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><strong>PRE-ADMISSION</strong></th>
<th><strong>ADMISSION/PRE-OP</strong></th>
<th><strong>INTRA-OPERATIVE</strong></th>
<th><strong>POST-OP</strong></th>
<th><strong>DISCHARGE</strong></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 1-4 h; assess if the patient requires closed-loop/shunt device and notify if unit is required</td>
<td>Severe Shunt Infusion Protocol Checklist to be completed in OR (no eating, no fluids, no anesthetic)</td>
<td>Neurological Vital Signs Q 2-4 h</td>
<td>Vital signs and Neurological Vital Signs q 8 hr</td>
</tr>
<tr>
<td>CT scan or MRI (new diagnostic should have a L/M R, otherwise could be just a FAST MRI) in 100 patients</td>
<td>MRI 3D FAST MRI or MRA is optional, abnormal or shunt components out of place.</td>
<td>OR Infusion</td>
<td>Head circumference recorded</td>
<td>Head circumference recorded</td>
</tr>
<tr>
<td>Short waves if CT/MRI or MRA is required, abnormal or shunt components out of place.</td>
<td>Monitor for signs &amp; symptoms of increased ICP</td>
<td>Vital Signs Q 3-4 h</td>
<td>Signs and symptoms of increased ICP</td>
<td>Signs and symptoms of increased ICP</td>
</tr>
<tr>
<td>Abdominal ultrasound (recent shunt insertion, abdominal examination)</td>
<td>Neurosurgeon to review bloodwork results and consult appropriate services, if any abnormalities</td>
<td>IV fluids Q 3-4 h</td>
<td>Head circumference daily</td>
<td>Head circumference daily</td>
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<tr>
<td>Pregnancy screening as per policy: <em>Embryopathy Screening Policy</em></td>
<td>Perineal bedding as per policy pre- and post-operative</td>
<td>Vital signs Q 3-4 h</td>
<td>Monitor for signs &amp; symptoms of increased ICP</td>
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</tr>
<tr>
<td>Routine labs including CBC, Electrolytes, PT/INR and Thrombogram</td>
<td>Admission to the operating room</td>
<td>Infusion</td>
<td>Vital signs q 8 hr</td>
<td>Vital signs q 8 hr</td>
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<tr>
<td>If suspected spinal fluid leak to consider initiating the capsular seal</td>
<td>Ventriculoperitoneal shunt insertion</td>
<td>Vital signs q 8 hr</td>
<td>Head circumference daily</td>
<td>Head circumference daily</td>
</tr>
<tr>
<td>Short shunt insertion should be considered in patients who have had a shunt surgery within the past 8 months</td>
<td>Monitor for signs &amp; symptoms of increased ICP</td>
<td>Blood pressure q 8 hr</td>
<td>Head circumference daily</td>
<td>Head circumference daily</td>
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<tr>
<td>If suspected infection: medical team to consider: blood, urine, urine</td>
<td>Neurosurgeon to review bloodwork results and consult appropriate services</td>
<td>Monitor for signs &amp; symptoms of increased ICP</td>
<td>Blood pressure q 2-4 h</td>
<td>Vital signs q 8 hr</td>
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<tr>
<td>Blood pressure</td>
<td>Neurosurgeon to review bloodwork results and consult appropriate services</td>
<td>Vital signs q 2-4 h</td>
<td>Blood pressure q 2-4 h</td>
<td>Vital signs q 8 hr</td>
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<tr>
<td>Pre-op bedding as per policy pre-operative</td>
<td>Consults</td>
<td>Vital signs q 2-4 h</td>
<td>Blood pressure q 2-4 h</td>
<td>Vital signs q 8 hr</td>
</tr>
<tr>
<td>Post-op bedding protocol</td>
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<td>Vital signs q 2-4 h</td>
<td>Blood pressure q 2-4 h</td>
<td>Vital signs q 8 hr</td>
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<td>Post-operative care: consults as required</td>
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<td>Vital signs q 2-4 h</td>
<td>Blood pressure q 2-4 h</td>
<td>Vital signs q 8 hr</td>
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<td>Vital signs q 8 hr</td>
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**Consults:**
- Neurosurgery consult if indicated
- Neurosurgeon to complete pre-operative orders in electronic system
- IV therapy for hydration and antibiotics if indicated
- Neurosurgeon to obtain consent from parent/ward/child

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### MEDICATIONS

- Complete medication reconciliation. Ensure to evaluate if child is on any antibiotics or other medications (prescription or over-the-counter) that may affect surgery or G.A. medication reconciliation policy.
- Anesthesia ordered
- Based on pain assessment give:
  - Morphine
  - Anti-emetics as required (dimenhydrinate or ondansetron)

- See Anesthesia Guidelines

- Antibiotics ordered based on pain assessment:
  - Cefazolin
  - Metronidazole

- Antibiotics to be given in G.A. Room: See intra-operative phase

- Medication reconciliation completed (medication reconciliation policy)

- Anesthesia ordered

- Anti-emetics
  - Dimenhydrinate

- Anti-emetics ordered based on pain assessment.

### CHILDREN'S EDUCATION AND TEACHING

- Review child & family's knowledge base

- Provide hydrocephalus information: [www.healthykids.ca](http://www.healthykids.ca)

- Provide shunt instruction: [www.healthykids.ca](http://www.healthykids.ca)

- Parental education: [www.healthykids.ca](http://www.healthykids.ca)

- Discharge Preparation

  - Pre-operative teaching:
    - NPO instructions
    - OR time
    - IV insertion if applicable
    - Pre-op 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
    - Child/family vendor awareness/understanding of plan of care

  - Post-operative teaching:
    - Wound to remain dry for 48 hours
    - Pain management
    - Bandage change as needed
    - SIH to notify if any leakage noted
    - Expected recovery
    - Wound care teaching to family
    - Signs and symptoms of increased ICP
    - Review future planning
      - [www.healthykids.ca](http://www.healthykids.ca)
    - Discharge teaching
      - Review with family: wound care
      - Review: hydrocephalus information: [www.healthykids.ca](http://www.healthykids.ca)
      - Review: discharge teaching
      - Discharge teaching: [www.healthykids.ca](http://www.healthykids.ca)

- Follow-up appointment (as imaging required)

- Child/family understand awareness and understanding of plan of care post-discharge

- If child has a programmable valve: M.O.R.P to document setting and ensure family is aware of programmable valve, current setting and M.O.R.P. teaching. Provide family with a Patient Card.
4.0 Guideline Group and Reviewers

Guideline Group Membership:
1. Patricia Rowe, RN (EC), MN, NP Paeds Nurse Practitioner Neurosurgery
2. Maria Lamberti-Pasculli, RN, Neurosurgery Research Nurse
3. Sara Breitbart, 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. Arbel 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


Attachments:

Shunt protocol.pdf
ventricular_shunt_CPG_September_2021.pdf