Stroke in Childhood

Clinical guideline for diagnosis, management and rehabilitation

Stroke association

RCPCH Royal College of Paediatrics and Child Health
Leading the way in Children's Health

Identify children with suspected stroke

1 Identify potential stroke

- Acute focal neurological deficit
- Speech disturbance
- Unexplained, persistent change in conscious level (GCS ≤ 12 **OR** AVPU < V)

Also consider stroke in children with:

- New onset focal seizures
- New onset severe headache
- Ataxia
- Dizziness
- Resolved acute focal neurological deficit
- Sickle Cell Disease

Neurological assessment

PedNIHSS definitions	Scale definition
1a. Level of Consciousness:	**0** = Alert; keenly responsive **1** = Not alert, but arousable by minor stimulation **2** = Not alert, requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make non-stereotyped movements **3** = Responds only with reflex motor or autonomic effects or totally unresponsive
1b. LOC Questions: *Tested by asking age and 'where is XX', XX referring to the name of the parent or other familiar family member present (> 2 years)*	**0** = Answers both questions correctly **1** = Answers one question correctly **2** = Answers neither question correctly
1c. LOC Commands: *Tested by asking to open / close the eyes and to 'show me your nose' or 'touch your nose' (> 2 years)*	**0** = Performs both tasks correctly **1** = Performs one task correctly **2** = Performs neither task correctly
2. Best Gaze: *Horizontal eye movements tested*	**0** = Normal **1** = Partial gaze palsy **2** = Forced deviation / complete gaze palsy
3. Visual: *Tested by visual threat (2–6 years); confrontation, finger counting (> 6 years)*	**0** = No visual loss **1** = Partial hemianopia **2** = Complete hemianopia **3** = Bilateral hemianopia (including cortical blindness)
4. Facial Palsy: *Tested by patient showing teeth or raising eyebrows / close eyes*	**0** = Normal symmetrical movement **1** = Minor paralysis (flattened nasolabial fold, asymmetry on smiling) **2** = Partial paralysis (total or near total paralysis of lower face) **3** = Complete paralysis of one or both sides
5 & 6. Motor Arm and Leg: *Tested by patient extending arms 90 degrees (if sitting) or 45 degrees (if supine), and the leg 30 degrees*	**5a. Left Arm, 5b. Right Arm** **0** = No drift for full 10 seconds **1** = Drift ≤ 10 seconds **2** = Some effort against gravity **3** = No effort against gravity **4** = No movement **5** = Amputation **6a. Left Leg, 6b. Right Leg** **0** = No drift for full 5 seconds **1** = Drift 5 seconds **2** = Some effort against gravity **3** = No effort against gravity **4** = No movement **5** = Amputation
7. Limb Ataxia: *Tested for by reaching for a toy / kicking a toy (< 5 years); finger-nose-finger / heel-shin tests (> 5 years)*	**0** = Absent **1** = Present in one limb **2** = Present in two limbs
8. Sensory: *Observe behavioural response to pin prick*	**0** = Normal; no sensory loss **1** = Mild to moderate sensory loss **2** = Severe to total sensory loss
9. Best Language: *Tested by observing speech and comprehension (2–6 years); describe picture (> 6 years)*	**0** = Normal **1** = Mild to moderate aphasia **2** = Severe aphasia **3** = Mute, global aphasia

2 Pre-hospital care: Ring 999 / 111

- Manage Airway
- Administer high flow O_2 if clinically indicated
- Perform a capillary glucose test within 15 minutes of presentation
- Treat HYPOGLYCAEMIA (If capillary blood glucose 3 mmol/L give 2 ml/kg of 10% dextrose)
- Assess using **FAST**
- Transport to nearest ED with acute paediatric services
- Priority call / pre-alert ED of impending arrival of child with suspected stroke
- Activate (locally defined) acute paediatric stroke pathway
- If Sickle Cell Disease is suspected, discuss with paediatric haematologist who should be present in pre-hospital care / ED

3 ED: Activate acute stroke pathway

! This algorithm is not wholly applicable to children with Sickle Cell Disease. If Sickle Cell Disease is suspected:
- Discuss with paediatric haematologist
- Exchange transfusion even if initial imaging is normal

- Intubate if GCS < 8, AVPU = U, if there is a loss of airway reflexes or there is suspected / proven raised intracranial pressure
- Administer high flow O_2 and target SpO_2 ≥ 92%
- If the circulation is compromised give a 10 ml/kg isotonic fluid bolus
- Perform a capillary glucose test within 15 minutes of presentation. If capillary blood glucose 3 mmol/L give 2 ml/kg of 10% dextrose and consider a hypoglycaemia screen

4 Investigations

- Venous or capillary blood gas
- FBC, PT, APTT
- Fibrinogen
- Urea and electrolytes
- Blood glucose
- Group and save
- C-reactive protein
- Liver function tests
- Blood cultures as appropriate

Monitoring

- BP
- Temperature
- SpO_2
- HR
- RR
- GCS
- Assess PedNIHSS score

See 'Neurological assessment'

5 Urgent brain imaging

Perform CT / CTA < 1 Hour of ED admission

Record time of symptom onset
Window for tPA = 4.5 hours

Record time of admission
Window for imaging = 1 hour

6 Stroke mimic

MRI with stroke-specific sequences should be performed in patients with suspected stroke when there is diagnostic uncertainty.

Haemorrhagic stroke

Urgent discussion with neurosurgical team regarding need for transfer.

Arterial ischaemic stroke

Consider suitability for other emergency interventions, such as; Thrombectomy or Decrompressive craniectomy.

7 Treatment for Arterial ischaemic stroke (AIS)

Aspirin

- 5mg/kg ≤ 1 hour (Unless CI, e.g. parenchymal haemorrhage)
- Delay for 24 hours in context of thrombolysis

In children presenting with AIS Thrombolysis, the use of tPA...
may be considered if 2–8 years and ***could*** be considered if ≥ 8 years

IF ALL OF THE FOLLOWING ARE TRUE:

- PedNIHSS ≥ 4 and ≤ 24
- tPA can be administered ≤ 4.5 hours of symptom onset
- CT has excluded intracranial haemorrhage
- CTA demonstrates normal brain parenchyma or minimal early ischaemic change
- CTA demonstrates partial / complete occlusion of the intracranial artery corresponding to clinical / radiological deficit

OR

- MRI and MRA showing evidence of acute ischaemia on diffusion weighted imaging + partial / complete occlusion of the intracranial artery corresponding to clinical / radiological deficit

PROVIDING THAT THERE ARE NO CONTRAINDICATIONS

aPTT=Activated partial thromboplastin time; **AVPA**=Alert, Voice, Pain, Unresponsive; **CI**=Contra-indication; **CT**=Computerised tomography; **CTA**=Computerised tomography angiography; **ED**=Emergency Department; **FAST**=Face, Arms, Speech Time; **FBC**=Full blood count; **GCS**=Glasgow Coma Scale; **HR**=Heart rate; **LOC**=Level of consciousness; **MRA**=Magnetic resonance angiogram; **MRI**=Magnetic resonance imaging; **AIS**=Arterial ischaemic stroke; **O_2**=Oxygen; **PedNIHSS**=Paediatric National Institute of Health Stroke Scale; **PT**=Prothrombin time; **RR**=Respiratory rate; **SpO_2**=Oxygen saturation; **tPA**=Tissue plasminogen activator.

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Produced in line with the full RCPCH clinical guideline.
For further details on all recommendations, visit: www.rcpch.ac.uk/stroke-guideline