Fresh "AIR" for Stroke Care

Setting the Stage for the ICH Initiative

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Stroke Program Coordinator

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Stroke Outreach Coordinator

The University of Kansas Health System

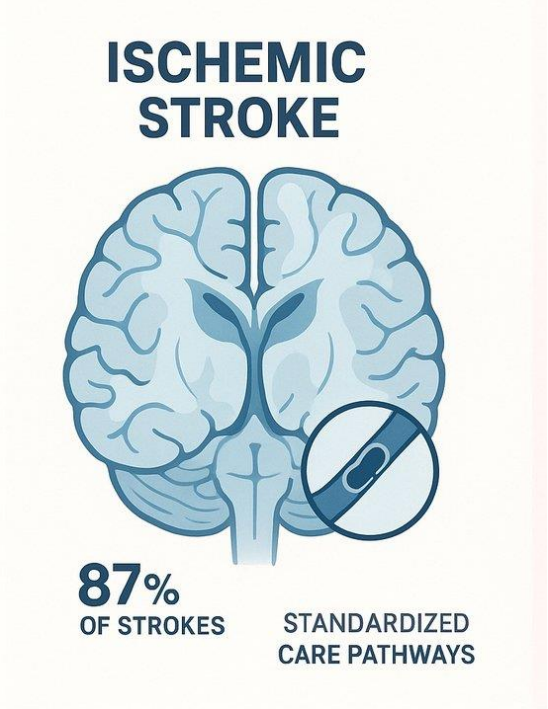
The Stroke Landscape

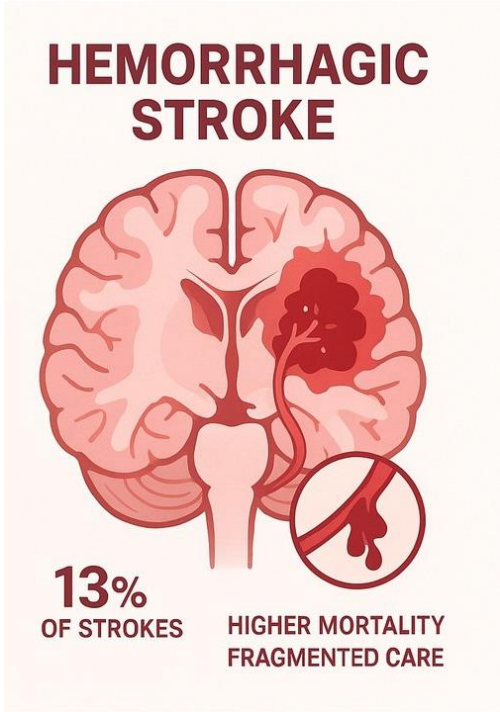
Ischemic Stroke

- Majority of cases *(87% of all strokes)*
- Highly standardized workflows
- Established AST response protocols
- Comprehensive order sets & guidelines
- Consistent treatment pathways

Hemorrhagic Stroke

- Smaller Proportion *(~13% of strokes)*
- Higher mortality and disability rates
- Fragmented workflows
- Variable treatment approaches
- Limited standardized protocols

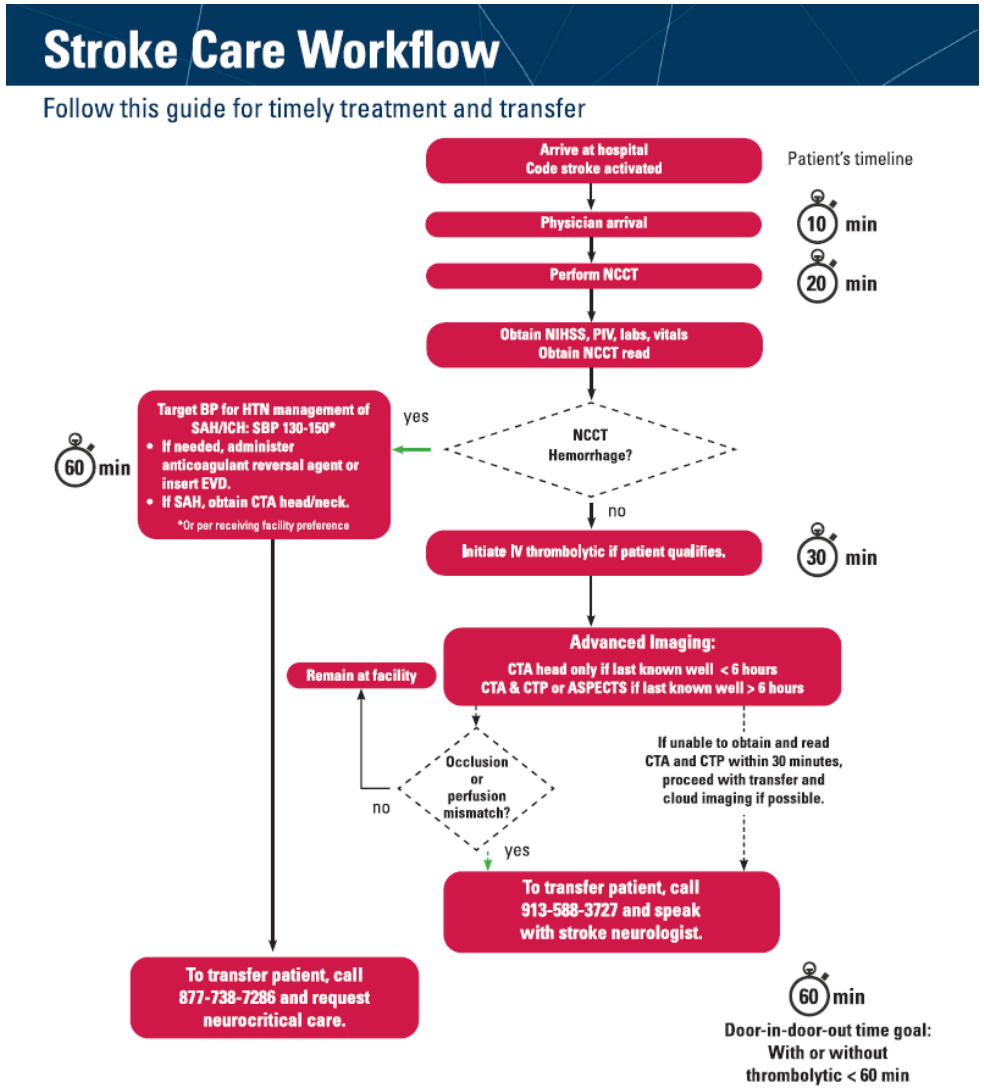




KISS Website Resources

www.kissnetwork.us

Stroke Care Workflow



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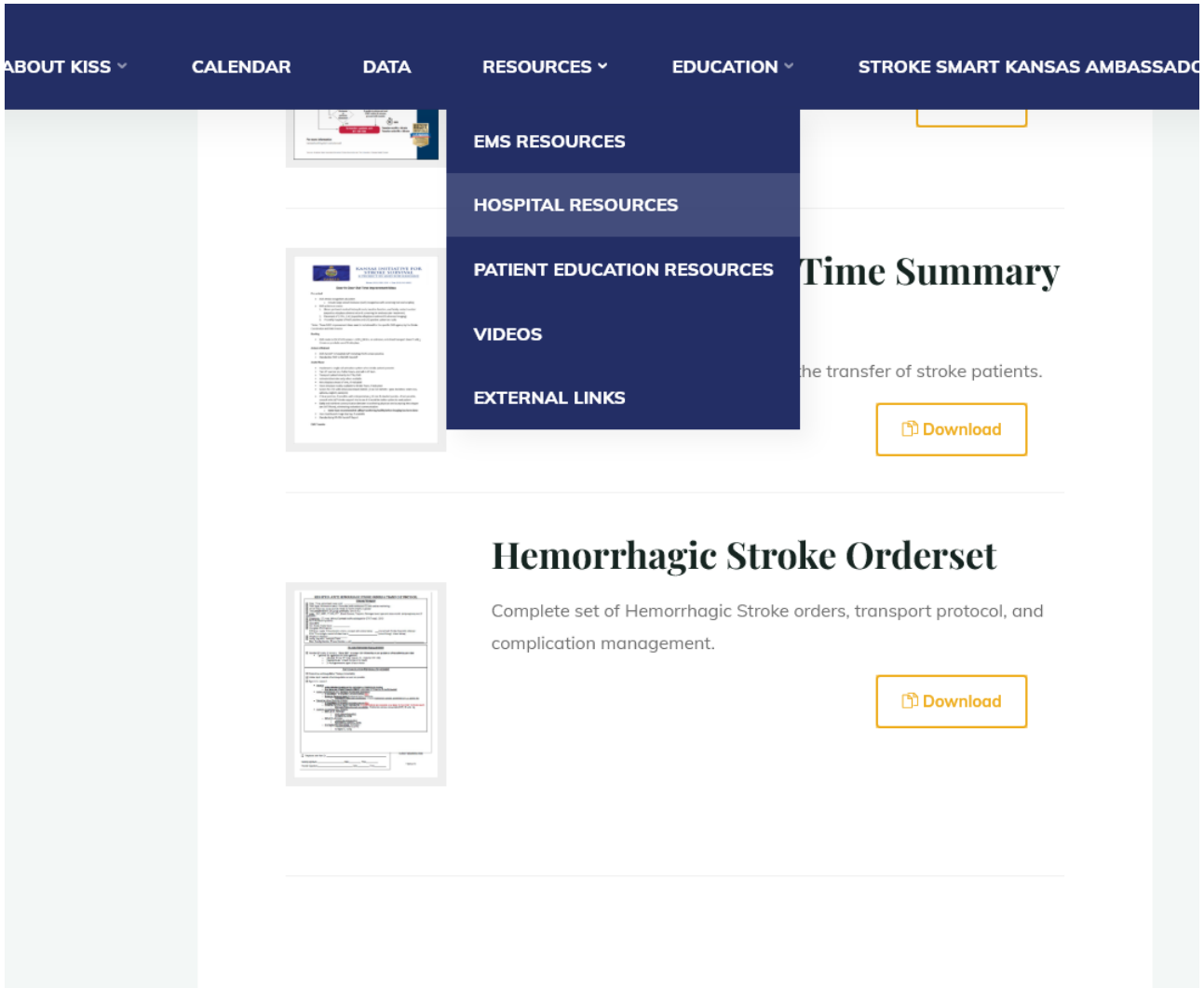

KISS HYPER-ACUTE HEMORRHAGIC STROKE ORDERS

KISS HYPER-ACUTE HEMORRHAGIC STROKE ORDERS & TRANSPORT PROTOCOL

STROKE WORKUP

☒ Date / Time patient last known well: _____
☒ Vital Signs: Minimum of every 15 minutes (with continuous O2 and cardiac monitoring)
☒ O2 at 2 liters per nasal cannula: titrate for SpO2 of 94% or greater
☒ **Two peripheral IV's** (18 gauge preferable, one in AC)
☒ Labs: CBC, BMP, PT/INR, PTT, Blood Glucose, Troponin, fibrinogen level, type and cross-match, and pregnancy test (if applicable)
☒ Diagnostic: CT Head Without Contrast (notify radiologist for STAT read); EKG
☒ Get CTA Head if possible
☒ Strict NPO
☒ NIH Stroke Scale Score: _____
☒ Complete tPA Checklist :
☐ Patient meets IV thrombolytic criteria, proceed with orders below. ___Consult with Stroke Specialist obtained
☐ IV Thrombolytic contraindicated due to _____ (cross through orders below)
☒ Weight in kilograms _____
☒ Notify Dispatch / Transport Team
Best Family Member Phone Number – cell _____--_____--_____

KISS HYPER-ACUTE HEMORRHAGIC STROKE ORDERS

BLOOD PRESSURE MANAGEMENT

☒ Monitor BP every 15 minutes. **Keep SBP in range 130-150mmHg or per guidance of transferring provider**

- **Options for hypertension management:**
  - Labetalol 10 mg IVP (may repeat x 1). (Hold for HR < 60)
  - Nicardipine gtt. 5 mg/hr to max of 15 mg/hr
  - Or Antihypertensive agent of your choice

ANTICOAGULATION REVERSAL (IF NEEDED)

☒ Discontinue anticoagulation Therapy immediately

☒ Initiate rapid reversal of anticoagulation as soon as possible

☒ Agents for reversal:

- Heparins
  - **Unfractionated Heparin (UFH):** Administer IV Protamine for reversal
  - **Low Molecular Weight Heparin (LMWH):** Administer IV Protamine for partial reversal
- Factor Xa-Inhibitors or (e.g., Apixaban, Rivaroxaban, Edoxaban)
  - **If Drug taken < 2 hrs prior:** Activated charcoal 50 g
  - **Preferred Reversal Agent:** Andexanet alpha, if available
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- Dabigatran (Direct Thrombin Inhibitor)
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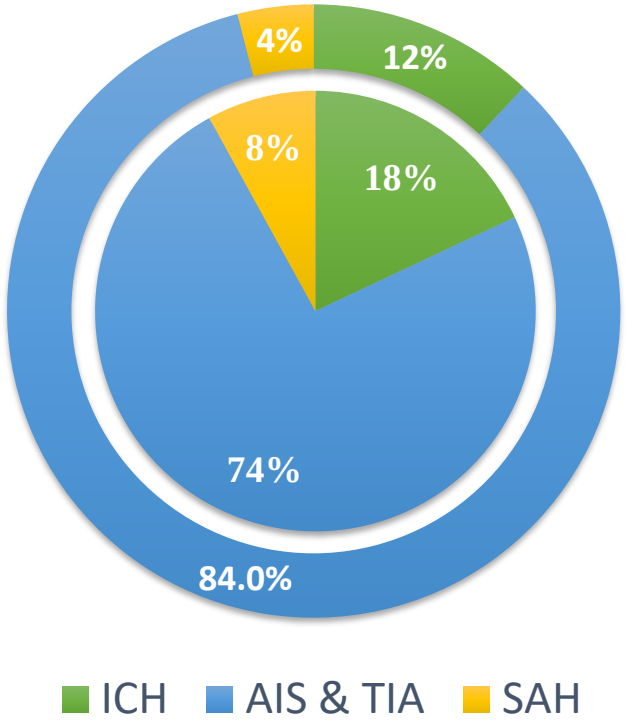
- Vitamin K Antagonists *(e.g., Warfarin)*
  - **INR 1.3-1.9:** Administer
    - 10-20 IU/kg 4-FactorPCC
    - IV Vitamin K, 10 mg
  - **INR ≥2.0:** Administer…
    - 25-50 IU/kg 4-Factor PCC
    - Administer IV Vitamin K, 10 mg
  - **If 4-Factor PCC Unavailable**: Administer…
    - Fresh Frozen Plasma (FFP)
    - IV Vitamin K, 10 mg

Stroke Center

Infrastructure & People Supporting Optimal Outcomes

Stroke Program Structure

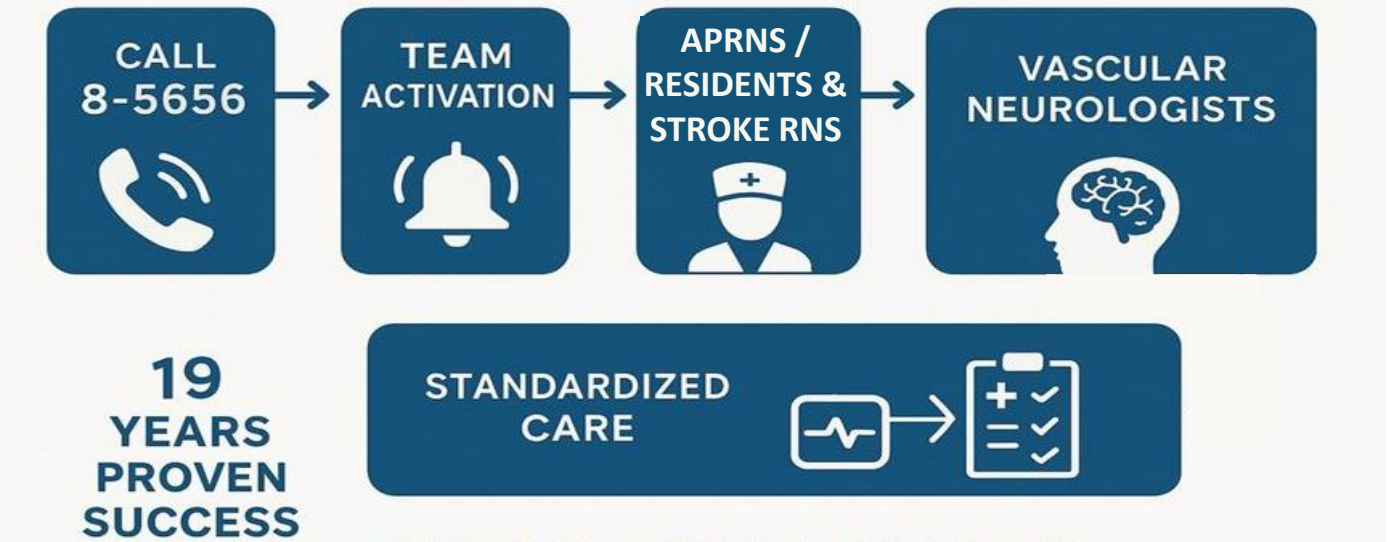
- ~2200 Activations / year
- ~1,000 Primary Coded Strokes / year
- ~500 Secondary Coded Strokes / year
- 1 x Neuro ICU (28 beds)
- 2 x Neuro Progressive Care Units (32 Beds Each)
- 24/7 Vascular Neurology Physician Teams
  - Day Activation Team
  - Day Primary Team
  - Night Activation Team
- 24/7 Neurocritical Care, Neuroradiology, Neuro-Anesthesia, Neuro-Interventional Radiology, Neurosurgery, etc.



Our Starting Point: ASRT

ASRT

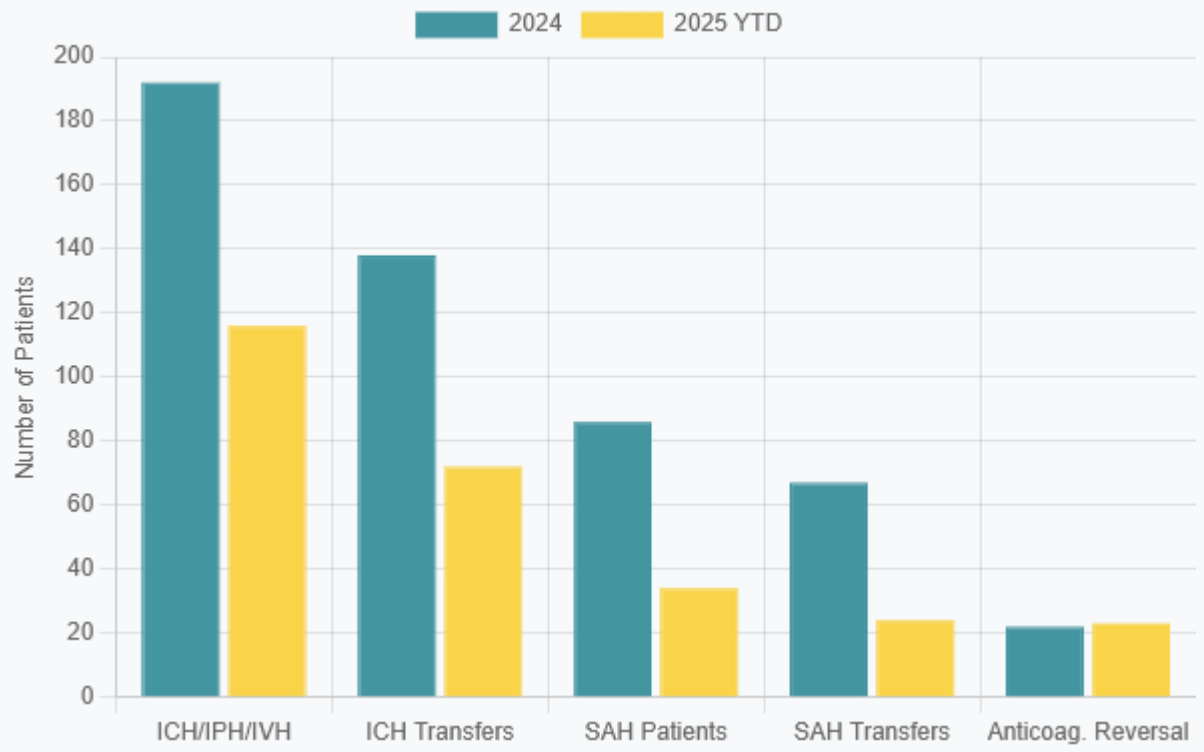
Acute Stroke Response Team



- **Core members:** APRNs, neurology residents, ICU RNs, vascular neurologists
- Rapid Evaluation of patients with potential stroke & Acute Treatment Stratification
- Standardized workflow with clear roles and structured order sets
- Built on evidence-based practice and continuous improvement

Our Baseline Data

2024–2025 ICH Data



Total ICH/IPH/IVH Patients

192 (2024) | **116** (2025 YTD)

ICH Patient Transfers

138 (2024) | **72** (2025 YTD)

Total SAH Patients

86 (2024) | **34** (2025 YTD)

SAH Patient Transfers

67 (2024) | **24** (2025 YTD)

Anticoagulation Reversal

22 (2024) | **23** (2025 YTD)

Reversal Rate

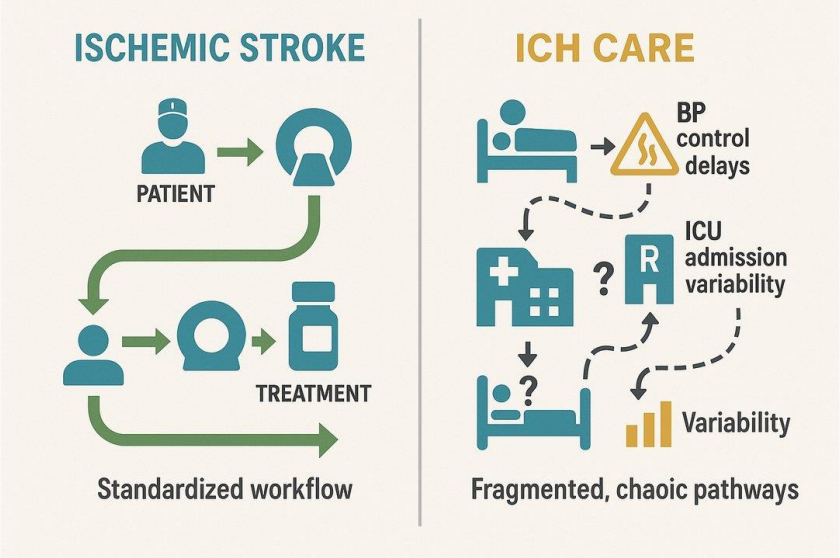
11.5% (2024) | **19.8%** (2025 YTD)

Source: TUKHS Stroke GWTG Registry Database

The Problem with ICH Care: *Beyond the Numbers*

What We Saw

- Transfers arriving late with **limited feedback** on pre-hospital care
- Significant **delays in BP medications** affecting stabilization
- **ICU beds not always available** when patients arrived
- **Documentation gaps** in anticoagulation reversal timelines



Why it Matters

- No standardized response for ICH like ischemic stroke
- **Variability in workflows** → Variability in outcomes
- Delays in BP control, reversal, & bed placement
- Benchmarking limitations make it hard to compare performance
- Same severity → very different outcomes

Why We Got Involved

Drivers for Change

Internal

- Inconsistent workflows across departments
- Variable care pathways for ICH patients
- Opportunity to improve integration

External

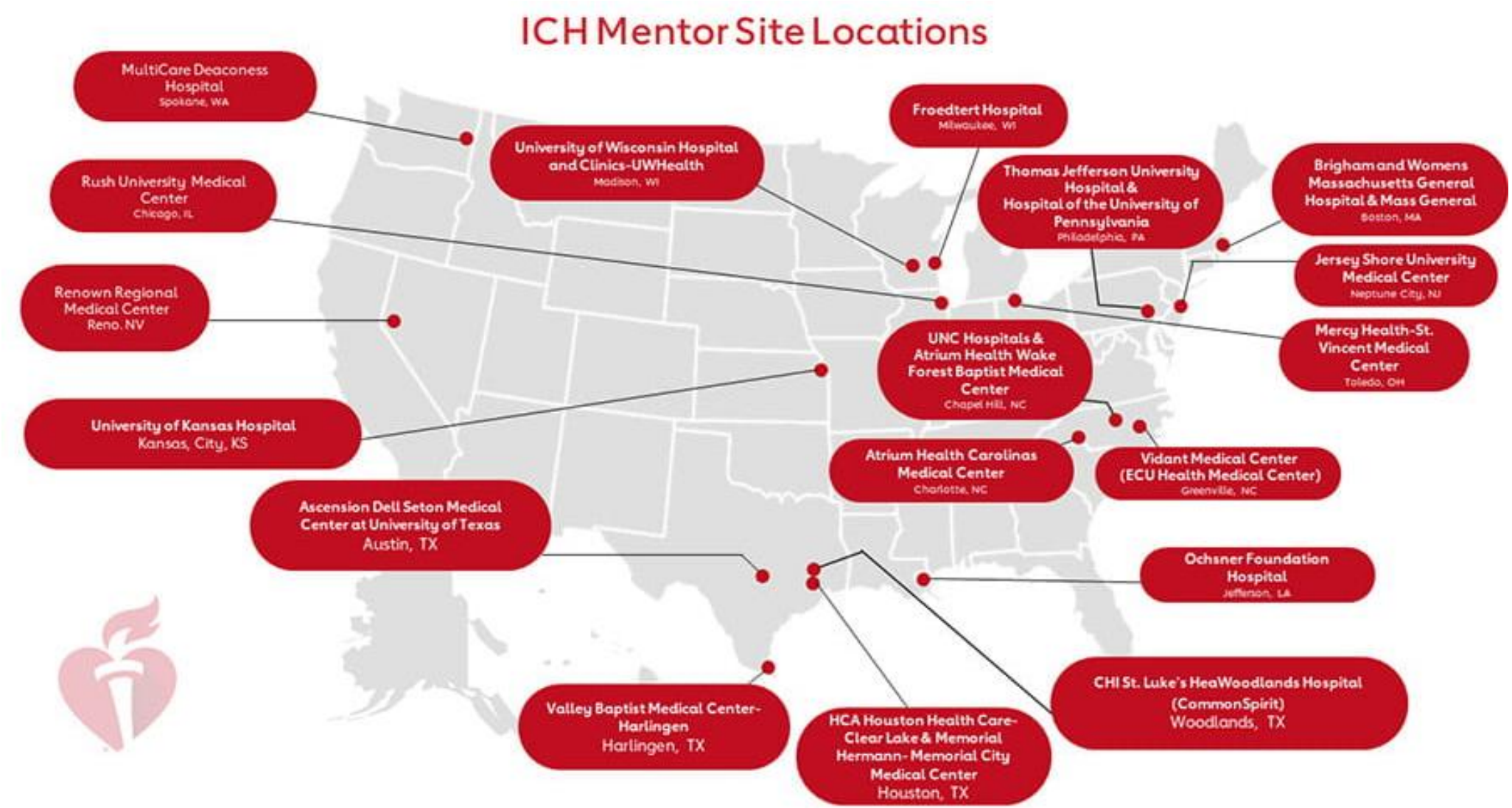
- AHA ICH Phase II project launch
- Growing national focus on ICH outcomes
- Evidence supporting bundled interventions

Quality

- Joint Commission expectations evolving
- GWTG benchmarking opportunities
- Performance metrics for hemorrhagic stroke

Vision

- *"Do for ICH what ASRT did for ischemic stroke"*
- Create structured response process
- Level the playing field for all patients



REVIEW ARTICLE | Originally Published 22 May 2023 |

2023 Guideline for the Management of Patients With Aneurysmal Subarachnoid Hemorrhage: A Guideline From the American Heart Association/American Stroke Association

Brian L. Hoh, MD, MBA, FAHA, Chair, Nerissa U. Ko, MD, MAS, Vice Chair, Sepideh Amin-Hanjani, MD, FAHA, Sherry Hsiang-Yi Chou, MD, MSc, Salvador Cruz-Flores, MD, MPH, FAHA, Neha S. Dangayach, MD, MBBS, MSCR, Colin P. Derdeyn, MD, FAHA, ... SHOW ALL ... , and Babu G. Welch, MD | AUTHOR INFO & AFFILIATIONS

Stroke • Volume 54, Number 7 • https://doi.org/10.1161/STR.0000000000000436

REVIEW ARTICLE | Originally Published 17 May 2022 |

2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association

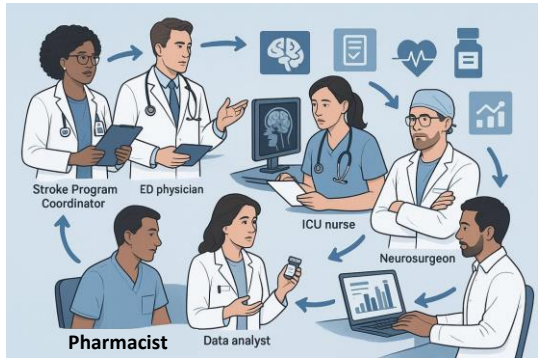
Steven M. Greenberg, MD, PhD, FAHA, Chair, Wendy C. Ziai, MD, MPH, FAHA, Vice Chair, Charlotte Cordonnier, MD, PhD, Dar Dowlatshahi, MD, PhD, FAHA, Brandon Francis, MD, MPH, Joshua N. Goldstein, MD, PhD, FAHA, J. Claude Hemphill III, MD, MAS, FAHA, ... SHOW ALL ... on behalf of the American Heart Association/American Stroke Association | AUTHOR INFO & AFFILIATIONS

Building the Foundation

First Steps

- Formed Interdisciplinary ICH Committee
- **Subcommittees:**
  1. “AIR” Activation Process Development
  2. Transfer Protocol Review and Optimization
  3. Clinical Practice Guidelines Update
  4. Data and Metrics Tracking

Stakeholders in the Initiative



A true interdisciplinary approach to improve ICH care

Informatics & Data Analytics
Integrated systems and set up metrics tracking

Lab
Expert on obtaining initial POC testing

Stroke Program Admin Team
Initiative leadership and coordination

ED
First point of contact and initial stabilization

Radiology
Rapid imaging and diagnostic support

ICU / Neurocritical Care
Direction for Critical care management

Neurosurgery
Direction for surgical assessment and intervention

Pharmacy
Medication management and reversal agents

Neurology
Activation support & guidance for clinical protocols

ASRT Nursing
Leadership, project direction, & bed side implementation

Core Objectives

1. **Reduce** door-in-door-out (DIDO) times for transfers.
2. **Shorten time** from hospital arrival to diagnosis and treatment.
3. **Decrease** morbidity and mortality in ICH patients.
4. **Standardize** care processes to reduce variability.
5. **Optimize** interdisciplinary communication for better outcomes.
6. **Ensure compliance** with updated clinical practice guidelines.

Meeting Structure & Collaboration

How We Made It Work

Monthly ICH Initiative Committee

Regular meetings to align all stakeholders and track overall progress

Subcommittees with Focused Scope

Specialized teams tackling specific workflow challenges

Hybrid Meeting Model

A variety of in-person, virtual, and asynchronous options to ensure participation

Scorecards & Shared Documents

Unified tracking system for alignment and accountability

QI Projects

Project	Description
AIR Activation Protocol	Develop a clear protocol with defined triggers and team roles.
Education and Training	Launch hospital-wide training, including simulations for Code ICH.
Transfer Protocol Optimization	Streamline transfer acceptance and reduce delays.
Clinical Practice Guidelines Update	Review and revise protocols to reflect the latest evidence in AHA released Guidelines.
Informatic Updates	Temporary updates were made to EPIC to serve as a transition while we work to implement more long-term solutions.
Data Tracking and Quality Improvement	Establish meaningful metrics and monitor performance regularly.

Collaboration Across Departments

Partners in the Build

Radiology

Developed rapid notification of ordering providers, ensuring immediate AIR activation

Emergency Department

Focused on initial stabilization, lab draws, BP management, and anticoagulation reversal

ICU

Established efficient handoff protocols and immediate admission pathways for all ICH patients

Neurosurgery & Critical Care

Embedded in protocol development from the start, ensuring surgical expertise throughout

Data & Metrics

Key Performance Indicators

Time-Based Target Metrics

BP Control	Labs Sent	Reversal	ICU Arrival
< 10 min	**< 15 min**	**< 30 min**	**< 30 min**

Current Metrics

- Timing and efficacy of first BP medication
- Antithrombotic prior to transfusion
- Assessment for rehabilitation
- Baseline severity score
- Dysphagia screening within 24 hours
- Documentation of VTE prophylaxis
- Anticoagulant reversal time and agent (DOAC)
- Coagulopathy reversal
- Avoidance of corticosteroids
- Blood pressure treatment at discharge
- Dysphagia screening prior to oral intake
- Transfer pathway and times

Additional Metrics

- Protocol compliance by department
- ICU length of stay
- Staff response times
- Neurological outcomes at discharge
- 30-day readmission rates

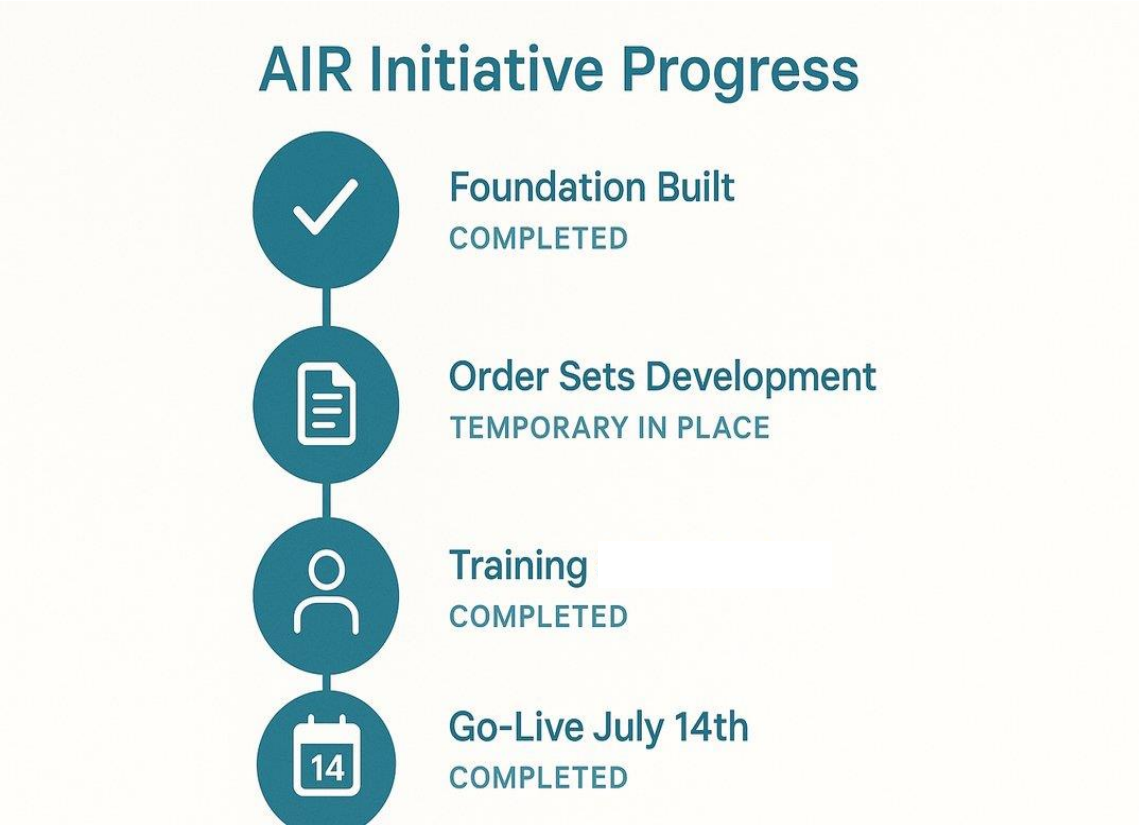
Barriers

- Data collection silos between departments
- Inconsistent documentation practices
- Timing discrepancies in EHR entries
- Limited transfer data from outside facilities
- Workload barriers to real-time documentation
- Need for automated data extraction tools

Where We Are Now

Current Status

- Foundation built
- Order sets in development
- Metrics defined
- Staff Educational materials prepared
- Education provided
- Transfer process in place
- AIR team has gone live



AIR ACTIVATION

- Acute ICH Response
- **Goals:**
  1. Reduce time from hemorrhagic stroke diagnosis to initiation of treatment
  2. Decrease morbidity and mortality associated with hemorrhagic stroke
  3. Standardize care processes to reduce variability in patient outcomes
  4. Optimize interdisciplinary communication and collaboration
  5. Ensure compliance with updated clinical practice guidelines

ED STAT RN AIR CHECKLIST
☐ Ensure AIR activation initiated after confirmation of acute intracranial hemorrhagic finding on imaging.
☐ Obtain IV Access.
☐ Connect patient to monitor.
☐ Blood Pressure Goals: Initial SBP >220: goal of 130 - 180 Initial SBP <220: goal of 130 - 150
☐ Initiate blood pressure treatment within 10 minutes.
☐ Labs sent within 15min: INR, TEG, CBC, Type & Cross.
☐ Assist with medication administration and vitals q15 min.
☐ Huddle with team and coordinate with AIR RN for ICU placement.

AIR Population

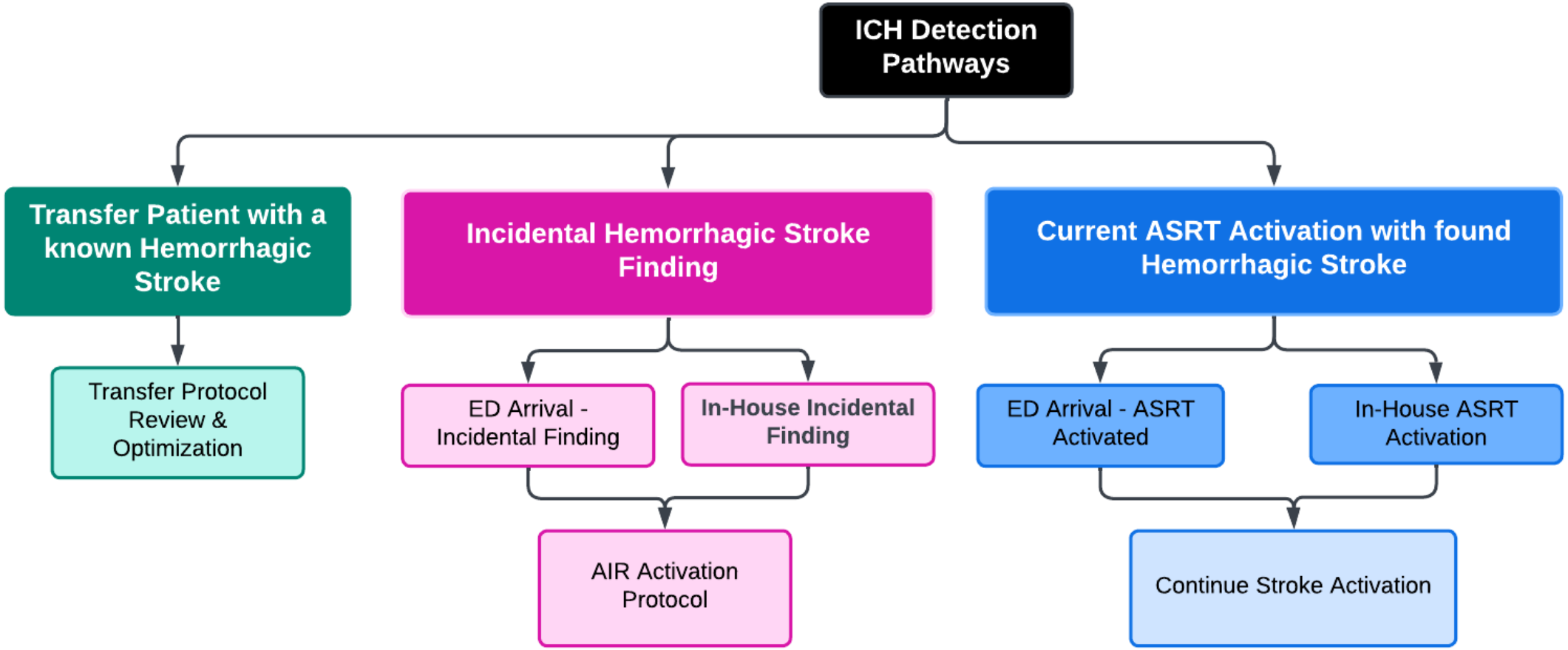
Inclusion:

- Intracerebral hemorrhage (ICH)
- Intraventricular hemorrhage (IVH)
- Intraparenchymal hemorrhage (IPH)
- Subarachnoid hemorrhage (SAH)

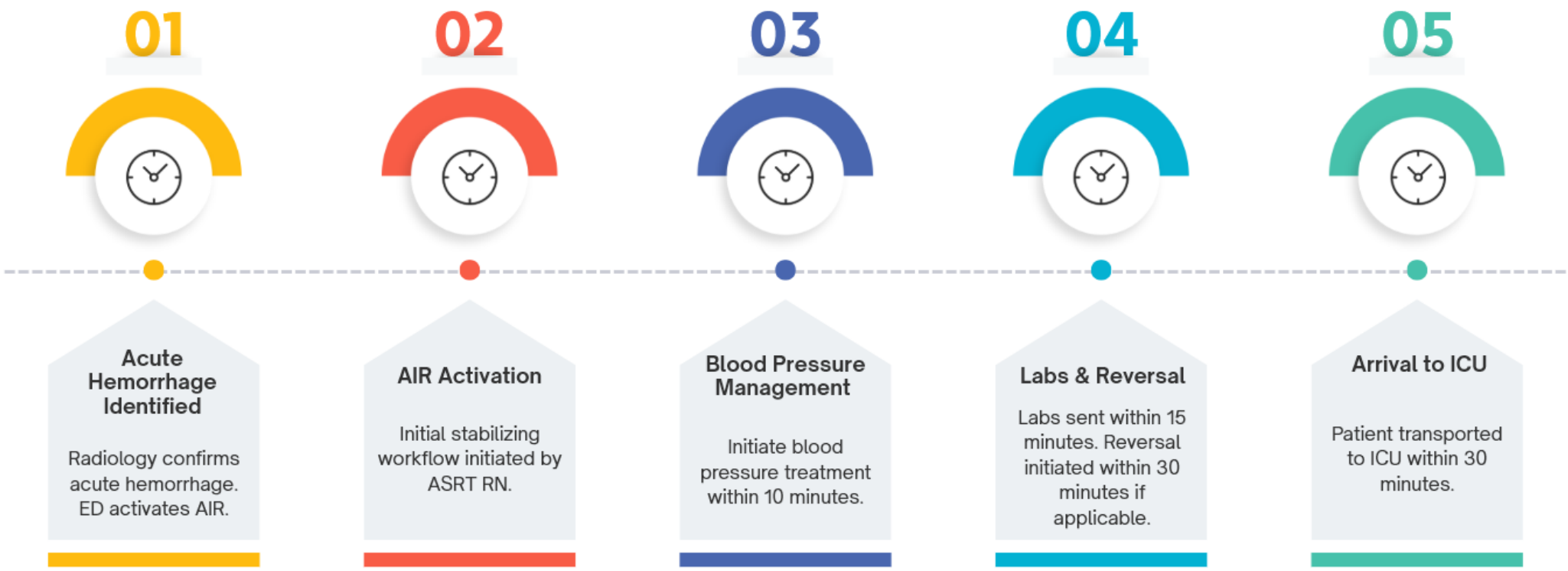
Exclusion:

- Subdural hematomas (SDH)
- Traumatic hemorrhages
- Chronic hemorrhages

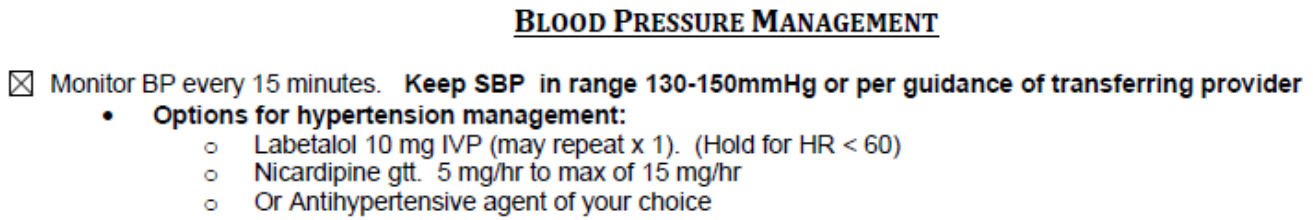
Identification Pathways



Workflow & Time Goals



Blood Pressure Management



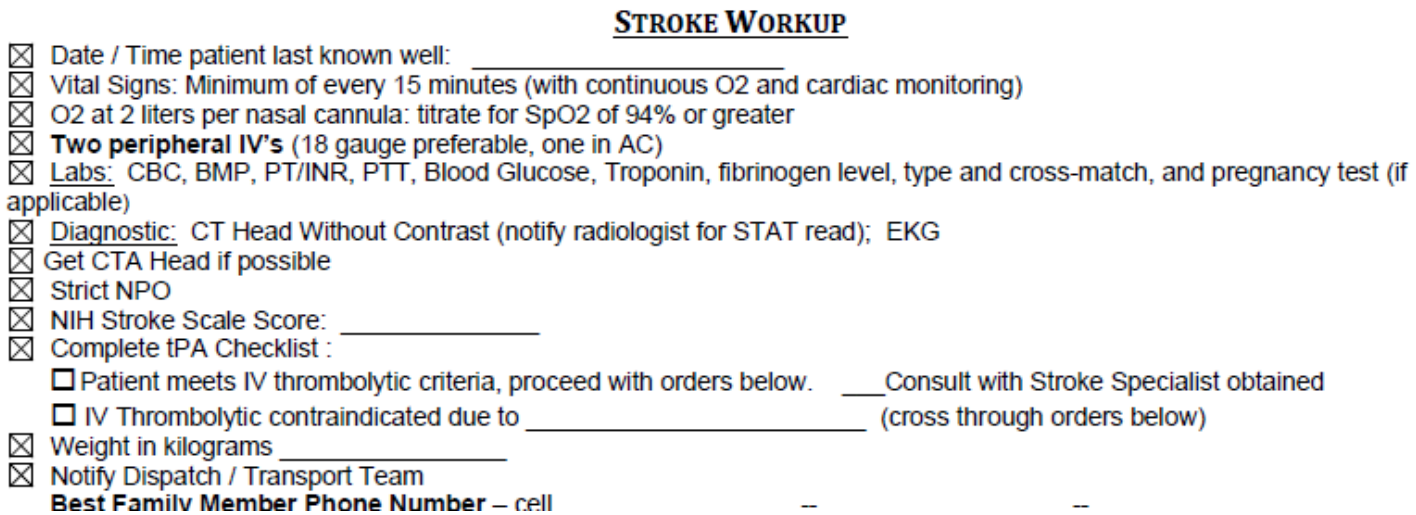
BLOOD PRESSURE MANAGEMENT

☒ Monitor BP every 15 minutes. **Keep SBP in range 130-150mmHg or per guidance of transferring provider**

- **Options for hypertension management:**
  - Labetalol 10 mg IVP (may repeat x 1). (Hold for HR < 60)
  - Nicardipine gtt. 5 mg/hr to max of 15 mg/hr
  - Or Antihypertensive agent of your choice

- BP goals align with current National ICH Patient Care Guidelines
- **Goal:**
  - Blood pressure medication initiated within **10 minutes** of identification of acute intracranial hemorrhage.
  - **Initial SBP < 220** → SBP goal of 130-150
  - **Initial SBP > 220** → SBP goal of 130-180
- **First Line BP treatment:** Nicardipine

Labs



STROKE WORKUP

☒ Date / Time patient last known well: _____
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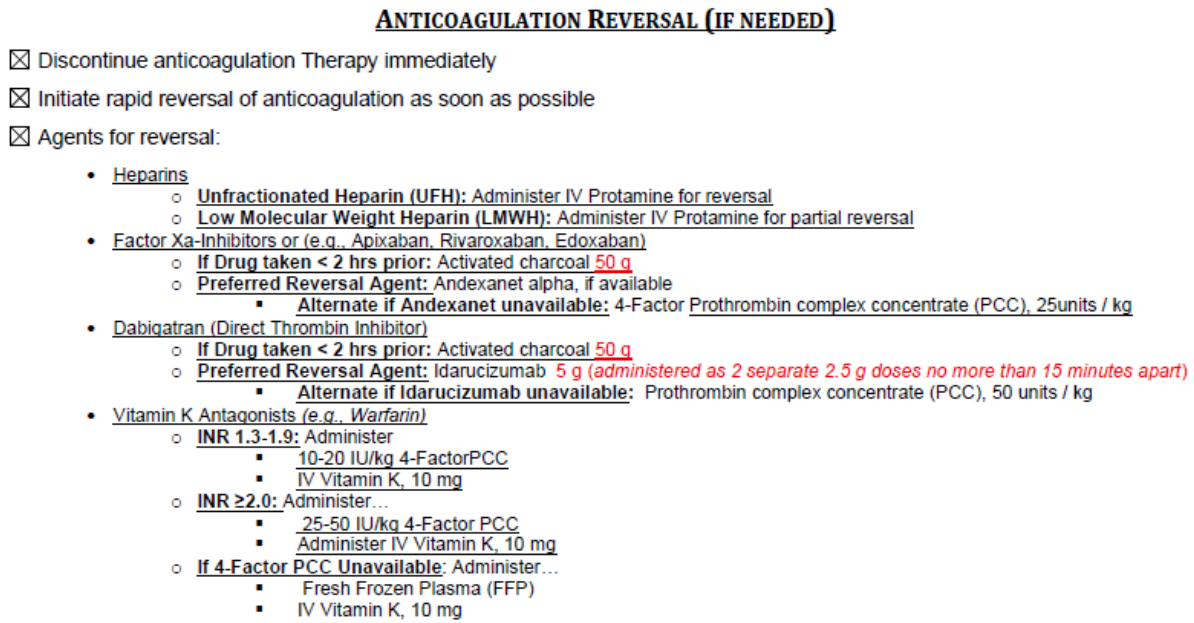
☒ O2 at 2 liters per nasal cannula: titrate for SpO2 of 94% or greater
☒ **Two peripheral IV's** (18 gauge preferable, one in AC)
☒ Labs: CBC, BMP, PT/INR, PTT, Blood Glucose, Troponin, fibrinogen level, type and cross-match, and pregnancy test (if applicable)
☒ Diagnostic: CT Head Without Contrast (notify radiologist for STAT read); EKG
☒ Get CTA Head if possible
☒ Strict NPO
☒ NIH Stroke Scale Score: _____
☒ Complete tPA Checklist :
☐ Patient meets IV thrombolytic criteria, proceed with orders below. ___Consult with Stroke Specialist obtained
☐ IV Thrombolytic contraindicated due to _____ (cross through orders below)
☒ Weight in kilograms _____
☒ Notify Dispatch / Transport Team
Best Family Member Phone Number – cell -- --

- Labs drawn and sent within **15 minutes** of identification of acute ICH
  - INR/PTT
  - CBC (platelets)
  - **TEG (**Thromboelastography), is possible
  - Type and Cross

Anticoagulation Reversal



ANTICOAGULATION REVERSAL (IF NEEDED)

☒ Discontinue anticoagulation Therapy immediately

☒ Initiate rapid reversal of anticoagulation as soon as possible

☒ Agents for reversal:

- Heparins
  - **Unfractionated Heparin (UFH):** Administer IV Protamine for reversal
  - **Low Molecular Weight Heparin (LMWH):** Administer IV Protamine for partial reversal
- Factor Xa-Inhibitors or (e.g., Apixaban, Rivaroxaban, Edoxaban)
  - **If Drug taken < 2 hrs prior:** Activated charcoal 50 g
  - **Preferred Reversal Agent:** Andexanet alpha, if available
    - **Alternate if Andexanet unavailable:** 4-Factor Prothrombin complex concentrate (PCC), 25units / kg
- Dabigatran (Direct Thrombin Inhibitor)
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    - IV Vitamin K, 10 mg
  - **INR ≥2.0:** Administer…
    - 25-50 IU/kg 4-Factor PCC
    - Administer IV Vitamin K, 10 mg
  - **If 4-Factor PCC Unavailable**: Administer…
    - Fresh Frozen Plasma (FFP)
    - IV Vitamin K, 10 mg

- **Goal:** Anticoagulation reversal initiated within **30 minutes** of identification of acute intracranial hemorrhage
- Driven by the pharmacist

Where to go from here?

Your Challenge

- Identify your current pathways for recognizing and managing hemorrhagic stroke
- Map out who gets called, when, and how
- Look for opportunities to standardize early steps like BP control, reversal, and transfer readiness
- Establish a feedback loop between referring and receiving sites

What's Next

- We'll share outcome data and lessons learned from our initiative during the upcoming TUKHS Bi-State Stroke Offering
- Together, we can strengthen ICH care across the region

Order Set Reminder

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