1.0 Introduction

Patients with hydrocephalus requiring cerebrospinal fluid diversion via a shunt were identified as a population that Neurosurgery cared for that required streamlining of care due to high volumes and complications such as infection which were relatively high compared to other procedures. This clinical practice guideline has been updated to reflect emerging changes in evidence (initial document developed 1997/98).

Target Population

- Inclusion: (May include cysto-peritoneal shunting and subdural peritoneal shunts)
- Infant/child with hydrocephalus requiring 1st shunt intervention.
- Child with existing shunt for hydrocephalus management.
- Newborn to 18 years of age with signs/symptoms of shunt malfunction (i.e. nausea/vomiting, headache, lethargy, irritability &/or altered level of consciousness (LOC))

Target Users

- All health care providers who may encounter a patient with a shunt or requiring a shunt.

2.0 Definitions

- **Shunt:** Referring only to a ventricular-peritoneal shunt
- **Shunt Revision:** Surgical replacement or change to an existing shunt

3.0 Clinical Practice Recommendations

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# Ventricular Peritoneal Shunt Insertion or Revision

**Expected Date of Discharge:** Post-op Day (POD) # 2

<table>
<thead>
<tr>
<th>PRE-ADMISSION</th>
<th>ADMISSION/PRE-OP</th>
<th>INTRA-OPERATIVE</th>
<th>POST-OP</th>
<th>DISCHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• History &amp; physical assessment (including fontanelle assessment and head circumference if less than 10 months)</td>
<td>• Neurological Vital Signs Q 1-4h, assess if the patient requires immediate intervention and notify if required</td>
<td>• See Shunt Infusion Protocol Checklist to be completed in OR (sitting room staff only)</td>
<td>• Neurological Vital Signs Q 2-3h</td>
<td>• Vital signs and Neurological Vital Signs per discharge</td>
</tr>
<tr>
<td>• CT scan or MRI (new diagnostic should have a 4D MRI, otherwise must be FAST MRI if sufficient) and head US if infant and clinically appropriate</td>
<td>• ICP monitor: ICP/CSF lines if patient &gt; 10 months</td>
<td>• Intracranial pressure monitored on alarm</td>
<td>• Head circumference recorded</td>
<td>• Head circumference recorded</td>
</tr>
<tr>
<td>• CT scan and/or MRI: if clinical conditions warrant, however, usually not required</td>
<td>• Monitor for signs &amp; symptoms of increased ICP</td>
<td>• Head circumference monitored: increase not limited</td>
<td>• Signs and symptoms of increased ICP</td>
<td>• Signs and symptoms of increased ICP</td>
</tr>
<tr>
<td>• Short series if CT/MRI or MRI is insufficient, abnormal or short sequences out of phase. (Could be targeted/shunting short series looking at specific area if recent imaging)</td>
<td>• Neurosurgeon to review neurosurgical results and consult appropriate services if any abnormalities</td>
<td>• Monitor for signs &amp; symptoms of increased ICP</td>
<td>• Child and family educational pain management and pain control</td>
<td>• Child and family educational pain &amp; nausea well controlled prior to discharge</td>
</tr>
<tr>
<td>• Abdominal ultrasound (recent shunt insertion, abdominal tumors)</td>
<td>• Pre-op bathing as per policy pre-op bathing policy</td>
<td>• Monitor for signs &amp; symptoms of increased ICP</td>
<td>• Ensure patient has had bowel movement</td>
<td>• Ensure patient has had bowel movement</td>
</tr>
<tr>
<td>• Pregnancy screening as per policy: DHEA/SHBG, Pregnancy Panel</td>
<td></td>
<td>• Monitor for signs &amp; symptoms of increased ICP</td>
<td>• Indomethacin is assessed</td>
<td>• Indomethacin is assessed</td>
</tr>
<tr>
<td>• Routine labs including CBC, Electrolytes, PT/INR and TSH/T4</td>
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<tr>
<td>• If suspected with medical team to consider initiating the team's protocol</td>
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<tr>
<td>• Short shunt insertion is unlikely considered in patients who have had a shunt surgery within the past 8 months</td>
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<tr>
<td>• If suspected with medical team to consider electrolytes, vitals</td>
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<td>• Call neurosurgeon immediately if the symptoms are marked or rapidly progressive</td>
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<tr>
<td>• Pre-op bathing as per policy pre-op bathing policy</td>
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<tr>
<td>• Assess pre-operative costs and hospitalization</td>
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<tr>
<td>• Assess family understanding of plan of care</td>
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</tbody>
</table>

**Consults**

- Neurosurgery consult if indicated
- Neurosurgeon to complete pre-operative orders in electronic system
- IV therapy for hydration (steroids & antibiotics if indicated)
- Neurosurgeon to obtain consent from parent/ guardian/ child
- Consults based on abnormalities (for example Endo/ urology, General Pediatrics, General Surgery)
- Social Work, Child Life consult as indicated

**Post-Op**

- CT scan: Fast MRI or head ultrasound depending on clinical age
- Observe post-op shunt series if not required – must be ordered when specifically indicated
- Vital signs monitored and Neurological Vital Signs per discharge

**Discharge**

- Head circumference recorded
- Signs and symptoms of increased ICP
- Child and family educational pain & nausea well controlled prior to discharge
- Indomethacin is assessed

**Institutional Policies**

- **Vital signs and Neurological Vital Signs per discharge**
- **Head circumference recorded**
- **Signs and symptoms of increased ICP**
- **Child and family educational pain & nausea well controlled prior to discharge**
- **Indomethacin is assessed**
<table>
<thead>
<tr>
<th>Activity</th>
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<tbody>
<tr>
<td>Activity As Tolerated</td>
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<tr>
<td>Nutrition &amp; Diet</td>
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<td>Nutrition &amp; Diet</td>
<td>Nutrition &amp; Diet</td>
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<tr>
<td>NPO or Diet As Tolerated</td>
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<td>NPO or Diet As Tolerated</td>
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<tr>
<td>Anaesthesia: NPO guidelines</td>
<td>Anaesthesia: NPO guidelines</td>
<td>Anaesthesia: NPO guidelines</td>
<td>Anaesthesia: NPO guidelines</td>
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<tr>
<td>Pain Assessment</td>
<td>Pain Assessment</td>
<td>Pain Assessment</td>
<td>Pain Assessment</td>
</tr>
<tr>
<td>Age appropriate pain assessment using: pain assessment tool</td>
<td>Age appropriate pain assessment as per previous schedule: pain assessment tool</td>
<td>Age appropriate pain assessment as per previous schedule: pain assessment tool</td>
<td>Age appropriate pain assessment as per previous schedule: pain assessment tool</td>
</tr>
<tr>
<td>Patient observation</td>
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<tr>
<td>Age appropriate pain assessment as per previous schedule: pain assessment tool</td>
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</tbody>
</table>

**Pain Management**

- Continue pain management: pain assessment tool
- Patient observation
- Age appropriate pain assessment as per previous schedule: pain assessment tool

**Dressing & Wound Care**

- Prevent infection: Consider using a sterile dressing for 7 days post-op
- Inspect wound daily
- Change dressing as needed
- Monitor for any signs of infection
- Notify healthcare provider if wound is not healing

**Discharge**

- Patient is discharged on postoperative day 1
- Provide written discharge instructions
- Schedule follow-up appointment with primary care provider or neurosurgeon
- Schedule follow-up appointment with neurosurgeon

**Post-Operative Care**

- Monitor vital signs every 4 hours
- Encourage early mobility
- Monitor for signs of shunt malfunction
- Notify healthcare provider if any signs of infection are present

**Summary**

- Ventriculoperitoneal shunt insertion or revision
- Postoperative care
- Discharge instructions
- Follow-up appointments

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<th>Pre-operative teaching</th>
<th>Post-operative teaching</th>
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</thead>
<tbody>
<tr>
<td>- Complete medication reconciliation. Errors to evaluate if child is on any antimicrobial or other medications (prescription or over-the-counter) that may affect surgery or GA. Medication reconciliation policy.</td>
<td>- NPO instructions</td>
<td>- Wound to remain dry for 48 hours</td>
</tr>
<tr>
<td>- Anesthesia ordered</td>
<td>- OR insertion</td>
<td>- Pain management</td>
</tr>
<tr>
<td>- Based on pain assessment give:</td>
<td>- Pain</td>
<td>- Review with family wound care</td>
</tr>
<tr>
<td></td>
<td>- Anticipated</td>
<td>- Review/Provide short course information <a href="http://www.sickkidshealth.ca">www.sickkidshealth.ca</a></td>
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<tr>
<td></td>
<td>- Morphine</td>
<td>- Review/Provide short course information <a href="http://www.sickkidshealth.ca">www.sickkidshealth.ca</a></td>
</tr>
<tr>
<td></td>
<td>- Anti-emetics as required (dimenhydrinate or ondansetron)</td>
<td>- Children's Health Information</td>
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<td></td>
<td></td>
<td>- Follow-up appointment (s) imaging required</td>
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</tbody>
</table>
| | | | - If child has a programmable valve: MOPF to document setting and ensure families are aware of programmable valve, current setting and instruction to phone 
| | | | - Ventriculoperitoneal Shunt Insertion or Revision |

**Ventricular Peritoneal Shunt Insertion or Revision**
4.0 Guideline Group and Reviewers

Guideline Group Membership:
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4. Dr. Abhaya Kulkarni: Staff Neurosurgeon
5. Dr. D.D. Cochrane: Staff Neurosurgeon

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2. Dr. James Rutka: Staff Neurosurgeon
3. Dr. Peter Dirks: Staff Neurosurgeon
4. Dr. Michael Taylor: Staff Neurosurgeon
5. Arbel Manciat-Emo, RN (EC), MN, NP Paeds Nurse Practitioner Neurosurgery
6. Herta Yu, RN (EC), MN, NP Paeds Nurse Practitioner Neurosurgery
7. Dr. Dennis Scolnik Staff Physician, Emergency
8. Dr. Jamie Hutchison Staff Physician, CCU
9. Sabrina Boodhan, Pharmacist

External Reviewers:
1. Dr Jan Riva-Cambrin MD FRCS: Assistant Professor of Neurosurgery, University of Utah
2. Dr. Mandep Tamber MD, PhD, FRCS: Assistant Professor, Pediatric Neurosurgery University of Pittsburgh School of Medicine
Children’s Hospital of Pittsburgh

5.0 References

17. Riva-Cambrin MD FRCS: Assistant Professor of Neurosurgery, University of Utah
2. Dr. Mandep Tamber MD, PhD, FRCS: Assistant Professor, Pediatric Neurosurgery University of Pittsburgh School of Medicine
Children’s Hospital of Pittsburgh

Attachments:

Shunt protocol.pdf
ventricular shunt_CPG_Sepertember 2021.pdf

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