Pediatric Thrombectomy

Translating adult standard of care to pediatric patients

DATE: September 16, 2016 PRESENTED BY: Ittai Bushlin MD, PhD and Adrienne McDougal, RN
Objectives:

• Review acute management of pediatric stroke

• Describe the development of an acute pediatric stroke program

• Describe successful thrombectomy in a pediatric patient with acute stroke
No financial disclosures
Pediatric Stroke
Epidemiology

• Rate of arterial ischemic stroke in children (1 month – 18 yo): 0.6 – 7.9/100,000
• Rates of arterial ischemic stroke in adults older than 45 years: 3.4 – 22.8/100,000
• Common risk factors: congenital heart disease, sickle cell disease, vasculopathy, infection, hematologic
• Presentation: focal deficit, headache, AMS, seizure
• 60% left with permanent neurologic deficits

Acute therapy in pediatric stroke

- Acute therapies have been used in children 2 years and older
- ~2% of children receive IV tPA
- Mechanical thrombectomy described in case reports, with no trial data demonstrating efficacy/safety
- Current guidelines:
  - IV tPA generally not recommended outside of clinical trial
  - No consensus about the use of tPA in older adolescents
  - Mechanical thrombectomy through interventional neuroradiology (INR) may be reasonable for some children
- Pediatric hospitals with rapid stroke response may be tailored to administer tPA, but not endovascular therapy

Acute Pediatric Stroke: OHSU
Doernbecher Children’s Hospital/OHSU

- Pediatric ER
- PICU
- Level 1 trauma center
- Joint Commission Certified Comprehensive Stroke Center (neurology, neurosurgery, neuroradiology, neurointerventional)
- 8 pediatric neurologists
Acute stroke management

- Neuroprotection
- Consider acute therapies
Program development
Translating adult standard of care to children

- Identified a need - using the process we have in place for adults was not sufficient

- Collaborated with interprofessional teams of adult and pediatric stakeholders

- Involved direct care staff from early stages of the process

- Identified educational opportunities (for RNs and MDs) and developed curriculum

Caterpillars are NOT small butterflies

Children are NOT small adults
Acute stroke therapy team

- Pediatric/Adult Stroke Neurology
- Pediatric ICU/Adult Neuro ICU
- Angiography/Neuro interventional team
- Pediatric anesthesia
- Emergency Department
- Stroke coordinator
- Nursing leadership
- Pediatric Rapid Response team
- Neuroradiology
- Emergency Communication center
- Lab
Process Maps: transport

- Developed algorithm for transport of children who may be candidates for endovascular therapy
Process Maps: care at OHSU

• Developed algorithm for patient flow and provider responsibilities at OHSU
### Paging System

- Creation of pager groups for acute pediatric stroke and peds INR alert

<table>
<thead>
<tr>
<th>Role</th>
<th>Response expectation</th>
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<tbody>
<tr>
<td>PICU RRT</td>
<td>Meet the patient on ED, go with patient to imaging, angio, back to PICU</td>
</tr>
<tr>
<td>PICU Charge</td>
<td>Prepare for patient admission and 1:1 assignment</td>
</tr>
<tr>
<td>Adult Stroke Response Nurse</td>
<td>Check in with PICU RRT – meet team when pt arrives</td>
</tr>
<tr>
<td>Peds Anesthesia</td>
<td>Be available within one hour of page, check in with PICU intensivist and meet patient at angio or imaging</td>
</tr>
<tr>
<td>PICU physician group</td>
<td>Arrange and control transport. Help triage patients, assume care after acute therapies, or in stroke patients who are not candidates for acute therapies, back up for anesthesia</td>
</tr>
<tr>
<td>Adult Stroke 12600 (not on paging group – paged separately)</td>
<td>Resource for managing patients with acute stroke</td>
</tr>
<tr>
<td>CT/MRI</td>
<td>Prepare for patient arrival</td>
</tr>
<tr>
<td>Angio Tech</td>
<td>Off hours: Check in with comm center arrival on site within 30</td>
</tr>
<tr>
<td>Angio RN</td>
<td>Off hours: Check in with comm center arrival on site within 30</td>
</tr>
<tr>
<td>Neuro Interventionist</td>
<td>Check in with comm center arrival on site within 30</td>
</tr>
<tr>
<td>ED</td>
<td>Assume initial care of patients transferred from OSH, facilitate consultant evaluation and transport to imaging or angio</td>
</tr>
<tr>
<td>Lab</td>
<td>Expedites labs drawn for potential tPA candidates</td>
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<tr>
<td>Pharmacy</td>
<td>Prepares IV tPA if indicated, programs pump to administer</td>
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Education

• PICU mock code of acute stroke
• Development of education modules for nursing and physicians
• Multidisciplinary review of acute peds stroke cases for QI
Case
Clinical presentation

- 8 y/o F
- 9 days fever, vomiting, 1 day of chest pain
- 1 hour after acute onset expressive aphasia, lethargy

- Studies
  - CSF: WBC 0, RBC 0, Glucose 60, Protein 16
  - Troponin 12.2, WBC 15.8
  - EKG: deep asymmetric T wave inversions diffusely
  - Bedside TTE: moderate septal motion abnormalities, PFO
Workup

• Developed right sided hemiparesis in ED
• Neuroimaging
CT Head wo contrast

CTA head and neck

ASPECTS = 10
Transferred to DCH PICU

- Arrival 4 hours after onset of symptoms
- Ped NIHSS = 14 on admission (expressive aphasia, dysarthria, right facial droop, right hemiparesis, and right hemisensory loss)
- TTE: Minimal motion of ventricular septum, PFO, no clot
- To INR suite 6 hours after symptom onset
Clinical course

• Workup:
  – Cardiac MRI: septal akinesis
  – UE and LE Dopplers: negative for clot
  – Extensive infectious, hypercoagulable, autoimmune workup: negative

• Treatment
  – Received IVIG for presumed viral myocarditis
  – Anticoagulation with subcutaneous enoxaparin was started approximately 24 hours after thrombectomy

• Clinical progress
  – Discharged after 7 days to inpatient rehab
  – Aphasia improved, right sided hemiparesis improved; ambulating with assistance
Summary

• Acute therapy for stroke in children: low volume, high risk cases

• No trial data supporting endovascular therapy in children

• Endovascular therapy can be considered in pediatric patients, and consensus guidelines and processes for implementation are needed

• Successful implementation of endovascular therapy requires the coordination of timely responses by an inter-professional team

• Studies are needed to understand if endovascular therapy is safe and effective in children
Future directions

- Regularly update curriculum with nurses and physicians
- Enter children undergoing endovascular therapy in stroke registry
- Hold simulations/mock stroke codes
- Coordinate multidisciplinary stroke case conference
- Establish telemedicine
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Pediatric ED
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Neuro ICU
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Questions?

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Thank You