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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<table>
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<tr>
<th><strong>PRE-ADMISSION</strong></th>
<th><strong>ADMISSION/PER-OP</strong></th>
<th><strong>INTRA-OPERATIVE</strong></th>
<th><strong>POST-OP</strong></th>
<th><strong>DISCHARGE</strong></th>
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<tr>
<td><em>History &amp; physical assessment (including fontanelle assessment and head circumference if less than 10 months)</em>&lt;br&gt; <em>CT scan or MRI (new diagnosis should have a 4D MRI, otherwise could just be FAST MRI) to assess ventricular size or Head U/S (if infant and clinically appropriate)</em>&lt;br&gt; <em>Shunt series if CT/MRI or U/S is equivocal, abnormal or shunt components out of place. (Could be targeted lateral ventricular series looking at specific area if recent revision)</em>&lt;br&gt; <em>Abdominal ultrasound (recent shunt insertion, abdominal tumours)</em>&lt;br&gt; *Pregnancy screening as per policy: <em>Early Pregnancy Testing Plan</em>&lt;br&gt; <em>Routine labs including CBC, Electrolytes, PT/INR and Liver Function</em>&lt;br&gt; <em>If suspected spinal or medical team to consider initiating the spinal shunt</em>&lt;br&gt; <em>Shunt insertion should be considered in patients who have had a shunt surgery within the past 6 months</em>&lt;br&gt; <em>If suspected infection: medical team to consider antibiotics, intravenous, catheter</em>&lt;br&gt; <em>Call neurosurgery immediately if the symptoms are rapidly or rapidly progressive</em>&lt;br&gt; *Pre-op shaving as per policy <em>pre-op bathing policy</em>&lt;br&gt; <em>Assess pre-operative costing and hospitalization</em>&lt;br&gt; <em>Assess family understanding of plan of care</em></td>
<td><em>Neurological Visual Signs 0-48h: assess if the patient require close/constant observation and notify if required</em>&lt;br&gt; <em>If 10 months of age, check and record fontanelle 3-4h and head circumference daily</em>&lt;br&gt; <em>Monitor for signs &amp; symptoms of increased ICP</em>&lt;br&gt; <em>Neurosurgeon to review bloodwork results (consider appropriate services if any abnormalities)</em>&lt;br&gt; *Pre-op bathing as per policy <em>pre-op bathing policy</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em></td>
<td><em>See Short Infusion Protocol Checklist to be completed in OR (nursing room staff only)</em>&lt;br&gt; <em>OR Inf/Rec</em>&lt;br&gt; <em>Limited by signs on door</em>&lt;br&gt; <em>Number of people scrubs/scrubbing not limited</em>&lt;br&gt; <em>Patient position feet closer to door than head</em>&lt;br&gt; <em>Fit Azolin 30 mg/kg IV (max 2g)</em>&lt;br&gt; <em>One pre-op dose</em>&lt;br&gt; <em>One oral dose 8-12 hrs after to be continued with post op orders</em>&lt;br&gt; <em>Have clipped as needed, not shaved</em>&lt;br&gt; <em>Local sedation required by each participant</em>&lt;br&gt; <em>Bisgaard gloves required for each participant</em>&lt;br&gt; <em>Skin preparation</em>&lt;br&gt; <em>Ponction aid, sterile, &amp; adhesive material</em>&lt;br&gt; <em>Clamp applied to surgical field &amp; 1-hour</em>&lt;br&gt; <em>Lacer™ over surgical field</em>&lt;br&gt; <em>Dermabond™ was administered</em>&lt;br&gt; <em>Skin incision or removed as per usual practice</em>&lt;br&gt; <em>Bandage impregnated with antibacterial</em>&lt;br&gt; <em>If Easiput not available: Regular absorbent dressing with Antibiotic</em>&lt;br&gt; <em>Injection – Intrathecal</em>&lt;br&gt; <em>Vancomycin (15mg in 1ml of normal saline)</em>&lt;br&gt; <em>Oxycodone (0.5mg in 2 ml of normal saline)</em>&lt;br&gt; <em>Skin shaving as per standard practice</em>&lt;br&gt; <em>Neurosurgeon to document in electronic patient chart: nature of surgery, type of shunt device (including name of valve system, setting of programmable device if used), any complications and surgical incidence</em>&lt;br&gt; <em>Obtain signed consent to also be over-read by Neurosurgeon incl: nature of surgery, how of shunt device (including name of valve system, setting of programmable device if used), any complications and surgical incidence</em>&lt;br&gt; <em>Neurosurgeon to notify and if patient needs any heightened monitoring post-op dressing applied to all wounds. Leave in place overnight</em>&lt;br&gt; <em>Dressing applied to all wounds. Leave in place overnight</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em></td>
<td><em>Vital signs &amp; Neurological Vital Signs G3-H hours post-op</em>&lt;br&gt; <em>Head circumference recorded</em>&lt;br&gt; <em>Signs and symptoms of increased ICP</em>&lt;br&gt; <em>Child and family verbalization pain &amp; muscle well controlled prior to discharge</em>&lt;br&gt; <em>Ensure patient has had a bowel movement</em>&lt;br&gt; <em>Infection is assessed</em></td>
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<tr>
<td>Nutrition &amp; Diet</td>
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<td>NPO or Diet As Tolerated (Anesthesia NPO guidelines)</td>
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<td>Complete falls assessment, document in care plan and on patient record (falls and CSE policy)</td>
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<td>Elevate head of bed as per medical orders</td>
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<tr>
<td>Activity as tolerated or bedrest as per medical team</td>
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<tr>
<td>Encourage deep breathing and coughing exercises</td>
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<tr>
<td>Nutrition &amp; Diet</td>
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<tr>
<td>Sips to Diet As Tolerated</td>
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**Dressing & Wound Care**
- Neurosurgeon to refer in sheet type of closure (staples or suture)
- Incision to remain cleaned for 24-48 hours post-op
- Notify MD if dressing wet or oozing from incision noted
- Change pillow case daily and pins

**Fixed Management**
- Discontinue IV when antibiotics completed, tolerating full fluids and no new notes and no further investigations pending (CT, MRI)

**Pain Assessment**
- Age appropriate pain assessment using pain assessment tool(s) as per previous selection
- NAPQI
- FLACC
- Wong
- Numeric
- Faces
- NCMPC-R
- NCPQIPV

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**Activity**
- Activity As Tolerated
- Nutrition & Diet
- Diet As Tolerated
- Patient to be using moderate amounts with no nausea and maintaining hydration prior to discharge
- Neurosurgeon to refer in sheet type of closure (staples or suture)
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<td><strong>Patient Education and Teaching</strong></td>
</tr>
<tr>
<td>- Review child &amp; family’s knowledge base</td>
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<tr>
<td>- Provide hydrocephalus information: <a href="http://www.sickkids.ca">www.sickkids.ca</a></td>
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<tr>
<td>- Provide shunt information: <a href="http://www.sickkids.ca">www.sickkids.ca</a></td>
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<tr>
<td>- Orientation to Ward and Routines (both family and child)</td>
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<tr>
<td>- Discharge Preparation</td>
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</table>

**Pre-operative teaching:**
- NPO instructions
- OR time
- IV insertion if applicable
- Preop bath
- Transport to OR
- Answer questions or offer resource for short related questions
- Recovery room
- Post-op medications
- Pain management
- Assess child & family’s understanding
- Childfamily verify awareness/understanding of plan of care

**Post-operative teaching:**
- Wound to remain dry for 48 hours
- Pain management
- IV insertion if applicable
- Preop bath
- Transport to OR
- Answer questions or offer resource for short related questions
- Recovery room
- Post-op medications
- Pain management
- Assess child & family’s understanding
- Childfamily verify awareness/understanding of plan of care

**Discharge medication reconciliation:**
- Patients discharged with medications reconciliation protocol
- Medications received:
  - Analgesics
  - Antibiotics
  - Antiseptics
  - Urokinase or directed

**Anesthesia:**
- General anesthesia
- Sedation
- Pain management

**Medication reconciliation:**
- Pain management
- Analgesics
- Antibiotics
- Anti-septic
- Urokinase or directed

**Anesthesia:**
- General anesthesia
- Sedation
- Pain management

**Medication reconciliation:**
- Pain management
- Analgesics
- Antibiotics
- Anti-septic
- Urokinase or directed
4.0 Guideline Group and Reviewers

Guideline Group Membership:
1. Patricia Rowe, RN (EC), MN, NP Paeds Nurse Practitioner Neurosurgery
2. Maria Lambert-Pasculli, RN, Neurosurgery Research Nurse
3. Sara Breitelbart, RN (EC), MN, NP Paeds Nurse Practitioner Neurosurgery
4. Dr. Abhaya Kulkarni: Staff Neurosurgeon
5. Dr. D.D. Cochrane: Staff Neurosurgeon

Internal Reviewers:
1. Dr. James Drake, Chief of Neurosurgery
2. Dr. James Rutka: Staff Neurosurgeon
3. Dr. Peter Dirks: Staff Neurosurgeon
4. Dr. Michael Taylor: Staff Neurosurgeon
5. Arbelle Manicat-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 FRCSC: Assistant Professor of Neurosurgery, University of Utah
2. Dr. Mandeep Tamber MD, PhD, FRCSC: Assistant Professor, Pediatric Neurosurgery University of Pittsburgh School of Medicine
Children’s Hospital of Pittsburgh

5.0 References

15. Whitehead, W.E. A New Hydrocephalus Clinical Research Network protocol to reduce cerebrospinal fluid shunt

Attachments:

Shunt protocol.pdf
ventricular shunt_CPG_September 2021.pdf