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Background

Children with acute ischemic stroke are increasingly treated successfully with acute therapies. This requires timely identification of stroke in children. Delays in diagnosis prompted pediatric centers in the United States to develop multidisciplinary stroke teams capable of responding emergently to children with brain attack symptoms. We aimed to determine whether the establishment of a stroke alert system at a pediatric hospital decreases the time to diagnosis of children presenting to the emergency department with acute onset focal neurologic deficits.

Methods

- The stroke alert system at Boston Children's Hospital was implemented in 2014.
- A stroke alert is activated when a child presents within 5 hours of onset of a focal neurologic deficit.
- A Pediatric NIHSS is performed. If criteria for thrombolysis are met, emergent imaging is obtained.
- Retrospective review of the medical records for stroke alerts between 2014 and 2016.
- Retrospective review of the medical records of children with brain attack symptoms who had a stroke consult between 2011 and 2013.
- Statistics: Fisher's Exact Test, Pearson Chi-Square, Wilcoxon rank sum tests
- Approved by the Institutional Review Board of Boston Children's Hospital. Consent not required.

Results

Patient Characteristics	Before stroke alert system	After stroke alert system	
Consults	14	65	
Median age	15.5 y (4-25)	12 y (1-27)	
History			
Stroke	3 (21%)	2 (3%)	p=0.04
TIA	5 (36%)	14 (22%)	p=0.28
CHD	0	10 (15%)	p=0.19
HbSS	2 (14%)	6 (9%)	p=0.63

Presenting symptoms	Before stroke alert system	After stroke alert system	
Arm weakness	7 (50%)	30 (46%)	p=0.79
Leg weakness	5 (36%)	22 (34%)	p=0.89
Sensory deficit	3 (21%)	22 (34%)	p=0.53
Headache	6 (43%)	21 (32%)	p=0.47
Dysarthria	3 (21%)	16 (25%)	p=1.0
Facial weakness	3 (21%)	13 (20%)	p=1.0
Language deficit	4 (29%)	13 (20%)	p=0.49
Visual complaint	3 (21%)	12 (18%)	p=1.0
AMS	2 (14%)	12 (18%)	p=1.0
LOC	3 (21%)	10 (15%)	p=0.69
Gait abnormality	2 (14%)	7 (11%)	p=0.66
Dizziness/vertigo	2 (14%)	6 (9%)	p=0.63
Seizure	0	5 (8%)	p=0.58
Ataxia	1 (7%)	3 (5%)	p=0.56

Time from symptom onset to ED arrival

Time from ED arrival to neuroimaging

Time from ED arrival to neuroimaging as a function of sedation

Diagnosis	Before stroke alert system	After stroke alert system	
AIS	3 (21%)	6 (9%)	p=0.19
IPH	0	1 (2%)	p=1.0
TIA	4 (29%)	11 (17%)	p=0.43
Headache	3 (21%)	23 (35%)	p=0.36
Seizure	0	7 (11%)	p=0.34
Psychogenic	1 (7%)	3 (5%)	p=0.56
Infectious or inflammatory	0	5 (8%)	p=1.0
Neoplasm	0	1 (2%)	p=1.0
Other*	3 (21%)	11 (17%)	p=0.71

*Bell's palsy, dystonia, necrotizing granulomatous lesion, peripheral neuropathy, peripheral vertigo, recrudescence of prior stroke symptoms, syncope, vaso-occlusive crisis without central nervous system involvement
AIS – acute ischemic stroke, IPH – intraparenchymal hemorrhage, TIA – transient ischemic attack

Conclusions

The establishment of a stroke alert system at a children's hospital decreases the time to diagnosis of children presenting to the emergency department with brain attack symptoms by over 50%. This is an important first step in ensuring that a greater proportion of children with acute ischemic stroke are diagnosed within a time frame that enables treatment with acute interventions.