Pediatric Code Stroke

Project Lead: Afsaneh Pirzadeh, Sarah Fleisher

Project Sponsor: Matt Pizzuto

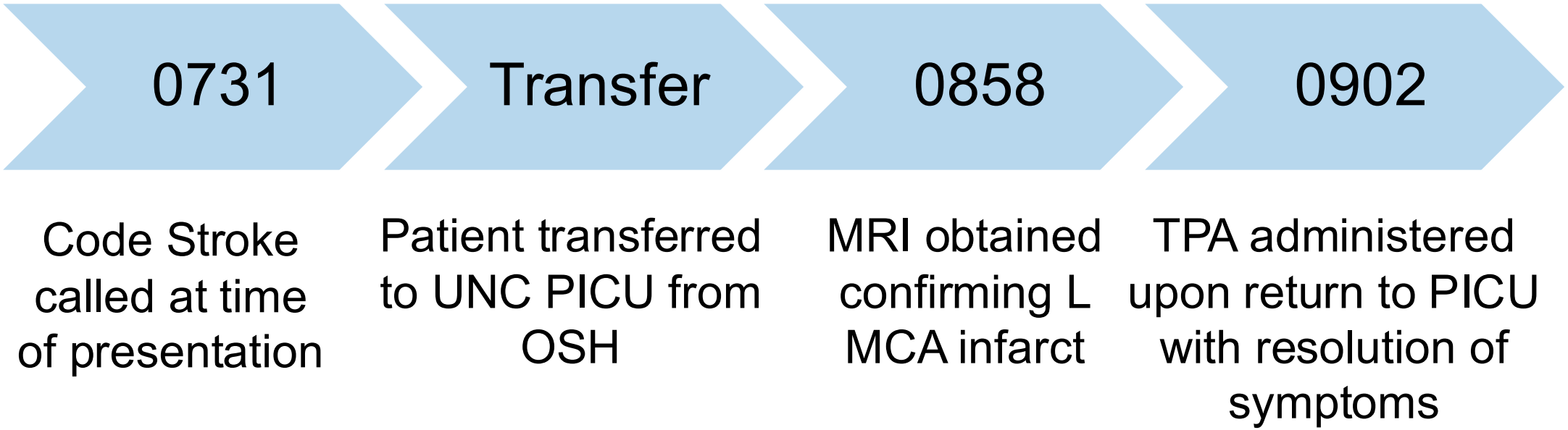
Project Team Members: May-Britt Sten, Crystal Wagner, Matthew Johnson, Kathryn Pier, Katelyn Bricker

UNC HEALTH℠

UNC INSTITUTE FOR HEALTHCARE QUALITY IMPROVEMENT

Patient Story

Previously healthy 14 yo presents with acute R sided arm weakness



Importance

Extensive etiologies, risk factors, and stroke types in pediatrics

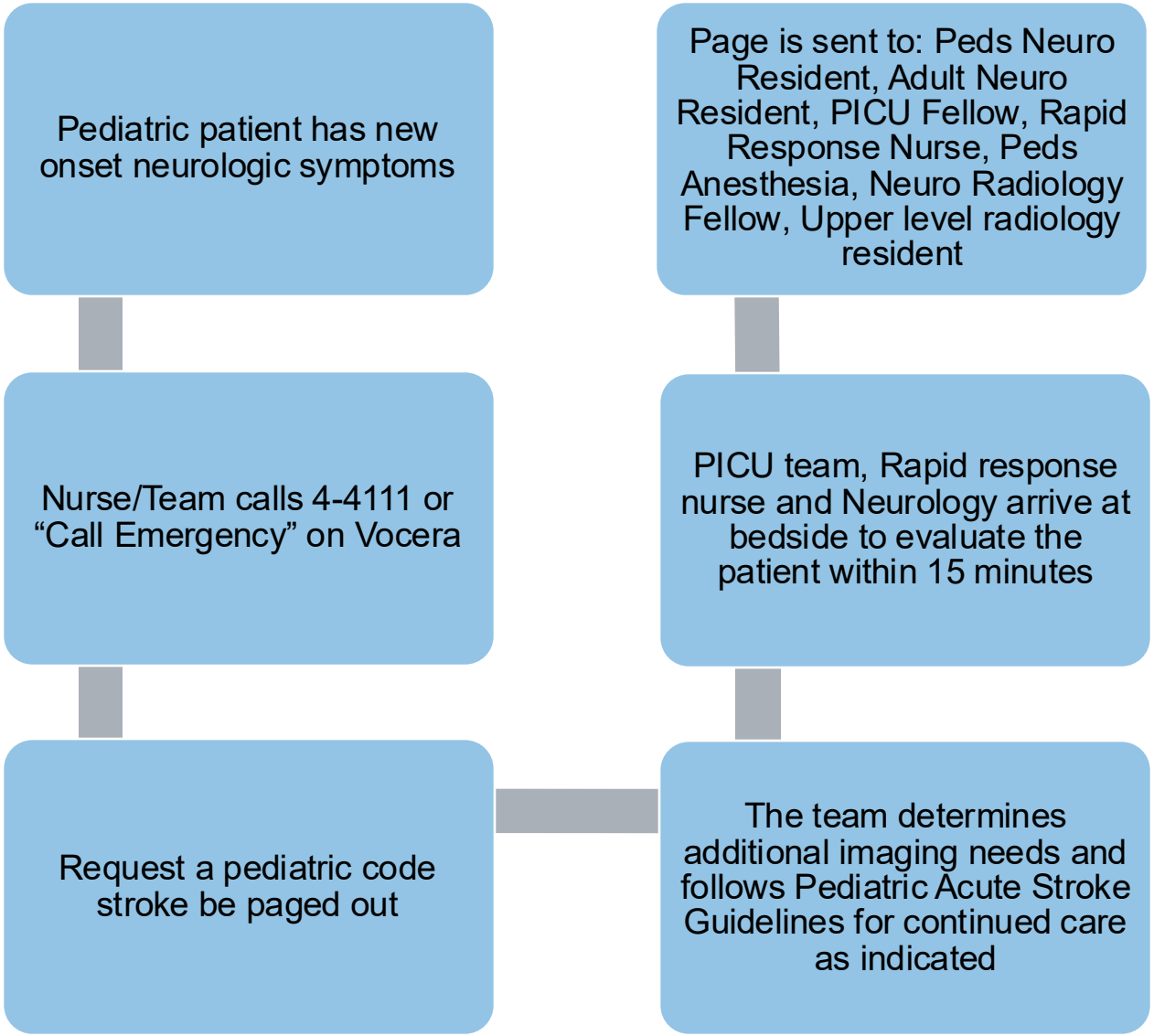
Low volume of patients, but high stakes

A delayed diagnosis can lead to the potential for decades of neurologic sequelae or even death

Smart Aim: 100% of pediatric stroke patients have symptom recognition and a code stroke called

No pediatric stroke patients are missed

What is a Code Stroke?

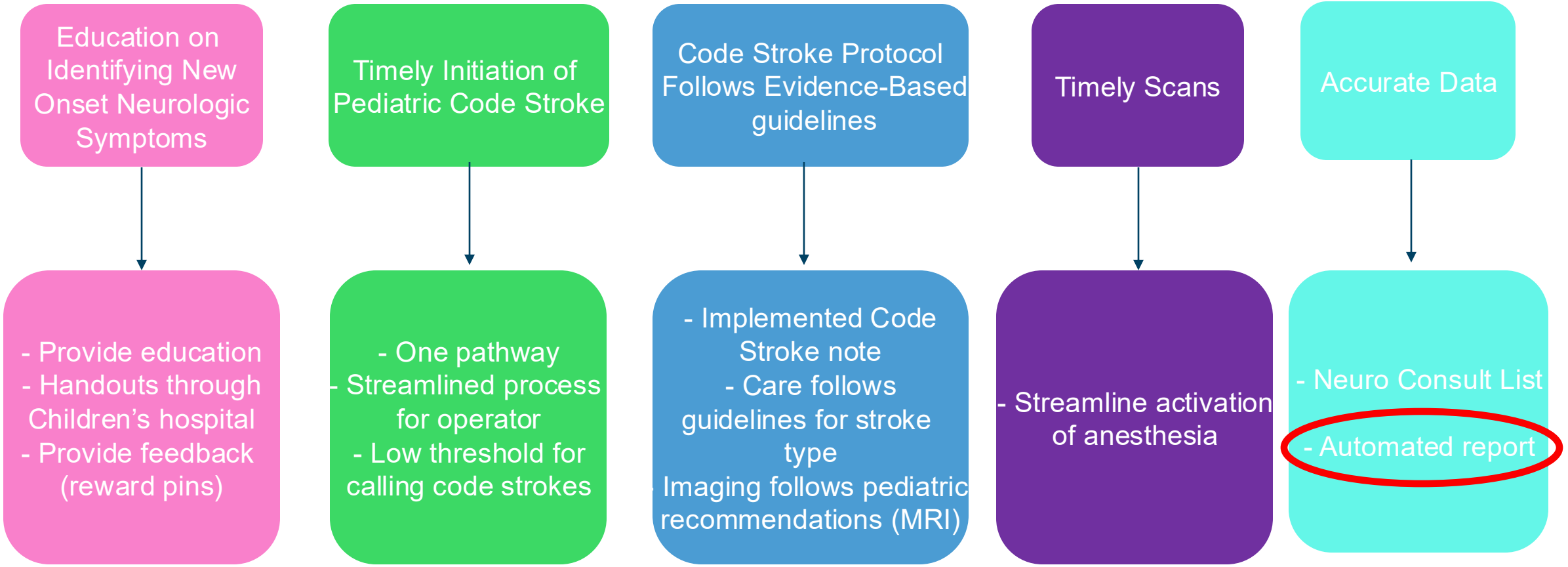


Not a resource-intensive call

MRI/CT does not get cleared

Anesthesia does not put ORs on hold or change their schedule in any way unless contacted after evaluation that sedation is required or that an intervention is required

Interventions



Kids have STROKES too!

Remember TIME=BRAIN

BE AWARE of Pediatric Stroke Risk Factors:

- Congenital Cardiac Conditions
- Cardiac Surgery
- Myocarditis
- Arrythmias
- Clotting Disorders
- Anemia
- Dehydration
- Sickle Cell Disease
- Vasculopathies

- Infection (meningitis, mastoiditis, Lemierre's)
- Trauma (head and neck)
- Cerebral hemorrhage/ edema

- Drugs (cocaine, amphetamines, OCPs)
- Chemotherapy

QUICKLY IDENTIFY Stroke Symptoms

New* focal neurological deficits (*change from baseline)

Confusion, difficulty speaking or understanding others

Sudden, severe headache, especially with vomiting & sleepiness

Trouble seeing in one or both eyes, double vision

Weakness or numbness on one side of the body (face, arm or leg)

Trouble walking, dizziness, loss of balance and coordination

New Onset Seizures, especially on on one side of the body or a patient at risk for stroke

ACT FAST . . .

- **Consult** the Children's Acute Stroke Guidelines
- **Activate** a PEDIATRIC CODE STROKE by calling 4-4111
  - —A "Pediatric Code Stroke" page will go out listing the location (no other information will be shared).
  - —This will bring a neurologist to the bedside
  - —There will be no overhead page

Link to Guidelines
Search for Stroke
Home - Children's Clinical Care Portal

PREPARE . . .

The Pediatric Code Stroke Team

- **WILL** ask you for an SBAR including the time of the patient's Last Known Normal (last time patient did not have symptoms)
- **MAY** ask you to prepare to travel for an MRI or CT scan

Our goal is **60 minutes** from recognition to treatment.

UNC Pediatric Acute Stroke Pathway

Acute stroke criteria

1. Acute onset change from baseline neuro exam
   Usually < 24 hours but can be up to 4 days or more for venous infarcts, vasospasm, or edema
2. New onset seizure especially in high risk patient (see green box)
3. Focal neurologic deficit
   - Unilateral weakness/sensory change
   - Vision loss/double vision
   - Speech difficulty
   - Dizziness/trouble walking
   - Sudden severe HA w/accompanying symptoms

High Risk Patients

1. Congenital Heart Disease, myocarditis, arrhythmias
2. Coagulopathies
3. Anemia, dehydration
4. Vasculopathies, Sickle Cell Disease (see purple box)
5. Infection (menigitis, mastoiditis, Lemierre's, etc)
6. Trauma (head and cervical)
7. Cerebral hemorrhage/edema
8. Drugs (Certain chemotherapy, cocaine, amphetamines, OCPs, etc)

Stroke Suspected?

Yes

Call Operator (4-4111) and ask for Peds Code Stroke Page

- This is not an overhead page
- Only location will be given. NO PHI
- This page will notify multiple groups, a neurologist will arrive to the bedside

Initiate neuroprotective care (see blue box)

- Assessment by stroke team
- Stroke team documentation via .pedneurocodestroke dotphrase
- If imaging is requested, move to page 2

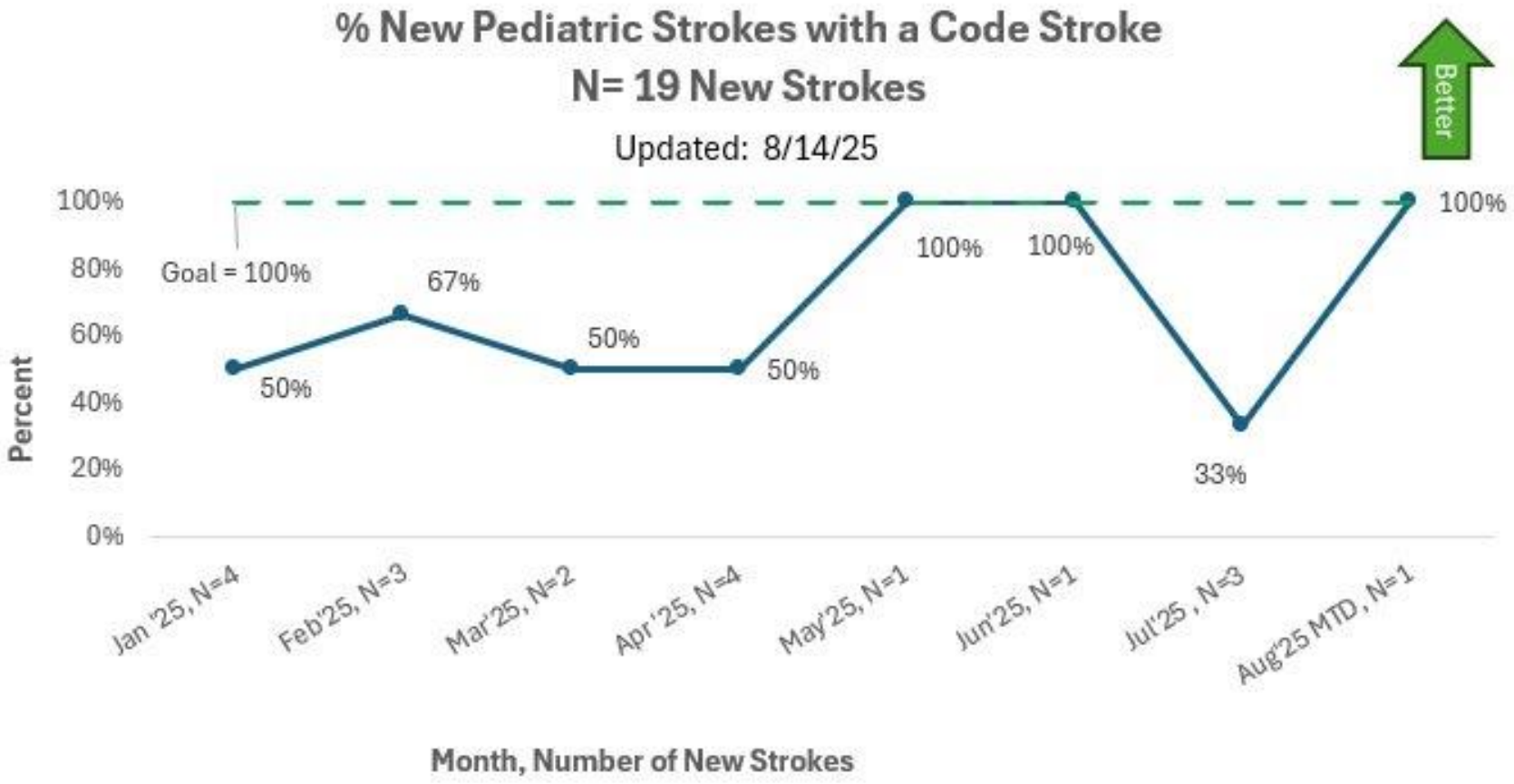
Neuroprotective Care

- NPO, establish access (≥2 large bore IVs)
- STAT Labs: CBC w/diff, DIC profile, T&S + ABO/Rh, Chem10
- HOB flat - for ischemic strokes
- Normonatremia
- Normotension: SBP 50th-90th %ile for age
  - Tx hypotension w/NS +/- pressors
  - Tx significant HTN to lower by ~25% over 24 hrs (faster if tPa candidate)
- Normovolemia: isotonic fluid (i.e. NS)
- Normoglycemia
  - Age ≥ 2y: No glucose in fluids unless hypoglycemic
  - Age < 2y: Glucose containing fluids (i.e. D5NS)
- Normal O2, CO2, and pH
- Normothermia: consider scheduled acetaminophen
- Seizure control: AED ASAP with suspected seizure activity
- Consider placement of arterial line

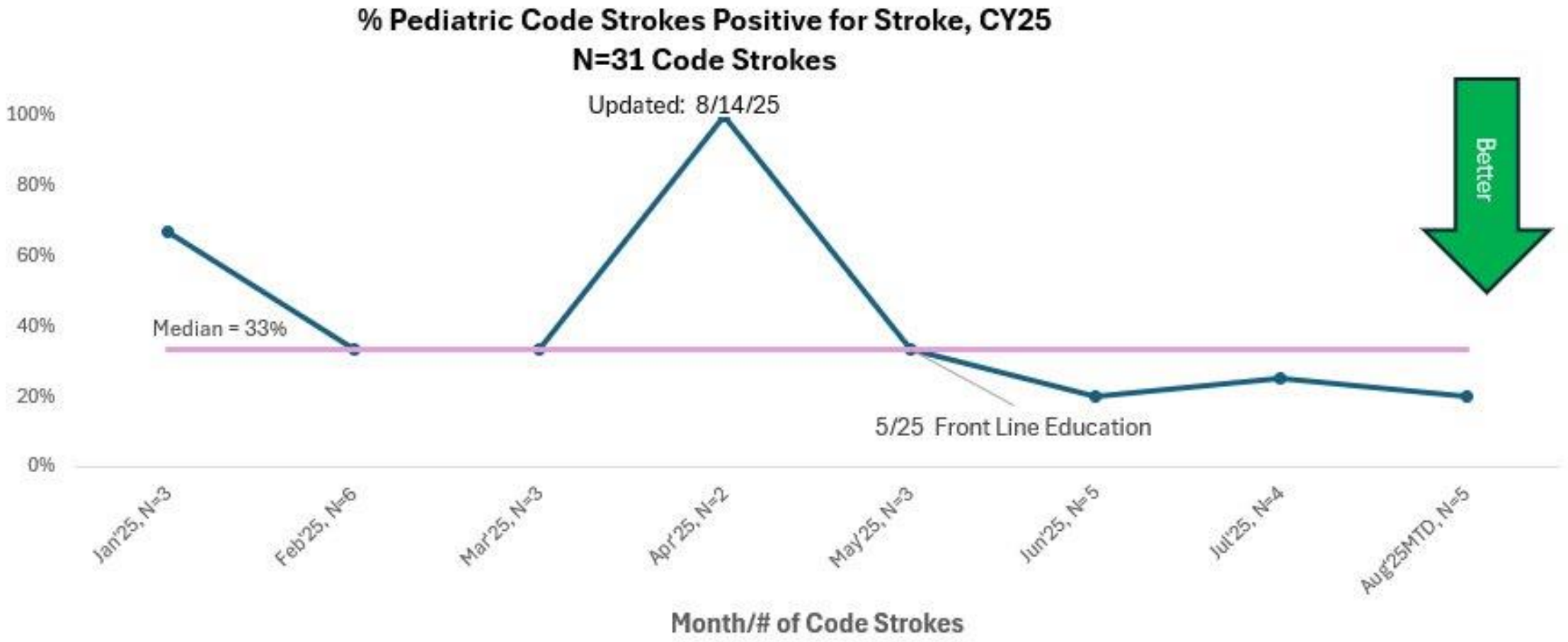
Note: Patients with **Sickle Cell Disease**
Add the following:

- Consult peds hem/onc
- Notify pheresis lab of possible urgent exchange transfusion
  - < 10 kg = manual exchange. Place PAL and PIV
  - > 20 kg = automated exchange. Place > 8Fr line
  - 10-20 kg, discuss with pheresis
- While awaiting pheresis, consider:
  - simple transfusion if Hgb < 10
  - confirmatory imaging (see page 2)
- Obtain additional labs
  - HGBSCD = hemoglobin/thalassemia profile - most important and needs to be ordered STAT to determine pheresis
  - HEA = RBC phenotyping - only needs to be sent on new sickle cell patients
  - LFTs and retic

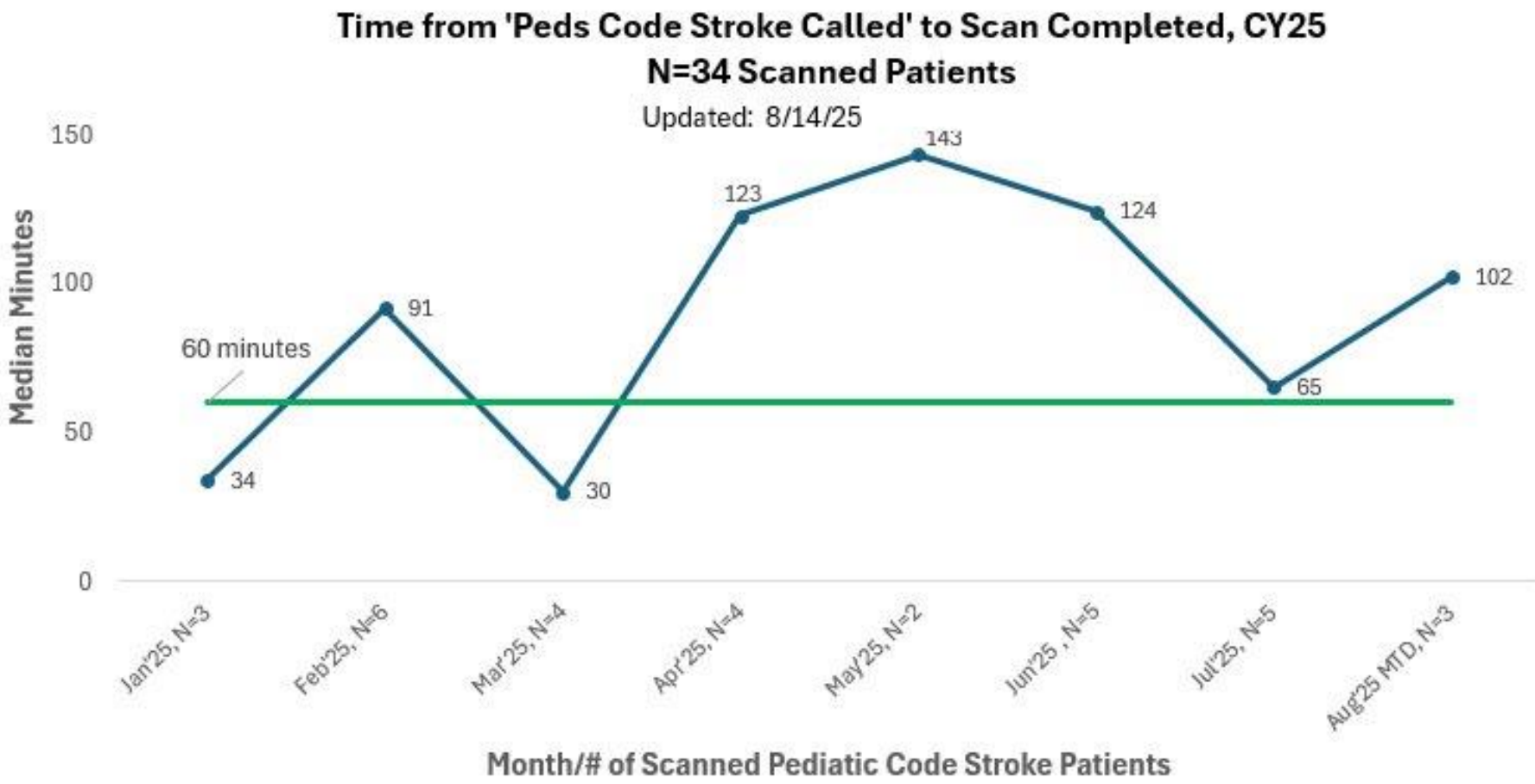
Measures


% New Pediatric Strokes with a Code Stroke
N= 19 New Strokes
Updated: 8/14/25
Better
100%
80%
60%
40%
20%
0%
Percent
Goal = 100%
50%
67%
50%
50%
100%
100%
33%
100%
Jan '25, N=4
Feb'25, N=3
Mar'25, N=2
Apr '25, N=4
May'25, N=1
Jun'25, N=1
Jul'25 , N=3
Aug'25 MTD , N=1
Month, Number of New Strokes

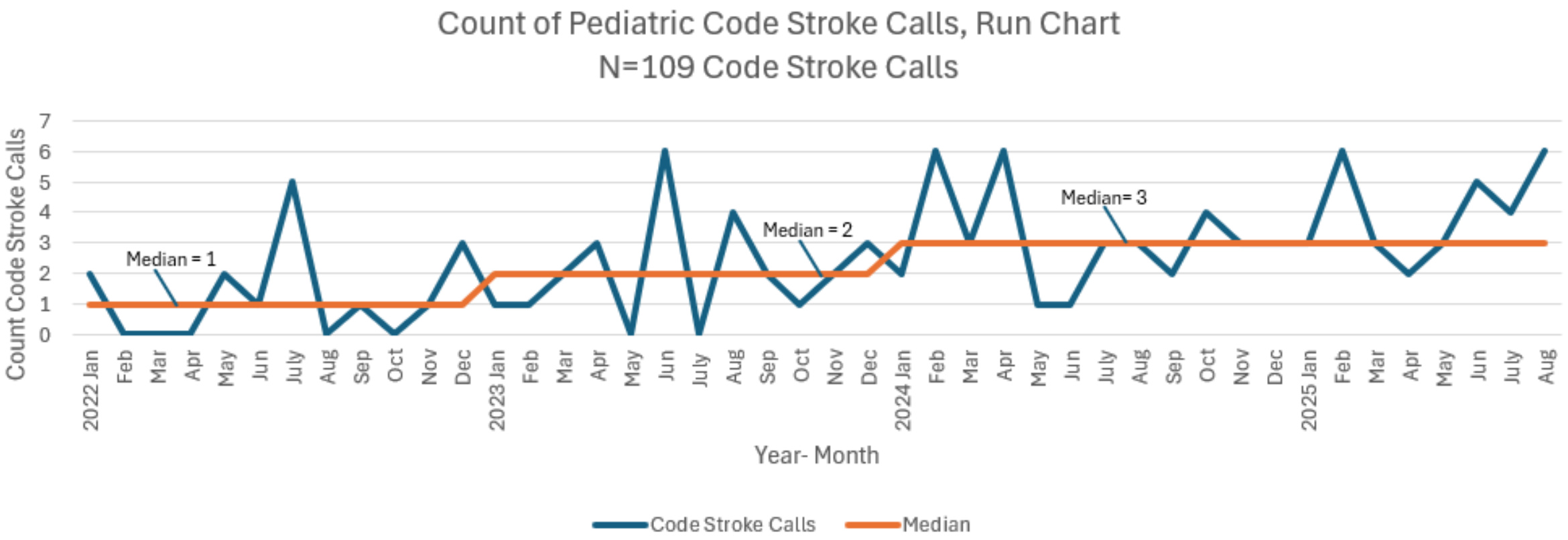
Measures


% Pediatric Code Strokes Positive for Stroke, CY25
N=31 Code Strokes
Updated: 8/14/25
100%
80%
60%
40%
20%
0%
Median = 33%
Better
5/25 Front Line Education
Jan'25, N=3
Feb'25, N=6
Mar'25, N=3
Apr'25, N=2
May'25, N=3
Jun'25, N=5
Jul'25, N=4
Aug'25MTD, N=5
Month/# of Code Strokes

Measures


Time from 'Peds Code Stroke Called' to Scan Completed, CY25
N=34 Scanned Patients
Updated: 8/14/25
Median Minutes
150
100
50
0
60 minutes
34
91
30
123
143
124
65
102
Jan'25, N=3
Feb'25, N=6
Mar'25, N=4
Apr'25, N=4
May'25, N=2
Jun'25 , N=5
Jul'25, N=5
Aug'25 MTD, N=3
Month/# of Scanned Pediatic Code Stroke Patients

Measures


Count of Pediatric Code Stroke Calls, Run Chart
N=109 Code Stroke Calls
Count Code Stroke Calls
0
1
2
3
4
5
6
7
Median = 1
Median = 2
Median= 3
2022 Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sep
Oct
Nov
Dec
2023 Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sep
Oct
Nov
Dec
2024 Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sep
Oct
Nov
Dec
2025 Jan
Feb
Mar
Apr
May
Jun
July
Aug
Year- Month
Code Stroke Calls
Median

2025 YTD Pediatric Stroke by Age, Sex, Location & Presenting Disease

N=19 Strokes (8/14/25)

★ No Code Stroke Called

Infant
0-1 year

17 day old, M, PICU
Meningitis

1 month, F, PICU
Meningitis

7 month, M, PICU
Non accidental trauma

Early Childhood
1-5 years

5 yo, M, PICU
>90% TBSA Burns/ECMO

5 yo, M, 5CH
ATRT Brain Tumor

3 yo, F, ED
Previously Healthy

Middle Childhood
6-12 years

7 yo, M, 5CH
B Cell ALL

12 yo, M, ED
B Cell ALL

8 yo, F, 6 CH
Autoimmune encephalitis
with recent lobectomy

6 yo, M, ED
ALL

10 yo, M, 7 CH
Acute AMS/emesis, HTN,
bradycardia

Adolescence+
13-18+ years

19 yo, M, ED
B-Cell ALL w/mets

19 yo, M, ED
B-Cell ALL w/mets

19 yo, M, 5CH
B-Cell ALL w/mets

15 yo, M, 7CH
TBI w Bone Flap
Replacement

17 yo, M, ED
SCD

13 yo, F, PICU(PLC)
SCD

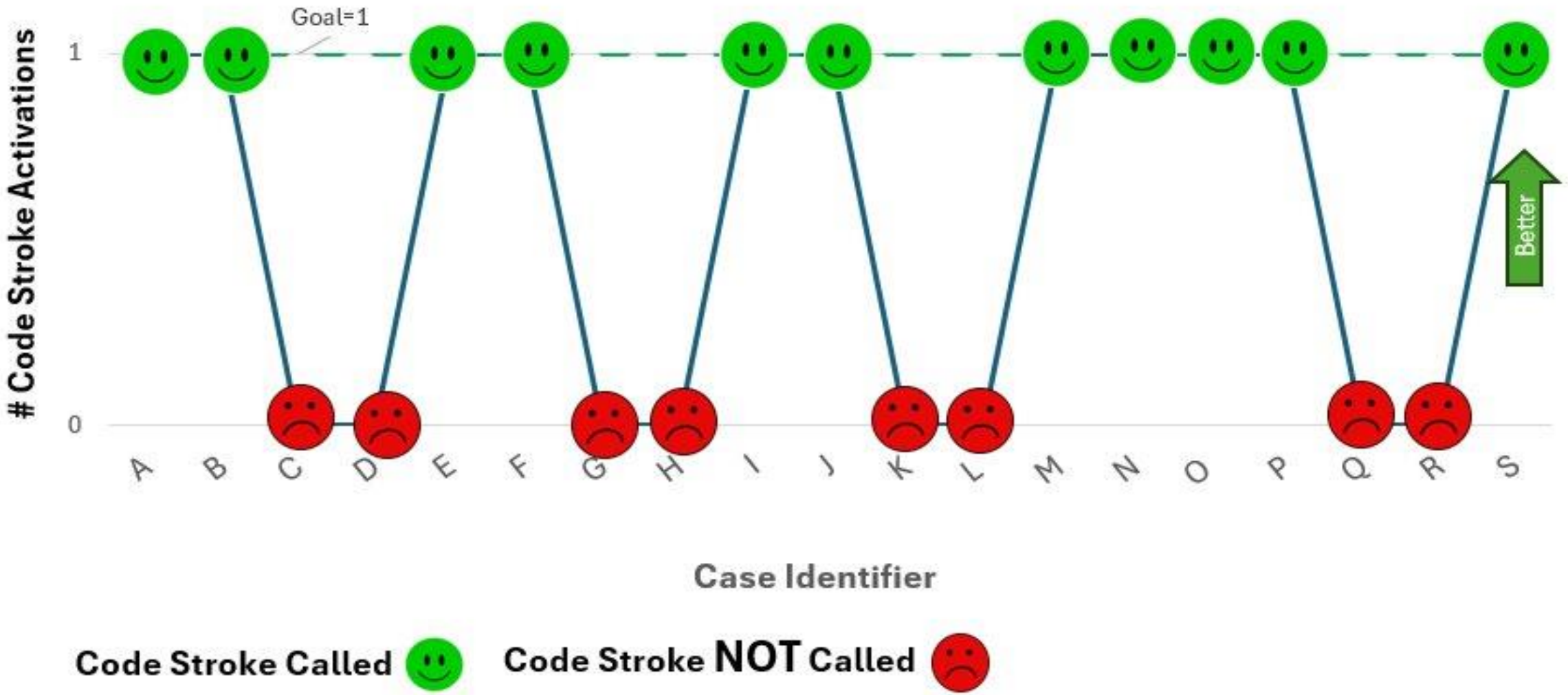
14 yo, F, PICU
Previously Healthy

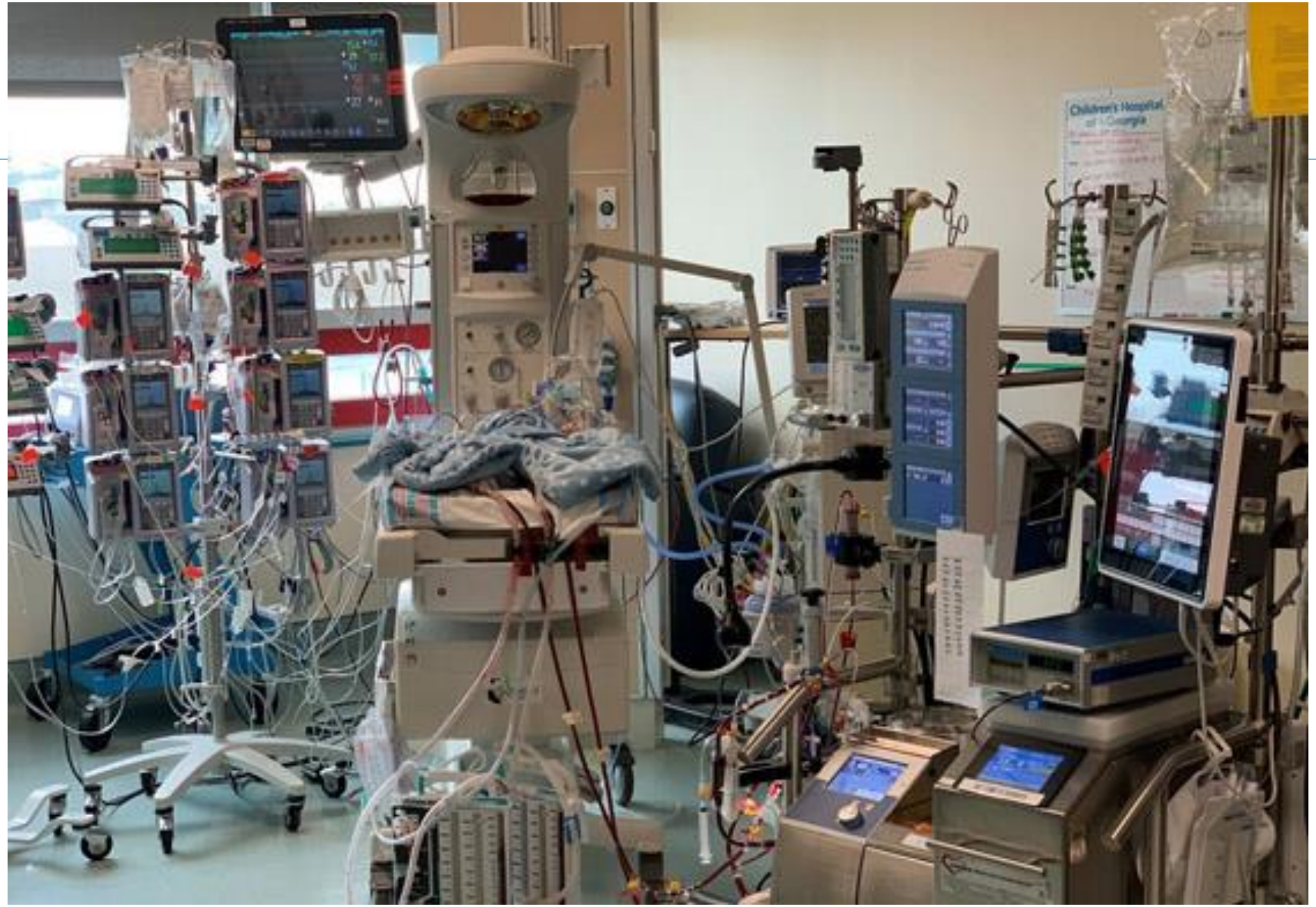
17 yo, F, PICU
ALL

UNC Health

Pediatric Strokes With Code Stroke Activations, CY 2025
N=19 Confirmed Strokes

Updated: 8/14/25





https://www.augustahealth.org/images/neonatal-ecmo.jpg

Sustainment & Spread

1. Continue to engage key stakeholders, share data
2. Recurrent education series – lectures and simulations
3. Feedback mechanism from case reviews
4. Joining national stroke database/research groups
5. Obtain pediatric stroke center designation

Acknowledgements

May-Britt Sten, MSN, RN, CPHQ

Carlton Moore, MD, MS

Pediatric Neurology, Anesthesia, Heme/Onc

Pediatric Emergency Department

Pediatric Residency Program

Pediatric Pharmacy

Radiology Department

Children’s Hospital nursing staff

Many Many More!