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

### Chief Complaint

**Presents with:**
- Altered mental status
- Irregular respirations, bradycardia, and hypertension
- Acute neurological deficit
- Severe dehydration secondary to emesis
- Unstable vital signs
- Status epilepticus

**Presents with:**
- Emesis
- Headache
- Parental concern for shunt malfunction

**Presents with:**
- Fever (< 6 mo from last shunt surgery)
- Redness, swelling, or drainage at shunt site
- Tenderness/redness at abdominal site

**Presents with:**
- Abdominal pain with no other S/S of shunt malfunction

**Presents with:**
- Seizure (new or increased)

**Presents with:**
- None of the other criteria mentioned

### ED Course

**ED MD to evaluate STAT**
- Neurosurgery consult STAT
- VS and continuous cardiac monitoring
- Establish IV access
- Zofern if necessary
- HOB 30°/head midline
- NPO
- STAT head CT with RN/monitors
  - +/- Shunt series, at Neurosurgery discretion
  - IV/IVF, Pre-op Labs: CBC, BMP, PT/PTT, Type and Screen

**ED MD to evaluate**
- Neurosurgery consulted after exam
- Zofern and/or pain control
- HOB 30°/head midline
- NPO
- Order Quick Brain MRI with RN/monitors after evaluation
  - +/- Shunt series, at Neurosurgery discretion
  - IV/IVF, Pre-op Labs: CBC, BMP, PT/PTT, Type and Screen

**ED MD to evaluate**
- Evaluate for source of infection, including:
  - CBC, CRP, Blood cultures, UA/UC (girls < 2 years, all boys < 6 months or uncircumcised boys < 12 months, all Myelo’s)
  - Consider antibiotics after shunt tap if high level of concern

**ED MD to evaluate**
- Evaluate for non-shunt source of abdominal pain, including:
  - UA/UC
  - Possible abdominal ultrasound
  - Neurosurgery consulted if there is a neurosurgical concern

**Consult Neurosurgery**
- +/- imaging at Neurosurgery discretion
- Consider Neurology consult

### Disposition

**Shunt malfunction → OR/Neurosurgery admit**
- No shunt malfunction → Disposition per ED
  - Consider neurology referral for migraine evaluation if clinically indicated

**Shunt infection → OR/Neurosurgery admit**
- No shunt infection → Disposition per ED

**Shunt concern → Disposition per Neurosurgery**
- No shunt concern → Disposition per ED

### EXCLUSION GUIDELINES

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

Disclaimer: This guideline is designed for general use with most patients; each clinician should use their own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.
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**CLINIC PROTOCOL**

**Imaging (goal is within 60 minutes of presentation):**
- May go to imaging off monitor if stable (no bradycardia, respiratory abnormalities, 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:
  - “Quick brain” MRI without sedation is first choice for stable patients
    - Order MRI head without contrast, with shunt assessment as indication
  - Head CT without contrast if MRI not available within 60 minutes or if the patient is unstable
- Consider US of abdomen if abdominal pain

**Medication considerations:**
- Ondansetron (Zofran) prn nausea or vomiting
  - 8–15 kg – 2 mg IV/ODT
  - 15+ kg – 4 mg IV/ODT
- Acetaminophen (Tylenol) prn pain or fever
  - 15 mg/kg PO/PR
- Morphine prn severe pain
  - 0.1 mg/kg IV; use caution in altered mental status
- Lorazepam (Ativan) prn seizure
  - 0.1 mg/kg IV, max 2 mg per dose
- Fosphenytoin prn ongoing/refractory seizures
  - 15–20 mg PE/kg IV loading dose

**Consultations:**
- Consult neurosurgery
  - Immediately for all unstable patients (altered mental status, Cushing triad, acute focal neurological deficit, ongoing seizure activity)
  - After physician evaluation for other cases if indicated after ED assessment
- Tap of shunt to assess CSF and pressures to be completed at discretion of neurosurgery
- Shunt Series radiographs to be obtained at discretion of neurosurgery
- Neurology for new seizure or headache without shunt findings

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

**Differential diagnosis:**
- 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

**Discharge or Admission criteria:**
- General guidelines:
  - Shunt malfunction or suspected shunt malfunction: Neurosurgery to admit to OR, PICU or floor
  - Unlikely shunt malfunction: Disposition to be determined by ED

**Quality measures:**
- MRI or CT within 60 minutes of triage
- Return to ED for same problem within 48 hours for discharged patients