JOHNS HOPKINS ALL CHILDREN'S HOSPITAL
HOUGH FAMILY INSTITUTE FOR BRAIN PROTECTION SCIENCES

Childhood Arterial Ischemic Stroke (Non-Sickle Cell) Clinical Pathway

JOHNS HOPKINS
All Children's Hospital

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Updated: April 30, 2026

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This pathway is intended as a guide for physicians, physician assistants, nurse practitioners and other healthcare providers. It should be adapted to the care of specific patient based on the patient's individualized circumstances and the practitioner's professional judgment.

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Rationale:

This pathway was developed by a consensus group of Johns Hopkins All Children's Hospital (JHACH) Pediatric Emergency Medicine Physicians, Critical Care Physicians, Hematologists, Neurosurgeons, and key health care professionals directly involved in the management of pediatric stroke. This pathway was developed to standardize the management of children with suspected or confirmed arterial ischemic stroke (AIS), and addresses the following clinical questions and/or problems:

1. Evaluation of pediatric stroke
2. Appropriate diagnostic testing
3. Management of childhood AIS
4. When to consider intravenous tissue-type plasminogen activator (tPA)
5. When to consider catheter-directed intra-arterial thrombectomy
6. Pharmacotherapy for childhood AIS

Background:

Cerebral ischemia occurs within minutes to hours of arterial occlusion. Due to the lack of recognition of acute neurological deficits and a failure to include stroke as a differential diagnosis, children encounter considerable diagnostic delay of stroke when compared to adults. Many patients present within 6 hours of symptom onset, but the median time to radiological confirmation ranges from 15 to 21 hours. The incidence of childhood arterial ischemic stroke is 1-2/100,000 per year in Western developed countries.

While the mortality rate is approximately 1/3 that of adults, stroke in children carries lifelong morbidity. Of those children greater than one month affected by stroke, nearly 65% sustain lasting motor deficits, and 50% are found to have cognitive deficits (Mastrangelo, Giordo, Ricciard, et al., 2022).

Definitions (Ferriero, Fullerton, Bernard, et al., 2019)**:**

Acute perinatal arterial ischemic stroke occurs in the neonatal period, often presenting with symptomatic seizures. The injury likely occurred immediately before, during, or immediately following birth.

Presumed perinatal arterial ischemic stroke is retrospectively diagnosed by the presence of a chronic ischemic injury on neuroimaging in an infant presenting in the first year of life with emerging hemiparesis.

Childhood arterial ischemic stroke is diagnosed by the presence of acute ischemic injury on neuroimaging beyond the first month of life.

Hemorrhagic stroke, also referred to as intracranial hemorrhage, occurs as a result of bleeding from an artery in the brain directly into brain tissue.

Sub-acute stroke, as defined by our facility for neurointerventional and acute management, includes ischemic injury > 24 hours and > 48 hours for posterior circulation stroke.

Diagnosis – Suspected Stroke:

The clinical presentation of stroke can differ based on age, setting, and subtype. Individuals aged 18 years and older who exhibit symptoms of a stroke should be considered for transfer to an Adult Primary Stroke Center. Administering intravenous tissue plasminogen activator (tPA) can offer significant benefits for adults with arterial ischemic stroke, although guidelines for its use in pediatric patients are limited (Prabhakaran et al., 2026).

Evaluation:

Focal neurologic deficit is defined as one or more of the following:

- Unilateral weakness or sensory change
- Vision loss or disturbance
- Speech or language disturbance
- Difficulty walking or loss of balance/coordination
- New-onset seizure with focal findings

OR the deficit is of sudden onset or represents sudden worsening of a pre-existing neurologic deficit.

Clinicians should obtain the following information:

- Time of symptom(s) onset
- Time that patient was last known well (symptom-free or “normal”)
- Time that the patient last ate or drank

Examples of a focal neurological deficit include, but are not limited to, abrupt-onset hemiparesis, monoparesis, monocular or binocular vision loss, diplopia, aphasia, dysarthria, ataxia, and a sudden decrease in level of consciousness.

Differential diagnosis/Stroke mimics to consider:

- Post-seizure (Todd's) paralysis
- Complex migraine: Hemiplegic, Hemisensory, Confusional
- Metabolic/genetic disorders (Mitochondrial Encephalopathy Lactic Acidosis, and stroke-like symptoms [MELAS], Leigh's, etc.)

Stroke Alert:

Any health care provider can and should activate a Stroke Alert (dial 7-3111 if at desk phone or via JABBER [call ACH Security-Emergency]) and evaluate the need for transfer to a higher level of care (e.g., intensive care unit [ICU]). The head unit clerk (HUC) can also place a Stroke Alert using the Connexall portal, under the direction of a provider. Responding members may also include the Medical Emergency Team (MET), and those health care personnel will assume care of the patient until the Stroke Alert is discontinued.

If the patient is in the Emergency Center (EC), the health care provider utilizes the JHACH emergency notification system (RAVE) when an acute arterial ischemic stroke is suspected.

Please note that only health care providers should activate a Stroke Alert. If non-health care personnel suspect stroke, a Rapid Response should be activated to facilitate urgent patient evaluation by MET members.

Standard text should include **"Stroke Alert: patient location, patient age, requesting provider, call back number."**

Team members:

Active role:

- Lead Provider = attending responsible for care in the unit from which the alert is called
- Clinical Nurse = nurse responsible for the care of the patient for whom the alert is called
- Neurologist on call
- Radiologist responsible for reading computed tomography (CT)/magnetic resonance imaging (MRI)
- CT and MRI personnel
- Pediatric Intensive Care Unit (PICU) Attending and Nurse Leader for any proven stroke
- Nursing Supervisor
- Anesthesia

May be included as clinically appropriate, but not required for initial stroke alert notification:

- Hematology - involved for proven ischemic or hemorrhagic stroke
- Neurosurgery - notify for posterior fossa stroke, large (>1/2 territory) or middle cerebral artery (MCA) stroke, malignant edema, any bleed

Diagnostic imaging:

1. Brain CT without contrast
    a. Evidence of primary hemorrhagic stroke:
        i. Discontinue Stroke Alert via the hospital central communication center (RAVE). Standard text should include “Stroke Alert: Discontinued”
        ii. Direct discussion with Neurosurgery
        iii. Admit to the appropriate inpatient unit
        iv. Consider a brain CT angiogram (CTA) to evaluate for arteriovenous malformation or aneurysm
        v. If CT is negative, proceed with Brain MRI and magnetic resonance angiography (MRA) of the Head and Neck
    b. Evidence of venous-distribution hemorrhagic stroke:
        i. Discontinue Stroke Alert via the JHACH emergency notification center (RAVE). Standard text should include “Stroke Alert: Discontinued”.
        ii. Direct discussion with Hematology
        iii. Admit to the appropriate inpatient unit
        iv. Consider brain CT venogram or magnetic resonance (MR) venogram to evaluate for cerebral sinovenous thrombosis (CSVT)

2. Brain MRI and brain MR angiogram, Head and Neck:
    a. Obtain on 3T or stronger
    b. Stroke neuroimaging protocol: MRI Axial FLAIR, DTI, SWI; MRA, TOF, COW
    c. If there is evidence of *acute* arterial ischemic stroke (AIS) on MRI, send confirmation via JHACH emergency notification center (RAVE). The head unit clerk (HUC) can also place a Stroke Alert using the Connexall portal, under the direction of a provider. Standard text should include “Stroke Alert: Confirmed AIS, patient location, patient name, patient age, primary provider, call back number.”
    d. If there is evidence of *sub-acute* arterial ischemic stroke on MRI, discontinue Stroke Alert via JHACH emergency notification center (RAVE). Standard text should include “Stroke Alert: Discontinued.”

Roles and responsibilities:

1. Lead Attending Physician or Designee (Advanced Practice Provider [APP]/ Resident)
    a. Report to bedside to perform and document Pediatric National Institutes of Health Stroke Score (Peds NIHSS), Appendix A
    b. Assume responsibility as primary provider and contact until patient transferred to the appropriate unit
    c. Provide emergent and urgent support treatment

2. Nursing:
    a. Initiate emergent support treatment:
        i. Support airway, breathing, circulation (ABCs) (refer to Pediatric Advanced Life Support [PALS], if needed).
        ii. Obtain intravenous (IV) access with a large-bore catheter (2 sites).
        iii. Obtain ordered STAT prothrombin time (PT)/international normalized ratio (INR), partial thromboplastin time *(*PTT), fibrinogen, complete blood cell count (CBC), point of care (POC) glucose, basic metabolic profile (BMP), type and screen, and both urine and serum human chorionic gonadotropin (HCG).
    b. Initiate urgent support treatment:
        i. Nothing per mouth (NPO)
        ii. Maintain the head of bed (HOB) 30 degrees or less
        iii. Maintain seizure precautions
        iv. Maintain normal oxygen saturations (SpO2)
        v. Maintain normotension
        vi. Maintain normovolemia
        vii. Maintain euglycemia
        viii. Maintain normothermia

3. Neurologist (All Children's Specialty Physician Group):
    a. Report to the bedside if within the hospital, or call the ED Attending Physician
        i. Confirm suspected acute childhood arterial ischemic stroke based on the report and proceed with diagnostic imaging
        ii. *If suspected sub-acute childhood arterial ischemic stroke*, discontinue Stroke Alert and continue clinical management
    b. Seizure control by treating any suspected seizure activity as indicated

4. Neurointerventional Radiologist (when available):
    a. Prepare and mobilize staff for diagnostic imaging and/or neurointervention

5. CT and MRI Personnel:
    a. Prepare and mobilize for diagnostic imaging

6. Anesthesia:
    a. Prepare and mobilize for sedation needs for diagnostic imaging and/or neurointervention

7. Neurosurgery:
    a. Prepare for intervention in the event of hemorrhagic stroke

Catheter-directed intra-arterial thrombectomy considerations:

The amount of ischemic injury may be reduced when recanalization and reperfusion are accomplished within the first hours of symptom onset.

Individuals ≥ 18 years of age exhibiting symptoms of stroke should be considered for transfer to an Adult Primary Stroke Center. The use of intravenous (systemic) tPA should be considered, as it may significantly benefit an adult with arterial ischemic stroke. Systemic tPA in pediatric patients is not well established and should only be administered under the explicit guidance of a Stroke Neurologist.

Catheter-directed intra-arterial thrombectomy can be performed in the Johns Hopkins All Children's Interventional Radiology Suite by a neurointerventional radiologist, *if available*.

Considerations, if any of the following exist:

1. Radiographically confirmed cerebral large artery occlusion
2. Ped NIHSS ≥ 6
3. Symptom onset ≤ 24 hours (≤ 48 hours for posterior circulation stroke)
4. Ability to transfer the patient to the PICU immediately following the procedure
5. Neurointerventionalist to determine technical feasibility based on the weight and age of the patient on a case-by-case basis

Absolute contraindications:

a. Intracerebral hemorrhage

If the patient meets #1-4 and has no contraindications, a direct discussion between the Attending Physician and the Neurointerventional Radiologist is *strongly recommended*.

Management of Confirmed Stroke:

Supportive Treatment - Utilize the Pediatric Acute Ischemic Stroke Focused Order Set:

1. NPO status (minimum 24 hours)
2. Head of bed flat
    a. If intracerebral hemorrhage is suspected or confirmed, place the HOB at 30 degrees
3. Maintain seizure precautions
4. Maintain normal SpO2, carbon dioxide (CO2) levels, and potential of hydrogen (pH)
5. Normotension as defined below:
    a. Target systolic blood pressure (SBP) between the 50th and 90th percentile for age
    b. For hypertension, decrease BP by approximately 15% over 24 hours
    c. Patients with intracranial arteriopathy may be sensitive to rapid decreases in blood pressure
    d. Monitor hourly or more frequently as clinically indicated
6. Normovolemia:
    a. Utilize isotonic fluids at maintenance requirements with a fluid bolus as

indicated

7. Euglycemia:
    a. Closely monitor blood glucose during the first 24 hours after stroke
    b. Hypoglycemia and hyperglycemia should be avoided
    c. Blood glucose goal 60 - 180 mg/dL
8. Normothermia:
    a. Identify and treat sources of hyperthermia
    b. Treat temperature >38º with acetaminophen
9. Neurological check:
    a. Perform every 15 minutes for the first 2 hours, then every 30 minutes for the next 4 hours, then every hour, for a total of 24 hours.

Consultations:

1. Neurology - to assist in seizure management and treatment decisions
2. Neurosurgery - to assist in managing suspected arteriopathy or stroke involving ½ MCA territory or posterior fossa stroke (concern for malignant edema requiring hemicraniectomy)
3. Hematology - to assist in laboratory evaluation and pharmacotherapy
4. Interventional Radiology (IR): When meeting criteria of large vessel occlusion (LVO), window up to 24 hours from last seen well LVO: vertebral, Basilar, Carotid, M1, M2, A1, PCA.
5. Cardiology - if cardioembolic source suspected
6. Genetics - if connective tissue disorder suspected (e.g., Ehlers-Danlos, Loeys-Dietz)
7. Rehabilitation/Physiatry - to assist in rehabilitation needs and potential for an inpatient rehabilitation facility
8. Educational Services for school-aged children to assist in Individualized Education Plan (IEP) and/or 504 plan

Pharmacotherapy:

The absence of antithrombotic therapy is associated with a 1.5-2-fold increased risk of recurrent stroke (Ferriero, Fullerton, Bernard, et.al., 2019). **Any antithrombosis medication(s) not listed below (e.g., alteplase [tPA]) should only be ordered after approval by a Stroke Team Neurologist.** Refer to *ACH Pediatric Acute Ischemic Stroke Focused* order set.

1. If it is a non-cardioembolic arterial ischemic stroke without severe thrombophilia, and/or most cases of dissection:
    a. Administer aspirin 3-5 mg/kg/day for 3 months. Following 3 months of therapy, reduce aspirin dose to 1-2 mg/kg/day for a minimum of an additional 21 months.
    b. Decision on whether to continue antiplatelet therapy after two years should be made by the primary outpatient stroke team.

2. If there is a cardioembolic arterial ischemic stroke, known severe thrombophilia, recurrent AIS while on antiplatelet therapy, and/or for select cases of extracranial dissection:
    a. Administer low molecular weight heparin (LMWH) dosing per *ACH Pediatric Acute Ischemic Stroke Focused* order set
    b. Following 3 months of LMWH therapy, transition to aspirin 1-2 mg/kg/day for an additional 21 months.
    c. The primary stroke team should decide on whether to increase the length of anticoagulation therapy.

3. If there is an arterial ischemic stroke > ½ MCA territory:
    a. No antithrombotic therapy indicated for the initial 96 hours.
    b. Consider frequent clinical assessment and serial imaging (CT or MRI as indicated) within the first 72 hours to monitor cerebral edema or hemorrhagic transformation as directed by Neurosurgery.
    c. Consider decompressive surgery to prevent herniation and brainstem compression.
    d. Initiate aspirin or short-anticoagulant in accordance with criteria in items 1 and 2 above, based on whether a cardioembolic or non-cardioembolic stroke, after 96 hours, and when the patient is free from cerebral edema or hemorrhagic transformation.

4. Posterior fossa ischemic stroke-unfractionated heparin is the medication of choice.

5. Unfractionated heparin may be used in lieu of low molecular weight heparin, per policy, if there is concern for bleeding complications.

Diagnostic Imaging:

1. Transthoracic echocardiogram with bubble study to assess for a right-to-left shunt
2. Electrocardiogram (EKG) to assess for arrhythmia
3. Electroencephalography (EEG) to assess for subclinical seizures
4. If not already obtained, brain MR Angiogram (MRA) to assess for arteriopathy
5. Consider neck MRA to assess for cervical arterial dissection
6. Consider a four-extremity Doppler ultrasound to assess for deep vein thrombosis in an embolic stroke with a right-to-left intracardiac shunt
7. Brain CT 24 hours following catheter-directed intra-arterial thrombectomy

Laboratory Evaluation:

1. Thrombophilia evaluation to evaluate for an inherited or acquired condition that may lead to a hypercoagulable state via Thrombophilia Workup in the *ACH Pediatric Acute Ischemic Stroke Focused* order set and any additional recommendations from Hematology
2. Inflammatory markers (erythrocyte sedimentation rate [ESR], C-reactive protein [CRP], antinuclear antibody [ANA])

3. Infectious disease evaluation, as childhood infections have been identified as a trigger for stroke, including herpesvirus (Epstein-Barr Virus [EBV], cytomegalovirus [CMV], Varicella-Zoster Virus [VZV]) and parvovirus B19.

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In the EC or while inpatient, does the clinician suspect a stroke following neurologic evaluation due to any of the following:

- Unilateral weakness or sensory change
- Vision loss or disturbance
- Trouble walking or loss of balance / coordination
- New onset seizure with focal finding

Exclusion Criteria:

- Patients with sickle cell – refer to Sickle Cell Pathway

YES

Lead Provider to Activate Stroke Alert

ER: Use hospital emergency notification center (RAVE), or HUC can place via Connexall portal

Inpatient: Jabber **-** call ACH Security-Emergency, 7-3111 on desk phone, or HUC can place via Connexall portal - **Required Team Members** will be notified

Ensure the following:

- Support ABCs
- Place/confirm 2 large bore IV (need 18-20 gauge)
- Obtain stat PT/PTT, CBC, CMP, fibrinogen, type and screen, POC glucose, HCG
- Order Brain CT without contrast

If in **EC**, use *Peds ED Stroke/BAT-JHH-BMC-ACH* order set

If **inpatient**, use *ACH Pediatric Acute Ischemic Stroke Focused* order set

NO

Off Pathway. Consider alternate diagnosis.

Evidence of hemorrhagic stroke on initial CT?

YES

Discontinue Stroke Alert

- If primary hemorrhagic stroke, consult Neurosurgery
- If venous-distribution hemorrhagic stroke, consult Hematology
- If patient in EC, admit to PICU

NO

- Obtain Brain MRI and MR Angiogram, Head and Neck (MRI axial FLAIR, DTI, SWI, MRA TOF COW) without contrast
- If MRI unavailable *within 25 minutes,* obtain CTA Head and Neck with contrast

If in **EC**, use *Peds ED Stroke/BAT-JHH-BMC-ACH* order set

If **inpatient**, use *ACH Pediatric Acute Ischemic Stroke Focused* order set

- Patient's provider to have direct discussion with Radiology and Neurology.
- Confirmed arterial ischemic stroke?

YES

Candidate for catheter-directed intra-arterial thrombectomy?

YES

Direct discussion with Neurointerventional Radiology for next steps

NO

Admit to PICU if not already done:

- Place NPO
- Head of bed <30 degrees
- Seizure precautions
- Maintain:
  - Normal SpO2
  - Normotension
  - Normovolemia
  - Normothermia

Health Care Provider:

- Consider pharmacotherapy
  - Antithrombosis medication(s) such as alteplase (tPA) should only be ordered after approval by a Stroke Team Neurologist
  - Use *ACH Pediatric Acute Ischemic Stroke Focused* order set
- Consult Neurosurgery if posterior circulation stroke

NO

Discontinue Stroke Alert

- Admit to appropriate inpatient unit, if not already done
- Maintain Neuroprotective Care
- Consider Differential Diagnoses:
  - Complicated migraine
  - Demyelinating disease
  - Intracranial infection
  - Methotrexate (MTX) usage/history
  - Pseudotumor cerebri
  - Toxic exposure
  - Trauma
  - Tumor

Discharge Planning:

Much of the recovery happens within the first months after a stroke, but improvement can still be seen even long after a stroke occurs. The cornerstone of helping the repair and recovery process is rehabilitation. Rehabilitation involves different therapies, including physical, occupational, and speech therapy (Bernson-Leung & Rivkin, 2016).

Discharge Considerations:

1. Patient may benefit from transfer to an inpatient rehabilitation facility
2. Medications available for pickup at the patient's preferred pharmacy
3. Ensure caregivers understand instructions for medication administration and when to seek immediate medical attention

Follow Up:

1. Primary Care Physician within 1-2 weeks
2. Neurology within 4 weeks of discharge, unless otherwise indicated
3. Stroke Clinic (Neurology, Hematology, and Rehabilitation) 3-4 months after initial diagnosis. Stroke Clinic is held regularly at the Outpatient Care Center (OCC).

Outcome Measures:

1. Pediatric National Institutes of Health Stroke Scale on presentation
2. Time: Presentation (“door”) to brain CT
3. Time: Presentation (“door”) to brain MRI
4. Time: Presentation (“door’) to site puncture for thrombectomy
5. Post-thrombectomy Thrombolysis in Cerebral Infarction (TICI) score
6. Pediatric National Institutes of Health Stroke Scale on discharge
7. Pediatric Stroke Outcome Measure (PSOM) recorded throughout follow-up

References:

Bernson-Leung, M. E., & Rivkin, M. J. (2016). Stroke in neonates and children. *Pediatrics in Review, 37*(11), 463–477. https://doi.org/10.1542/pir.2016-0002

Ferriero, D. M., Fullerton, H. J., Bernard, T. J., Billinghurst, L., Daniels, S. R., DeBaun, M. R., deVeber, G., Ichord, R. N., Jordan, L. C., Massicotte, P., Meldau, J., Roach, E. S., & Smith, E. R. (2019). Management of stroke in neonates and children: A scientific statement from the American Heart Association/American Stroke Association. *Stroke, 50*(3), e51–e96. https://doi.org/10.1161/STR.0000000000000183

Goldemund, D. (2025, March 4). *Pediatric NIH stroke scale*. Stroke-Manual.com. https://www.stroke-manual.com/pediatric-nih-stroke-scale/

Mastrangelo, M., Giordo, L., Ricciardi, G., De Michele, M., Toni, D., & Leuzzi, V. (2022). Acute ischemic stroke in childhood: a comprehensive review. *European journal of pediatrics*, *181*(1), 45–58. https://doi.org/10.1007/s00431-021-04212-x

Powers, W. J., Derdeyn, C. P., Biller, J., Coffey, C. S., Hoh, B. L., Jauch, E. C., Johnston, K. C., Johnston, S. C., Khalessi, A. A., Kidwell, C. S., Meschia, J. F., Ovbiagele, B., & Yavagal, D. R. (2015). 2015 American Heart Association/American Stroke Association focused update of the 2013 guidelines for the early management of patients with acute ischemic stroke regarding endovascular treatment: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke, 46*(10), 3020–3035. https://doi.org/10.1161/STR.0000000000000074

Prabhakaran, S., Gonzalez, N. R., Zachrison, K. S., Adeoye, O., Alexandrov, A. W., Ansari, S. A., Chapman, S., Czap, A. L., Dumitrascu, O. M., Ishida, K., Jadhav, A. P., Johnson, B., Johnston, K. C., Khatri, P., Kimberly, W. T., Lee, V. H., Leslie-Mazwi, T. M., Mac Grory, B., Madsen, T. E., … Yaghi, S. (2026). *2026 guideline for the early management of patients with acute ischemic stroke: A guideline from the American Heart Association/American Stroke Association*. *Stroke*. Advance online publication. https://doi.org/10.1161/STR.0000000000000513

Rivkin, M. J., Bernard, T. J., Dowling, M. M., & Amlie-Lefond, C. (2016). Guidelines for urgent management of stroke in children. *Pediatric Neurology, 56*, 8–17. https://doi.org/10.1016/j.pediatrneurol.2016.01.016

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Childhood Arterial Ischemic Stroke (Non-Sickle Cell) Clinical Pathway

Institute for Brain Protection Sciences

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Date Approved by Clinical Pathway Development Council (CPDC): April 7, 2026

Date Approved by JHACH Clinical Practice Council: April 15, 2026

Date Content Last Revised: April 30, 2026

Date Available on Webpage: April 30, 2026

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Date Approved by JHACH Clinical Practice Council: December 17th, 2019

Date Available on Webpage: February 1st, 2020

Disclaimer:

Clinical Pathways are intended to assist physicians, physician assistants, nurse *practitioners,* and other health care providers in clinical decision-making by describing a range of generally acceptable approaches for diagnosing, managing, or preventing specific diseases or conditions. The physician must make the ultimate judgment regarding the care of a particular patient in light of the patient's individual circumstances.

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Appendix A

Instructions for use in Epic:

- Go to “Rarely Used” or calculator tab (ER and outpatient)
- Access Stroke navigator tab
- Select Peds NIH tab

**Note: After totaling the score, a table of the questions and scores is created and saved into the “flowsheets” tab. From there, it can be copied and pasted into a note. Each exam is time-stamped, allowing comparison for improvement versus worsening over time.

Pediatric National Institutes of Health Stroke Scale (Ped NIHSS)

Level of Consciousness: Choose score, even if full evaluation is hindered by obstacles such as intubation, language barrier	0 = Alert, responsive 1 = Arousable by minor stimulation 2 = Requires repeated or painful stimulation 3 = Responds with reflex motor or is unresponsive
Level of Consciousness Questions: “How old are you?” Credit given if the child states the number or shows the correct number of fingers. “Where is the *family member*?” *A family member* must be present. Credit given if the child points to or gazes purposefully at a family member.	0 = Two answers correct 1 = One answer correct 2 = Zero answers correct
Level of Consciousness Commands 1. Open and close eyes 2. Touch/ show me your nose. Substitute another one-step command if the hands cannot be used.	0 = Two tasks correct 1 = One task correct 2 = Zero tasks correct
Best Gaze Only test horizontal eye movements. A score of 1 is given when gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present.	0 = Normal 1= Partial gaze palsy 2 = Forced deviation or total gaze paresis not overcome by oculocephalic maneuver.
Visual For children >6 years, visual fields are tested by confrontation using finger counting. For children aged 2–6 years, visual fields are tested using visual threat.	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia (including cortical blindness)
Facial Palsy Score: symmetry of grimace, close eyes, raise eyebrows, and show teeth.	0 = Normal symmetrical movement 1 = Minor paralysis 2 = Partial paralysis (total of near-total paralysis of the lower face) 3 = Complete paralysis of one or both sides
Motor Arm (left and right): Arms are extended with palms down at a 90-degree angle if sitting, or a 45-degree angle if supine. Drift is scored if the arm falls before 10 seconds. For children too young to follow directions, power in limb should be graded by observation, excluding time limits.	0 = No drift, limb holds for full 10 seconds 1 = Drift but has some effort against gravity 2 = Some effort against gravity, but the limb cannot get to or maintain a position 3 = No effort, limb falls 4 = No movement 9 = Amputation, joint fusion (explain)
Motor Leg (left and right): Legs are extended 30 degrees while supine. Drift is scored if the leg falls before 5 seconds. For children too young to follow directions, power in limb should be graded by observation, excluding time limits.	0 = No drift, limb holds for full 5 seconds 1 = Drift but has some effort against gravity 2 = Some effort against gravity, but the limb cannot get to or maintain a position 3 = No effort, limb falls 4 = No movement 9 = Amputation, joint fusion (explain)
Limb Ataxia Finger-nose-finger and heel-shin test bilateral. For children <5 years, substitute the task with reaching for a toy with their arms and kicking a toy or the examiner’s hand with their legs.	0 = Absent 1 = Present in one limb 2 = Present in two limbs
Sensory Sensation to a pin prick. For children too young to report sensory loss, observe for behavioral response to a pin prick. The examiner should test as many body areas as needed to assess hemisensory loss (excluding the hands).	0 = Normal, no sensory loss 1 = Mild/ moderate sensory loss 2 = Severe/ total sensory loss, patient not aware of being touched

Best Language For children > 6 years and normal language development prior to stroke, the patient should perform *table 1*, and *figures 1, 2,* and *3.* For children ages 2–6 years, the score is based on observation of language comprehension and speech during the exam.	0 = Normal, no aphasia 1 = Mild/ moderate, some obvious loss of fluency 2 = Severe, all communication through fragmented expression 3 = Global aphasia, usable speech or auditory comprehension
Dysarthria. If the patient is thought to have an adequate sample of speech, aphasia can be rated by articulation clarity.	0 = Normal 1 = Mild/ moderate, slurs at least some words 2 = Severe, unintelligible, or mute 9 = Intubated or other barrier (explain)
Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained throughout testing. Since the abnormality is scored only if present, the item is never untestable.	0 = No abnormality 1 = Inattention to simultaneous stimulation in one of the sensory modalities 2 = Profound hemi-inattention or orients to only one side of space

Note. Adapted from *Pediatric NIH stroke scale*, by D. Goldemund, 2025, Stroke-Manual.com (https://www.stroke-manual.com/pediatric-nih-stroke-scale/).

Table 1: Best Language

Repetition	Repetition task for the following words: “Stop,” “stop and go,” “If it rains, we play inside,” “The President lives in Washington.”
Reading	Read items in *Figure 3*
Naming	Name items in *Figure 1*
Fluency and word finding	Describe what is happening in *Figure 2*

Figure 1: Best Language

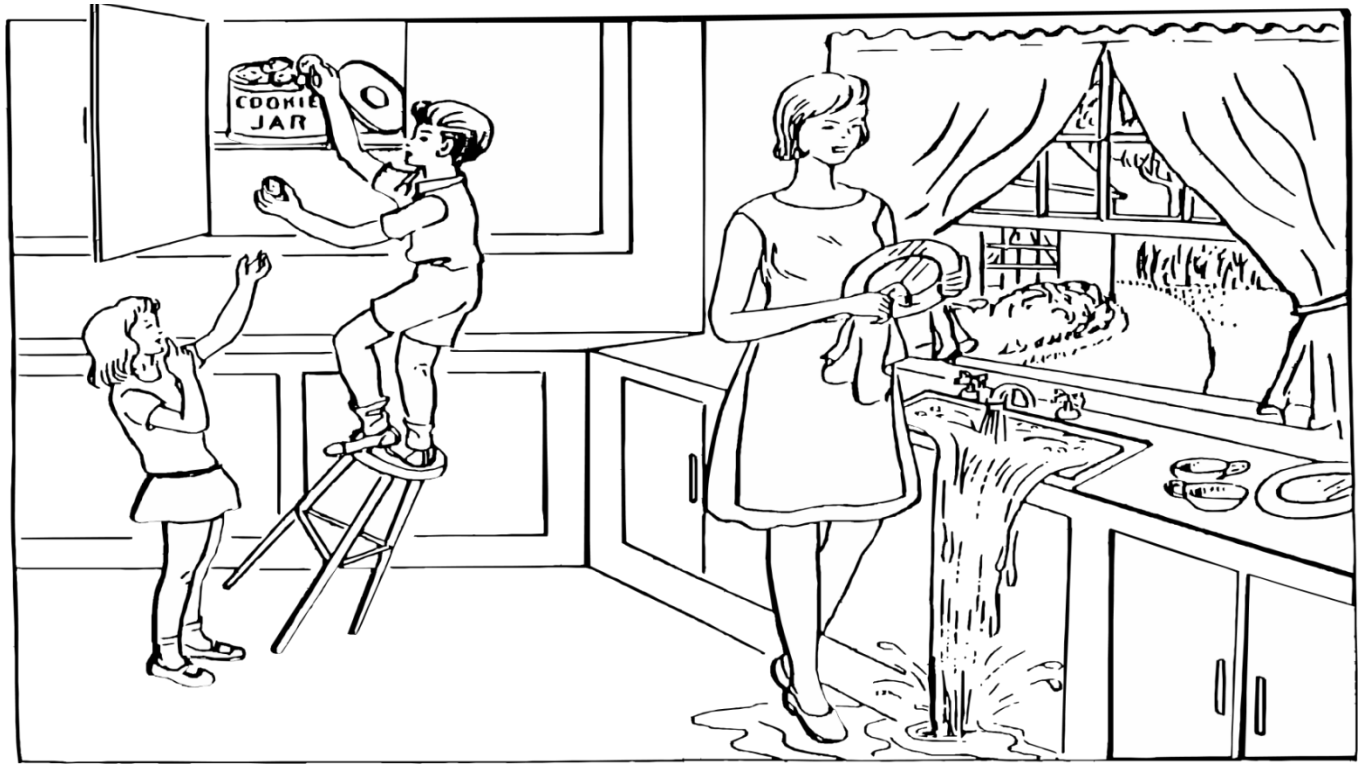


Figure 2: Best Language

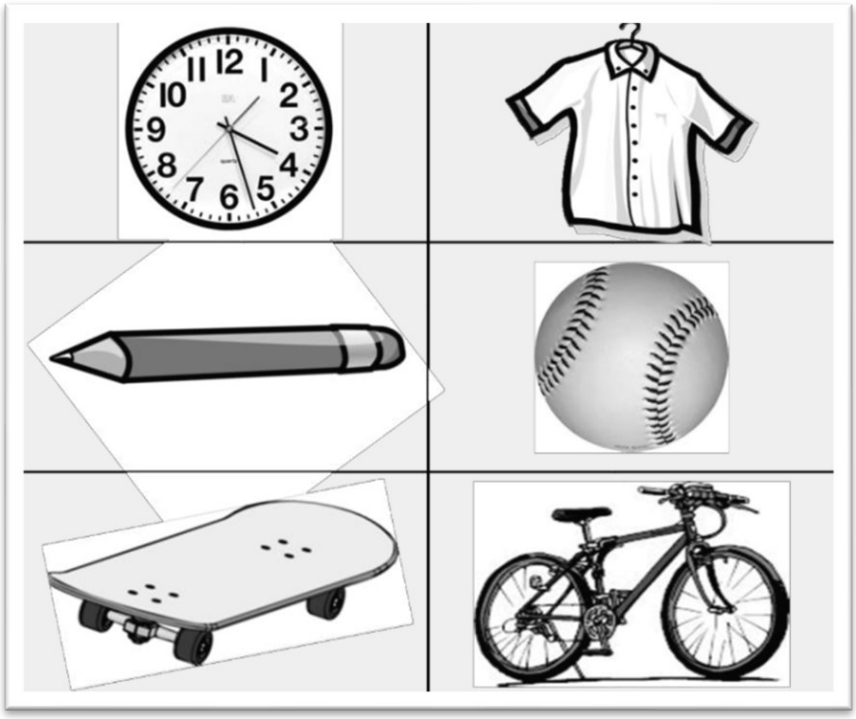


Figure 3: Best Language

