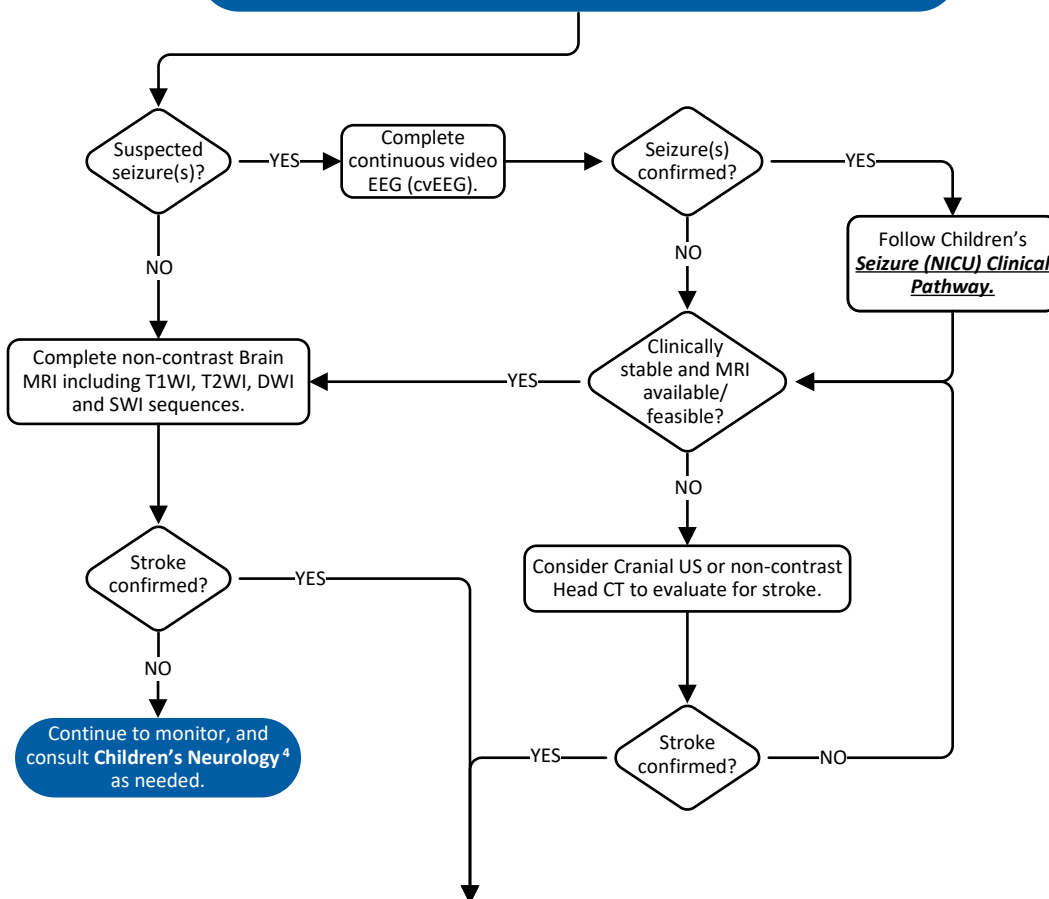


Neonate (≤ 28 days of life) presents with clinical signs¹ of stroke.



¹ Clinical Signs of Neonatal Stroke

Neonates **typically present with seizures** during the first 72 hours of life (65-94% depending on stroke type).

Other signs might include:

- Poor feeding
- Apnea
- Hypotonia
- Encephalopathy

² Labs for Evaluation

- CBC with differential (CBC-d)
- CMP
- CRP
- Type and screen
- DIC panel (PT/PTT, Fibrinogen, INR)

³ High Risk for Recurrent Strokes

Patient history of:

- Known congenital heart disease
- Other known genetic/metabolic conditions with increased stroke risk

Family history of:

- Thrombophilia
- Thromboembolic event:
 - AIS or MI at ≤ 50 years of age
 - ≥ 3 miscarriages
 - Maternal history of stillbirth
 - VTE in 1st degree relative

⁴ Contact information

Consulting for Acute Management:

- Transfer Center: 404-785-7778

NICU Transfer:

- Scottish Rite NICU: 404-785-5160
- Arthur M. Blank NICU: 404-785-6600

Outpatient Scheduling:

- Neurology: 404-785-2046
- Neurosurgery: 404-785-2900
- Hematology: 404-785-1200

Begin Acute Phase Management

- Consult **Children's Neurology**⁴ to initiate treatment plan based on stroke type and order labs².
- Consider cvEEG and Brain MRI if not already completed.

Thrombotic

All Thrombotic Stroke Types

- Do **NOT** administer TPA.
- Consider **transfer to Children's**⁴ for **MRA/MRV** and **Neurology** evaluation if risk for **hypercoagulability**.
- Obtain Placental pathology if available.
- Consider infectious work-up, including a lumbar puncture and empiric antibiotics.

Acute Ischemic Stroke (AIS)

- Obtain **Transthoracic Echo**.
- Consider US of extremities with existing central line for source of clots.

Cerebral Venous Sinus Thrombosis (CVST)

- **Consult Children's Hematology**⁴ for recommendations regarding anticoagulation and hematologic work-up.
- **Consider MRV in 5-7 days** to assess for clot propagation.

High risk for recurrent strokes³?

YES

NO

Consult Children's Hematology⁴ for recommendations regarding starting anticoagulation and hematologic work-up.

Anticoagulation therapy is not recommended.

Acute Hemorrhagic Stroke (AHS)

**Does not include intraventricular hemorrhage (IVH) or periventricular hemorrhagic infarction (PVHI)*

- Do **NOT** administer anticoagulants.
- **Consult Children's Neurosurgery**⁴ to determine need for MRA/MRV for any venous or arterial abnormality and/or need to transfer for further evaluation and treatment.
- Obtain Placental pathology if available.
- Consider administering **Vitamin K**.
- Measure head circumference daily.
- **Consult Children's Hematology**⁴ for recommendations regarding hematologic work-up.

Beyond Acute Phase Management

- **Schedule follow-up in 4-6 weeks** with Children's outpatient Vascular Neurology (Stroke) or Neonatal Neurology clinic.
- Early Intervention (PT/OT/SLP) referrals
- Follow up with Children's Developmental Progress Clinic.
- Cerebral Palsy, Psychiatry and Orthopedic outpatient evaluation.

References

- Armstrong-Wells, J., et al., *Prevalence and predictors of perinatal hemorrhagic stroke: results from the kaiser pediatric stroke study*. Pediatrics, 2009. 123(3): p. 823-8.
- Arnaez, J., et al., *Neonatal Arterial Ischemic Stroke: Risk Related to Family History, Maternal Diseases, and Genetic Thrombophilia*. Clin Appl Thromb Hemost, 2018. 24(1): p. 79-84.
- Berfelo, F.J., et al., *Neonatal cerebral sinovenous thrombosis from symptom to outcome*. Stroke, 2010. 41(7): p. 1382-8.
- Bhatt, M.D. and A.K. Chan, *Venous thrombosis in neonates*. Fac Rev, 2021. 10: p. 20.
- Billinghurst, L.L.M., MSc, FRCPCBeslow, Lauren A. MD, MSCEAbend, Nicholas S. MD, MSCEUohara, Michael BSJastrzab, Laura EdSLicht, Daniel J. MDIchor, Rebecca N. MD, <Incidence and predictors of epilepsy after pediatric arterial ischemic stroke.pdf>. Neurology: Clinical Practice, 2/14/2017. Volume 88 p. 630 – 637
- Chang, C.J., et al., *Cerebral infarction in perinatal and childhood bacterial meningitis*. QJM, 2003. 96(10): p. 755-62.
- Christensen, R., et al., *Cerebral Venous Sinus Thrombosis in Preterm Infants*. Stroke, 2022. 53(7): p. 2241-2248.
- Cole, L., et al., *Clinical Characteristics, Risk Factors, and Outcomes Associated With Neonatal Hemorrhagic Stroke: A Population-Based Case-Control Study*. JAMA Pediatr, 2017. 171(3): p. 230-238.
- Curtis, C., et al., *Thrombophilia risk is not increased in children after perinatal stroke*. Blood, 2017. 129(20): p. 2793-2800.
- Dunbar, M. and A. Kirton, *Perinatal Stroke*. Semin Pediatr Neurol, 2019. 32: p. 100767.
- Ferriero, D.M., et al., *Management of Stroke in Neonates and Children: A Scientific Statement From the American Heart Association/American Stroke Association*. Stroke, 2019. 50(3): p. e51-e96.
- Glass, H.C., et al., *Safety of Early Discontinuation of Antiseizure Medication After Acute Symptomatic Neonatal Seizures*. JAMA Neurol, 2021. 78(7): p. 817-825.
- Jan, W., et al., *Diffusion-weighted imaging in acute bacterial meningitis in infancy*. Neuroradiology, 2003. 45(9): p. 634-9.
- Jennifer Armstrong-Wells MD, M. and M. Donna M. Ferriero MD, *Diagnosis and acute management of perinatal arterial ischemic stroke*. Neurology: Clinical Practice, 2014.
- Lee, S., et al., *Pathways for Neuroimaging of Neonatal Stroke*. Pediatr Neurol, 2017. 69: p. 37-48.
- Lehman, L.L., et al., *Workup for Perinatal Stroke Does Not Predict Recurrence*. Stroke, 2017. 48(8): p. 2078-2083.
- Monagle, P., & Newall, F. (2018). Management of thrombosis in children and neonates: practical use of anticoagulants in children. Hematology. American Society of Hematology. Education Program, 2018(1), 399–404. <https://doi.org/10.1182/asheducation-2018.1.399>
- Pressler, R.M., et al., *Treatment of seizures in the neonate: Guidelines and consensus-based recommendations-Special report from the ILAE Task Force on Neonatal Seizures*. Epilepsia, 2023. 64(10): p. 2550-2570.
- Pryde, K., et al., *Stroke in paediatric pneumococcal meningitis: a cross-sectional population-based study*. Arch Dis Child, 2013. 98(8): p. 647-9.
- Rivkin, M.J., et al., *Guidelines for Urgent Management of Stroke in Children*. Pediatr Neurol, 2016. 56: p. 8-17.
- Shellhaas, R. A., Chang, T., Tsuchida, T., Scher, M. S., Riviello, J. J., Abend, N. S., Nguyen, S., Wusthoff, C. J., & Clancy, R. R. (2011). The American Clinical Neurophysiology Society's Guideline on Continuous Electroencephalography Monitoring in Neonates. Journal of clinical neurophysiology : official publication of the American Electroencephalographic Society, 28(6), 611–617. <https://doi.org/10.1097/WNP.0b013e31823e96d7>
- Shellhaas, R.A., et al., *Treatment Duration After Acute Symptomatic Seizures in Neonates: A Multicenter Cohort Study*. J Pediatr, 2017. 181: p. 298-301 e1.
- Somma, J., I.I. Sussman, and J.H. Rand, *An Evaluation of Thrombophilia Screening in an Urban Tertiary Care Medical Center*. American Journal of Clinical Pathology, 2006. 126(1): p. 120-127.
- Srivastava, R., J. Mailo, and M. Dunbar, *Perinatal Stroke in Fetuses, Preterm and Term Infants*. Semin Pediatr Neurol, 2022. 43: p. 100988.
- Swainman, K.F., *Swaiman's Pediatric Neurology*. 2017.