Clinical Guideline: East of England Paediatric Arterial Ischaemic Stroke Pathway – Regional Guideline

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For use in: All Paediatric Units, Emergency Departments, Radiology, Paediatric Neurology, Paediatric Anaesthesia, PaNDR, PICU

Used by: All paediatric units, Emergency Departments (ED/PAU/CAU), Radiology departments (CT/CTA capable), Paediatric Neurology teams, Paediatric Anaesthesia, PaNDR, PICU, Interventional Radiology, and relevant operational teams involved in stroke recognition, imaging, and transfer.

Key Words: Stroke, Arterial Ischaemic Stroke (AIS), CT Angiogram, Thrombolysis, Thrombectomy, Paediatric Stroke Pathway

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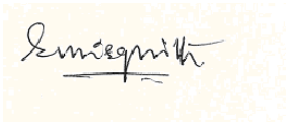
Clinical Lead Dr Ronald Misquith	

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Contents

1. Scope

Trust-wide: children's services. Since stroke services are regionally centralised, this guideline is also relevant to other paediatric units in the East of England region.

2. Purpose

To provide a clear pathway for identification and management of arterial ischaemic stroke (AIS) in children and young people aged 29 days to 18 years.

This guideline does not cover neonatal stroke, haemorrhagic stroke or cerebral venous sinus thrombosis.

This guideline may be used in combination with the RCPCH guideline "Stroke in Childhood" (2017). The two guidelines should be fully compatible, but this document aims to reflect region-specific considerations and recent developments in practice.

3. Definitions

Acronym	Definition
AIS	arterial ischaemic stroke
APTT	activated partial thromboplastin time
AVPU	Alert, Voice, Pain, Unresponsive
CRP	C reactive protein
CTA	computed tomographic angiogram
CUH	Cambridge University Hospitals NHS Foundation Trust
CVST	cerebral venous sinus thrombosis
GCS	Glasgow Coma Scale
MCA	middle cerebral artery
MRA	magnetic resonance angiogram
PaNDR	Paediatric And Neonatal Decision support and Retrieval service
PCAIS	posterior circulation arterial ischaemic stroke
PedNIHSS	Paediatric National Institutes of Health Stroke Scale
PT	prothrombin time
RCPCH	Royal College of Paediatrics and Child Health
SCD	sickle cell disease
TIA	transient ischaemic attack
tPA	tissue plasminogen activator
VZV	varicella zoster virus

4. Introduction

Stroke is one of the top ten causes of childhood death and the majority of survivors are left with significant impairment.

Rapid recognition of childhood stroke enables time-critical intervention, which may be lifesaving or disability-reducing.

Since childhood stroke is a rare but very serious and potentially treatable condition, the diagnosis needs to be considered and excluded in a significantly larger group of children than will actually be confirmed to have stroke.

5. Features suggestive of stroke

Suspect stroke in the presence of any of the following:

- FAST (Face, Arms, Speech, Time) criteria: new facial droop; arm weakness, and/or difficulties with speech. (Absence of FAST criteria does **not** exclude stroke.)
- Any new focal neurological deficit
- Aphasia
- Unexplained reduced level of consciousness (age-appropriate GCS <12 or AVPU <V) at presentation

Consider stroke in the presence of any of the following:

- New-onset focal seizures
- New-onset severe headache
- Ataxia or dizziness
- Sudden onset of neck pain or neck stiffness
- Altered mental status including transient loss of consciousness or behavioural change
- Witnessed acute focal neurological deficit which has since resolved

The following non-specific symptoms can be present in a child presenting with stroke:

- Nausea and/or vomiting
- Behavioural change
- Fever

For a list of risk factors for childhood AIS, see Appendix 1.

6. Immediate actions upon suspecting stroke

Good outcomes for children and young people (CYP) with stroke depend on rapid assessment and treatment. Close collaboration between Ambulance Services, the Emergency Department, the Paediatric team, and diagnostic services is essential.

If a stroke is suspected by the Ambulance crew or Emergency Department staff, this must be treated as a time-critical emergency and immediately escalated to the paediatric decision-making clinician (usually registrar or consultant). The child or young person should be prioritised for urgent assessment and appropriate investigations, with support from the wider clinical team as needed.

The Paediatric team should then liaise with the tertiary Paediatric Neurologist to agree on the most appropriate management and intervention.

16 -18-year-olds can be managed according to adult stroke pathway, with support from local adult stroke team.

Immediate stabilisation

Complete an urgent A-to-E assessment of the child and address any immediately life-threatening issues, then proceed to urgent neuroimaging (see below) and take the following steps.

- Monitor blood pressure, temperature, oxygen saturation, heart rate and respiratory rate in all children and young people presenting with a clinical diagnosis of stroke
- Target oxygen saturations above 92%
- Obtain IV access and take blood for:

  - Capillary or venous blood gas and glucose
  - Urea, creatinine and electrolytes
  - Full blood count
  - CRP
  - Group and save
  - PT, APTT and fibrinogen.
  - Consider liver function tests, blood cultures and other tests as specifically relevant (for example, haemoglobin electrophoresis and reticulocyte count in SCD)
- Maintain normal fluid, glucose and electrolyte balance
- Treat hypotension
- Use the PedNIHSS and GCS or AVPU to assess the child's neurological status and conscious level
- Withhold oral feeding (eating and drinking) until the swallow safety has been established
- Treat hypertension if and only if:
  - The patient may be eligible for thrombolysis, but systolic blood pressure exceeds the 95th percentile for age by more than 15%
  - Hypertensive encephalopathy is suspected
  - End organ damage or dysfunction (e.g. cardiac or renal failure) is present

Neuroimaging

- Cranial CT including CTA should be performed within one hour of arrival at hospital in every child with a suspected stroke.
- CTA should extend down to the aortic arch if CT does **not** show haemorrhage; if CT does demonstrate haemorrhage, then CTA may be limited to intracranial vasculature.
- MRI should **only** be considered for assessment of suspected acute stroke if it is available within one hour of arrival to hospital.

Where there is a high suspicion of possible stroke (i.e. any of the criteria listed above under "suspect stroke" are present) then CTA should always be undertaken. It is an acceptable consequence that children with, for example, a first episode of hemiplegic migraine or Todd's paresis will receive a CTA. Where only the criteria under "consider stroke" are listed then imaging is at the discretion of the clinician. If in doubt, please discuss with the Paediatric Neurology Consultant on call.

Urgent imaging does not need to be undertaken in this timeframe if there is full recovery from the deficit by the time child is assessed, as they would not qualify for thrombolysis.

Regional considerations

- Every Children's Emergency Department should be able to offer timely CTA to children of all ages at any time, together with prompt first-line reporting locally.
- In addition to first-line reporting, all images should be sent urgently ("blue-light transfer") to CUH where the Consultant Paediatric Neurologist will liaise with the Consultant Neuroradiologist on duty for urgent review.
- The referring team must also discuss by phone with the Consultant Paediatric Neurologist. If calling out of hours, please ask the CUH switchboard operator specifically to connect you to the consultant as the registrar is unlikely to be able to make the necessary decisions.

7. Time-critical interventions for acute AIS

All children presenting with AIS with symptom onset within the last 24 hours should be discussed urgently with the Consultant Paediatric Neurologist on duty at CUH. Thrombolysis should be considered within 4.5 hours of symptom onset. Mechanical thrombectomy should be considered within 12 hours of symptom onset (even though often it will not be indicated after 6 hours).

Where stroke symptoms were present on waking and the exact time of onset is unknown (but could be within 24 hours), all cases should be discussed urgently with paediatric neurology as above: in some cases, radiological findings may indicate that thrombectomy would still be worth attempting.

Neither thrombectomy nor thrombolysis is, at present, an option for children under 2 years old.

Thrombolysis
Commence thrombolysis in children aged 2 years or older if **all** of the criteria below are present, and **none** of the contraindications below are present:

Criteria for thrombolysis:
- Acute focal neurological deficit consistent with arterial ischaemia **and**
- PedNIHSS ≥ 4 and ≤ 24 **and**
- tPA can be administered ≤ 4.5 hours of symptom onset **and**
- CT has excluded intracranial haemorrhage **and**
- CTA demonstrates normal brain parenchyma or minimal early ischaemic change **and**
- CTA demonstrates occlusion of the intracranial artery corresponding to the deficit

OR
- MRI and MRA show evidence of acute ischaemia and occlusion of the intracranial artery corresponding to deficit

Contraindications to thrombolysis:
- Unknown time of symptoms onset **or**
- Pregnancy **or**
- Clinical presentation suggestive of subarachnoid haemorrhage (SAH), even if brain imaging is negative for blood **or**
- Patient who would decline blood transfusion if indicated **or**
- History of prior intracranial haemorrhage **or**
- Known cerebral arterial venous malformation, aneurysm or neoplasm **or**
- Persistent systolic blood pressure more than 15% above the 95th percentile for age while sitting or supine **or**
- Glucose <2.8mmol/L or >22.2mmol/L **or**
- Bleeding diathesis including platelets <100, PT >15s (INR >1.4), or elevated aPTT more than upper limits of the normal range **or**
- Clinical presentation consistent with acute myocardial infarction (MI) or post-MI pericarditis that requires evaluation by Cardiology before treatment **or**
- Prior stroke, major head trauma, or intracranial surgery within the past three months **or**
- Major surgery or parenchymal biopsy within 10 days (relative contraindication) **or**
- Gastrointestinal or urinary bleeding within 21 days (relative contraindication) **or**
- Arterial puncture at non-compressible site or LP within seven days (relative contraindication – note that patients who have had cardiac catheterisation via a compressible artery are not excluded) **or**
- Cancer, or patient is within one month of completion of cancer treatment **or**
- Underlying significant bleeding disorder. Patients with a mild platelet dysfunction, mild von Willebrand disease, or other mild bleeding disorders are *not* excluded; **or**
- Mild deficit (PedNIHSS < 4) at start of tPA infusion or at time of sedation for neuroimaging, if applicable **or**
- Severe deficit suggesting large territory stroke, with pre-tPA PedNIHSS >24, regardless of the infarct volume seen on neuroimaging **or**
- Stroke suspected to be because of subacute bacterial endocarditis, moyamoya, sickle cell disease, meningitis, bone marrow, air, or fat embolism **or**
- Previously diagnosed primary angiitis of the central nervous system (PACNS) or secondary central nervous system (CNS) vasculitis. Focal cerebral arteriopathy of childhood is *not* a contraindication **or**
- Intracranial haemorrhage on pre-treatment head CT and MRI **or**

- Intracranial dissection (defined as at or distal to the ophthalmic artery) **or**
- Large infarct volume, defined by the finding of acute infarct on MRI involving one-third or more of the complete middle cerebral artery (MCA) territory involvement **or**
- Known allergy to recombinant tissue plasminogen activator
- Patient who received heparin within four hours must have aPTT in normal range **or**
- Low molecular-weight heparin (LMWH) within past 24 hours (aPTT and INR will not reflect LMWH effect) **or**
- Patient receiving effective oral anticoagulant treatment such as warfarin (if INR >1.3) or rivaroxaban.

If the referring clinician is uncertain about whether a contraindication applies, please discuss with the Consultant Paediatric Neurologist and/or other relevant teams, which may include the (adult) Stroke team or Haematology.

Treatment is only indicated for persisting neurological deficit: thrombolysis/thrombectomy should *not* be considered for transient ischaemic attack where symptoms have resolved.

Tissue plasminogen activator (alteplase) dosing:
Thrombolysis should be started at the location of diagnosis of AIS if criteria are met and there are no contraindications. This will usually be in the Children's Emergency Department or Paediatric Ward.

The decision to administer thrombolysis will be made jointly by the referring team and Paediatric Neurologist.

Whenever either thrombolysis or thrombectomy is under consideration, PANDR should be contacted (Tel: 01223 274 274) to facilitate a conference call involving the referring Consultant Paediatrician, the Consultant Paediatric Neurologist, the Consultant Neuroradiologist and if appropriate the Consultant Interventional Radiologist. The call to PANDR may be placed either by the referring team or the Paediatric Neurologist. It is not, however, necessary to wait for such a conference call before commencing thrombolysis where the referring Paediatrician and the Paediatric Neurologist are in agreement.

In hospitals where there is a hyperacute stroke service, it may be desirable to contact the adult stroke team for support in administering thrombolysis, although ultimately responsibility will remain with the paediatric teams.

The dose of alteplase is 0.9 mg/kg (max 90mg).

The first 10% (90mcg/kg; max 9mg) should be given as an IV bolus over 1-2 minutes, with the remaining 90% (810mcg/kg max 81mg) infused IV over 60 minutes.

More detail is available in the CUH Pharmacy Monograph (Paediatric IV Monographs: "Alteplase (Acute Ischaemic Stroke)"; Appendix 3). Alteplase is generally provided as powder for reconstitution using water for injection. It may be diluted further, if required, using 0.9% sodium chloride but *not* glucose.

At the time of writing, alteplase is preferred to tenecteplase in children as there is more data on its use.

Thrombectomy

Thrombectomy may be considered:
- Up to 12 hours from symptom onset
- In patients with a PedNIHSS score of at least 6
- Who are at least two years old.

Thrombectomy may be considered in patients who have already received thrombolysis.

All such patients should be discussed with the on-call Paediatric Neurology Consultant immediately. Please ask the CUH Switchboard specifically to put you through to the consultant. If thrombectomy is considered a possibility, this should proceed to a conference call facilitated by PANDR as above. Time-critical transfer can be arranged in parallel with this if appropriate.

CUH cannot currently guarantee 24/7 cover by an Interventional Radiologist and Anaesthetist able to undertake procedures in young children. All potential thrombectomy candidates should nevertheless be discussed.

Emergency Transfers

Any patient who might be a candidate for thrombectomy (including any patient who has received, or is receiving, thrombolysis) should be sent to CUH as a time-critical transfer – that is, by blue-light ambulance, rather than by planned retrieval. A decision to proceed to thrombectomy does *not* need to have been made to initiate transfer.

The following protocol for transfer should be followed:

- Complete the Safe Transfer of the Paediatric Patient (STOPP) Tool – Appendix 5
- The ambulance team should place a pre-alert call to the CUH Emergency Department
- The patient should be admitted via the Resuscitation Unit
- Once the patient is in transit, the sending team should notify the CUH Emergency Physician in Charge (EPIC) of the transfer by calling 07708509450, or via CUH Switchboard.

Where no time-critical intervention is a possibility, retrieval by PANDR will normally be preferred.

AIS in children with sickle cell disease

In addition to discussion with Paediatric Neurology, all such patients should be discussed with the Paediatric Haematology Consultant.

- Children and young people with SCD and acute neurological signs or symptoms (even with normal neuroimaging) should receive an urgent blood transfusion, aiming to reduce the HbS to less than 30%, and increase the haemoglobin concentration to more than 100–110g/l. This will usually require exchange transfusion.
- If exchange transfusion cannot be started within six hours, provide a small top-up transfusion to bring Hb to 100g/l.
- Exchange transfusion should be prioritised over thrombolysis or thrombectomy.
- All these patients will require emergency transfer to CUH (or another Paediatric Haematology Specialist Centre), generally for intensive care: this should normally be arranged as urgent retrieval by PANDR rather than time-critical/blue-light ambulance transfer.

Neurosurgical intervention

Patients with any of the following should be discussed urgently with the neurosurgical team:

- Impaired consciousness level
- Acute increase in PedNIHSS score after presentation
- Evidence of increased intracranial pressure
- Large stroke (midline shift; involvement of >1/3 of MCA territory; PedNIHSS score >15)
- Dissection on imaging

This discussion should not delay any other necessary interventions or transfer.

Decompressive hemicraniectomy may be considered in the most severe cases. For MCA infarctions, it may be indicated in the following circumstances:

- Onset within the last 48 hours **and**
- Decreased conscious level (scoring 1 or more in item 1a of PedNIHSS) **or** PedNIHSS >15 **and**
- Radiological signs of infarction of at least 50% of the MCA territory

In these circumstances, patients outside CUH should be ventilated, neuroprotected and transferred to CUH as a time-critical transfer.

For strokes involving other vascular territories, especially posterior circulation strokes, decompressive craniectomy or other surgical pressure-relieving measures may also be considered.

Children with moyamoya disease should be discussed with a paediatric neurosurgical centre with expertise in surgical revascularisation – at present, this is most likely to be at Great Ormond Street Hospital. This procedure will not be undertaken as part of hyper-acute treatment.

8. Further Care

All children with AIS, whether or not thrombolysis or thrombectomy has been given, should be transferred to CUH or an alternative Paediatric Neurology centre urgently, normally within 24 hours.

Observations

Frequency of observations (obs) required depends on clinical condition and what interventions have been undertaken. The frequencies below represent a minimum: some patients may require more frequent observations if they are unstable.

Patients who have received **thrombectomy (with or without thrombolysis)** require observations and neuro observations:

- Every 15 minutes for 6 hours
- Then every hour for 6 hours
- Then every 4 hours

And will also require checks of the puncture site and vascular observations on the relevant limb:

- Every 15 minutes for 1 hour
- Then every 30 minutes for 2 hours
- Then every hour for 3 hours
- Then every 4 hours

Patients who have received **only thrombolysis** require observations and neuro observations:

- Every 15 minutes for 2 hours
- Then every 30 minutes for 2 hours
- Then every hour for 6 hours
- Then every 2 hours for 10 hours
- Then every 4 hours

In any patient who has received thrombolysis, the mouth and tongue should be checked for swelling or other signs of anaphylaxis.

Patients who have received **neither thrombectomy nor thrombolysis** require observations and neuro observations:

- Every hour for 12 hours
- Then every four hours

Management

Aspirin should be started within 24 hours except in the presence of the following contraindications:

- Active peptic ulceration
- Bleeding disorders such as haemophilia
- Sickle cell disease (discuss with Haematology first)
- Thrombolysis within the previous 24 hours – after this period CT or (preferably) MRI head should be repeated to exclude haemorrhagic transformation before starting aspirin.

Aspirin dosing: 5mg/kg (maximum 300mg) once daily for 14 days, followed by 1mg/kg (maximum 75mg) ongoing.

Aspirin is not a contraindication to thrombolysis and may be given even if thrombolysis is still being considered. However, if thrombolysis has been given, aspirin should not be administered for 24 hours afterwards.

Duration of aspirin treatment is decided on a case-by-case basis but is usually at least several years.

Anticoagulation (as an alternative to aspirin) may be considered in children with underlying cardiac disease. This decision will require a multidisciplinary discussion involving haematologists, paediatric neurologists and cardiologists.

It is no longer considered necessary for patients to be nursed flat: the most comfortable position may be used.

Blood glucose should be monitored at least six-hourly in the first 24 hours, more frequently if clinically indicated.

PedNIHSS should be repeated at 24 hours, 7-10 days, and 3 months after the stroke.

The ongoing care and rehabilitation of children and young people with AIS, including secondary prevention, is discussed in the RCPCH guideline but is beyond the scope of this document.

Further investigation

The following investigations should be undertaken in all children with AIS except where there is a clearly defined cause such as traumatic dissection or recent varicella:

Blood tests

- FBC
- Iron studies
- Haemoglobinopathy screen
- Plasma homocysteine (for homocystinuria)
- Alpha-galactosidase (for Fabry disease)
- Fasting blood glucose
- Fasting cholesterol
- Lipoprotein (a)
- Antiphospholipid antibodies (lupus anticoagulant; anticardiolipin antibodies; anti-β2-glycoprotein 1 antibodies)

The following tests are not specifically recommended by the RCPCH guidelines but are also recommended regionally:

- Save serum
- Store DNA
- Lactate
- Ammonia
- Plasma amino acids
- ESR
- Varicella IgG, IgM and PCR
- ANA
- ANCA
- ASOT/anti-streptococcal antibodies
- Additional thrombophilia screening only after discussion with a Haematologist

Urine:

- Urine organic acids
- Urine toxicology if potentially relevant

Cardiac evaluation:

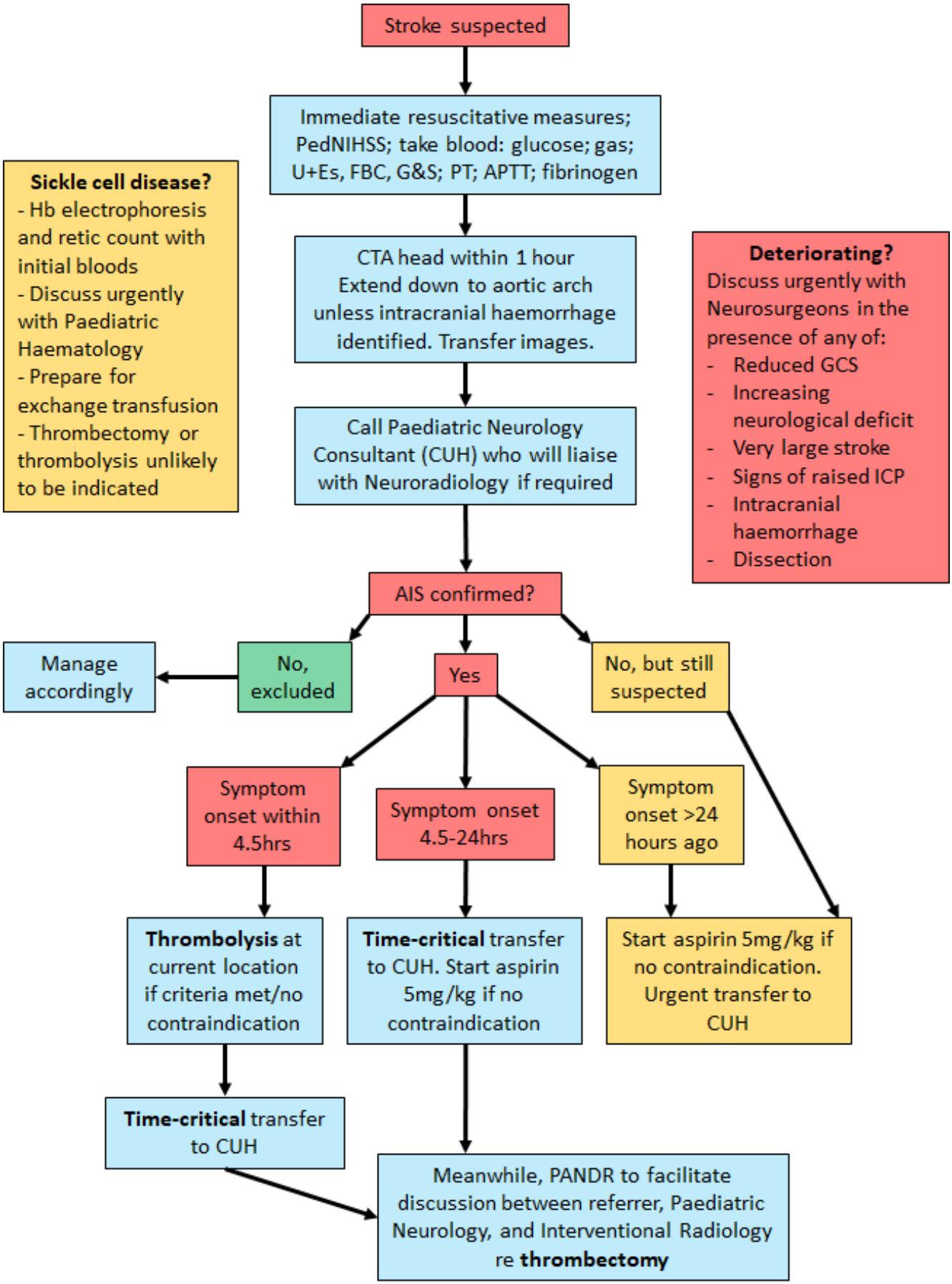
- 12-lead ECG
- Echocardiogram

Other investigations:

- If not already completed, vascular imaging (CTA or MRA) should be undertaken from the aortic arch to the vertex
- MRI brain should be performed if only CT has been undertaken so far
- If trauma is suspected: plain lateral x-ray of cervical spine in flexion and extension
- If arterial dissection is suspected, discuss catheter angiography with neuroradiology
- Transcranial Doppler should be performed in patients with sickle cell disease.

Additional investigations should be guided by clinical assessment, including history and examination for infection, recent immunisation, dysmorphic features, neurocutaneous stigmata, autoimmune disease and evidence of vascular disease in other organ systems.

Flowchart for management of suspected stroke



Appendix 1: Risk factors for arterial ischaemic stroke in children and young people

The following are probable major predisposing factors for AIS:

- Arteriopathy (focal cerebral arteriopathy of childhood; moyamoya; arterial dissection; central nervous system vasculitis)
- Congenital cardiac disease (especially, but not only, with right to left shunt)
- Sickle cell disease (especially HbSS or HbSβ)
- Homocystinuria
- Varicella zoster (chickenpox)
- Thrombophilias such as Factor V Leiden or protein C deficiency
- Antiphospholipid syndrome
- Iron deficiency anaemia
- Radiotherapy (especially cranial)
- Trauma
- Illicit drug use, particularly cocaine
- Fabry disease
- Neurofibromatosis
- Down syndrome
- Autoimmune disease such as systemic lupus erythematosus

The following characteristics are also associated with higher risk:

- Male sex
- Black or Asian ethnicity
- Combined oral contraceptive pill use
- Pregnancy

Appendix 2a: Paediatric NIH Stroke Scale (PedNIHSS) - Full version

This score can also be accessed through medical calculator sites such as MediCalc.

PedNIHSS Scoring Schedule to be performed as a minimum at:

Time Point	Performed
Baseline	At initial assessment
24 hours	Post-presentation
7 – 10 days	Early follow-up
3 months	Longer-term assessment

Severity Interpretation: Total scores range from 0-42 with higher values representing more severe infarcts:

Score Range	Severity
> 25	Very severe neurological impairment
15-24	Severe impairment
5-14	Moderately severe impairment
< 5	Mild impairment

Please use the following link for a downloadable copy of the Pediatric NIH Stroke Scale (PedNIHSS) – R. Ichord, 2004: NIH Stroke Scale for Kids (NIHSSK) – R

Pediatric NIH Stroke Scale (PedNIHSS) – R. Ichord, 2004

Administer stroke scale items in the order listed. Follow directions provided for each exam item. Scores should reflect what the patient does, not what the clinician thinks the patient can do. ***MODIFICATIONS FOR CHILDREN: Modifications to testing instructions from the adult version for use in children are shown in bold italic with each item where appropriate. Items with no modifications should be administered and scored with children in the same manner as for adults.***

Instructions	Scoring Definition
1a. Level of Consciousness: For children age 2 yrs and up, the investigator must choose a response, even if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation. ***For infants age 4 months up to age 2 years, multiply the score for this item by three, and omit scoring items 1b and 1c.***	0 = Alert; keenly responsive. 1 = Not alert, but arousable by minor stimulation to obey, answer, or respond. 2 = Not alert, requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped). 3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, areflexic.
1b. LOC Questions: The patient is asked the month and his/her age. The answer must be correct - there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not "help" the patient with verbal or non-verbal cues. ***Modified for children, age 2 years and up. A familiar Family Member must be present for this item: Ask the child "how old are you?" Or "How many years old are you?" for question number one. Give credit if the child states the correct age, or shows the correct number of fingers for his/her age. For the second question, ask the child "where is XX?", XX referring to the name of the parent or other familiar family member present. Use the name for that person which the child typically uses, e.g. "mommy". Give credit if the child correctly points to or gazes purposefully in the direction of the family member. Omit this item for infants age 4 months up to age 2 years. See comment under item 1a.***	0 = Answers both questions correctly. 1 = Answers one question correctly. 2 = Answers neither question correctly.
1c. LOC Commands: The patient is asked to open and close the eyes ***(For children > age 2 years, this command to open and close the eyes is suitable and can be scored as for adults.)*** and then to grip and release the non-paretic hand. ***For children > age 2 years, substitute the command to grip the hand with the command "show me your nose" or "touch your nose".*** Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to them (pantomime) and score the result (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored. ***Omit this item for infants age 4 months up to age 2 years. See comment under item 1a.***	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best Gaze: Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored but caloric testing is not done. If the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI) score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness or other disorder of visual acuity or fields should be tested with reflexive movements and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.	0 = Normal 1 = Partial gaze palsy. This score is given when gaze is abnormal in one or both eyes, but where forced deviation or total gaze paresis are not present. 2 =Forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver.
3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting ***(for children > 6 years)*** or visual threat ***(for children age 4 months to 6 years)*** as appropriate. Patient must be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia is found. If patient is blind from any cause score 3. Double simultaneous stimulation is performed at this point. If there is extinction patient receives a 1 and the results are used to answer question 11.	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia (blind including cortical blindness)

4. Facial Palsy: Ask, or use pantomime to encourage the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barrier obscures the face, these should be removed to the extent possible.	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 (absence of facial movement in the upper and lower face)
5 & 6. Motor Arm and Leg: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine) and the leg 30 degrees (always tested supine). Drift is scored if the arm falls before 10 seconds or the leg before 5 seconds. ***For children too immature to follow precise directions or uncooperative for any reason, power in each limb should be graded by observation of spontaneous or elicited movement according to the same grading scheme, excluding the time limits.*** The aphasic patient is encouraged using urgency in the voice and pantomime but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder or hip, ***or immobilization by an IV board,*** may the score be "9" and the examiner must clearly write the explanation for scoring as a "9".	Score each limb separately: **5a. Left Arm 5b. Right Arm 6a. Left Leg 6b. Right leg** 0 = No drift, limb holds 90 (or 45) degrees for full 10 seconds. 1 = Drift, Limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support. 2 = Some effort against gravity, limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity. 3 = No effort against gravity, limb falls. 4 = No movement
7. Limb Ataxia: This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, insure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. ***In children, substitute this task with reaching for a toy for the upper extremity, and kicking a toy or the examiner's hand, in children too young (< 5 years) or otherwise uncooperative for the standard exam item.*** Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion may the item be scored "9", and the examiner must clearly write the explanation for not scoring. In case of blindness test by touching nose from extended arm position.	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8. Sensory: Sensation or grimace to pin prick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. ***For children too young or otherwise uncooperative for reporting gradations of sensory loss, observe for any behavioral response to pin prick, and score it according to the same scoring scheme as a "normal" response, "mildly diminished" or "severely diminished" response.*** Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas [arms (not hands), legs, trunk, face] as needed to accurately check for hemisensory loss. A score of 2, "severe or total," should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will therefore probably score 1 or 0. The patient with brain stem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic score 2. Patients in coma (item 1a=3) are arbitrarily given a 2 on this item.	0 = Normal; no sensory loss. 1 = Mild to moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick but patient is aware he/she is being touched. 2 = Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.
9. Best Language: A great deal of information about comprehension will be obtained during the preceding sections of the examination. ***For children age 6 years and up with normal language development before onset of stroke: The patient is asked to describe what is happening in the attached, to name the items on the attached naming sheet (see pictures used in the STOP study, attached), and to read from the attached list of sentences (see the list of words/phrases from the STOP study; or who premorbid were known to be unable to read).*** Comprehension is judged from responses here as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in coma (question 1a=3) will arbitrarily score 3 on this item. The examiner must choose a score in the patient with stupor or limited cooperation but a score of 3 should be used only if the patient is mute and follows no one step commands. ***For children age 2 yrs to 6 yrs (or older children with premorbid language disability), score this item based on observations of language comprehension and speech during the preceding examination. For infants age 4 months to 2 years, score for auditory alerting and orienting responses.***	<u>For Children age 2 years and up:</u> 0 = No aphasia, normal 1 = Mild to moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided material difficult or impossible. For example in conversation about provided materials examiner can identify picture or naming card from patient's response. 2 = Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response. 3 = Mute, global aphasia; no usable speech or auditory comprehension. <u>For Infants age 4 months to 2 years:</u> 0= alerts to sound and orients visually or by behavior toward the location of origin of sound 2= alerts to sound, but does not have spatial orientation to sound 3= does not alert or orient to sound

10. Dysarthria: If patient is thought to be normal an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barrier to producing speech, may the item be scored "9", and the examiner must clearly write an explanation for not scoring. Do not tell the patient why he/she is being tested.	0 = Normal 1 = Mild to moderate; patient slurs at least some words and, at worst, can be understood with some difficulty. 2 = Severe; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric.
11. Extinction and Inattention (formerly Neglect): ***For children age 2 years and up:*** Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable. ***For children age 4 months to 2 years, score as "1" if there is either a sensory or motor deficit, score as a "2" if there are both sensory and motor deficits on the general neurological examination.***	0 = No abnormality. 1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities. 2 = Profound hemi-inattention or hemi-inattention to more than one modality. Does not recognize own hand or orients to only one side of space.
TOTAL SCORE	

Image #1: Describe what is happening in the picture

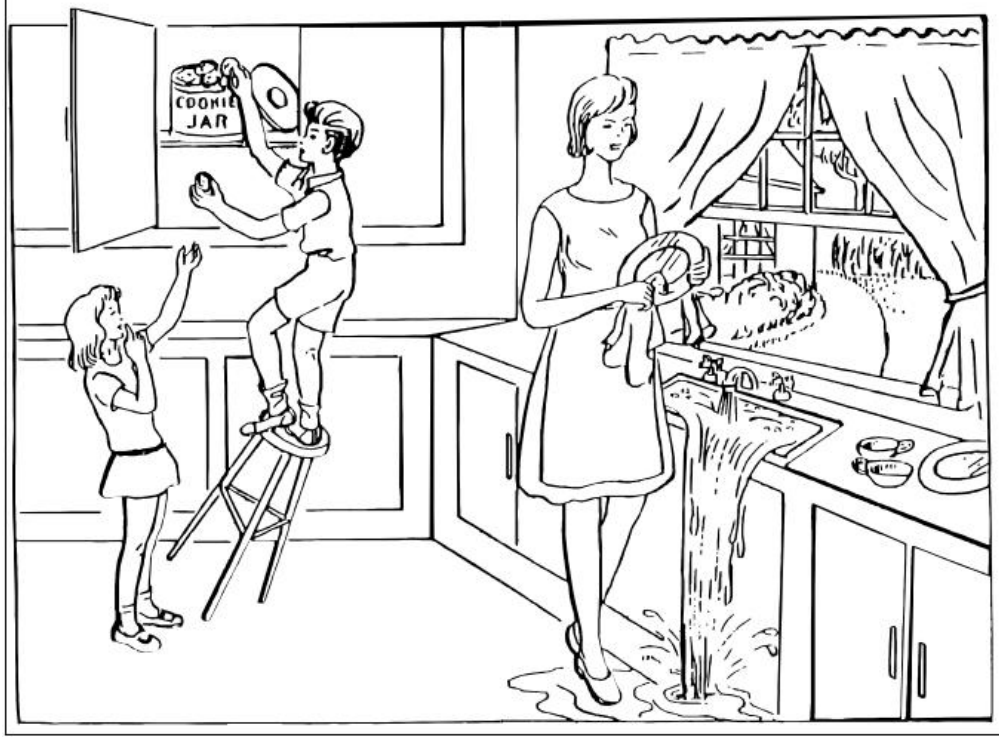
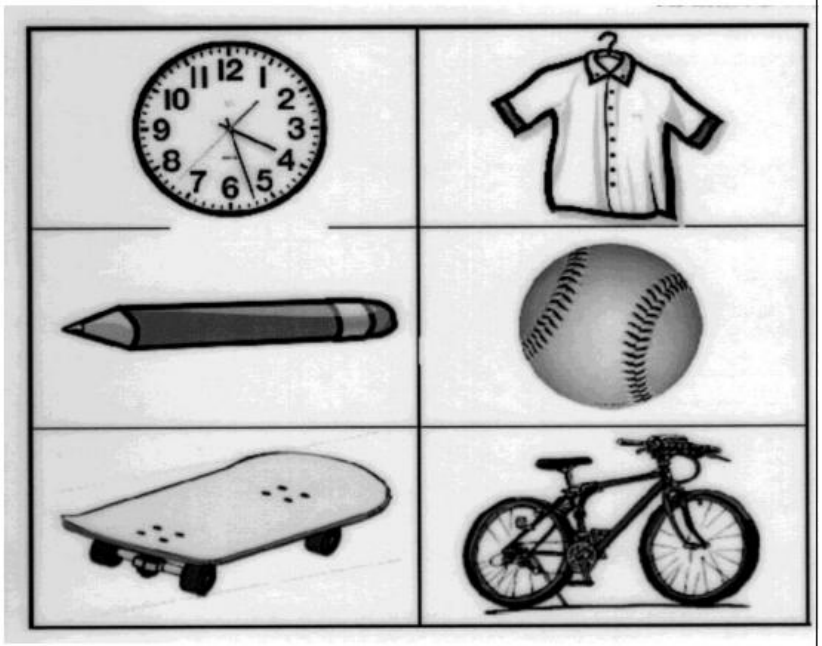


Image #2: Name these items



Pediatric NIH Stroke Scale: Testing material for Item 9 "Best Language"

*Items from the STOP neurologic exam:

1. Picture story – present the picture and ask the child to describe what is happening (see image #1)
2. Naming – pictures are of a clock, pencil, skateboard, shirt, baseball, bicycle (see image #2
3. Repetition – each of 4 word-repetition tasks is presented:
    a. Stop
    b. Stop and go
    c. If it rains we play inside
    d. The President lives in Washington
4. Reading – each of 3 items is presented for the child to read (adjust expectations according to child's age/school level):
    a. Stop
    b. See the dog run
    c. Little children like to play outdoors

Appendix 2b: Paediatric NIH Stroke Scale – Quick Reference (1-page)

	Domain	How to assess	Scoring system		Score	
1a	Level of consciousness		0	Alert, keenly responsive		
			1	Not alert, but rousable by minor stimulation		
			2	Requires repeated stimulation to attend, or strong or painful stimulation to make nonstereotyped movements		
			3	Responds only with reflex motor or automatic effects or totally unresponsive		
1b	Level of consciousness questions	''Where is (familiar family member present in room)?'' and ''How old are you?'' (>2 years)	0	Answers both questions correctly		
			1	Answers one question correctly		
			2	Answers neither question correctly		
1c	Level of consciousness Commands	'Open/Close your eyes', 'Touch your nose' (>2 years)	0	Performs both tasks correctly		
			1	Performs one task correctly		
			2	Performs neither task correctly		
2	Best gaze	Assess horizontal eye movements	0	Normal		
			1	Partial gaze palsy		
			2	Forced deviation / complete gaze palsy		
3	Visual	Visual threat (2-6 years), Confrontation, finger counting (>6 years)	0	No visual loss		
			1	Partial hemianopia		
			2	Complete hemianopia		
			3	Bilateral hemianopia (i.e. blind)		
4	Facial Palsy	Show teeth/ raise eyebrows/ close eyes	0	Normal symmetrical movement		
			1	Minor paralysis (flattened nasolabial fold, asymmetry on smiling)		
			2	Total or near total paralysis of lower face		
			3	Complete paralysis of one or both sides		
5a 5b	Motor Left Arm Motor Right Arm	Extend arm 90° (if sitting) or 45° (if supine)	0	No drift for full 10 seconds	Left	Right
			1	Drift <10seconds		
			2	Some effort against gravity		
			3	No effort against gravity		
			4	No movement		
6a 6b	Motor left leg Motor right leg	Extend leg 30°	0	No drift for full 5 seconds	Left	Right
			1	Drift < 5 seconds		
			2	Some effort against gravity		
			3	No effort against gravity		
			4	No movement		
7	Limb Ataxia	Reach for/kick a toy (<5 years), finger-nose/heel-shin (>5 years)	0	Absent		
			1	Present in one limb		
			2	Present in two limbs		
8	Sensory	Behavioural response to pin prick	0	Normal		
			1	Mild to moderate sensory loss		
			2	Severe to total sensory loss		
9	Best Language	Spontaneous speech and comprehension (2-6 years); describe a picture (>6 years)	0	Normal		
			1	Mild to moderate aphasia		
			2	Severe aphasia		
			3	Mute – no words		
10	Dysarthria	Speech during the rest of assessment	0	Normal		
			1	Mild slurring (comprehensible)		
			2	Severe slurring/incomprehensible		
11	Extinction/inattention	Bilateral simultaneous stimuli (visual and/or tactile)	0	No inattention		
			1	Inattention to one sensory modality or extinction with simultaneous stimuli		
			2	Complete neglect of one side		
Total score *Add the 15 subdomain scores to give a total score between 0 and 42.* *A score <4 or >24 excludes consideration of thrombolysis.*						

Appendix 3: Monograph on alteplase

CAMBRIDGE UNIVERSITY HOSPITALS NHS TRUST- PAEDIATRIC INTRAVENOUS DRUG MONOGRAPH

NAME OF DRUG	NORMAL PAEDIATRIC DOSE	I.V ADMINISTRATION		STABILITY	OTHER INFORMATION
		BOLUS	INFUSION		
ALTEPLASE (Actilyse) (rt-PA tissue-type plasminogen activator) Vials contain alteplase 10mg, 20mg or 50mg powder with water for injections as the solvent for reconstitution	**Acute ischaemic stroke:** **MUST meet criteria set out in 'Paediatric arterial ischaemic stroke' guideline** <u>Children 2-18 years</u> Total dose: 0.9 mg/kg (max 90 mg) to be given in TWO steps: **First 10%** (0.09mg/kg; max 9mg) to be given as bolus over 1-2 minutes, **Then infuse remaining 90%** (0.81mg/kg; max 81mg) over 60 minutes.	**FIRST STEP:** Reconstitute vial with water for injections (WFI) to produce a 1mg/mL solution as shown below: - 50mg vial with 48.5mL WFI to give a concentration of 1mg/mL - 20mg vial with 19.4mL WFI to give a concentration of 1mg/mL - 10 mg vial with 9.7mL WFI to give a concentration of 1mg/mL Displacement values: 1.5mL for the 50mg vial 0.6mL for the 20mg vial 0.3mL for the 10mg vial. Mix gently to avoid foam formation. <u>Rate:</u> **Inject 10% of the total dose slowly over 1 to 2 minutes** and the rest by infusion (See infusion section).	**SECOND STEP:** Infuse the remaining 90% (0.81 mg/kg; max 81 mg) of the dose undiluted (**1 mg/ml**) or, if needed, further dilute using compatible fluid to a minimum concentration of 200 micrograms/mL. <u>Rate:</u> **Infuse the remaining 90% of the dose over 60 minutes.** <u>Compatible fluids:</u> Sodium chloride 0.9%. Do not dilute with glucose 5%	Do not store above 25°C Store in original package in order to protect from light Use straight away	**Contraindicated** if known hypersensitivity to alteplase or allergic to gentamicin. Reconstituted solution should be particle free, clear and colourless to a pale-yellow solution. **Acute events which may accompany administration:** Injection site haemorrhage, catheter site haemorrhage, angina, hypotension, bradycardia and tachycardia, hypersensitivity reactions. Administration of intravenous heparin or platelet aggregation inhibitors such as aspirin should be avoided in the first 24 hours after treatment with Actilyse due to an increased haemorrhagic risk. If heparin is required for other indications (e.g. prevention of deep vein thrombosis) please discuss dose with paediatric haematologist.

Reviewed by: Benjamin Wyness References: Medusa injectable guide. Viewed online 12/12/2024
Checked by: Stephanie Aldridge SPC Actilyse 10mg powder for solution Last updated: 10/09/2024. Viewed on-line 12/12/2024
Paediatric arterial ischaemic stroke CUH guideline 2020 V1
SEL Paediatric Formulary. Viewed online 12/12/2024

Date of preparation: December 2024

Appendix 4: Protocol used at CUH for paediatric CTA

These parameters have all been taken from a Siemens AS Plus.

CT Head

We would topogram the patient from vertex to skull base then scan our patient caudocranially using the parameters below for a standard paediatric head scan.

CT HEAD – Scan Parameters

Parameter	Value
Care Dose	4D selected
Care kV	On
Quality ref mAs	407
Ref kV	100
Dose saving optimiser	3 (unenhanced study)
Rotation time	1 second
Pitch	0.8
Slice thickness	1.0 mm (Acq 128×0.6 mm)
Scan direction	Caudocranial
Scan range	Vertex → Skull base

CT HEAD – Reconstructions

Recon #	Job Type	Window	Kernel / Algorithm	Slice / Increment	Notes
1st recon	Axial	Baby brain	J30s medium smooth	1.0 mm / 0.7 mm	Safire 3
2nd recon	Axial	Inner ear	H70h very sharp	1.0 mm / 0.7 mm	
3rd recon	3D MPR	Cerebrum	J40s medium	3.0 mm / 3.0 mm	Safire 3

CT HEAD ANGIOGRAM – Vertex to C3

We would topogram the patient from vertex to arch and usually bolus track our contrast by placing the ROI on the arch of aorta. Depending on the child's size contrast would be either given by a pump at 2 to 3ml per second or for really small children a hand injection may be necessary and bolus tracking would not apply. 1ml per kg of contrast is given.

Scan Parameters

Parameter	Value
Care Dose	4D selected
Care kV	On
Quality ref mAs	180
Ref kV	80
Dose saving optimiser	11 (vascular study)
Rotation time	0.5 seconds
Pitch	1.4
Slice thickness	0.6 mm (Acq 128×0.6 mm)
Scan direction	Caudocranial
Scan range	Vertex → C3

Reconstructions

Recon #	Job Type	Window	Kernel / Algorithm	Slice / Increment	Notes
1st recon	Axial	Neuro angio	H20f smooth	0.6 mm / 0.4 mm	
2nd recon	Axial	Neuro angio	J45f medium	0.75 mm / 0.5 mm	Safire 4

CT HEAD & CAROTID ANGIOGRAM – Vertex to Carina

We would topogram the patient from vertex to carina and usually bolus track our contrast by placing the ROI on the arch of aorta. Depending on the child's size contrast would be either given by a pump at 2 to 3ml per second or for really small children a hand injection may be necessary and bolus tracking would not apply. 1ml per kg of contrast is given.

Scan Parameters

Parameter	Value
Care Dose	4D selected
Care kV	On
Quality ref mAs	225
Ref kV	80
Dose saving optimiser	11 (vascular study)
Rotation time	0.5 seconds
Pitch	1.4
Slice thickness	0.6 mm (Acq 128×0.6 mm)
Scan direction	Caudocranial
Scan range	Vertex → Carina

Reconstructions

Recon #	Job Type	Window	Kernel / Algorithm	Slice / Increment	Notes
1st recon	Axial	Neuro angio	H20f smooth	2.0 mm / 2.0 mm	
2nd recon	Axial	Neuro angio	H20f smooth	0.6 mm / 0.4 mm	
3rd recon	3D MPR (Coronal)	Neuro angio	H20f smooth	1.0 mm / 0.7 mm	
4th recon	3D MPR (Sagittal)	Neuro angio	H20f smooth	1.0 mm / 0.7 mm	

Appendix 5: Safe Transfer of the Paediatric Patient (STOPP) Tool

For the most up-to-date version of the STOPP Tool, please visit the PaNDR website: STOPP Tool | PaNDR

STOPP! Safe Transfer of the Paediatric Patient Tool

For use on ALL transfers of children BETWEEN hospitals. The referring hospital is responsible for the completion of this form prior to and during transfer. It is recommended that on arrival at the receiving hospital, a copy is made, and the original returned to the local hospital for audit purposes and filing in the patient notes.

Patient Details First Name: Surname: Address: Hospital Number: NHS Number:	Weight (KG): True □ Estimate □ Date of Birth: Age: Years Months ALLERGIES:
Date & Time of referral:	Call made by:
REFERRING Team Contact Details Consultant: Hospital: Ward/Location: Contact no:	**RECEIVING Team Contact Details** Consultant: Hospital: Ward/Location: Contact no:

SUMMARISED CLINICAL DETAILS (Safeguarding concern? If yes, add to patient summary) Yes □ No □

Presenting complaint:

Current problem + reason for transfer:

Organ support required:

Past medical history:

Drug history:

Has this patient been d/w retrieval team: Yes, clinical support □ Yes, bed finding □

TRANSFER INDICATION: Escalation of treatment □ Investigations □ Repatriation □ Palliation □ Bed status □

RISK ASSESSMENT: PERFORM RISK ASSESSMENT ON PAGE 2 THEN TICK APPROPRIATE TRANSFER CATEGORY IN TABLE BELOW AND SIGN ASSESSMENT.
If Paediatric Consultant not aware: STOP AND INFORM NOW

Transfer Category Respiratory Screen Status: Cubicle required? Yes □ No □ Unknown □ □ Transfer no longer required □ Ward level (level 0) □ Basic critical care (level 1) □ Intermediate critical care (level 2) □ Advanced critical care (level 3) □ AND/OR Time critical	**Recommended Transfer Team** **Referring Hospital Personnel:** □ Parents □ Nurse/ODP □ Anaesthetist/Paediatrician □ Ambulance Crew □ **Requested:** □ Patient Transport Service □ East of England Ambulance: standard crew □ East of England Ambulance: paramedic crew
ASSESSMENT COMPLETED BY: Doctor: (Name, Role, Signature) Nurse: (Name, Role, Signature)	

Paediatric and Neonatal Decision Support and Retrieval

PaNDR referral hotline: **01223 274274**

RISK ASSESSMENT PRIOR TO TRANSFER:			
TRAUMA	Complete vital signs below	Are there concerns about the spine? Is this a major trauma? Is this burns?	YES / NO YES / NO YES / NO
A		Is there any risk of airway compromise? (e.g. stridor, foreign body, burns)	YES / NO
B	RR =	Is the RR outside the normal age-adjusted range?	YES / NO
		Any evidence of respiratory distress/increased work of breathing/ prolonged apnoea's/exhaustion	YES / NO
	Sats =	> 2L/min O2 to maintain sats > 94% Use of High Flow oxygen Use of CPAP/BIPAP Presence of Empyema	YES / NO YES / NO YES / NO YES / NO
		Intubated and ventilated?	YES / NO
C	BP =	Is the systolic BP or HR outside the normal age-adjusted range?	YES / NO
		Are there signs of poor peripheral perfusion, e.g. CRT > 2 secs?	YES / NO
	HR =	ABG: Lactate > 2 or BE > -2	YES / NO
		Fluid boluses: > 40mls/kg within 6 hours	YES / NO
D		GCS low <8/fluctuating or AVPU (P or U)	YES / NO
		Risk of progressive intracranial event or signs of raised ICP?	YES / NO
		Newly diagnosed inborn error of metabolism	YES / NO

IF ANSWERED YES TO ANY ABCD TRIGGERS

ENSURE PAEDIATRIC CONSULTANT IS AWARE AND HAS AGREED THE TRANSFER
COMPLETE TRANSFER RISK ASSESSMENT BELOW
IF INDICATED CONTACT PaNDR (Tel: 01223274274) FOR ADVICE BEFORE PROCEEDING
Consider risk of deterioration on route that may require airway/respiratory/cardiovascular support.
Consider skill set needed for the patients' needs

TRANSFER CATEGORY	ANY TRIGGERS	STAFF REQUIRED	DISCUSS WITH PaNDR?
Time Critical (Level 1 - 3) **e.g. Acute neurosurgical emergency, Life/limb threatening problem, acute abdomen requiring surgery, testicular torsion, major burns, trauma**	**YES**	Local Team: Nurse/ODP + Senior Doctor (airway + paeds resus-trained) AND appropriately trained ambulance crew Tell Ambulance operator: **"this is a paediatric time critical transfer, there is immediate risk of death or life changing loss of limb"**	**YES, BUT** **Anticipate Time Critical Transfer**: Mobilise local team early and aim to leave within 30 minutes of decision to transfer
Level 0 (ward Level) Children not requiring continuous monitoring	NO	Parent/Carer* and/or nurse Ambulance: standard crew/transport *Parent can use own transport if deemed safe by clinical team	NO
Level 1 (Basic critical care) Children needing continuous monitoring or IV therapy Or any PCC Level 1 Care	NO	Competent Nurse or Doctor OR appropriately trained ambulance crew	NO
	YES	Nurse/ODP AND Senior Doctor (paeds resus-trained) AND appropriately trained ambulance crew OR PaNDR Transfer (if agreed)	Discuss with your Consultant
Level 2 (Intermediate critical care) Level 1 + single system support requirements (e.g. CPAP, NIV)	YES	Nurse/ ODP AND Senior Doctor (airway + paeds resus-trained) AND appropriately trained ambulance crew OR PaNDR Transfer (if agreed)	YES
Level 3 (Advanced critical care) Intubated and ventilated	YES	PaNDR Transfer - UNLESS time critical (see box above)	YES

Paediatric and Neonatal Decision Support and Retrieval

PaNDR referral hotline: **01223 274274**

East of England Paediatric Critical Care Operational Delivery Network

PaNDR Paediatric & Neonatal Decision Support

TRANSFER OBSERVATIONS RECORD:

(Prior to departure, during transfer: (circle) continuous/15m/30m, and on arrival)

NORMAL AGE-ADJUSTED PHYSIOLOGICAL PARAMETERS (as per nPEWS)				
AGE	< 11 months	1-4	5-12	>13
RR	30-50	20-40	20-25	15-25
HR	110-150	90-140	80-120	70-100
Sys BP	70-90	85-100	90-110	100-120

Temperature °C	TIME																	
	39																	39
	38																	38
	37																	37
	36																	36
	35																	35
Heart Rate & Blood Pressure	240																	240
	230																	230
	220																	220
	210																	210
	200																	200
	190																	190
	180																	180
	170																	170
	160																	160
	150																	150
	140																	140
	130																	130
	120																	120
	110																	110
	100																	100
	90																	90
	80																	80
	70																	70
Respiratory Rate	60																	60
	50																	50
	40																	40
	30																	30
	20																	20
	15																	15
	10																	10
	5																	5
	0																	0
O_2 Sats																		
FiO2																		
Neurological Assessment	AVPU																	
	Pupil R																	
	Pupil L																	
BM / glucose																		
Ventilator Settings																		
	Pre departure							Transfer										
Date																		
Time																		

Pain assessment:	Time departed base: Time handed over:
Details of any treatments given:	Date:
Details of incidents (Please also complete Trust report):	Signed:

TRANSFER DOCUMENTATION CHECKLIST: (please detail/tick as necessary)

Transfer Personnel:

Doctor 1 (name, speciality & grade):

Doctor 2 (name, speciality & grade):

Nurse/ODP (name, speciality & grade):

Parent/guardian name and number:

Communication:

- ☐ Bed in destination hospital identified and availability confirmed
- ☐ Senior medical handover has taken place and transfer agreed
- ☐ Paediatric referral for children with co-morbidities
- ☐ For surgical transfers, where medical input is also required, ensure senior handover to paediatric team
- ☐ Parents/Carers informed of transfer and any parental concerns discussed.
- ☐ Parents/Carers invited to accompany child

Equipment:

- ☐ Appropriate drugs & Grab bag available
- ☐ Face mask and self-inflating bag
- ☐ Suction unit available and batteries fully charged
- ☐ Sufficient oxygen in portable cylinder available
- ☐ Appropriate restraint device available
- ☐ Batteries on monitor and/or infusion pumps fully charged
- ☐ Infusion devices rationalised and secured

Drugs/Fluids:

- ☐ Analgesia
- ☐ Intubation drugs
- ☐ Emergency drugs
- ☐ IV Fluids
- ☐ Blood

Transport:

Time ambulance service called:
Ambulance reference no:
Ambulance arrival time at referring hospital:

- ☐ Transfer staff have a mobile phone/money
- ☐ Return travel arrangements confirmed & Team have contact details e.g.: taxi/ward numbers

Interventions on Transfer:

Patient Specific Instructions for transfer (tailor to needs): (please tick)

- ☐ Receiving paediatric consultant notified (all specialities)
- ☐ ETT secure and minimal leak
- ☐ Sp02 enabled
- ☐ End tidal Co2 monitoring (if intubated)
- ☐ CXR reviewed (if intubated)
- ☐ NIBP in situ and set to an appropriate recording interval
- ☐ Nil by mouth/consider NG tube for surgical patients
- ☐ Blood glucose monitoring
- ☐ Maintenance IV fluids
- ☐ Well-secured IV access (x 2 if required)
- ☐ ID bracelet x2
- ☐ Temperature monitoring

Paperwork for transfer (photocopy the following): (please tick when complete)

- ☐ Referral letter
- ☐ Copy of current medical, nursing notes and investigations (include recent clinic letter for long-term patients)
- ☐ Copy of current drugs chart, PEWs chart and fluid charts
- ☐ Upload/transfer radiology onto relevant IT system
- ☐ Three copies of STOPP Tool (for patient notes in referring, receiving hospitals and audit)
- ☐ Transfer Datix (Completed as per specific Trust policy)

References

- National Library of Medicine: Calculated decisions: Pediatric NIHSS Stroke Scale (PedNIHSS) - PubMed
- RCPCH 2017 Childhood Stroke Guideline - Stroke guideline 2017.pdf

Contributors

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- **Paediatric Intensive Care Unit (PICU), Cambridge University Hospitals NHS Foundation Trust (CUH)** Represented by **Dr Riaz Kayani** (PICU Consultant)
- **Paediatric Anaesthesia, Cambridge University Hospitals NHS Foundation Trust (CUH)** Represented by **Dr Anna Hutton** (Anaesthetic Paediatric Consultant; Interim Paediatric Anaesthesia Lead) and **Dr Muhilan Kanagaratham** (Consultant Anaesthetist)
- **Interventional Radiology, Cambridge University Hospitals NHS Foundation Trust (CUH)** Represented by **Dr Yogish Joshi** (Interventional Radiologist; Thrombectomy Service Lead for Neuro-IR)
- **Paediatric Pharmacy, Cambridge University Hospitals NHS Foundation Trust (CUH)** Represented by **Ben Wyness** (Paediatric Pharmacist) and **Laura Houldcroft** (Paediatric Pharmacist)
- **Eastern Paediatric Epilepsy Network (EPEN)** Represented by **Dr. Bina Mukhtyar** (Consultant Paediatrician NNUH — *EPEN Lead),* **Dr Arun Saraswatula** (Consultant Paediatrician, West Suffolk Hospital) and **Dr. Sreeni Tekki-Rao** (Consultant Paediatrician, Luton & Dunstable Hospital)
- **East of England Paediatric Critical Care Operational Delivery Network (EoE PCC ODN)** Represented by **Liz Langham** (Network Director), **Alison Clark** (Senior Lead Nurse), **Dr Ronald Misquith** (Clinical Lead)
- **North Thames Paediatric Network (NTPN)** Represented by **Lauren Martin** (Deputy Network Director, NTPN) and **Dr. Prab Prabhakar** (Consultant Paediatric Neurologist, GOSH — NTPN Clinical Lead for Neurology).

Disclaimer

Exceptional Circumstances Form

Form to be completed in the **exceptional** circumstances that the Trust is not able to follow ODN approved guidelines.

Details of person completing the form:	
Title:	Organisation:
First name:	Email contact address:
Surname:	Telephone contact number:
Title of document to be excepted from:	
Rationale why Trust is unable to adhere to the document:	
Signature of speciality Clinical Lead: Date:	Signature of Trust Nursing / Medical Director: Date:
Hard Copy Received by ODN (date and sign):	Date acknowledgement receipt sent out:

Please email form to: kelly.hart5@nhs.net requesting receipt.
Send hard signed copy to: Kelly Hart
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