Ventricular Peritoneal Shunt Insertion or Revision

This is a CONTROLLED document for internal use only, valid only if accessed from the Policies and Procedures site.

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

Printable version

©The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document was developed solely for use at SickKids. SickKids accepts no responsibility for use of this material by any person or organization not associated with SickKids. A printed copy of this document may not reflect the current, electronic version on the SickKids Intranet. Use of this document in any setting must be subject to the professional judgment of the user. No part of the document should be used for publication without prior written consent of SickKids.

Ventricular Peritoneal Shunt Insertion or Revision **Expected Date of Discharge: Post-op Day (POD) # 2**

	PRE-ADMISSION	ADMISSION/PRE-OP	INTRA-OPERATIVE	POST-OP	DISCHARGE

ASSEMENT, MONITORING, CONSULTS AND INVESTIGATIONS	• History & physical assessment (including fontanelle assessment and head circumference if less than 18 months)
	• CT scan or MRI (new diagnosis should have a full MRI, otherwise could just be FAST MRI to assess ventricular size) or Head US (if infant and clinically appropriate).
	• Shunt series if CT/MRI or HUS is equivocal, abnormal or shunt components out of place. (Could be targeted/partial shunt series looking at specific area if recent revision)
	• Abdominal ultra-sound (recent shunt insertion, abdominal symptoms)
	• Pregnancy screening as per policy- Pregnancy Screening Policy
	• Routine labs including CBC, Electrolytes, PTT/INR and Type/Screen
	• If suspected sepsis medical team to consider initiating the sepsis protocol
	• Shunt infection should be seriously considered in patients who have had a shunt surgery within the past 6 months
	• if suspected dehydration medical team to consider electrolytes, urinalysis
	• Call neurosurgery immediately if the symptoms are marked or rapidly progressive
	• Pre-op bathing as per policy pre-op bathing policy
	• Assess pre-operative coping and hospitalization
	• Assess family understanding of plan of care
	
	Consults
	• Neurosurgery consult once investigations completed
	• Use interprofessional and family team approach:
	  • Review needs based on outcomes,
	  • Form a team to address needs,
	  • Use team to follow up recommendations for change
		• Neurological Vital Signs Q 1- 4h assess if the patient require close/constant observation and notify unit if required
		• If < 18 months of age, check and record fontanel Q 2- 4h and head circumference daily
		• Monitor for signs & symptoms of increased ICP
		• Neurosurgeon to review bloodwork results (consult appropriate services if any abnormalities)
		• Pre-op bathing as per policy pre-op bathing policy
		
		Consults
		• Anesthesia consult if indicated
		• Neurosurgeon to complete pre- operative orders in electronic system
		• IV therapy for hydration and/or antibiotics if indicated
		• Neurosurgeon to obtain consent from parent/guardian /child
		• Consults based on co-morbidities (for example Endocrine, Hematology, General Pediatrics, General Surgery)
		• Social Work, Child Life consult as indicated
			• See Shunt Infection Protocol Checklist to be completed in OR (operating room staff only)
			
			OR traffic:
			• Limited by signs on door
			• Number of people scrubbed/observing not limited
			• Patient position feet closer to door than head
			
			ceFAZolin 30 mg/kg IV (max 2g)
			• One pre-incision dose
			• One post op dose (8 hrs later) to be ordered with post op orders
			
			• **Hair clipped** as needed, not shaved
			• **Formal scrub** required by each participant
			• **Double gloves** required for each participant
			• **Skin preparation**
			  • Remove dirt, debris, & adhesive material
			  • Chloraprep applied to surgical field & not washed off
			  • ILoban™ over surgical field
			• Ensure ceFAZolin was administered
			• Shunt implanted or revised as per usual practice:
			  Bactiseal impregnated shunts or If Bactiseal not available: Regular shunt catheter with Antibiotic injection – intrathecal
			  ▪ Vancomycin (10mg in 1 mL of normal saline) and
			  ▪ Gentamicin (4mg in 2 mL of normal saline)
			• Skin closure as per standard practice
			• 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 incision closure
			• Dictated surgical note to also be completed by Neurosurgeon including: nature of surgery, type of shunt device (including name of valve system, setting of programmable device if used), any complications and surgical incision closure
			• Neurosurgeon to notify unit if patient needs any heightened monitoring post-op dressing applied to all wounds. Leave in place overnight.
			• Dressing applied to all wounds. Leave in place overnight
				• Neurological Vital Signs Q2-4h
				• Vital Signs Q 2-4 h
				• Bowel sounds Q shift
				• If < 18 months of age check and record fontanel Q 2- 4h and head circumference daily
				• Monitor for signs & symptoms of:
				  • Increased ICP
				  • Sepsis
				
				Imaging
				• CT scan, Fast MRI or head ultra-sound depending on child's age
				• Routine post-op shunt series is not required – will only be order when specifically indicated
					• Vital signs and Neurological Vital Signs pre discharge
					• Head circumference recorded
					• Signs and symptoms of increased ICP
					• Child and family verbalize pain & nausea well controlled prior to discharge
					• Ensure patient has had a bowel movement
					• Incision is assessed

©The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document was developed solely for use at SickKids. SickKids accepts no responsibility for use of this material by any person or organization not associated with SickKids. A printed copy of this document may not reflect the current, electronic version on the SickKids Intranet. Use of this document in any setting must be subject to the professional judgment of the user. No part of the document should be used for publication without prior written consent of SickKids.

ROUTINE MANAGEMENT	**Activity** • Activity As Tolerated **Nutrition & Diet** • NPO or Diet As Tolerated Anesthesia NPO guidelines	**Activity** • Complete falls assessment; document in care plan and on patient record falls and ESE policy • Activity As Tolerated **Nutrition & Diet** • NPO or Diet As Tolerated Anesthesia NPO guidelines		**Activity** • Elevate head of bed as per medical orders • Activity as tolerated or bedrest as per medical team • Encourage deep breathing and coughing exercises **Nutrition & Diet** • Sips to Diet As Tolerated **Dressing & Wound Care** • Neurosurgeon to note in chart type of closure (staples/sutures) • Incision to remain covered for 24-48 hours post op • Notify MD if dressing wet or oozing from incision noted • Change pillow case daily and prn **Fluid Management** • Discontinue IV when antibiotics completed, tolerating full fluids and no emesis and no further investigations pending (CT, MRI)	**Activity** • Activity As Tolerated **Nutrition & Diet** • Diet As Tolerated • Patient to be eating moderate amounts with no emesis and maintaining hydration prior to discharge **Dressing & Wound Care** • Remove original dressing prior to discharge, cover with new Primipore if required (if less than 48 hours) • Review wound care instructions • MD/NP to view incision prior to discharge • If dissolvable sutures: instruct family that sutures will dissolve over time (~ 3-4 weeks) • If sutures: instructions for family MD to remove 10th day post-op • If staples: give staple remover to family with instructions for family MD to remove 10th day post-op • If staples: give staple remover to family with instructions for family MD to remove 10th day post-op • Information worker to book follow-up appointment in Neurosurgery Clinic in 6-8 weeks • Neurosurgeon to indicate if further

PAIN ASSSEMENT	• Age appropriate pain assessment using: pain assessment policy
	• Initiate Comfort Promise bundle
	• Parent observation
	• Pain assessment tools (choose most appropriate):
	  • PIPP
	  • FLACC
	  • Word
	  • Numeric
	  • Faces
	  • NCCPC-R
	  • NCCPC-PV
		• Age appropriate pain assessment as per previous selection pain assessment policy		• Age appropriate pain assessment as per previous selection pain assessment policy	• Continue pain management pain assessment policy
					• Parent observation
					• Age appropriate pain assessment as per previous selection

©The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document was developed solely for use at SickKids. SickKids accepts no responsibility for use of this material by any person or organization not associated with SickKids. A printed copy of this document may not reflect the current, electronic version on the SickKids Intranet. Use of this document in any setting must be subject to the professional judgment of the user. No part of the document should be used for publication without prior written consent of SickKids.

MEDICATIONS	• Complete medication reconciliation. Ensure to evaluate if child is on any antithrombotic or other medications (prescription or homeopathic) that may affect surgery or G.A. medication reconciliation policy
	• Analgesics ordered
	• Based on pain assessment give:
	  • Acetaminophen
	  • Morphine
	• Anti-emetics as required (dimenhyDRINATE or ondansetron)
		• See Anesthesia Guidelines
		• Analgesics ordered based on pain assessment
		• Morphine or Acetaminophen
		• Antibiotics to be given in OR Room - See intra-operative phase
				• Medication Reconciliation completed medication reconciliation policy
				• Analgesics ordered
				  ▪ Acetaminophen
				  ▪ Morphine
				• Antibiotics
				  • ceFAZolin 30 mg/kg IV (max 2g) give 1 dose 8 hrs post intra operative dose
				• Anti-emetics
				  • Ondansetron or dimenhyDRINATE
					• Discharge medication reconciliation completed medication reconciliation policy
					• Analgesics; based on pain assessment

CHILD & FAMILY EDUCATION AND TEACHING	• Review child & family's knowledge base • Provide hydrocephalus AboutKidsHealth information www.aboutkidshealth.ca • Provide shunt revision/infection AboutKidsHealth information www.aboutkidshealth.ca • Orientation to Ward and Routines (both family and child) • 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 shunt related questions • Recovery room • Post op medications/Pain management • Assess child & family's understanding • Child/family verbalize awareness/understanding of plan of care		**Post-operative teaching**: • Wound to remain dry for 48 hours • Hair shampoo on day 3 • RN to be notified if any leakage noted from incision site • Expected bruising • Wound care teaching to family • Signs and symptoms of increased ICP • Review/Provide shunt revision/infection AboutKidsHealth information www.aboutkidshealth.ca • Review/Provide hydrocephalus AboutKidsHealth information www.aboutkidshealth.ca • If child has a programmable valve: MD/NP to document setting and ensure families are aware of programmable valve, current setting and MRI restrictions. RN to reinforce teaching	• Review with family wound care • Review/Provide shunt revision/infection AboutKidsHealth information www.aboutkidshealth.ca • Review/Provide hydrocephalus AboutKidsHealth information www.aboutkidshealth.ca • Medications • Clinic numbers, office number, contact number • Follow-up appointment (is imaging required) • Child/family verbalize awareness and understanding of plan of care post-discharge • If child has a programmable valve: MD/NP to document setting and ensure families are aware of programmable valve, current setting and MRI restrictions. RN to reinforce teaching. Provide family with a Patient Data card.

©The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document was developed solely for use at SickKids. SickKids accepts no responsibility for use of this material by any person or organization not associated with SickKids. A printed copy of this document may not reflect the current, electronic version on the SickKids Intranet. Use of this document in any setting must be subject to the professional judgment of the user. No part of the document should be used for publication without prior written consent of SickKids.

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. 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

1. Chalyakunapruk,N; Veenstra, D.L.; Lipsky, B.A.; Saint, S. Chlorhexidine compared with povidone-Iodine solution for vascular catheter site care: A meta analysis. Annals of Internal Medicine. 2002; 136 (11): 792-801.
2. Edwards, P.S.; Lipp, A.; Holmes, A. Preoperative skin antiseptics for preventing surgical wound infections after clean surgery. Cochrane Database Systematic Review, 3: CD003949.2004.
3. Ragel, B.T.; Browd, S.R.; Schmidt, R.H. Surgical shunt infection: significant reduction when using intraventricular and systemic antibiotic agents. Journal of Neurosurgery 2006; 105: 242-247.
4. Mangram, A.J.; Horan, T.C.; Pearson, M.L.; Silver, L.C.; Jarvis, W.R. (1999) Guideline for prevention of surgical site infection, 1999. Infection Control and Hospital Epidemiology 20 (4), 247-277.
5. Institute for Health Care Improvement. Getting Started Kit: Reduce Surgical Complications How to Guide. 1997;1-25..
6. Leverstein-Van Hall, M.A.; Hopmans, T.E.M.; Berkelbach Van Der Sprenkel, J.W.; Blok, H.E.M.; Van Der Mark, W.A.M.A.; Hanlo, P.W.; Bonten, M.J.M. A bundle approach to reduce the incidence of external ventricular and lumbar drain-related infections. Journal of Neurosurgery 2010; 112. 345-353. Class B
7. Anderson, D.J.; Kaye, K.S.; Classen, D.; Arias, K.M.; Podgorny, K. Burstin, H.; Calfee, D.P.; Coffin, S.E.; Dubberke, E.R.; Fraser, V.; Gerding, D.N.; Griffin, F.A.; Gross, P. Klompas, M. Lo, E.; Marschall. J.; Mermel, L.A.; Nicolle, L.; Pegues, D.A.; Perl, T.M.; Saint, S.; Salgado, C.D.; Weinstein, R.A.; Wise, R.; Yokoe, D.S. Strategies to prevent surgical site infections in acute care hospitals. Infection Control Hospital Epidemiology 2008; 29:S51-S61. Class A
8. Berrios-Torres, S.I. Surgical site infection toolkit. Center for Disease Control and Prevention. Class A. 2009.
9. Kestle, J.R.W.; Riva-Cambrin, J.; Wellons, J.C.; Kulkarni, A.V.; Whitehead, W.E.; Walker, M.L.; Oakes, W.J.; Drake, J.M.; Luerssen, T.G.; Simon, T.D.; Holubkov, R. A standardized protocol to reduce cerebrospinal fluid shunt infection: The hydrocephalus clinical research network quality improvement initiative. Journal of Neurosurgery: Pediatrics 2011; 8: 22-29.
10. Centers for Disease Control and Prevention. www.cdc.gov
11. Kulkarni, A.V.; Drake, J.M.; Lamberti-Pasculli, M. Cerebrospinal fluid shunt infection: a prospective study of risk
12. factors. Journal of Neurosurgery. 2001; 94: 195-201.
13. Children's Hospitals' Solutions for Patient Safety – SPS Prevention Bundles www.solutionsforpatientsafety.org.
14. Kestle, J.R.W.; Cochrane, D.D.; Kulkarni, A.V.; Limbrick, D.D.; Leurssen, T.G.; Oakes, W.J.; Riva-Cambrin, J;
15. Rozzelle, C.; Simon, T.D.; Walker, M.L.; Wellons III, J.C.; Browd, S.R.; Drake, J.M.; Shannon, C.N.; Tamber, M.S.;
16. Whitehead, W.E. A New Hydrocephalus Clinical Research Network protocol to reduce cerebrospinal fluid shunt
17. Infection. Journal of Neurosurgery: Pediatrics 2016; 17:391-396

Attachments:

Shunt protocol.pdf

ventricular shunt_CPG_September 2021.pdf

©The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document was developed solely for use at SickKids. SickKids accepts no responsibility for use of this material by any person or organization not associated with SickKids. A printed copy of this document may not reflect the current, electronic version on the SickKids Intranet. Use of this document in any setting must be subject to the professional judgment of the user. No part of the document should be used for publication without prior written consent of SickKids.