ED GUIDELINE

SUSPECTED SHUNT MALFUNCTION OR INFECTION

Children's MINNESOTA

Aim: To standardize the workup and management of patients with ventricular shunts who present to the ED.

EXCLUSION GUIDELINES

Patients **excluded** from this guideline:
- Clear alternate etiology
- No shunt

Chief Complaint (Note 1)	ED Course*	Disposition

Presents with:
• Altered mental status
• Irregular respirations, bradycardia and hypertension (concern for Cushing's Triad)
• Acute neurological deficit
• Severe dehydration secondary to emesis
• Unstable vital signs
• Status epilepticus
	• ED MD to evaluate STAT, place in resuscitation room
	• Neurosurgery consult STAT
	• VS and continuous cardiac monitoring
	• Establish IV access
	  ○ IVF, Pre-op Labs: CBC, BMP, PT/PTT, Type and Screen
	• Ondansetron if necessary (Table 1)
	• HOB 30º/head midline
	• NPO
	• Imaging (Note 2):
	  ○ STAT head CT with RN/monitors
	  ○ STAT shunt series if CT abnormal/different from pt baseline
		• *Shunt malfunction:* Disposition per Neurosurgery (OR, PICU, med/surg)
		• *No shunt malfunction*: Disposition per ED
		Consider neurology referral for migraine evaluation if clinically indicated.

Presents with:
• Emesis
• Headache
• Parental concern for shunt malfunction
	• ED MD to evaluate
	• Neurosurgery consulted after exam
	• Establish IV access
	  ○ IVF, Pre-op Labs: CBC, BMP, PT/PTT, Type and Screen
	• Ondansetron and/or pain control (Table 1)
	• HOB 30º/head midline
	• NPO
	• Imaging (Note 2):
	  ○ Order Quick Brain MRI with RN / monitors after evaluation
	  ○ Shunt series if MRI abnormal/different from pt baseline	

Presents with: • Fever (< 6mo from last shunt surgery) • Redness, swelling or drainage at shunt site • Tenderness/redness at abdominal site	• ED MD to evaluate • Evaluate for source of infection, consider: ○ CBC, CRP, Blood cultures, UA/UC, CXR, viral studies • Consult Neurosurgery to discuss need for imaging (note 1), shunt tap, and antibiotics (Table 1)	• *Shunt infection:* Disposition per Neurosurgery (OR, PICU, med/surg) • *No shunt infection:* Disposition per ED

Presents with:
• Abdominal pain with no other S/S of shunt malfunction
	• ED MD to evaluate
	• Evaluate for non-shunt source of abdominal pain, including:
	  ○ UA/UC
	  ○ Possible abdominal ultrasound (Note 2)
	• Neurosurgery consulted if there is a neurosurgical concern	

Presents with: • Seizure (new or increased)	• ED MD to evaluate • Additional shunt symptoms -> consult Neurosurgery • No shunt symptoms, missed seizure medication dose, or other obvious source for seizure --> Neurology consult • Refer to seizure and status epilepticus guideline	• *Shunt concern:* Disposition per Neurosurgery • *No shunt concern:* Disposition per ED
Presents with: • None of the other criteria mentioned	• ED MD to evaluate • Neurosurgery consulted if there is neurosurgical concern	

***Vital signs:** VS with BP q1h while in ED, or as otherwise indicated by clinical status

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NOTES:

Note 1: Differential diagnosis includes but not limited to:

- Shunt failure
- Shunt infection (usually in the first 1–3 months after placement)
- Viral illness
- Medication toxicity
- Missed medication doses (e.g., anti-epileptics)
- Migraine headache

Note 2: Imaging (goal is within 60 minutes of presentation)

- May go to imaging off monitor if stable (no bradycardia, respiratory abnormalities, acute neurological deficit, other unstable vitals, seizure or altered mental status)
- Patients with fever or abdominal pain but no other symptoms of shunt complication may not require imaging
- Definitive imaging for all patients except isolated fever:
    - "Limited/Quick brain" MRI without sedation is first choice for stable patients
        - Order Limited Brain MRI without contrast
    - Head CT without contrast if MRI not available within 60 minutes or if the patient is unstable
    - Shunt series required if MRI or HCT abnormal or different from patient baseline (required STAT prior to OR if going for revision)
    - Consider US of abdomen if abdominal pain

Table 1: Supportive Medications

Indication	Medication	Dose	Comments
Analgesic/Pain	Acetaminophen (First Line)	15 mg/kg PO/PR/IV (Max 650 mg/dose)	
	Ibuprofen (First Line)	10 mg/kg PO (Max 600 mg/dose)	
	Ketorolac (First Line)	0.5 mg/kg IV/IM (Max 15 mg/dose)	
	Morphine (Second Line)	0.1 mg/kg IV (Max 4 mg/dose)	Use caution in altered mental status.
	Fentanyl (Second Line)	1 mcg/kg Intranasal (Max 100 mcg/dose)	If patient is stable and IV access is problematic Use caution in altered mental status.
Antiemetic	Ondansetron	0.15 mg/kg/dose IV/PO (Max 4 mg/dose)	Use Oral Disintegrating Tablets (ODT) if giving PO
Anti-seizure	Refer to the Seizure and Status Epilepticus Guideline for Treatment Options and Dosing. Order via "Seizure Rescue Medications" Orderset		
Antimicrobial	Cefepime	50 mg/kg/dose IV every 8 hours (Max 2000 mg/dose)	If allergy to beta-lactam, use Meropenem IV 40 mg/kg/dose every 8 hours (Max 2000 mg/dose)
	Vancomycin	3 months to <18 years: 20 mg/kg every 8 hours (Max 1250 mg/dose). For patients less than 3 months, 18 years or greater, or patients with renal dysfunction, refer to Star Net Vancomycin Dosing and Monitoring Guideline	Star Net Vancomycin Dosing and Monitoring Guidelines
Miscellaneous	Acetazolamide	5 mg/kg IV/PO	Only order if requested by Neuro

WORKGROUP: Sheridan Byrne and Melissa Hammerschmidt (NSG), Tom Skrypek (ED), Kate Allen (PHM), Raschka (Pharmacy), Pomputius and Ullman (ID, ASP)