric Neurosurgery
The Children's Hospital

What is intracranial pressure (ICP) monitoring?

Intracranial pressure monitoring uses a probe placed inside the skull to sense the pressure inside the skull and send this measurement to a recording device.

Why does my child need ICP monitoring?

There are a number of reasons why your child may need ICP monitoring, such as following a head injury or VP shunt surgery to their brain. It may also be required if your child has displayed symptoms which suggest they may have high pressure within their skull.

The neurosurgeons will explain why your child needs to have ICP monitoring and how long it may be needed for. Monitoring usually lasts for 24 hours, but sometimes we need to monitor for longer periods of time (48 hours or more).

What does ICP monitoring involve?

The ICP monitoring probe is inserted during a short operation under general anaesthetic. This means your child will be unconscious and will not be able to feel anything.

A consultant anaesthetist (doctor who helps to put your child to sleep) will talk to you and your child (if appropriate) about the anaesthetic.

After the operation, the probe will be connected to a device called a Codman box or Raumedic, which links to a computer. It will constantly record your child's intracranial pressure (pressure within their skull). A nurse will write down the pressure measurement every hour.

What are the risks?

ICP monitoring is considered to be a safe procedure, which can help us to understand your child's condition and help us to plan any treatment they might need.

As with all procedures there are a few potential risks.

- bleeding in the cranial cavity (space around the brain)
- infection (this is always a risk with any procedure which breaks the skin)
- a small amount of the cerebrospinal fluid (CSF), which surrounds the brain and spinal cord, leaking from the place where the ICP probe was inserted, after the operation. The ICP probe insertion site will be checked regularly, but if you notice anything leaking from the wound please tell the nurses.

Some children complain of a headache after this operation. We can give your child pain relief to make sure they are comfortable.

The surgeon will discuss the risks with you in more detail.

What are the benefits?

Measuring the pressure in your child's head will allow the doctors to identify whether further surgery is required.

Are there any alternatives?

There are no alternative ways to measure the real time pressure in your child's head. There are other tests, such as an eye fundus exam which can show swelling at the back of the eye which is associated with high pressure.

Anaesthetic risks

In modern anaesthesia, serious problems are uncommon. Risk cannot be removed completely, but modern equipment, training and drugs have made general anaesthesia a much safer procedure in recent years. Throughout the whole of life, a person is at least 100 times more likely to suffer serious injury or death in a road traffic accident than as a result of anaesthesia¹.

Most children recover quickly and are soon back to normal after their operation and anaesthetic. Some children may suffer side effects like sickness or a sore throat. These usually last only a short time and there are medicines available to treat them if necessary.

The exact likelihood of complications depends on your child's medical condition and on the nature of the surgery and anaesthesia your child needs. The anaesthetist can talk to you about this in detail before the operation.

Consent

We will ask you for your written consent (agreement) for the operation to go ahead. If there is anything you are unsure about, or if you have any questions, please ask the doctor before signing the consent form. When discussing consent the surgeon will go through all benefits and risks of the operation.

If this is a planned procedure for your child (instead of an emergency operation) you may have been seen in a pre-admission clinic and should have received information about how to prepare your child for the procedure.

Fasting instructions

If your child is coming into hospital to have this procedure as a planned operation (not as an emergency procedure), please make sure that you follow the fasting (starving) instructions. These should be included with your appointment letter or would have been given at the pre-operative assessment appointment.

If this surgery is an emergency, the nurses on the ward will give you fasting instructions.

Fasting is very important before an operation. If your child has anything in their stomach whilst they are under anaesthetic, it might come back up while they are unconscious and get into their lungs.

Pregnancy statement

All girls aged 12 years and over will need to have a pregnancy test before their operation or procedure. This is in line with our hospital policy.

We need to make sure it is safe to proceed with the operation or procedure, because many treatments including anaesthetic, radiology (X-rays), surgery and some medicines carry a risk to an unborn child.

The pregnancy test is a simple urine test and the results will be available immediately. If the result is positive, we will discuss this and work out a plan to support your child.

What happens before the operation?

You will be asked to bring your child in to hospital at **7.30am**. They need to come to Children's Theatre Direct Admissions (TDA). This is based on Robin's Ward at the Children's Hospital in Oxford.

When you arrive, you and your child will be greeted by a nurse or healthcare assistant and will be shown to the waiting area. The nurse will check your child's paperwork and put some name-bands around their wrists or ankles. They will also measure your child's temperature, heart rate and breathing rate.

Your child will then be seen before their surgery by the neurosurgical team. The doctors will also take your child's medical history and samples of blood. This is to make sure the right type of blood is available during the surgery, if it is needed. The blood test will also be sent to check their electrolyte levels (biochemistry) and for any signs of infection.

A nurse or healthcare assistant will look after you and your child until your child is in theatre. There are also play specialists available to help your child prepare for the operation and to keep them distracted with play activities both before and after the operation. They will also help with preparing them for their anaesthetic. There are toys and gaming devices available for all ages.

The nurse and healthcare assistant will make sure you understand the routine of the day and your child's care before the operation. They can answer any questions you both may have.

In the anaesthetic room

A nurse and one parent or carer can come with your child to the anaesthetic room. Your child can also take a toy or comforter.

It may be possible to give the anaesthetic with your child sitting on your lap. Your child may either have anaesthetic gas to breathe, or an injection through a cannula (a thin plastic tube that is placed under the skin, usually on the back of the hand). Local anaesthetic cream (EMLA or Ametop, sometimes known as 'magic cream'), can be put on their hand or arm before injections so they do not hurt as much. It works well for 9 out of 10 children.

If the anaesthetic is given by gas, it will take a little while for your child to be anaesthetised. They may become restless as the gases take effect. If an injection is used, your child will normally become unconscious very quickly indeed. Some parents may find this upsetting.

When your child is asleep you will be asked to leave quickly so that the medical staff can concentrate on looking after them. The nurse will take you back to the ward to wait for your child.

Your child will then be taken into the operating theatre to have the operation. The anaesthetist will be with them at all times.

What happens during the operation?

Before the operation starts, some of your child's hair may have to be shaved. The surgeons will try to shave the smallest area possible and it will grow back in time, after the operation.

The surgeon will make an incision (cut) approximately 1.5cm long on the top of their head. They will then make a very small hole in the skull. The ICP probe will be inserted through this hole. The wire from the probe will be brought out separately through another small cut about 1cm away from the 1st cut, to prevent infection and leak of brain fluid (CSF).

The probe will be stitched in place to prevent it being pulled out; these stitches will be removed when the neurosurgeons agree it is time to remove the ICP probe. The wound will be closed with dissolvable stitches, which will usually dissolve within 7 to 14 days but can take 6 weeks.

From the time your child goes to sleep in the anaesthetic room to the time you can see them in recovery is approximately 1 hour.

After the operation

After the operation your child will be taken to the recovery room while they come round from the anaesthetic. You will then be collected to go with the nurse to the recovery room where you will be able to see them.

A recovery nurse will look after your child until they are ready to come back to the ward. The nurse will make regular checks of your child's pulse, blood pressure, temperature and wound. They will also make sure your child has adequate pain relief. The nurse will then bring you and your child back to the ward.

The nurse will need to look in your child's eyes with a small torch, to check that they are reacting as they should. They will also ask them a couple of questions (if they are old enough /able to answer) to check their level of consciousness.

Some children remain sleepy for a little while after their operation, while other children wake up quickly. If your child is still sleeping, it is important for the nurse to wake them up, to check that they can be easily woken.

When your child goes to sleep for the night, the nurses will not continue to wake them, but can monitor them using other checks.

The nurse will also need to assess how much movement and sensation your child has in their limbs. Once your child begins to recover, the frequency of these checks can be reduced. We will also regularly inspect your child's wound, to check for leaking or bleeding.

Recovery from the anaesthetic

When your child is awake from the anaesthetic they can start drinking and, if they are not sick, they can begin to eat a light diet. Often, children are given fluids through their cannula until they are able to tolerate their normal diet again.

Occasionally, the anaesthetic may leave your child feeling sick for the first 24 hours and they may vomit. The best treatment for this is rest and small, frequent amounts of fluid, toast or biscuits. We can also give medication to help with this, but it should settle with time.

The hospital experience is strange and unsettling for some children so do not be concerned if your child is more clingy, easily upset, or has disturbed sleep. Just be patient and understanding.

It is likely your child will be ready to go home around 3 days after the operation.

Pain assessment and pain relief

Your child's named nurse will use a pain assessment tool to help assess your child's pain score after their operation. This is a chart which helps us to gauge how much pain your child may be feeling.

You and your child will be introduced to this assessment tool either at their pre-assessment visit or on the ward before their operation. You can continue to use this assessment at home to help manage your child's pain if you wish.

Your child will be given paracetamol when they need it after the operation. Most children are comfortable and only require one or two doses while in hospital.

Connecting the probe to the monitor

When your child returns from the operating theatre they will be connected to the monitor (box). If your child wants to go to the toilet or walk around briefly then the box can be unplugged from the wall and taken with them.

You may notice a change in the pressure reading if your child does anything that might alter the pressure inside their head. This can include moving about, changing position in bed, coughing or sneezing, vomiting or crying. You will also notice that the pressure reading changes depending on whether your child is awake or asleep.

When the nurse comes to read the pressures they will also record what your child is doing at the time. This helps to build up a complete picture of what might be causing the change in pressure.

When the doctors decide that enough information about your child's intracranial pressure has been recorded, the ICP monitoring will be stopped.

The neurosurgeons will discuss the results with you when the readings have been analysed. They can then plan any treatment that may be needed.

The ICP probe and stitches will be removed on the ward. Your child can have paracetamol before this is done, to relieve any discomfort. The site from where the probe is removed should heal over within a couple of days.

One or two small dissolvable stitches will remain where the cut to insert the ICP probe was made. These will dissolve within 7 to 14 days.

Wound care and hygiene

You can wash your child's hair after the ICP probe has been removed. A mild/baby shampoo can be used, but avoid soaking or rubbing the wound, as this causes the stitches to dissolve too quickly, which may result in the wound opening or not healing well.

Fresh, clean water should be used to wash and rinse their hair, as this reduces the risk of infection. It is also important to avoid using conditioner, moisturisers or body lotion around the wound area, as they can also cause the stitches to dissolve too quickly and be a risk for infection.

Your child should be discouraged from scratching the wound, as this could cause an infection. If the wound becomes red, inflamed or painful please see your child's GP or call the ward.

Please make sure you have enough children's paracetamol at home, ready for when your child comes home from hospital.

Follow-up care

If your child has a headache or tenderness where the probe was inserted you can give them children's paracetamol, but not more than once every 4 to 6 hours, and no more than 4 doses in a 24 hour period. Please make sure you follow the correct dosage instructions for your child's age.

Your child's doctor will tell you if they need a follow-up appointment. The letter confirming the date and time of the appointment will come by post within 2 weeks. Please contact the hospital switchboard and ask to speak to your consultant's secretary if this does not arrive after this time.

If your child is found to have high intracranial pressure, the neurosurgeons or craniofacial team will arrange a follow-up appointment with you before your child leaves hospital.

Getting back to normal

Speak to your child's nurse for advice about when they can return to school and go back to normal activity and sports.

Signs to look out for

Please watch out for the following symptoms when you return home with your child:

- drowsiness or confusion
- raised temperature within a few days of leaving hospital
- the wound site looking red or inflamed or feeling hotter than the surrounding skin
- any leaking of fluid from the wound.

A leak of fluid means there is potential for infection to get in to the wound. We may need to put a small stitch in the wound to help stop the leak.

If your child has any of these symptoms you should contact the ward urgently (contact numbers are at the end of the leaflet).

How to help with your child's recovery

A healthy balanced diet is important for your child's recovery, as it gives them energy to recover and helps with wound healing.

Regular pain relief is important, as it helps reduce any discomfort. This will help your child to keep moving, which can speed up their recovery.

Please make sure you have enough children's paracetamol at home, ready for when your child comes home from hospital. You can give them children's paracetamol, but not more than once every 4 to 6 hours, with no more than 4 doses in a 24 hour period.

You can also give them children's ibuprofen every 6 to 8 hours, but only give a maximum of 4 doses in a 24 hour period.

Please make sure you follow the correct dosage instructions for your child's age.

How to contact us

If you have any further questions, worries or queries about your child once you get home, please contact us. We are available 24 hours a day, 7 days a week.

Robin's Ward

Telephone: **01865 231 254/5**

Melanie's Ward

Telephone: **01865 234 054/5**

Neurosurgical Nurse Specialist

Telephone: **01865 226 535**

To contact your child's consultant's secretary, please phone the John Radcliffe Hospital Switchboard:

Telephone: **0300 304 7777**

If your child requires urgent treatment, please call 999 or go to your nearest Emergency Department.

How can I give feedback about my experience?

We would like to hear about your experience with our Childrens Services. Please ask for a paper copy to fill in.

References

¹From the Royal College of Anaesthetists (2014) Fourth Edition
Your child's general anaesthetic. Information for parents and guardians of children.

Website: www.rcoa.ac.uk/patientinfo

***We hope that this information is useful to you
and would welcome any comments about
the care or information you have received.***

***Please bring this leaflet with you on the day
of your child's operation.***

Further information

If you would like an interpreter, please speak to the department where you are being seen.

Please also tell them if you would like this information in another format, such as:

- Easy Read
- large print
- braille
- audio
- electronic
- another language.

We have tried to make the information in this leaflet meet your needs. If it does not meet your individual needs or situation, please speak to your healthcare team. They are happy to help.

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Oxford University Hospitals NHS Foundation Trust
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