INTRACRANIAL PRESSURE (ICP) MONITORING VIA RICKHAM RESERVOIR, CODMAN MONITOR OR LUMBAR CATHETER - CHW

PROCEDURE ©

DOCUMENT SUMMARY/KEY POINTS

- This document provides details for I.C.P monitoring and removal of I.C.P devices for:
  - Codman monitor
  - Rickham reservoir and
  - Lumbar catheter
- Monitoring via a Rickham reservoir requires aseptic technique for the insertion of the butterfly needle into the Rickham reservoir. This procedure is performed by the **Neurosurgical Registrar only**. Nursing staff are not permitted to perform this procedure.
  NOTE: if the butterfly needle is already placed in the Rickham reservoir an RN may perform the connection procedure with the assistance of the biomedical engineer.
- When a child has a lumbar catheter in situ, the Neurosurgical Registrar is not required and a Registered Nurse (RN) may connect the child to the monitor with assistance of the biomedical engineer.
- When a child has a codman monitor in situ an RN may connect the monitoring without the assistance of a biomedical engineer.
- The procedures within this document can be used in Grace Centre for Newborn Care and Wards. PICU follow a separate procedure.
- Removal of butterfly needle, codman wire or lumbar catheter is performed by an **RN.**

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st July 2013	**Review Period**: 3 years
Team Leader:	Nurse Educator	**Area/Dept**: Commercial Travellers Ward

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This Policy/Procedure may be varied, withdrawn or replaced at any time. Compliance with this Policy/Procedure is mandatory.

CHANGE SUMMARY

- Section 3 to include information and pictures for Phillips Monitor.
- Section 4 – removal of pictures 3 & 4.
- Other minor grammatical changes.

READ ACKNOWLEDGEMENT

- All clinical (medical and nursing) staff involved in the care of a child undergoing ICP monitoring are to read and acknowledge they understand the contents of this document.

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Intracranial Pressure Monitoring

Rationale

Intracranial pressure (I.C.P) monitoring is performed to investigate and develop a greater understanding of the Cerebrospinal Fluid dynamics, and evaluate any possible disturbance or change in the child's intracranial pressure.

This document is to assist nursing staff to provide the appropriate care for children who are undergoing I.C.P monitoring.

General Principles

- Monitoring via a Rickham reservoir requires aseptic technique for the insertion of the butterfly needle into the reservoir.
- If monitoring is to be achieved via insertion of a butterfly needle into the Rickham Reservoir, the **Neurosurgical Registrar ONLY** performs this procedure. Nursing staff are not permitted to perform this procedure.
- When a child has a lumbar catheter in situ, the Neurosurgical Registrar is not required and a **Registered Nurse** (RN) may connect the child to the monitor with assistance of the biomedical engineer.
- When a child has a codman monitor in situ an RN may connect the monitoring without the assistance of a biomedical engineer.

Education/Evidence

- I.C.P. monitoring is performed to assist in the measurement of intracranial pressure and helps to confirm diagnosis of conditions such as Hydrocephalus and Benign Intracranial Hypertension (BIH).
- This procedure is also performed to investigate possible causes of increasing head circumference, shunt system malfunction and possible arrested hydrocephalus.

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1 I.C.P Monitoring Via Rickham Reservoir

Equipment required

- X 1 Sterile Drape
- Sterile gloves
- X 1 Dressing pack
- Alcoholic Chlorhexidine solution 0.5%
- X 1 Transducer pack
- X 1 Sterile CSF tube
- X 1 25 gauge butterfly needle + 1 spare
- X 2 large occlusive transparent dressings
- X 1 packet sterile gauze swabs
- X 1 10mL syringe
- X 2, 2mL syringes
- IV luer lock cap
- X 1 three way tap
- X 2 crepe bandages
- 7.5 cm white elastoplast tape
- X 1 razor
- X 1 normal saline ampoule

Procedure

1. Explain the procedure to the child and/or parents.
2. The procedure is attended at the child's bedside, ensuring privacy is maintained. Prepare equipment but **do not open** until the Neurosurgical Registrar is ready to scrub, and the biomedical engineer is present.
3. The Rickham Reservoir site may need to be shaved and this must be attended to by the Neurosurgical Registrar.
4. Infants and toddlers will need to be gently restrained by wrapping them in a 'cuddly blanket' or drawsheet leaving their head exposed.
5. For neonates administer a dose of sucrose two minutes prior to the insertion of the needle.
6. Neonates (or infants under 3 months of age) have full cardio-respiratory monitoring whilst the needle is in situ for I.C.P monitoring.
7. The RN should continue to observe the child's level of consciousness throughout the procedure and document this in the patient's medical record.
8. The Neurosurgical Registrar primes the 3 way tap and butterfly needle with normal saline, and cleans the skin over the Rickham Reservoir with Alcoholic Chlorhexidine 0.5%.
9. An occlusive transparent dressing is placed over the Rickham Reservoir site to promote a sterile field.
10. The 25G butterfly needle is inserted into the Rickham Reservoir and a CSF specimen may be collected at this point.

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11. The 3 way tap and transducer are connected to the end of the butterfly tubing, which in turn is connected to the ICP monitor. The biomedical engineer zeros the machine while the 3 way tap is open to air. The 3 way tap is then turned on to the patient and luer lock cap is applied – See Picture 1

Picture 1

12. The second occlusive transparent dressing is then used to secure the butterfly needle onto the scalp. The transducer is taped to side of the head and then 1-2 crepe bandages are applied to the child's head and secured with elastoplast tape.

13. At the end of the procedure leave the child clean and comfortable

14. Dispose of equipment as per Hospital Waste Management Policy.

15. If a CSF specimen has been collected, label this with appropriate patient details, place in biohazard bag and escort/send to pathology department immediately.

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2 I.C.P Monitoring via Lumbar Catheter

Equipment required

- X 1 Sterile drape
- Sterile Gloves
- X 1 Dressing Pack
- X 1 Transducer Pack
- X 1 Three way tap
- X 1 Luer lock cap
- X 1 roll micropore tape
- Alcoholic Chlorhexidine solution 0.5%
- X 1 Ampoule of normal saline
- X 1 5mL syringe

Procedure

1. Explain the procedure to the child and/or parents.
2. Do not open the equipment until the biomedical engineer is present. The procedure is performed at the child's bedside. Ensure privacy is maintained.
3. The ICP monitor is set up beside the bed or cot.
4. Wash hands in Chlorhexidine 2% for 3 minutes as per hospital guidelines.
5. Put on sterile gloves.
6. RN assistant washes hands, opens equipment and pours the alcoholic Chlorhexidine 0.5%.
7. Sterile drape is placed under the end of the lumbar catheter
8. Connect the 3 way tap to the end of the lumbar catheter. Ensure that the 3 way tap is primed with CSF by allowing the CSF to enter the 3 way tap under gravity. Do not aspirate the CSF and ensure that the CSF flows into both ports of the 3 way tap. In addition ensure no air bubbles are present, as this will interfere with the data and calibration of the machine. Check calibration with the biomedical engineer. If there is no CSF flow, using aseptic technique disconnect the 3 way tap from the patient, prime with normal saline and then reconnect.
9. A transducer is connected to the distal end of the 3 way tap, which in turn is connected to the ICP monitor. The biomedical engineer zeros the machine while the 3 way tap is open to air. The intracranial pressure measurement is converted to a waveform on the monitor.
10. The 3 way tap is then turned on to the patient and the open port of the 3 way tap secured with a luer lock cap.
11. Observe the child's condition and level of consciousness during the procedure. Monitor for increased headache and/or irritability and notify Neurosurgical Registrar as necessary.
12. At the end of the procedure leave the child clean and comfortable.
13. Dispose of equipment as per Hospital Waste Management Policy.
14. If a CSF specimen has been collected, label this with appropriate patient details, place in biohazard bag and escort/send to pathology department immediately.

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3 I.C.P Monitoring via Codman Monitor

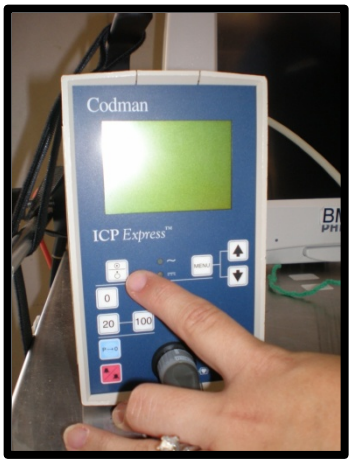
Equipment required

- Codman ICP Express Monitor
- Philips monitor

Procedure

1. The Codman Transducer will have been inserted and calibrated in the Operating Suite.
2. On arrival of the child to the ward post-operatively the following steps must be observed to initiate monitoring
    - Turn on the Philips monitor
    - Touch admit/discharge
    - Touch last name
    - Enter the child's name (must include last name, first name, DOB, MRN, gender)
    - Touch confirm
    - Plug the Codman monitor into the pressure port on the Philips monitor
    - If the waveform is missing press change screen
    - Touch '1 ECG & 1 PRESS'
    - Touch main set-up
    - Touch measurements
    - Scroll down
    - Touch ICP
    - Connect transducer
    - Turn on Codman
    - Touch zero ICP on Philips monitor

Plugging Codman Codman Monitor into the pressure port on the Philips monitor



Turning the Codman monitor on

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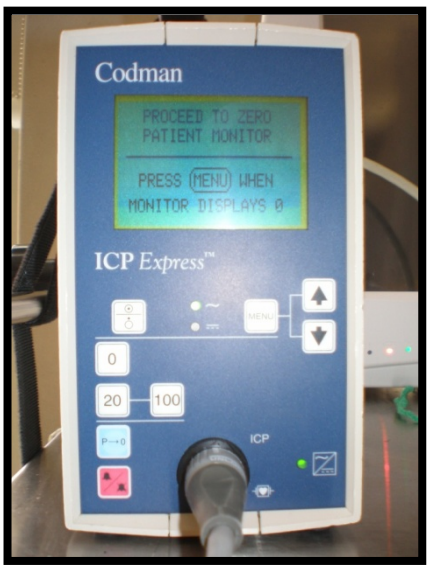
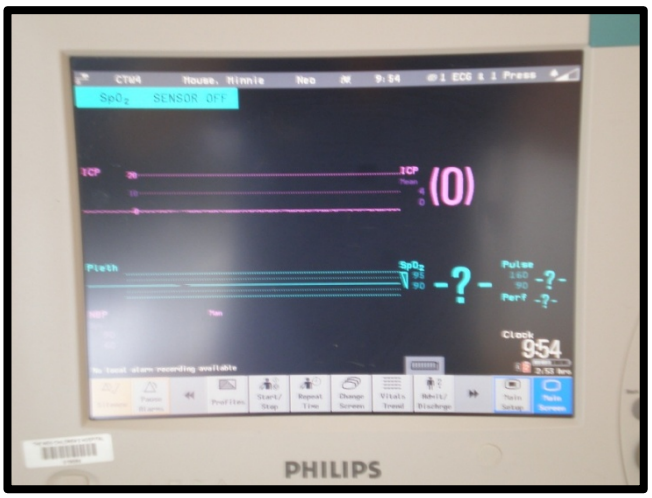
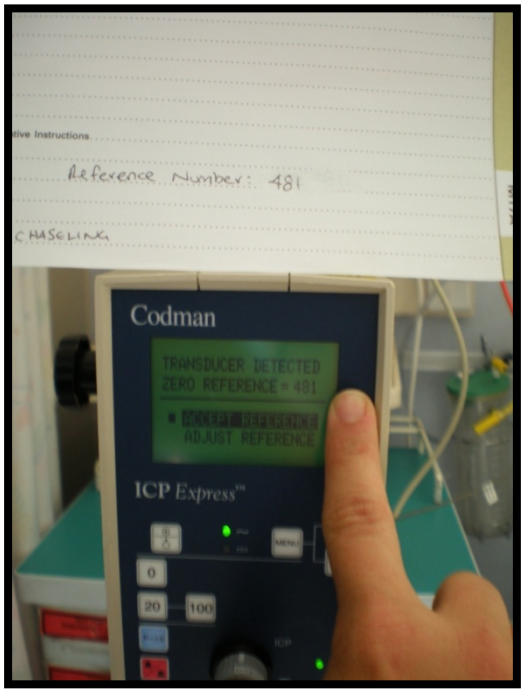
- When the Philips monitor reads 0, press menu on the Codman





- To ensure the zeroing process has been performed correctly, press 20 on the Codman monitor. The waveform on the Philips monitor should move up to 20. Press menu to return the waveform to normal.
- Accept the reference: check the reference number found in the post-op notes or on the MRN label on the Codman monitor. Accept the reference number on the Codman monitor by pressing menu.



3. Please consult with the biomedical engineer if there are any queries or concerns regarding either the Codman transducer or the setup procedure.

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4 Clinical Observations during I.C.P. Monitoring

- ICP monitoring is an invasive procedure and this carries potential risks of CSF infection and/or neurological complications such as low pressure headaches.
- Measure and record temperature, 4/24 during the ICP monitoring. Dependent on the child's diagnosis they may require neurological observations checked 4/24. Determine the need for neurological observations and the frequency with the Neurosurgical Registrar. Report any changes in vital signs or the neurological condition of the child to the Neurosurgical Registrar immediately.
- Neonates have full cardio-respiratory monitoring whilst the ICP monitor is in situ. Their behavioural state and level of arousal is assessed and documented every four hours.
- Check insertion site dressings hourly around butterfly needle, lumbar catheter or codman wire. These site checks need to be documented and signed for on the fluid balance chart in a dedicated column. The 3 way tap, bandage and outer dressings may feel damp and this will indicate signs of CSF leakage and/or disconnection from transducer.
- If a CSF leak is identified apply a pressure bandage and inform the Neurosurgical Registrar immediately. A CSF leak may occur due to raised ICP, a loose connection or dislodged catheter. The dressing may need to be taken down to investigate the leak and possibly tighten a loose connection. In the event that the dressing needs to be removed and reapplied, an aseptic technique is required.
- If CSF leak is identified from the butterfly needle entry site, the Neurosurgical Registrar may ask that the needle be removed using an aseptic technique. The monitoring procedure may be rescheduled at another time.
- In the event of equipment malfunction contact the biomedical engineer on call.
- Monitoring usually continues for 12 - 24hrs. The Neurosurgical Registrar will need to review the child and check the data obtained before the butterfly needle, lumbar catheter or codman monitor is removed.
- When the ICP monitoring has been completed an RN can remove the butterfly needle, lumbar catheter or codman monitor using aseptic technique.
- **NB** The lumbar catheter or codman wire may be secured with a suture and these require placement of a sterile occlusive dressing over the insertion site.

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5 Removal of Codman Monitor, Butterfly Needle from Rickham Reservoir, or Lumbar Catheter

Performed by Registered Nurse

Equipment required

- Sterile Gloves
- X 1 goggles
- X 1 packet sterile cotton balls
- X 1 sterile occlusive dressing
- X 1 stitch cutter (for lumbar catheter or codman wire)
- X 1 forceps (for lumbar catheter or codman wire)
- X 1 small primapore (for lumbar catheter or codman wire)

Procedure

1. Explain the procedure to the child and/or parent. The procedure is performed at the child's bedside. Ensure privacy is maintained.
2. Switch monitor power off at the wall.
3. Position the child on their side or supine, and gently restrain them as necessary. This will minimise child's movement during procedure and ensure uncomplicated removal.
4. Wash hands for one minute.
5. Prepare equipment.
6. Wash hands in Chlorhexidine 2% for 3 minutes and don gloves and goggles as per hospital guidelines

For removal of the Butterfly Needle

For the removal of the butterfly needle from the Rickham Reservoir, the assistant nurse firstly removes the head bandage, then gently lifts edges of occlusive dressing, being careful not to dislodge needle haphazardly (the wing of butterfly needle will remain stuck to a section of the occlusive dressing).

The RN who has prepared for asepsis gently lifts the butterfly needle in an upward direction and immediately applies pressure to puncture site with sterile cotton swab for 1-2 minutes. Once the RN has ensured that there is no CSF leakage via the puncture site cover with a sterile occlusive dressing.

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For removal of Codman Wire or Lumbar Catheter

- Wash hands for one minute.
- Prepare equipment.
- Wash hands for 3 minutes with Chlorhexidine 2%.
- Remove anchoring suture and gently withdraw catheter. Immediately apply pressure to insertion site with cotton swab for 1-2 minutes.
- After ensuring there is no CSF leakage place a dry dressing over the puncture site.
- If CSF leakage is evident after removal of the catheter, continue to apply a pressure dressing and notify Neurosurgical Registrar.
- At the end of the procedure leave the child clean and comfortable.
- The transducer is disconnected from the machine and disposed of appropriately. The transducer, lumbar catheter and codman wire are disposed of in the contaminated waste. The butterfly needle is disposed of in the sharps bin.
- **NOTE: The child must not be discharged from the Philips monitor until staff have received confirmation from the Neurosurgical Registrar that the data obtained has been downloaded.**

6 Post Procedure Observations

- Perform 4/24 temperature checks for at least 24 hours following removal of the device. An elevated temperature must be reported to the Neurosurgical Registrar as it may be the first indication of CSF infection.
- Observe the site to assess for presence of CSF leak.
- If a CSF leak has occurred either throughout the procedure or following removal of monitoring device, the child should lie flat and oral fluids should be encouraged. This will minimise the possible occurrence of a low-pressure headache.

7 Complications

- CSF infection is the greatest complication.
- Secondary and less common complications include equipment malfunction, air leaks and damage to the monitoring equipment which can all contribute to false recordings.

8 Related Information

- ICP Monitoring Systems in PICU: Management Practice Guideline: http://chw.schn.health.nsw.gov.au/o/documents/policies/guidelines/2007-0004.pdf

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