



STROKE PATHWAYS EMS - ER - ICU

DR. TAMORISH KOLE

PRESIDENT-ELECT, ASIAN SOCIETY OF EMERGENCY MEDICINE



PATHWAYS OF (NEW & OLD) DELHI !





Greetings.



WHO?



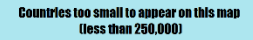
A

Photograph taken at the Yalta conference after World War II showing (from left to right in the front row) Winston Churchill, Franklin Delano Roosevelt, and Joseph Stalin.

WORLD AT A GLANCE.....



each square = 500,000 people



Abkhazie	Greenland
Samoa	Marshall Islands
São Tomé and Príncipe	Saint Kitts and Nevis
Saint Lucia	South Ossetia
Curaçao	Farø Islands
Saint Vincent and the Grenadines	Sri Lankine
Kiribati	Liechtenstein
Grenada	Monaco
Tonga	San Marino
Aruba	Palau
Federated States of Micronesia	Tuvalu
Seychelles	Nauru
Antigua and Barbuda	Niue
Andorra	Vatican City
Dominica	



TAMORISH KOLE  **INDIA**

STROKE EPIDEMIOLOGY



Epidemiology

- Stroke is the second commonest cause of death (10-12%), consumes >4% total healthcare costs, and is commonest cause of adult disability in western world.
- 80-85% are ischaemic (thrombotic or embolic) and 15-20% the more lethal haemorrhagic stroke (including 5% SAH), of which over 50% will die by 1 month.

Donnan G, Fisher M, Macleod M et al. Stroke. Lancet 2008;371:1612-23. [Reference]



STROKE STATS



1 IN 6 DIES OF STROKE IN LIFETIME

WORLD STATS

20 million people suffer from stroke every year. It causes **five million** deaths

5 million people are rendered disabled because of stroke

➤ **One** in **six** persons gets a stroke in his/her lifetime

INDIA STATS

1.5 million people suffer from strokes every year

3,000-4,000 Indians suffer from stroke every day

➤ **Strokes** cause **more deaths** in the country than **malaria, tuberculosis** and **HIV** combined

STROKE EFFECTS



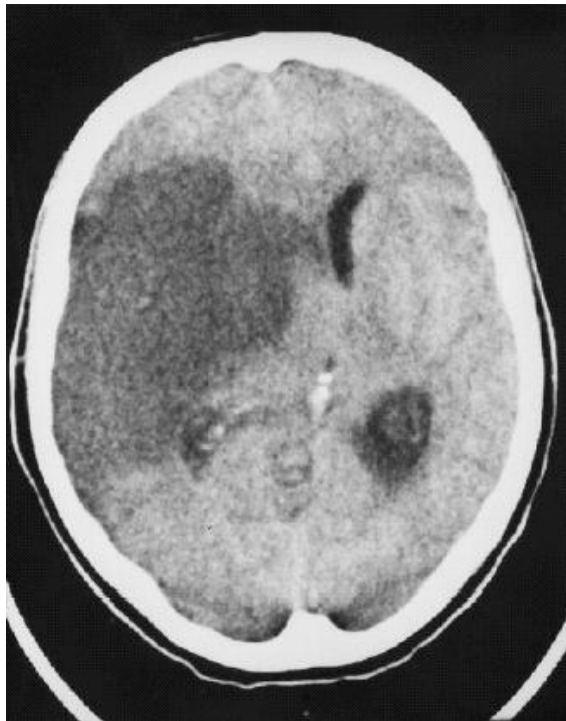
Stroke Morbidity and Mortality in India

- Prevalence 55.6 per 100,000 all ages (Dalal 2007)
- 0.63 million deaths (WHO 2005)
- 1.44-1.64 million cases of new acute strokes every year (WHO 2005, Murthy 2007)
- 6,398,000 DALYs (WHO 2009)
- 12% of strokes occur in the population aged <40 years (Shah + Mathur 2006)
- 28-30 day case fatality ranges from 18-41% (Dalal et al 2008, Das et al 2007)

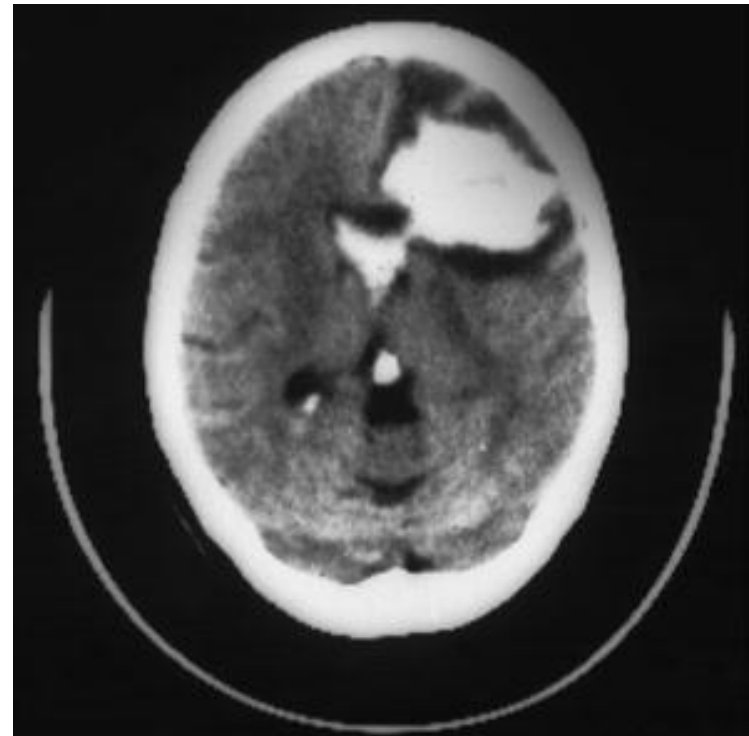
STROKE TYPES



85%
Ischemic

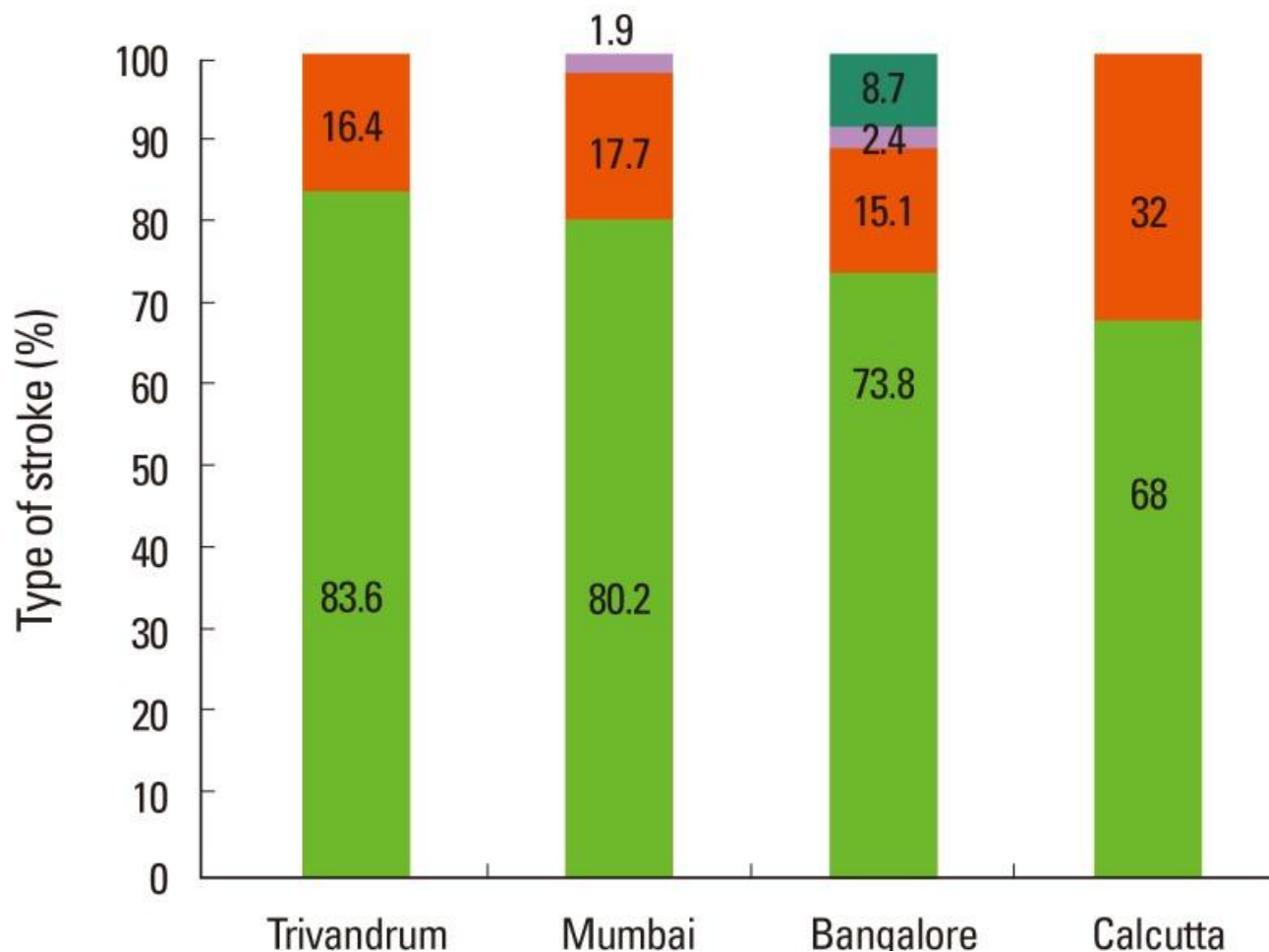


15 %
hemorrhagic



STROKE TYPES

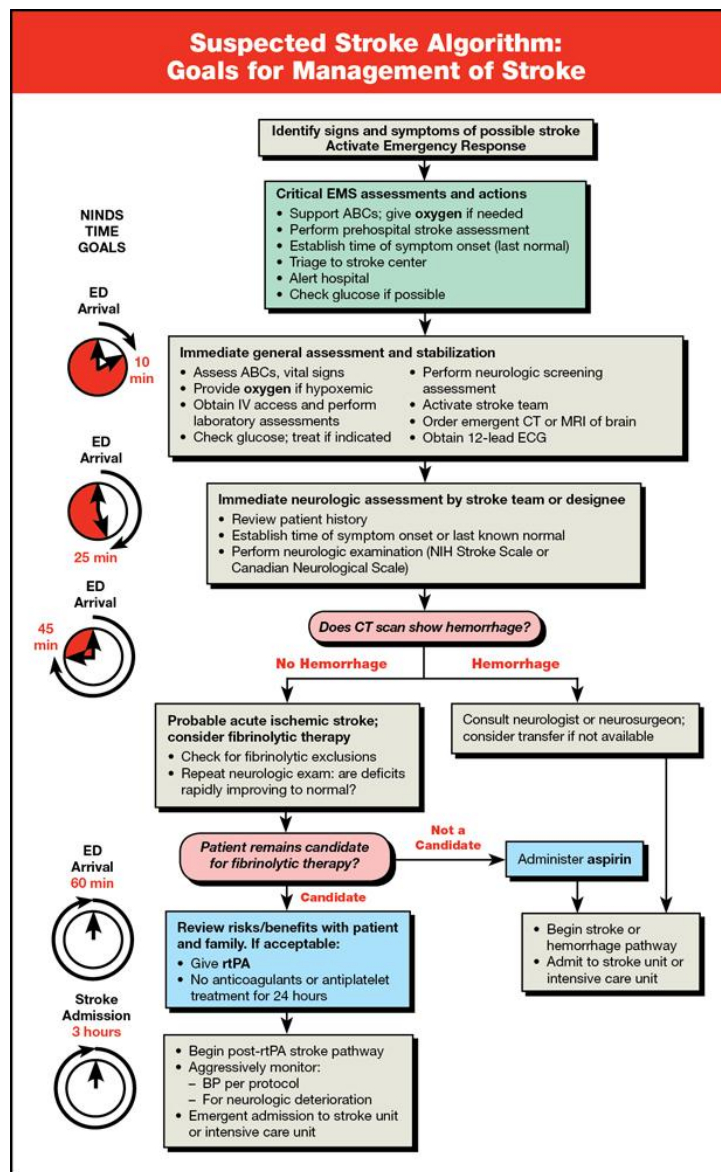
Others Hemorrhagic
Undetermined Ischaemic



Stroke Epidemiology and Stroke Care Services in India

Jeyaraj Durai Pandian^a and Paulin Sudhan^b

J Stroke. 2013 Sep; 15(3): 128–134.
Published online 2013 Sep 27. doi: [10.5853/jos.2013.15.3.128](https://doi.org/10.5853/jos.2013.15.3.128)



STROKE PATHWAY



American Heart Association®

life is why™

Suspected Stroke Algorithm: Goals for Management of Stroke

Detection	Patient or bystander recognition of stroke signs and symptoms
Dispatch	Immediate activation of 9-1-1 and priority EMS dispatch
Delivery	Prompt triage and transport to most appropriate stroke hospital and prehospital notification
Door	Immediate ED triage to high-acuity area
Data	Prompt ED evaluation, stroke team activation, laboratory studies, and brain imaging
Decision	Diagnosis and determination of most appropriate therapy; discussion with patient and family
Drug	Administration of appropriate drugs or other interventions
Disposition	Timely admission to stroke unit, intensive care unit, or transfer

ED indicates emergency department; and EMS, emergency medical services.

GUIDELINES 2013



AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke

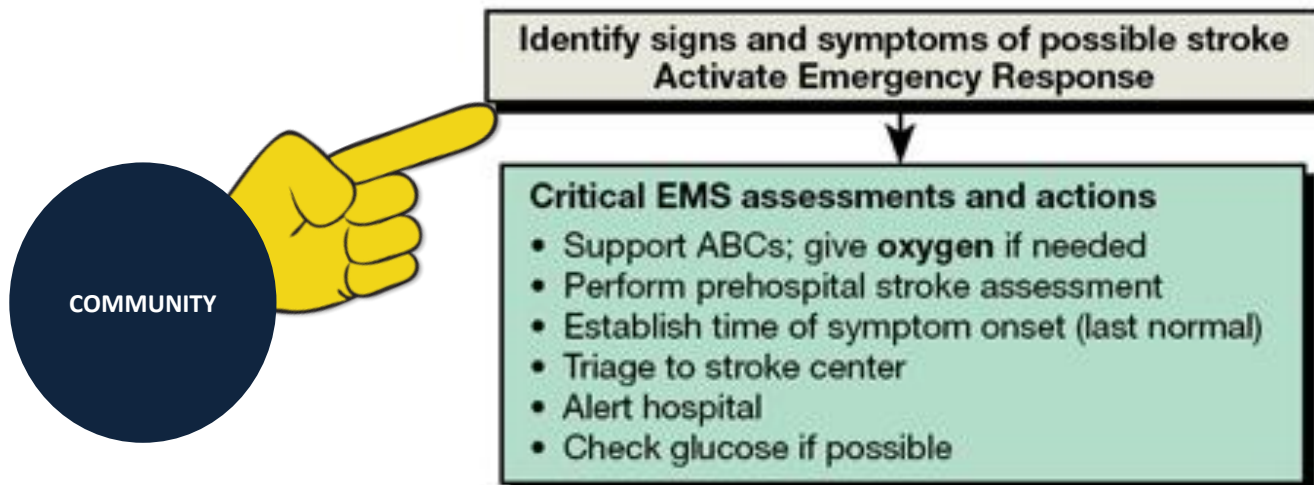
A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

*The American Academy of Neurology affirms the value of this guideline as an educational
tool for neurologists.*

*Endorsed by the American Association of Neurological Surgeons and Congress
of Neurological Surgeons*



Suspected Stroke Algorithm: Goals for Management of Stroke



ACUTE STROKE PATHWAY

STROKE ALERT



BRAIN STROKE IS A MEDICAL EMERGENCY

ব্রেন স্ট্রোক
একটি জরুরি ডাক্তারি অবস্থা

COMMUNITY



Has their face fallen to the side? Can they smile?



Can they lift both their arms and keep them there?



তাদের কথা কি অড়িয়ে যাচ্ছে?



এর যে কোন একটি লক্ষণ দেখা যাবে সাথে সাথে
১৯৯ এ ফোন করুন এবং জরুরি ডাক্তারি সহায়তা নিন



Suspected Stroke Algorithm: Goals for Management of Stroke

EMS



Identify signs and symptoms of possible stroke
Activate Emergency Response

Critical EMS assessments and actions

- Support ABCs; give oxygen if needed
- Perform prehospital stroke assessment
- Establish time of symptom onset (last normal)
- Triage to stroke center
- Alert hospital
- Check glucose if possible

ACUTE STROKE PATHWAY

EMS STROKE SCREEN



Cincinnati Pre-hospital Stroke Scale

1. FACIAL DROOP: Have patient show teeth or smile.



Normal:
both sides
of the face
move equally



Abnormal:
one side of
face does not
move as well
as the other
side

2. ARM DRIFT: Patient closes eyes & holds both arms out for 10 sec.



Normal:
both arms
move the
same or both
arms do not
move at all



Abnormal:
one arm does
not move or
drifts down
compared to
the other

3. ABNORMAL SPEECH: Have the patient say "you can't teach an old dog new tricks."

Normal: patient uses correct words with no slurring Abnormal: patient slurs words, uses the wrong words, or is unable to speak

INTERPRETATION: If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.



EMS ASSESSMENT & MANAGEMENT



ACUTE STROKE PATHWAY

Table 4. Prehospital Evaluation and Management of Potential Stroke Patients

Recommended	Not Recommended
Assess and manage ABCs	Do not initiate interventions for hypertension unless directed by medical command
Initiate cardiac monitoring	
Provide supplemental oxygen to maintain O ₂ saturation >94%	
Establish IV access per local protocol	Do not administer excessive IV fluids
Determine blood glucose and treat accordingly	Do not administer dextrose-containing fluids in nonhypoglycemic patients
	Do not administer medications by mouth (maintain NPO)
Determine time of symptom onset or last known normal, and obtain family contact information, preferably a cell phone	
Triage and rapidly transport patient to nearest most appropriate stroke hospital	Do not delay transport for prehospital interventions
Notify hospital of pending stroke patient arrival	

ABCs indicates airway, breathing, and circulation; IV, intravenous; and NPO, nothing by mouth.



EMS STANDARDS



- Stroke patients are dispatched at the highest level of care available in the shortest time possible.
- The time between the receipt of the call and the dispatch of the response team is <90 seconds.
- EMSS response time is <8 minutes (time elapsed from the receipt of the call by the dispatch entity to the arrival on the scene of a properly equipped and staffed ambulance).
- Dispatch time is <1 minute.
- Turnout time (from when a call is received to the unit being en route) is <1 minute.
- The on-scene time is <15 minutes (barring extenuating circumstances such as extrication difficulties).
- Travel time is equivalent to trauma or acute myocardial infarction calls.⁵

MI
TRAUMA
STROKE

ACUTE STROKE PATHWAY



ACUTE STROKE READY HOSPITAL



- Written emergency stroke care protocols
- Written transfer agreement with a hospital with neuro-surgical expertise
- Director of stroke care to oversee hospital stroke policies and procedures (this may be a clinical staff member or the designee of the hospital administrator)
- Ability to administer intravenous rtPA
- Ability to perform emergency brain imaging (eg, CT scan) at all times
- Ability to conduct emergency laboratory testing at all times
- Maintenance of a stroke patient log

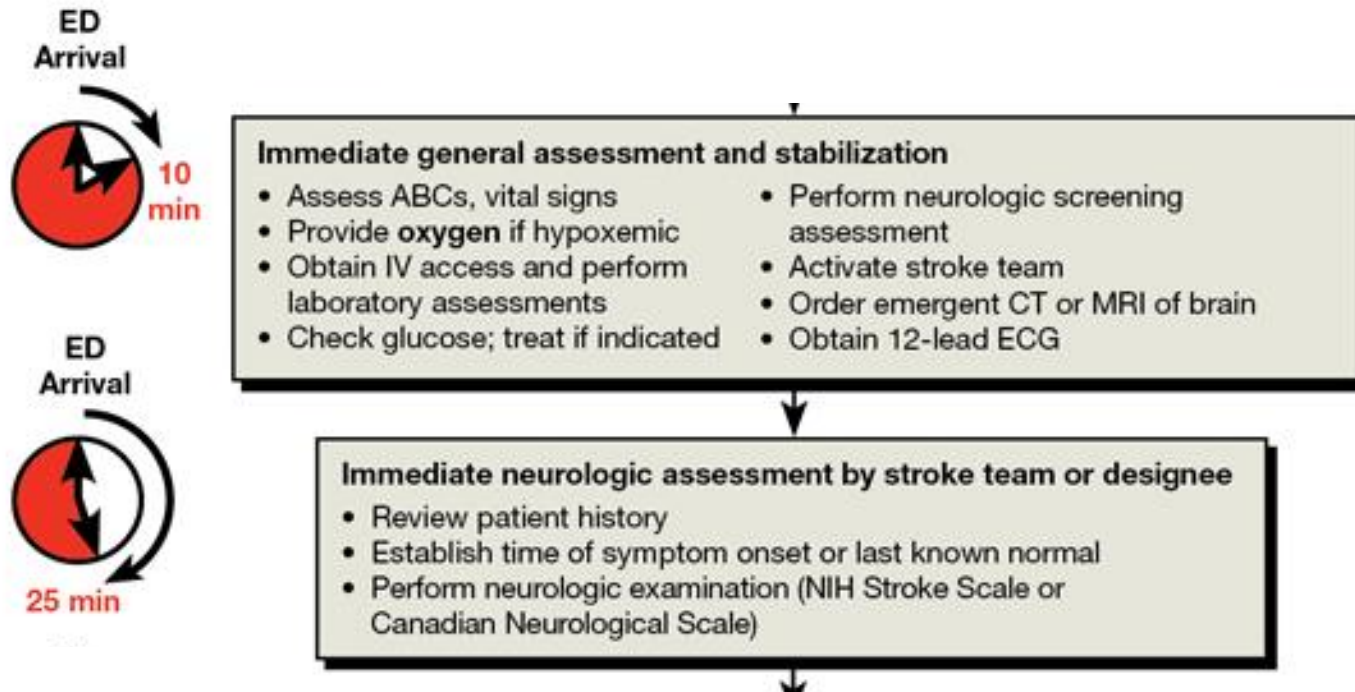
ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

Suspected Stroke Algorithm: Goals for Management of Stroke

ACUTE STROKE PATHWAY





EMERGENCY DEPARTMENT

Recognition Of Stroke In ER (ROSIER)

	YES	NO
Has there been loss of consciousness or syncope?	-1	0
Has there been a seizure?	-1	0
Asymmetric facial weakness?	1	0
Asymmetric hand weakness?	1	0
Asymmetric leg weakness?	1	0
Speech disturbance?	1	0
Visual field disturbance?	1	0

Total score

If total score >0 stroke likely

if total score -2, -1 or 0 stroke unlikely

NB : EXCLUDE HYPOGLYCEMIA

REFERENCE : **NICE CLINICAL GUIDELINES- STROKE** **EVIDENCE** **LEVEL 1B**



EMERGENCY DEPARTMENT

N I H STROKE SCALE

Patient Identification. ____-____-____

Pt. Date of Birth ____/____/____

Hospital _____ (____-____)

Date of Exam ____/____/____

Interval: ☐ Baseline ☐ 2 hours post treatment ☐ 24 hours post onset of symptoms ± 20 minutes ☐ 7-10 days
☐ 3 months ☐ Other _____ (____)

Time: ____:____ [] am [] pm

Person Administering Scale _____

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not go back and change scores. Follow directions provided for each exam technique. Scores should reflect what the patient does, not what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quickly. Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

Elements of the NIH Stroke Scale

11 item scoring system

Integrates components of neurological exam

Includes testing of LOC, select cranial nerves, motor, sensory, cerebellar function, language, inattention (neglect)

Maximum score: 42, minimum score: 0

Not a linear scale

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

Elements of the NIH Stroke Scale

- ☐ Neurological Examination
- ☐ LOC
- ☐ Mental status and cognitive function
- ☐ Cranial nerves
- ☐ Motor system
- ☐ Sensory function
- ☐ Cerebellar system (coordination and gait)
- ☐ Reflexes

- ☐ NIHSS
- ☐ LOC
- ☐ Best gaze
- ☐ Visual field testing
- ☐ Facial paresis
- ☐ Arm & leg motor function
- ☐ Limb ataxia
- ☐ Sensory
- ☐ Best language
- ☐ Dysarthria
- ☐ Extinction & inattention

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

NIHSS and Patient Outcomes

- ❑ Total scores range from 0-42 with higher values representing more severe infarcts
 - ❑ >25 Very severe neurological impairment
 - ❑ 15-24 Severe impairment
 - ❑ 5-14 Moderately severe impairment
 - ❑ <5 Mild impairment
 - ❑ Adams, HP, et al. (1999). *Neurology*: 53: 126 - 131.
- ❑ A 2-point (or greater) increase on the NIHSS administered serially indicates stroke progression. It is advisable to report this increase.



EMERGENCY DEPARTMENT

NIHSS and Patient Outcomes

- ❑ Initial score of 7 was found to be important cut-off point
 - ❑ NIHSS >7 demonstrated a worsening rate of 65.9%.
 - ❑ NIHSS <7 demonstrated a worsening rate of 14.8% and were almost twice (1.9x) as likely to be functionally normal at 48 hours (45%).

(DeGraba et al., 1999)

- ❑ NIHSS <5 most strongly associated with D/C home
- ❑ NIHSS 6-13 most strongly associated with D/C to rehab
- ❑ NIHSS >13 most strongly associated with D/C to nursing facility

(Schlegel et al., 2003)

- ❑ Likelihood of intracranial hemorrhage:

- ❑ NIHSS > 20 = 17% likelihood
- ❑ NIHSS < 20 = 3% likelihood

(Adams et al., 2003)



EMERGENCY DEPARTMENT

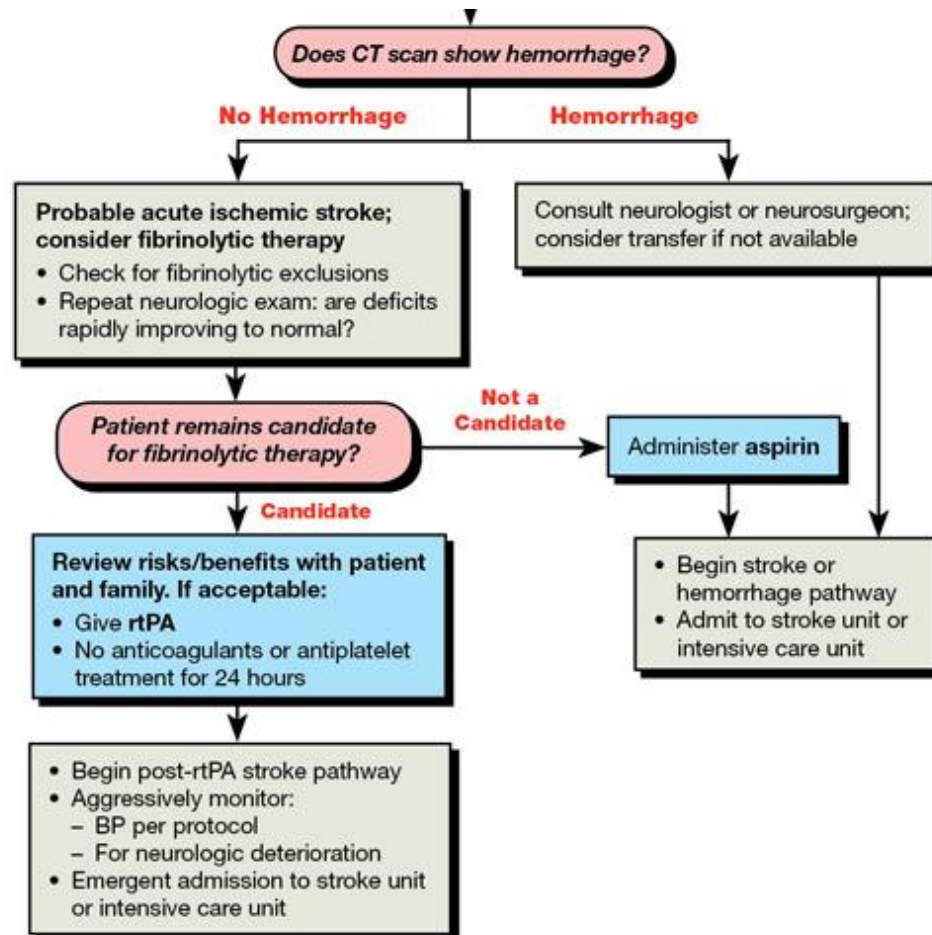
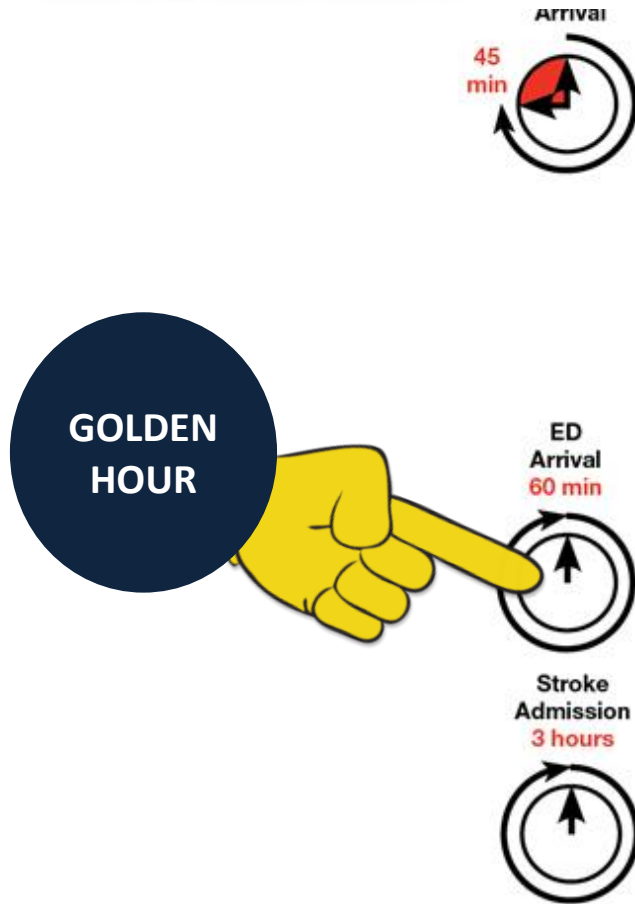
Stroke Mimics

Psychogenic	Lack of objective cranial nerve findings, neurological findings in a nonvascular distribution, inconsistent examination
Seizures	History of seizures, witnessed seizure activity, postictal period
Hypoglycemia	History of diabetes, low serum glucose, decreased level of consciousness
Migraine with aura (complicated migraine)	History of similar events, preceding aura, headache
Hypertensive encephalopathy	Headache, delirium, significant hypertension, cortical blindness, cerebral edema, seizure
Wernicke's encephalopathy	History of alcohol abuse, ataxia, ophthalmoplegia, confusion
CNS abscess	History of drug abuse, endocarditis, medical device implant with fever
CNS tumor	Gradual progression of symptoms, other primary malignancy, seizure at onset
Drug toxicity	Lithium, phenytoin, carbamazepine



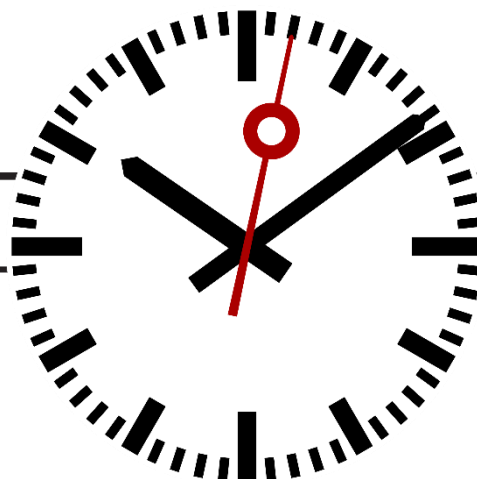
STROKE TEAM

ACUTE STROKE PATHWAY





EMERGENCY DEPARTMENT



Action

Time

Door to physician

≤10 minutes

Door to stroke team

≤15 minutes

Door to CT initiation

≤25 minutes

Door to CT interpretation

≤45 minutes

Door to drug (≥80% compliance)

≤60 minutes

Door to stroke unit admission

≤3 hours

CT indicates computed tomography; and ED, emergency department.

Source: Bock.⁹⁶

ACUTE STROKE PATHWAY



STROKE TEAM

Table 8. Immediate Diagnostic Studies: Evaluation of a Patient With Suspected Acute Ischemic Stroke

All patients

- Noncontrast brain CT or brain MRI
- Blood glucose
- Oxygen saturation
- Serum electrolytes/renal function tests*
- Complete blood count, including platelet count*
- Markers of cardiac ischemia*
- Prothrombin time/INR*
- Activated partial thromboplastin time*
- ECG*

Selected patients

- TT and/or ECT if it is suspected the patient is taking direct thrombin inhibitors or direct factor Xa inhibitors
- Hepatic function tests
- Toxicology screen
- Blood alcohol level
- Pregnancy test
- Arterial blood gas tests (if hypoxia is suspected)
- Chest radiography (if lung disease is suspected)
- Lumbar puncture (if subarachnoid hemorrhage is suspected and CT scan is negative for blood)
- Electroencephalogram (if seizures are suspected)

TEST
SERIES



ACUTE STROKE PATHWAY



STROKE TEAM

Table 10. Inclusion and Exclusion Characteristics of Patients With Ischemic Stroke Who Could Be Treated With IV rtPA Within 3 Hours From Symptom Onset

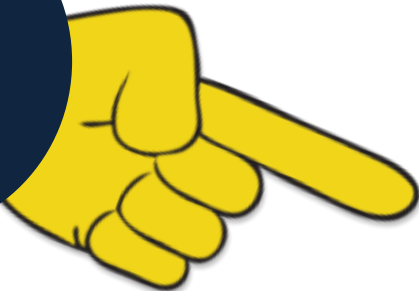
Inclusion criteria

- Diagnosis of ischemic stroke causing measurable neurological deficit
- Onset of symptoms <3 hours before beginning treatment
- Aged ≥ 18 years

Exclusion criteria

- Significant head trauma or prior stroke in previous 3 months
- Symptoms suggest subarachnoid hemorrhage
- Arterial puncture at noncompressible site in previous 7 days
- History of previous intracranial hemorrhage
- Intracranial neoplasm, arteriovenous malformation, or aneurysm
- Recent intracranial or intraspinal surgery
- Elevated blood pressure (systolic >185 mm Hg or diastolic >110 mm Hg)
- Active internal bleeding
- Acute bleeding diathesis, including but not limited to
- Platelet count $<100\,000/\text{mm}^3$
- Heparin received within 48 hours, resulting in abnormally elevated aPTT greater than the upper limit of normal
- Current use of anticoagulant with INR >1.7 or PT >15 seconds
- Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (such as aPTT, INR, platelet count, and ECT; TT; or appropriate factor Xa activity assays)
- Blood glucose concentration <50 mg/dL (2.7 mmol/L)
- CT demonstrates multilobar infarction (hypodensity $>1/3$ cerebral hemisphere)

INCLUSION
EXCLUSION
T<3 HRS



ACUTE STROKE PATHWAY



STROKE TEAM

Relative exclusion criteria

Recent experience suggests that under some circumstances—with careful consideration and weighting of risk to benefit—patients may receive fibrinolytic therapy despite 1 or more relative contraindications. Consider risk to benefit of IV rtPA administration carefully if any of these relative contraindications are present:

Only minor or rapidly improving stroke symptoms (clearing spontaneously)

Pregnancy

Seizure at onset with postictal residual neurological impairments

Major surgery or serious trauma within previous 14 days

Recent gastrointestinal or urinary tract hemorrhage (within previous 21 days)

Recent acute myocardial infarction (within previous 3 months)

INCLUSION
EXCLUSION
T<3 HRS

ACUTE STROKE PATHWAY



STROKE TEAM

ACUTE STROKE PATHWAY

Table 11. Additional Inclusion and Exclusion Characteristics of Patients With Acute Ischemic Stroke Who Could Be Treated With IV rtPA Within 3 to 4.5 Hours From Symptom Onset

Inclusion criteria

- Diagnosis of ischemic stroke causing measurable neurological deficit
- Onset of symptoms within 3 to 4.5 hours before beginning treatment

Relative exclusion criteria

- Aged >80 years
- Severe stroke (NIHSS>25)
- Taking an oral anticoagulant regardless of INR
- History of both diabetes and prior ischemic stroke

INCLUSION
EXCLUSION
T= 3-4.5 HRS



STROKE TEAM

Table 12. Treatment of Acute Ischemic Stroke: Intravenous Administration of rtPA

Infuse 0.9 mg/kg (maximum dose 90 mg) over 60 minutes, with 10% of the dose given as a bolus over 1 minute.

Admit the patient to an intensive care or stroke unit for monitoring.

If the patient develops severe headache, acute hypertension, nausea, or vomiting or has a worsening neurological examination, discontinue the infusion (if IV rtPA is being administered) and obtain emergent CT scan.

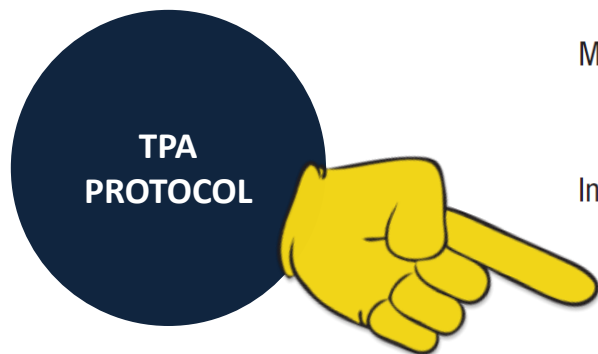
Measure blood pressure and perform neurological assessments every 15 minutes during and after IV rtPA infusion for 2 hours, then every 30 minutes for 6 hours, then hourly until 24 hours after IV rtPA treatment.

Increase the frequency of blood pressure measurements if systolic blood pressure is >180 mm Hg or if diastolic blood pressure is >105 mm Hg; administer antihypertensive medications to maintain blood pressure at or below these levels (Table 8).

Delay placement of nasogastric tubes, indwelling bladder catheters, or intra-arterial pressure catheters if the patient can be safely managed without them.

Obtain a follow-up CT or MRI scan at 24 hours after IV rtPA before starting anticoagulants or antiplatelet agents.

CT indicates computed tomography; IV, intravenous; MRI, magnetic resonance imaging; and rtPA, recombinant tissue plasminogen activator.





STROKE TEAM

Table 9. Potential Approaches to Arterial Hypertension in Acute Ischemic Stroke Patients Who Are Candidates for Acute Reperfusion Therapy

Patient otherwise eligible for acute reperfusion therapy except that BP is $>185/110$ mm Hg:

Labetalol 10–20 mg IV over 1–2 minutes, may repeat 1 time; or

Nicardipine 5 mg/h IV, titrate up by 2.5 mg/h every 5–15 minutes, maximum 15 mg/h; when desired BP reached, adjust to maintain proper BP limits; or

Other agents (hydralazine, enalaprilat, etc) may be considered when appropriate

If BP is not maintained at or below 185/110 mm Hg, do not administer rtPA

Management of BP during and after rtPA or other acute reperfusion therapy to maintain BP at or below 180/105 mm Hg:

Monitor BP every 15 minutes for 2 hours from the start of rtPA therapy, then every 30 minutes for 6 hours, and then every hour for 16 hours

If systolic BP >180 –230 mm Hg or diastolic BP >105 –120 mm Hg:

Labetalol 10 mg IV followed by continuous IV infusion 2–8 mg/min; or

Nicardipine 5 mg/h IV, titrate up to desired effect by 2.5 mg/h every 5–15 minutes, maximum 15 mg/h

If BP not controlled or diastolic BP >140 mm Hg, consider IV sodium nitroprusside

BP
CONTROL



ACUTE STROKE PATHWAY

GUIDELINES 2013



AHA/ASA Guideline

Guidelines for the Management of Spontaneous Intracerebral Hemorrhage

**A Guideline for Healthcare Professionals From the American Heart
Association/American Stroke Association**

*The American Academy of Neurology affirms the value of this guideline as an educational
tool for neurologists.*

*The American Association of Neurological Surgeons and the Congress of Neurological
Surgeons have reviewed this document and affirm its educational content.*



EMERGENCY DEPARTMENT

Table 4. Integral Components of the History, Physical Examination, and Work-Up of the Patient With ICH in the ED

	Comments
History	
Time of symptom onset (or time the patient was last normal)	
Initial symptoms and progression of symptoms	
Vascular risk factors	Hypertension, diabetes, hypercholesterolemia, and smoking
Medications	Anticoagulants, antiplatelet agents, decongestants, antihypertensive medications, stimulants (including diet pills), sympathomimetics
Recent trauma or surgery	Carotid endarterectomy or carotid stenting in particular, as ICH may be related to hyperperfusion after such procedures
Dementia	Associated with amyloid angiopathy
Alcohol or illicit drug use	Cocaine and other sympathomimetic drugs are associated with ICH, stimulants
Seizures	
Liver disease	May be associated with coagulopathy
Cancer and hematologic disorders	May be associated with coagulopathy

**ICH
ASSESSMENT**

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

Physical examination

Vital signs

Fever is associated with early neurologic deterioration¹⁰

Higher initial blood pressure is associated with early neurologic deterioration and increased mortality¹¹

A general physical examination focusing on the head, heart, lungs, abdomen, and extremities

A thorough but time-urgent neurologic examination

A structured examination such as the National Institutes of Health Stroke Scale can be completed in minutes and provides a quantification that allows easy communication of the severity of the event to other caregivers. GCS score is similarly well known and easily computed, and the initial GCS score is a strong predictor of long-term outcome.^{12,13} These can be supplemented as needed

ICH
ASSESSMENT

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

ICH ASSESSMENT

Serum and urine tests

Complete blood count, electrolytes, blood urea nitrogen and creatinine, and glucose

Prothrombin time or INR and an activated partial thromboplastin time

Higher creatinine is associated with hematoma expansion. Higher serum glucose is associated with hematoma expansion and worse outcome (although there are no data to suggest that normalization improves outcome)^{11,14}

Warfarin-related hemorrhages are associated with an increased hematoma volume, greater risk of expansion, and increased morbidity and mortality¹⁵⁻¹⁷

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

ICH ASSESSMENT

Toxicology screen in young or middle-aged patients to detect cocaine and other sympathomimetic drugs of abuse

Urinalysis and urine culture and a pregnancy test in a woman of childbearing age

Other routine tests

ECG

Chest radiograph

Cocaine and other sympathomimetic drugs are associated with ICH

To assess for active coronary ischemia or prior cardiac injury that may indicate poor cardiac function and to obtain a baseline in the event of cardiopulmonary issues during hospitalization

ACUTE STROKE PATHWAY



EMERGENCY DEPARTMENT

BP MANAGEMENT

Table 6. Suggested Recommended Guidelines for Treating Elevated BP in Spontaneous ICH

1. If SBP is >200 mm Hg or MAP is >150 mm Hg, then consider aggressive reduction of BP with continuous intravenous infusion, with frequent BP monitoring every 5 min.
2. If SBP is >180 mm Hg or MAP is >130 mm Hg and there is the possibility of elevated ICP, then consider monitoring ICP and reducing BP using intermittent or continuous intravenous medications while maintaining a cerebral perfusion pressure ≥ 60 mm Hg.
3. If SBP is >180 mm Hg or MAP is >130 mm Hg and there is not evidence of elevated ICP, then consider a modest reduction of BP (eg, MAP of 110 mm Hg or target BP of 160/90 mm Hg) using intermittent or continuous intravenous medications to control BP and clinically reexamine the patient every 15 min.

Note that these recommendations are Class C. SBP indicates systolic blood pressure; MAP, mean arterial pressure.

GUIDELINES 2015



Stroke

JOURNAL OF THE AMERICAN HEART ASSOCIATION



2015 AHA/ASA Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

William J. Powers, Colin P. Derdeyn, José Biller, Christopher S. Coffey, Brian L. Hoh, Edward C. Jauch, Karen C. Johnston, S. Claiborne Johnston, Alexander A. Khalessi, Chelsea S. Kidwell, James F. Meschia, Bruce Ovbiagele and Dileep R. Yavagal
on behalf of the American Heart Association Stroke Council



STROKE TEAM

Endovascular Interventions

1. Patients eligible for intravenous r-tPA should receive intravenous r-tPA even if endovascular treatments are being considered (*Class I; Level of Evidence A*). (Unchanged from the 2013 guideline)
2. Patients should receive endovascular therapy with a stent retriever if they meet all the following criteria (*Class I; Level of Evidence A*). (New recommendation):
 - (a) prestroke mRS score 0 to 1,
 - (b) acute ischemic stroke receiving intravenous r-tPA within 4.5 hours of onset according to guidelines from professional medical societies,
 - (c) causative occlusion of the internal carotid artery or proximal MCA (M1),
 - (d) age ≥ 18 years,
 - (e) NIHSS score of ≥ 6 ,
 - (f) ASPECTS of ≥ 6 , and
 - (g) treatment can be initiated (groin puncture) within 6 hours of symptom onset

ENDOVASCULAR
GUIDELINES

ACUTE STROKE PATHWAY

Endovascular treatment for acute ischaemic stroke in routine clinical practice: prospective, observational cohort study (MR CLEAN Registry)

[Ivo G H Jansen](#), medical researcher, [Maxim J H L Mulder](#), medical researcher, and [Robert-Jan B Goldhoorn](#), medical researcher, for the MR CLEAN Registry investigators

Correspondence to: I G H Jansen i.g.jansen@amc.nl

Accepted 2018 Feb 21.

16 centres that perform endovascular treatment in the Netherlands.

Participants

1488 patients included in the Multicentre Randomised Controlled Trial of Endovascular Treatment for Acute Ischaemic Stroke in the Netherlands (MR CLEAN) Registry who had received endovascular treatment, including stent retriever thrombectomy, aspiration, and all alternative methods for acute ischaemic stroke within 6.5 hours from onset of symptoms between March 2014 and June 2016.

TRIAL = REGISTRY

A statistically significant shift was observed towards better functional outcome in patients in the MR CLEAN Registry compared with the MR CLEAN trial intervention arm (adjusted common odds ratio 1.30, 95% confidence interval 1.02 to 1.67) and the MR CLEAN trial control arm (1.85, 1.46 to 2.34). The reperfusion rate, with successful reperfusion defined as a score of 2B-3 on the extended thrombolysis in cerebral infarction score, was 58.7%, the same as for patients in the MR CLEAN trial. Duration from onset of stroke to start of endovascular treatment and from onset of stroke to successful reperfusion or last contrast bolus was one hour shorter for patients in the MR CLEAN Registry. Symptomatic intracranial haemorrhage occurred in 5.8% of patients in the MR CLEAN Registry compared with 7.7% in the MR CLEAN trial intervention arm and 6.4% in the MR CLEAN trial control arm.

CANDIDATES FOR ICU

- Patients who present within 3-hr window and receive IV tPA.
- Patients who present within 3-9 hr window and receive experimental therapies.
- Patients with massive stroke and cytotoxic brain edema.
- Stroke complicated by respiratory failure, myocardial decompensation or uncontrollable hypertension.
- Stroke with large mismatch between core infarction and territory at risk requiring complex hemodynamic management.

ICU CARE BUNDLE

- Airway
- Breathing
- Circulation
- DVT
- Investigate, Intervene, Iterate
- Edema
- Fever
- Glucose
- Heart

ICU CARE BUNDLE

	Admission Day / / Day 0-1 (1st 24 hrs) ER to NICU		Day 2 / / NICU/WARD	Day 3 / / NICU/General Floor
Goals/ Outcomes	Identify acute ischemic stroke patient Document time of symptom onset Evaluate for treatment options and/or clinical trial Avoid aspiration NIH Stroke Scale (NIHSS)----- Barthel Index----- mRS_____		Neuro status stabilized/improved Avoid medical complications (Aspiration, Fever, Infection) Initial diagnostic tests results documented Rehab therapies initiated as appropriate tPA pts transferred from NICU to ward	Neuro status stabilized/improved Avoid medical complications Diagnostic tests documented Rehab therapies continued as appropriate Pt/Family understands disease process Transfer from NICU→ Floor Discharge if appropriate NIH Stroke Scale (NIHSS)----- Barthel Index----- mRS_____
Laboratory / Diagnostic tests	STAT CT Brain Without contrast EKG CXR Carotid Doppler 2D-Echocardiogram To consider: MRI/MRA Trans Cranial Doppler	RP 1 Coagulation profile Urine Analysis if febrile To consider : Thrombophilia profile (if age < 55; venous infarct)	Fasting Lipid Profile Fasting Homocysteine level Follow up on abnormal tests as needed PTT daily if on Heparin PT/INR daily if on Warfarin If pt received tPA: CT Brain without contrast To consider: • MRI/MRA • CT Angiogram • Trans Cranial Doppler (if Vertebral Basilar Circulation) • Trans Esophageal Echocardiography	PTT, if on heparin PT/INR if on Warfarin Follow-up abnormal tests To consider: • Angiogram • CXR if required • Fever work up if required
Assessments/ RN Interventions	Ventilator Support as per Unit/tPA protocol Neuro check as per Unit/tPA protocol Cardiac monitoring Continuous Pulse Ox, and titrate O2 to keep SpO2> 95% Bowel/Bladder/Skin assessment Avoid Foley cath Compression boots (unless anticoagulated) Head of Bed up 30°/Aspiration precautions Institute Falls Risk Precautions Barthel Index completed and documented Intubation/Ventilation Chest Therapy		Ventilator Support and Neuro checks as per unit protocol Cardiac monitoring Continuous pulse Ox, and titrate O2 to keep SpO2 > 95 % Bowel/Bladder/Skin assessment Avoid Foley catheter Compression boots (unless anticoagulate) Head of Bed up 30°/Aspiration precautions Pulmonary toilet Turn q2° if pt on bed rest Range of Motion as per Rehab if paralysis exists Hand/Foot splint as per Rehab as needed Ventilator/Chest therapy	Ventilator Support and Neuro checks as per Unit protocol Cardiac monitoring Continuous Pulse Ox and titrate O2 to keep SpO2 > 95 % Bowel/Bladder/Skin assessment Avoid Foley catheter Compression boots (Unless anticoagulated) Head of Bed up 30°/Aspiration precautions Turn q2° if pt on bed rest Range of Motion as per Rehab if paralysis exists Hand/Foot splint as per Rehab as needed To consider: • Discontinue cardiac monitor & Pulse Ox & transfer to floor or Discharge to home

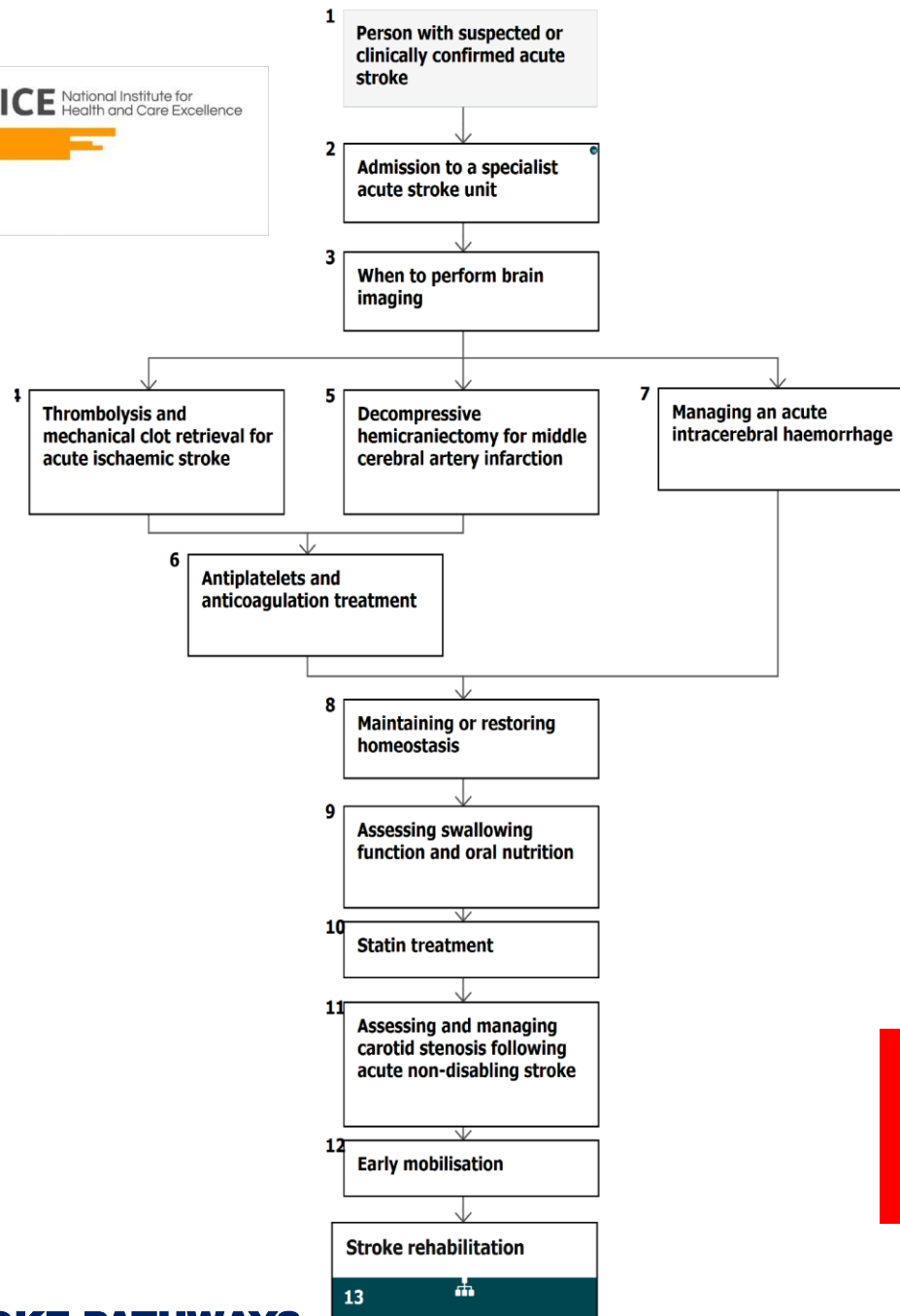
	Admission Day / / Day 0-1 (1st 24 hrs) ER to NICU	Day 2 / / NICU/WARD	Day 3 / / NICU/General Floor
Medications/ Treatments	IV NSS Evaluate admission medications BP meds with parameters as needed Paracetamol 650 mg p.o./PR q 4° prn temp>100° Sliding scale insulin as needed Bowel regimen prn To consider <ul style="list-style-type: none"> • Antiplatelet treatment • IV Heparin • tPA (no ASA, Heparin, or Warfarin for 24 hrs- refer to tPA protocol) • Investigational drug (refer to protocol) 	Renew IV Fluids or IV to Heplock Reassess BP meds with parameters as needed Paracetamol 650 mg p.o./ PR q 4° prn temp>100° Sliding scale insulin as needed Bowel regimen prn Continue from Day One as needed: Antiplatelet therapy IV Heparin To consider: <ul style="list-style-type: none"> • Warfarin if indicated • If pt received tPA, begin antiplatelets therapy or Heparin as appropriate • Investigational drug follow protocol 	Renew IV Fluids or IV to Heplock or Discontinue IV Reassess BP meds with parameters as needed Paracetamol 650 mg p.o./ PR q 4° prn temp>100° Sliding scale insulin and restart diabetic regimen if appropriate Bowel regimen prn Continue as appropriate: Antiplatelet therapy IV Heparin→Warfarin
Consults	Notify case manager on admission Notify social worker on admission Consult as needed <ul style="list-style-type: none"> • Physical Medicine & Rehabilitation (PMR) • Speech therapy • Primary MD • Cardiology 	Completion of consults ordered Day 1 Consult as needed: <ul style="list-style-type: none"> • Rehab Coordinator • Neuropsych • Neurosurgery • Vascular Surgery 	Completion of consults ordered Day 2 GI if feeding tube needed
Activity	Bed rest (Head of Bed up 30°) -or- Increase activity as tolerated To consider: Pt may come off monitor for testing or traveling to Rehab dept.	Bed Rest (Head of Bed up 30°) Increase activity as tolerated -or- Increase activity as per PM & R	Increase activity as tolerated -or- Pt. seen by Physiotherapist/Occupational therapist Increase activity per PM&R
Nutrition	Nutrition screen NPO/Aspiration precaution -or- Diet as recommended	NPO/Aspiration precautions Advance diet or per Dietician recommendations To consider: <ul style="list-style-type: none"> • Temporary feeding tube 	NPO/Aspiration precautions Tube feeding per dietician recommendations -or- Advance diet per Dietician Guidelines
Patient / Family Education Discharge Planning	Orient to unit routine Educate about disease process Educate about diagnostic tests and meds Discharge Planning Assessment initiated	Educate about diagnostic tests and meds Discuss discharge care options	Ongoing stroke education Start Warfarin teaching as needed Finalize disposition Plans (Home, Rehab) Discharge if appropriate

STROKE TEAM



Acute Stroke Team +/- dedicated, multidisciplinary Stroke Unit.

- Streamlining of care is single most important recommendation. Stroke Teams/Unit reduce death or dependency at 1 year from 62% to 56.4% (NNT 18), with an absolute risk reduction for mortality of 3% and need for institutional care by 2%.
- Features studied in trials include assessment and monitoring with protocols for medical, nursing and therapy; early management including physiological management, early mobilisation and nursing care; and multidisciplinary team rehabilitation.



STROKE PATHWAY



CONCLUDING THOUGHTS



www.acem2019delhi.com

ACEM 2019

NOVEMBER 7TH - 10TH, 2019
NEW DELHI, INDIA

THE 10TH ASIAN CONFERENCE
ON EMERGENCY MEDICINE



AFFORDABLE CARE



BRIDGING GAPS



CREATING IMPACT

STROKE PATHWAYS



thank you!

tamorish.kole@vpsrocklandhospitals.com