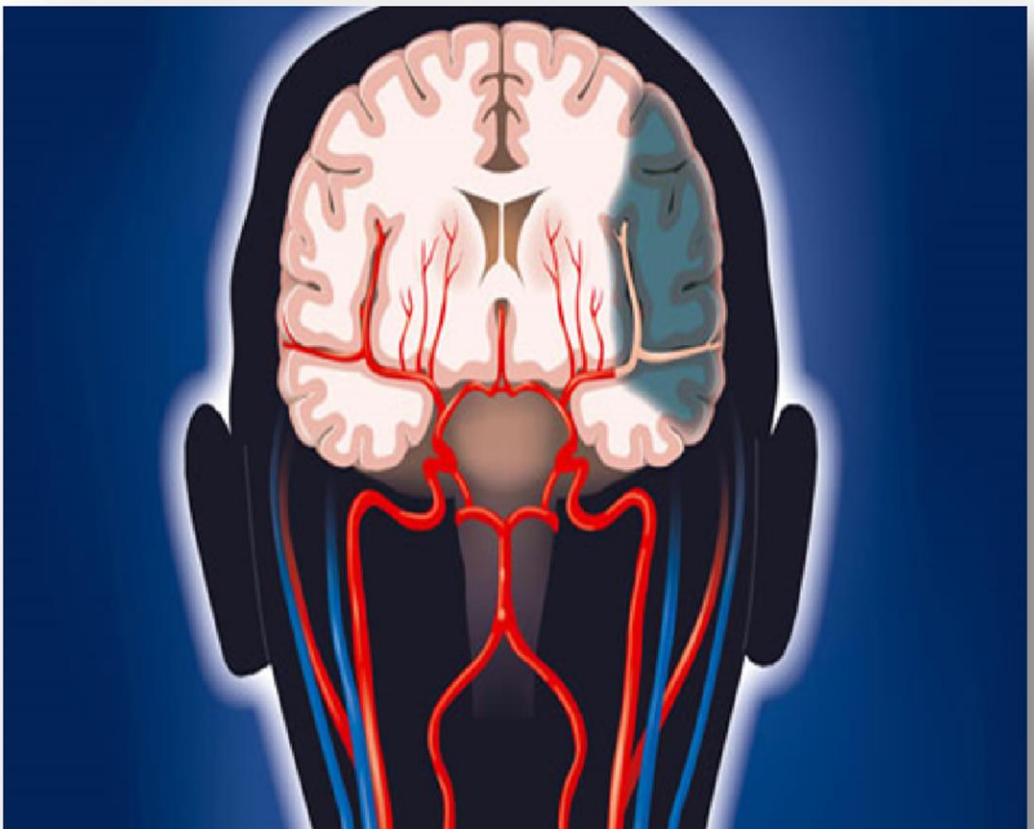
Government of Tamil Nadu
Department of Health & Family Welfare
National Health Mission

NATIONAL HEALTH MISSION
தேசிய நலவாழ்வு இயக்கம்
தமிழ்நாடு

TAMILNADU ACCIDENT & EMERGENCY CARE INITIATIVE
TAEI
Saving Lives Is Our Mission

Standard Operating Protocol for SCRIPT (Stroke Care and Rapid Intervention with Plasminogen activator and Thrombectomy)



Standard Operating Protocol
for SCRIPT
(**S**troke **C**are and **R**apid **I**ntervention with **P**lasminogen activator and **T**hrombectomy)

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Tamil Nadu Accident and Emergency Care Initiative
National Health Mission
Health and Family Welfare Department
Government of Tamil Nadu,
Chennai.

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Published by
Dr.Darez Ahamed, M.B.,B.S., I.A.S.,
Mission Director National Health Mission & Commissioner of Trauma Care
National Health Mission / State Health Society Tamil Nadu
5th Floor, DMS Annexe Building, DMS Complex,
369, Anna Salai, Teynampet, Chennai
Chennai-600 006.
EPBX Board No. [044] 24321310
Fax No. [044] 24320563
E-mail Address rchpcni[at]tn[dot]nic[dot]in

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Protocol Written by **Dr.R. Lakshmi Narasimhan**, M.D., D.M., Director & Professor of Neurology, Madras Medical College& Hospital, Chennai
Protocol Reviewed by (1) Dr. M. V. Padma Srivastava, Professor, Department of Neurology, All Indian Institute for Medical Sciences (2) Dr. DherajKhurana, In-charge Stroke Program & Professor, Department of Neurology, PGIMER, Chandigarh (3) Dr. Jeyaraj D. Pandian, Professor and Head, Department of Neurology, Christian Medical College& Hospital Ludhiana
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Design & Layout : Dr.J.Mariano Anto Bruno Mascarenhas, Technical Team Leader, TAEI

DEDICATION

to
All Patients
in
Emergency Departments

Whom we saved
&
Whom we failed to save

No greater opportunity, responsibility, or obligation can fall to the lot of a human being than to become a Emergency Department Personnel. In the care of the suffering, [the ED Personnel] needs technical skill, scientific knowledge, and human understanding. . .. Tact, sympathy, and understanding are expected of the ED Personnel, for the patient is no mere collection of symptoms, signs, disordered functions, damaged organs, and disturbed emotions. [The patient] is human, fearful, and hopeful, seeking relief, help, and reassurance.

Epigraph modified from

"No greater opportunity, responsibility, or obligation can fall to the lot of a human being than to become a physician. In the care of the suffering, [the physician] needs technical skill, scientific knowledge, and human understanding. . .. Tact, sympathy, and understanding are expected of the physician, for the patient is no mere collection of symptoms, signs, disordered functions, damaged organs, and disturbed emotions. [The patient] is human, fearful, and hopeful, seeking relief, help, and reassurance."

- Harrison's Principles of Internal Medicine, 1950

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Experts	NHM & TAEI	TNHSP & EMRI	IIT
Dr.R. Lakshmi Narasimhan, Script State Nodal Officer Director &Professor of Neurology, Madras Medical College& Hospital, Chennai Contact: lakshmineuro@gmail.com	Dr. DarezAhamed, I.A.S, Mission Director & Commissioner of Trauma care, National Health Mission, Tamil Nadu	Dr. (CAPT). M. Kamatchi Meenachisundaram Expert Advisor, TNHSP	Prof. Venkatesh Balasubramanian IIT Madras
Dr. M. V. Padma Srivastava, Professor, Department of Neurology, All Indian Institute for Medical Sciences	Dr.S.Gurunathan State Programme Manager (TAEI) & Joint Director	Dr.S.K.Thirunavukarasu Joint Director 108 & Joint Director (Admin), TAEI TNHSP	Thiru. Shanmugavel Consultant, IITM
Dr. DherajKhurana, In-charge Stroke Program & Professor, Department of Neurology, PGIMER, Chandigarh	Dr. J Mariano Bruno Mascarenhas Neuro Surgeon Technical Team Leader, TAEI	Thiru. M. Selvakumar State Head of Operations TN-EMRI, Chennai	Ms. Priya Natarajan Department of Engineering Design, IITM
Dr. Jeyaraj D. Pandian, Professor and Head, Department of Neurology, Christian Medical College& Hospital Ludhiana	Dr.Hamsadvani Kunganathan, Technical Consultant- UNICEF, National Health Mission	Dr. M. Seshathri Care Head TN- EMRI	Ms. Gayathri DS Department of Engineering Design, IITM
	Dr. Arthur Amit Suryakumar Assistant Program Officer, TAEI	Dr. P. Sivagurunathan Head, 104, EMLC	Thiru. Ajit Raghavendra Department of Engineering Design, IITM
	Dr.Kathirvel Assistant Program Officer, TAEI	Thiru. Karthikeyan M Biomedical Engineer	
	Tmt. Jeyalydia Wester Consultant, TAEI		
	Thiru. M. Manikandan Consultant, TAEI		
	Thiru. G. Prabakar HMIS Expert, TAEI		
	Dr. Suseendar KK Project Manager, AITSC		
	Mr. M. Neelakandan State Cosultant of SCRIPT		

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Background

National program for prevention and control of cancer, diabetes, cardiovascular diseases and stroke, targets to reduce the burden of non-communicable diseases (NCDs) through widespread IEC/BCC, screening of the populations for various NCDs and finally timely treatment and rehabilitation of patients suffering from them.

Stroke is an important component of the national NCD strategy. Stroke usually affects individuals later in the life (mostly after 60 years of age). But recently, it has been observed that even younger population are becoming prone to stroke mostly due to unhealthy life style, raised blood pressure or diabetes which occur due to stress and strains of modern day life. Stroke occurs when poor blood flow to the brain results in cell death. Stroke is a highly debilitating affliction that can result in partial or substantial loss of mental and physical faculties. The main risk factor for stroke is high blood pressure, cholesterol and diabetes. In 2013, stroke was the second most frequent cause of death after coronary artery disease, accounting for 6.4 million deaths (12% of the total) [GBD 2013 Mortality and causes of death]

Early initiation of treatment for stroke, preferably within the first hour, can significantly reduce its adverse effects by minimizing the damage to the brain. It, therefore, becomes imperative that diagnosis and treatment for stroke is available for the sufferers in the shortest possible time.

At present the treatment for stroke is available only at the tertiary care centers, i.e. hospitals attached to Medical Colleges (both public and private), Corporate hospitals (where treatment is very costly and is beyond the reach of a common man) and some private nursing homes or multi-specialty hospitals (which are also costly for an average patient). The State of Tamil Nadu has therefore, decided to provide the treatment of stroke at free of cost at district hospitals, where the CT scan and services of medical specialists are available. In the first instance, Chengalpet Medical College, District Headquarters Hospital, Kanchipuram will be covered due to the availability of scan in the Chengalpet Medical College and District hospital, Kanchipuram. For this purpose, the expert advice is being provided by Dr. R. Lakshmi Narasimhan, Professor, Institute of Neurology, Madras Medical College, Chennai.

Stroke Management Algorithm

The stroke management at the district level will be taken care of by a trained team (Stroke team) consisting of:

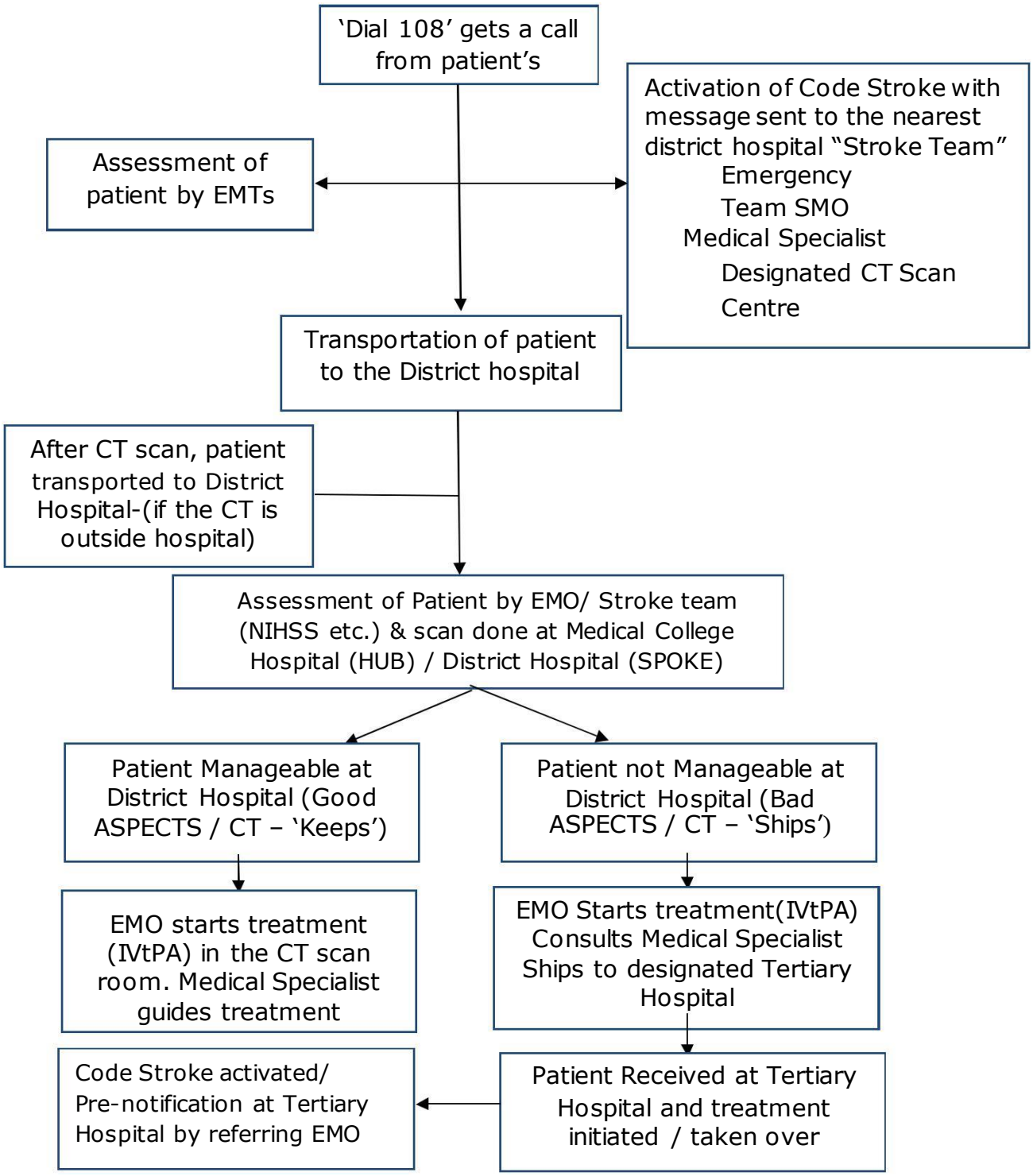
1) Radiologist: for conducting and interpreting a CT Scan on every suspected patient as early as possible.
2) Emergency Medical Officer: Emergency Medical Officers will have an important role in the management of stroke patients. Being first assessors of the patient they will be required to take quick and important decisions regarding management of these patients. Their training would be focused on a rapid triage and activation of stroke team.
3) Staff Nurses: Staff nurses working in the Emergency rooms of the district hospitals would be trained in rapid assessment and institution of immediate care (Measuring RBS, INR, setting up of 2 IV cannulas, starting the patient on oxygen, etc.) of the stroke patients. They would also be trained in the post-thrombolysis monitoring which is an extremely vital part of acute stroke care.
4) Medical Specialist/Neurologist: Initially, the medical specialist at the district hospitals would be responsible for giving treatment to stroke patients and later on, if and whenever neurologists become available, they will take over. They should be responsible for organizing the stroke team and review their functioning in the respective hospitals.

Role of '108 Ambulance' Service

'Dial 108' ambulance service will play a very important role in the total management of the stroke patients.

- Shifting of suspected stroke patients at the earliest to the nearest District/ Medical College hospital with capabilities of 24X7 CT scan
- Early Management of the patient during transport

Stroke Management Protocol



Code Stroke

An alert system will send a message to the concerned team of the hospital to which the patient is planned to be shifted. This pre-notification will be an important step for team activation to facilitate early treatment initiation in the Emergency room of the admitting hospital. This activation will be carried out by the paramedic or a central system to activate the "Stroke Team" of the hospital to which the stroke patient is being shifted.

Role of Medical colleges/ Tertiary care hospitals

Medical colleges in the state, both public and private, would act as Hubs for treatment of stroke patients referred from district/taluk hospitals which have CT scan facilities (Spokes). These medical colleges along with few key District hospitals would also act as mentors for the doctors working at the various district level stroke units and provide them tertiary level support.

A protocol will be available based upon which it will be possible to decide whether the patient needs to be shifted to the hub ("Drip and Ship") or can be managed at least during the acute stage in the spoke ("Drip and keep")

Acute Ischemic Stroke Management Protocols

Stroke is defined as sudden focal or global neurologic deficit of vascular origin lasting greater than 1 hour. If symptoms are fully reversible in <1 hour, it should be labelled as Transient Ischemic Attack (TIA).

Recognizing stroke

1) Sudden onset of weakness of one half of the body or one part of the body
2) Sudden onset of inability or difficulty in speech or sudden trouble understanding
3) Sudden onset of imbalance
4) Sudden onset of blindness
5) Sudden onset of dizziness or spinning
6) Sudden severe headache
7) Sudden loss of consciousness
8) Sudden numbness in one half of the body

Protocols

I) Protocol for IV Thrombolysis for Acute Ischemic Stroke (AIS)

II) Protocol for blood pressure management (In patients considered for thrombolysis)

III) Protocol for Stroke Unit Monitoring

V) Protocol for Swallowing Test: (To be carried out by the stroke nurse on a daily basis)

VI) Essential Elements to Designate a Primary Stroke Center:

VII) Protocol for Management of stroke at Basic Stroke Care Center: (Stroke ready hospitals)

VIII) Protocol for Referral to Primary Stroke Center

IX) Protocol for Management at Primary Stroke Center

X) Referral to Tertiary Center (Hub)

I) Protocol for IV Thrombolysis for Acute Ischemic Stroke (AIS)

Imaging protocol

A non-contrast CT scan should be carried out at the earliest in case of suspicion of stroke. CT Angiography is not mandatory – however if available it should be included along with the non-contrast CT scan for vascular assessment. CT perfusion is not needed.

CT scan signs of early ischemic stroke:

1) Hyperdense middle cerebral artery sign
2) Obscuration of lentiform nuclei
3) Obliteration of insular ribbon
4) Grey matter swelling

Presence of these early signs is not mandatory to initiate treatment. These may only be indicative of ensuing damage. A normal CT scan is not exclusion to tPA.

ASPECT score may be used to predict the risk of complications in stroke patients. (ASPECT <6 maybe indicative of high risk and patient may be referred to higher center)

Inclusion criteria (Must be all YES)

1) Age >18 years
2) Time of onset well established to be less than 4.5 hours
3) Clinical diagnosis of ischemic stroke with neurologic deficit
4) Head non-contrast CT scan (NCCT) without hemorrhage.
5) Consent form/risks/benefits: Discussed and documented in chart
6) Premorbid modified ranking scale < 3

Things not to do in patients after starting:

1) No nasogastric tube (NGT) insertion

2) No urinary catheter insertion

These can be inserted during the initial evaluation before starting thrombolysis (As patients might eventually require it and thrombolysis may prevent their insertion)

Exclusion criteria (Must be all NO)

1) SBP >185mm Hg or DBP > 110mm Hg despite simple measures to lower it acutely. (i.e. after 2 doses of labetalol 10-20mg)
2) Coma or severe obtundation
3) Stroke or head trauma in last 3 months
4) Symptoms of subarachnoid hemorrhage/ history of intracranial hemorrhage
5) Gastrointestinal/urinary or respiratory hemorrhage in last 21 days.
6) Known bleeding diathesis/peritoneal or hemodialysis
7) Major surgery within last 14 days
8) Arterial puncture at a non-compressible site within last 7 days
9) MI in the last 6 weeks
10) INR > 1.7
11) RBS <50 and>400mg%

Regimen for treatment of acute ischemic stroke with IVtPA:

1) Insert two IV lines in emergency department- one for rtPA and other for IV fluids and labetalol infusion or contrast for CTA, if needed.
2) Infuse rtPA 0.9mg/kg (maximum of 90mg) over 60 minutes with 10% of the dose given as a bolus dose over 1 minute
3) Admit the patient to CCU or a stroke unit for monitoring.

If CCU is NOT available, the patient can be managed in a ward with monitoring by Stroke nurse

4) Perform neurological assessment every 15 minutes during the infusion of rtPA and every 30 minutes for the next 6 hours and then every hour until 24 hours from treatment. The neurological assessments should be carried out by the stroke nurse or internist trained in NIHSS only.
5) If the patient develops severe headache, acute hypertension, nausea or vomiting, discontinue the infusion. (If agent is still being administered) and obtain a CT scan of the brain in emergent basis
6) Measure blood pressure every 15 minutes for the first 2 hours, every 30 minutes for the next 6 hours and then every hour until 24 hours from the initiation of the treatment.
7) Administer anti-hypertensive medications to maintain blood pressure at or below these levels. Maintain BP at <180/105 during rtPA infusion
   a) If diastolic BP is 105-120mm Hg or systolic BP is 180-220mm Hg, administer 10mg of labetalol intravenously over 1-2 minutes. The dose of labetalol may be repeated or doubled every 10-20 minutes to a maximum dose of 300mg/bradycardia

As an alternative, may start with the initial bolus dose of labetalol (20mg) and then follow with a continuous labetalol infusion at the rate of 2-8mg/min

   b) If diastolic BP is 121-140mm Hg or systolic BP >230 mm Hg, administer 10 mg of labetalol over 1-2 minutes. The dose of labetalol may be repeated or doubled every 10 minutes to a maximum dose of 300mg/bradycardia

As an alternative, may start with the initial bolus dose of labetalol (20mg) and then follow with a continuous labetalol infusion given at a rate of 2-8mg/min

If the blood pressure is not controlled, consider starting infusion of sodium nitroprusside

c) If diastolic blood pressure is >140 mm Hg, start infusion of sodium nitroprusside at a rate of 0.5mg/kg/min or nitroglycerin intravenously in drip

If not placed earlier, delay placement of nasogastric tubes, indwelling bladder catheters, or intra-arterial pressure catheters.

Intravenous rtPA (0.9mg/kg up to a maximum dose of 90mg) is strongly recommended for carefully selected patients who can be treated within 4.5 hours of onset of ischemic stroke and carries a grade A recommendation.

Intravenous administration of rtPA is currently the only FDA – approved therapy for treatment of patients with acute ischemic stroke. Early initiation of therapy for treatment (i.e. within 90 minutes) may be more likely to result in a favorable outcome. Treatment with rtPA is associated with symptomatic intracranial hemorrhage, which can be fatal (Level I). Close observation and monitoring of the patient and early management of arterial hypertension are critical. The use of anticoagulants and antiplatelet agents should be delayed for 24 hours after treatment.

A repeat CT head is needed after 24 hours or whenever there is any neurological deterioration. The staff should be vigilant and able to detect any deterioration in the condition of the patient

Antiplatelet therapy can be started if there is no hemorrhage in CT scan (small petechial hemorrhages are not a contradiction to start anti platelet therapy)

Dose of rtPA:

0.9 mg/Kg: 10% Bolus over 1 minute - 90% infusion over 60 minutes

Do not give: Aspirin/Heparin/Warfarin/Clopidogrel or other antithrombotic drugs within 24 hours of thrombolysis

II. <u>Protocol for blood pressure management (In patients considered for thrombolysis)</u>

1) If systolic blood pressure is 180-230mm Hg or if diastolic blood pressure is 105-120mm Hg for two or more readings 5-10 minutes apart:

   a) Give intravenous labetalol 10mg over 1-2 minutes. The dose may be repeated or doubled every 10-20 minutes up to a total dose of 300mg.
   b) Monitor blood pressure every 15 minutes during the use of labetalol treatment and observe for development of hypotension.

2) If systolic blood pressure is greater than 230 mm Hg or if diastolic blood pressure is in the range of 121-140 mm Hg for two or more readings 5 to 10 minutes apart.

   a) Give intravenous labetalol 10mg over 1 to 2 minutes. The dose may be repeated or doubled every 10 minutes up to a total dose of 300mg

3) Monitor blood pressure every 15 minutes during the use of labetalol treatment and observe for development of hypotension.
4) If no satisfactory response, infuse sodium nitroprusside (0.5 to 10mcg/kg/minute)
5) Continue monitoring of blood pressure
6) If the diastolic blood pressure is greater than 140 mm Hg for two or more readings for 5 to 10 minutes apart, the following is recommended.
   a) Infuse sodium nitroprusside (0.5 to 10mcg/kg/minute)
   b) Monitor blood pressure every 15 minutes during the infusion of sodium nitroprusside and observe for development of hypotension

The use of continuous arterial monitoring is advised if sodium nitroprusside is used. Blood pressure management in patients with acute stroke NOT candidates for thrombolysis:

For candidates not considered for thrombolysis – the BP levels can be allowed up to 220/110 or a mean arterial pressure (MAP) of 130

DBP > 140mm Hg	Sodium nitroprusside 0.5 mcg/kg/minute Nitroglycerin infusion
SBP >220 (or) DBP 121-140 mm Hg (or) MAP >130 mm Hg	Labetalol 10-20 mg IVP over 1-2 min; may repeat and double every 10 min up to maximum dose of 150 mg (or) Labetalol 10-20 mg IVP over 1-2 min; may repeat and double every 10 min up to maximum dose of 150 mg
SBP <220 mm Hg (or) DBP 105-120 mm Hg (or) MAP < 130 mm Hg	Antihypertensive therapy is indicated only if, Acute Myocardial Infarction, Aortic Dissection, Severe CHF, or Hypertensive Encephalopathy, is present

III. Protocol for stroke unit monitoring

a) Cardiac monitoring is recommended to screen for atrial fibrillation and other potentially serious cardiac arrhythmias that would necessitate emergency cardiac interventions. (Class I; Level of evidence B)

b) Patients who have elevated blood pressure and are otherwise eligible for treatment with IV rtPA should have their blood pressure carefully lowered to 185/110 mm Hg (Class I; Level of Evidence B), before thrombolysis is initiated.

c) Airway support and ventilatory assistance are recommended for the treatment of patients with acute stroke who have decreased consciousness or who have bulbar dysfunction that causes compromise of the airway. (Class I; Level of Evidence C).

d) Supplemental oxygen should be provided to maintain oxygen saturation >94%. (Class I; Level of Evidence C).

e) Sources of fever should be identified and treated, and antipyretic medication should be administered to lower temperature in patients with fever. (Class I; Level of Evidence C).

f) In patients with markedly elevated blood pressure, who, do not receive thrombolysis, a reasonable goal is to lower blood pressure by 15% during the first 24 hours after onset of stroke. Consensus exists that medications should be withheld unless the systolic blood pressure is >220 mm Hg or the diastolic blood pressure is >120 mm Hg (Class I; Level of Evidence C).

g) Hypovolemia should be corrected with intravenous saline and cardiac arrhythmias that may reduce cardiac output should be corrected. (Class I; Level of Evidence C).

h) Hypoglycemia (blood glucose <60 mg/dL) should be treated in patients with AIS. (Class I; Level of Evidence C).

i) Restarting antihypertensive medications is reasonable after the first 24 hours for patients who have pre-existing hypertension and are neurologically stable unless a specific contraindication to restarting treatment is known. (Class IIa; Level of Evidence B).

j) Evidence indicates that persistent in-hospital hyperglycemia during the first 24 hours after stroke is associated with worse outcomes than normoglycemia and thus, it is reasonable to treat hyperglycemia to achieve blood glucose levels in a range of 140 to 180 mg/dL and toclosely monitor to prevent hypoglycemia in patients with AIS. (Class IIa; Level of Evidence C).

IV. Protocol for Audit

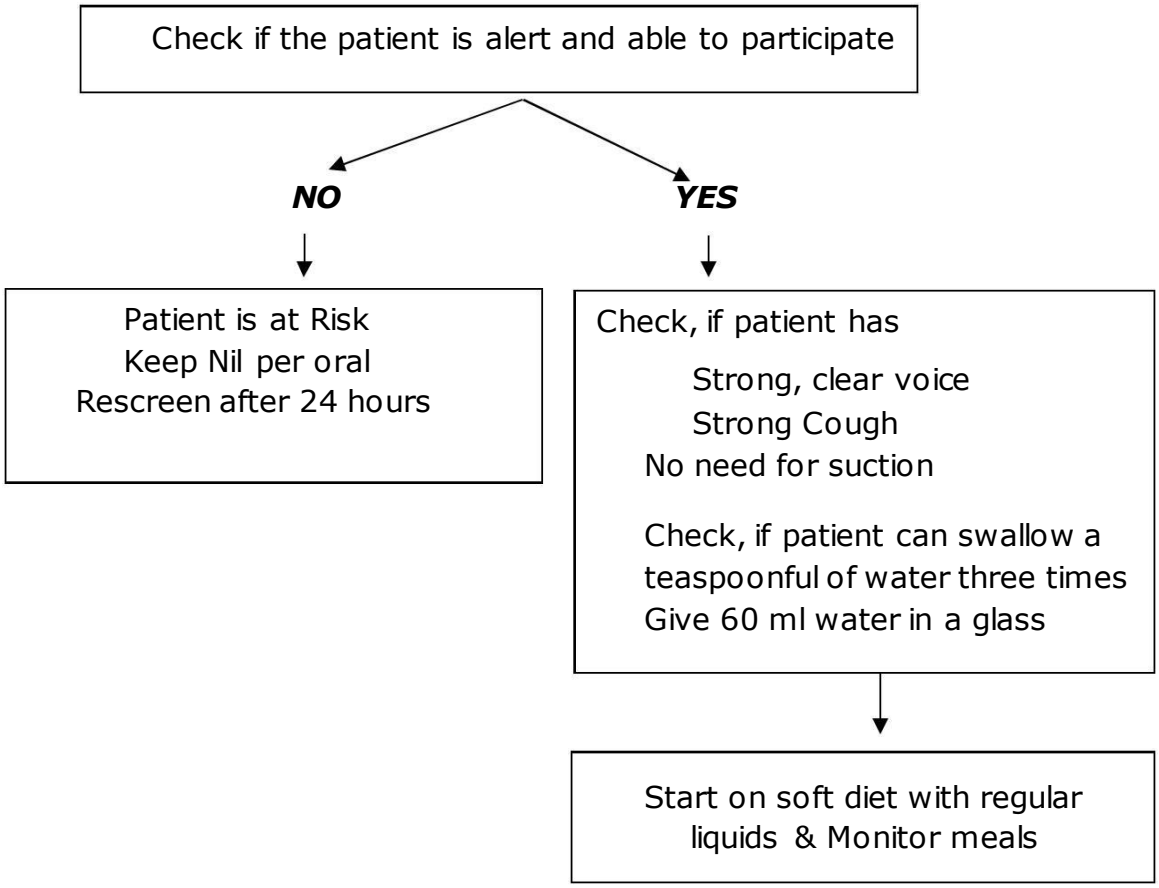
Standardized stroke performance measures

1) Demonstration that rtPA was considered
2) Recording all time points i.e, Time of stroke, time of reaching the hospital, time of CT scan, time of starting rtPA
3) Anti-thrombotic medication within 48 hours of hospitalization
4) Lipid profile during hospitalization
5) Deep vein thrombosis prophylaxis
6) Discharge on antithrombotics
7) Discharged on anti-hypertensives/anti-diabetic/lipid lowering medications
8) Anti-coagulation therapy for patients with Atrial fibrillation
9) Screen for dysphagia
10) Stroke education
11) Smoking and alcohol cessation
12) Demonstration that rehabilitation plan was considered.
13) Advise about follow-up

These measures should be maintained in a log book (indoor case file of the patient) for inspection at the end of three months. These would be required for quality improvement measures

V. Protocol for swallowing test: (To be carried out by the stroke nurse on a daily basis)

Before giving any oral feed to the patient it is important to conduct swallowing test. Position patient upright at 90 for screening



Signs of patient having difficulty in swallowing:

1) Gurgly, wet sounding voice
2) Coughing while swallowing
3) Left-over food in mouth

If NPO for three days and more: Start non-oral feeds such as naso-gastric tube feeding.

Prevention of deep vein thrombosis

This has to be started after 24 hours of thrombolysis or in case IV thrombolysis not done, it can be started within first 24 hours

Indications

Patient who have paralysis of lower limbs (unable to move the limb)

Unfractionated heparin 5000 U s/c BD or low molecular weight heparin (Enoxaparin 40mg s/c OD)

VI. Essential elements to designate a primary stroke center:

Patient Care Services	Support Services
1. Acute Stroke Team	1. Commitment, support of Director
2. Written Care Protocols	2. Neuroimaging Services
3. Emergency Medical Services	3. Lab Services
4. Stroke Unit (could be in ICU)	

Patient care services

A. Acute stroke team

1. Multi-disciplinary personnel with expertise in diagnosing and treating stroke; may include Emergency physician (EMO)

   (Will include the roster of emergency physician/personnel)

2. Minimum team should include an Emergency Stroke Physician and another healthcare provider (Stroke Nurse, etc.)
3. Someone from the team should be available 24×7
4. Team should have a logbook to track response times, diagnosis, treatments and outcomes of stroke

B. Written care protocols

1) Designed, adapted and utilized by the team; should include use of written protocols for patients eligible to receive IV rtPA treatment and other acute therapies such as stabilization of vital functions, and management of blood pressure in the emergency department
2) Protocols should also provide information regarding initial diagnostic tests and initial use of medications
3) The protocols should be reviewed/updated at least once per year
4) Team should have a logbook to track response times, diagnosis, treatments and outcome of stroke

C. Emergency medical services: (Pre-hospital assessment – 108)

1) Collaborative relationship between CCU which will serve as stroke units and emergency medical services personnel must be integrated to improve services and reduce transport delays
2) Calls for possible stroke should be assigned high priority for evaluation and transport into the emergency
3) Educational activities should be offered at least twice a year: This should be led by the Medical Specialist / Neurologist at the center

D. Emergency department physicians, nurses, etc

1) Personnel should be trained to diagnose and initiate treatment of acute stroke
2) Personnel should know about stroke team and its role
3) Emergency Department should document performance measures such as time from symptom onset to CT scan times and treatment
4) Educational activities for ED should occur at least twice a year to reinforce stroke diagnosis and treatment

E. Stroke Unit

1) Geographically distinct space can be provided within ER or ICU or medical or neurological ward, which must provide continuous telemetry or cardiac monitoring, written care protocols and BP monitoring at all times
2) Personnel should have expertise in managing strokes

<u>Support Services</u>

A. Neuroimaging services

1) CT scan
2) Should be available 24x7
3) Completed within 15 minutes of being ordered
4) Evaluation within 15 minutes

B. Laboratory Services

1) Emergency blood urea/ creatinine/ PT/ INR/ Platelet count/ Hemoglobin/ Serum Na/ Serum K
2) Available 24*7
3) Completed within 15-30 minutes of being ordered.

C. Essential equipment in emergency department

1) Pulse oximetry
2) Glucometer
3) INR point of care machine
4) BP instrument
5) EKG

D. Essential medication in emergency department specifically for stroke

1) Recombinant tissue plasminogen activator (rtPA) – 50 mg/20mg vials – 2
2) IV Labetalol
3) IV Sodium nitroprusside (to be used only if intraarterial monitoring is available)
4) IV Phenytoin
5) IV Nitroglycerin
6) 25% Glucose for Hypoglycemia and Insulin for Hyperglycemia.

VII. Protocol for management for stroke at basic stroke care center: (Stroke ready hospitals)

Stroke ready hospitals

At present the district hospitals should be designated as stroke ready hospitals which can provide basic care to all strokes being admitted. In addition, they should be able to diagnose type of stroke (ischemic/hemorrhagic) based on non-contrast CT scan and start basic care including tPA if patient fulfills criteria. They should be trained to identify patients which need to be referred to PSC.

1) Identification of stroke/TIA should be done
2) Blood glucose level, INR, haemogram, EKG to be done

3) Airway support is recommended for patients with acute stroke with decreased level of consciousness or compromised airway due to bulbar dysfunction

4) Oxygen by mask at the rate of 4-6 liters/ min should be started to maintain pulse oximetry >95%

5) Hypoglycemia/ Hyperglycemia in patients with acute stroke to be treated to achieve normoglycemia

6) Antiplatelet therapy, Aspirin (150 mg) to be given if CT rules out intracranial hemorrhage (possible only when CT is done)

7) Routine use of heparins in Acute Ischemic Stroke, including cardioembolic strokes is NOT recommended

8) Mild to moderately elevated blood pressure should not be treated routinely in the acute phase of stroke as this may worsen the outcome. A blood pressure level of >220/ 110 mm Hg should be treated with IV labetalol. (see BP protocol)

9) No drastic lowering of blood pressure in Acute Ischemic Stroke. Do not give sublingual nifedipine

10) Intravenous line with normal saline should be started. Do not give dextrose containing solutions

11) Swallowing assessment should be done prior to oral feeding

12) Fever in patients with acute stroke should be treated. The temperatures should be lowered with anti-pyretics

13) Nursing care should be directed to prevent pressure sores.

Rehabilitation including passive physiotherapy should be instituted from first day of stroke

VIII. Protocol for referral to Primary Stroke Center

Large district hospitals / medical colleges which fulfil requirements should be designated as PSCs. They will be receiving stroke patients directly and referred from stroke ready hospitals (DHs). They would be capable of handling most strokes and give care except the most complicated strokes which would be referred to tertiary care hospitals.

1) All stroke cases should undergo CT scan (if not available locally) to document ischemic versus hemorrhagic subtypes (mandatory for stroke prevention).
2) Altered consciousness
3) Severe headache
4) Uncontrolled seizures
5) Uncontrolled severe hypertension
6) Irregular breathing
7) Recurrent TIAs
8) Cardioembolic strokes for secondary prevention with anticoagulants and INR monitoring.

If patient is considered for shifting to PSC: A NG tube and catheter should be inserted and status communicated to PSC while patient is being shifted

IX. Protocol for management at Primary Stroke Center

1) Identification of acute stroke
2) All patients with acute stroke/TIA should have CT scan (plain) immediately and interpreted (within 30 minutes)
3) Basic investigations as suggested in Basic Stroke Care, plus platelets and PT/ INR should be sent out
4) Thrombolysis protocol where applicable
5) BP protocol where applicable
6) Routine use of corticosteroids, plasma volume expanders, not to be used
7) Treatment as listed in Basic Stroke Care to be followed
8) Swallowing assessment protocol should be applied
9) Antiplatelet therapy, Aspirin (150mg) should be given immediately for patients with Acute Ischemic Stroke, who are not candidates for thrombolytic therapy

X. Referral to Tertiary Center (Hub)

1) Acute ischemic strokes with large vessel involvement who, require bridging or intra-arterial therapies if, within the window period: These can be identified on basis of stroke severity. In general, all ischemic strokes with NIHSS > 12 should be considered as having large artery occlusion and possible candidates for bridging with Mechanical thrombectomy. These patients should be shifted after starting IV tPA if they fulfilled the conditions. The closest tertiary care hospital with facilities for mechanical thrombectomy should be notified and patient shifted

2) Large hemispheric infarct on CT scan, with impending herniation or malignant Middle Cerebral artery infarction, cases for decompression hemicraniectomy

3) Large intracerebral hemorrhage (only for bleeds close to surface) for decompression surgery

4) Cerebellar strokes in need of surgical intervention

5) Comprehensive evaluation for Stroke in young/ cardioemobolic strokes/ large vessel extra cranial disease/ recurrent strokes/ stroke of unknown etiology

6) Other special tests for Strokes in young patients: Prothrombotic work up, PFO testing, ELR.

   (5 and 6 may be shifted on an outpatient basis if they are stable)

Management Protocols for bleeding complications of thrombolysis

Intracranial Hemorrhage (ICH)

1) Symptoms and signs to suspect bleeding in the brain:
   a. Acute headache
   b. Change in sensorium
   c. Sudden hypertension or sudden hypotension
   d. Acute vomiting
   e. Increasing or fresh neurological deficits

   (Note that these features can be due to increasing infarct size and may not be due to intracranial hemorrhage)
2) If suspected, and the rtPA infusion is still on flow, discontinue rtPA infusion immediately.
3) Shift the patient for immediate plain CT head
4) If hemorrhage is confirmed in the brain, the symptomatic intracranial hemorrhage (SICH) is classified according to the amount of hemorrhage, midline shift, and presence of hydrocephalus. However, at district hospital level, it is advisable to shift the patient to tertiary referral center immediately
5) Before and during shifting, immediate raised intracranial pressure can be addressed by giving mannitol infusions

Systemic Hemorrhage

1) Symptoms and signs to suspect significant systemic hemorrhage
   a) Acute drop in blood pressure
   b) Hematemesis, Hemoptysis, large ecchymosis, Gum bleeds or other overt sites of bleeding
2) Compress any compressible sites of bleeding and consult appropriate additional services to consider mechanically occluding arterial or venous sources of medically uncontrollable bleeding
3) Check hemoglobin, platelets count, PT and CBC
4) Send blood bank sample for type and screen, cross-match and hold packed red cells appropriate to the hemorrhage volume, location and associated symptoms.

Management of Intracerebral hemorrhage

Intracranial Hemorrhage (ICH)

When ICH is suspected, rapid neuro-imaging with CT or MRI is recommended to distinguish ischemic stroke from ICH

Causes of primary intracerebral hemorrhage

1) Uncontrolled hypertension
2) Oral anticoagulation therapy
3) Antiplatelet therapy
4) Platelet and coagulation disorders
5) Vascular malformation
6) Cerebral amyloid angiopathy
7) Drug induced : cocaine, amphetamines

History

1) History suggestive of increased intracranial pressure- headache, vomiting, blurring of vision.
2) History of loss of consciousness/ fall
3) History of seizures
4) Past history of hypertension under irregular or no medication Signs:
5) Uncontrolled hypertension
6) Signs of neurological deficits
7) In pontine hemorrhage, pinpoint pupils and hyperthermia might be present

Management

Initial monitoring and management of ICH patients should take place in an intensive care unit, preferably one with physician and nursing neuroscience intensive care expertise. Mainstay of ICH therapy is to treat the underlying cause when possible. General treatment approach is always patient specific depending on clinical condition.

1) Stabilization of vital signs
2) Neurological exam
3) Supportive care
4) Management of seizures
5) Blood pressure control
6) Fever control
7) Anticoagulation correction
8) Blood sugar control
9) Surgical/Invasive interventions

Basic life support

ABC as dealt in management of ischemic stroke is important

Reversal of coagulopathy

1) Patients with elevated INR due to oral anticoagulant use should have their Warfarin stopped; they can be given vitamin K dependent factors. Intravenous Vitamin K could be used to correct INR
2) Patients with a severe coagulation factor deficiency or severe thrombocytopenia should receive appropriate factor replacement therapy or platelets, respectively
3) Use of platelet transfusions in ICH patients may be indicated for patients with severe thrombocytopenia

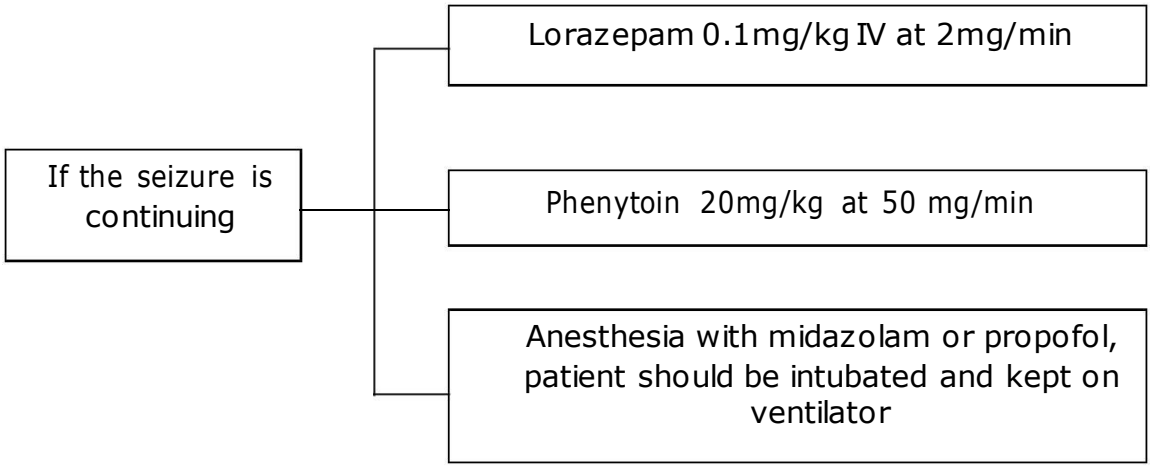
DVT (Deep Vein Thrombosis) prophylaxis

1) Consider using low dose unfractionated heparin (5000 U s/c or low molecular weight heparin for prevention of DVT, after 1 to 4 days from onset, if lack of mobility
2) Patients with ICH should have intermittent pneumatic compression for prevention of venous thromboembolism in addition to elastic stockings

Anticonvulsant therapy

Use of prophylactic anticonvulsant therapy in ICH is not recommended. Patients having seizures and patients with a change in mental status and whose EEG shows electrographic seizures should receive anti-epileptic drugs.

Step-wise approach to manage status epilepticus



Blood pressure control

Blood pressure control plays a crucial role in the management of Hemorrhagic stroke. It is different from that of ischemic stroke. Systolic blood pressure (SBP) should be reduced to <180 mm Hg within 1 hour and maintained for next 24 hours. But INTERACT study suggests more aggressive therapy with goal SBP <140 mm Hg leads to better outcomes.

The following drug protocol is recommended

1) If diastolic blood pressure (DBP) >140 mmHg, IV infusion of Sodium Nitroprusside (0.5 – 1.0 mcg/ kg/ min) and titrate till DBP decreases by 20%
2) SBP >230 mmHg &/or DBP >121 – 140 mmHg, Labetalol (10 mg IV over 1 –2 minutes). Repeat / double every 10 minutes up to 150 mg. If refactory, sodium nitroprusside should be used
3) SBP = 180-230 mmHg &/or DBP = 105-120 mmHg, Labetalol 10mg IV every 10 – 20 minutes up to 150 mg
4) SBP < 180 mmHg &/or DBP < 105 mmHg, antihypertensive are not indicated

Various antihypertensive medications that could be used are

LABETOLOL	-	Bolus 5 – 20 mg q15min, IV, Infusion 0.5-2 mg/ min (till 300mg)
HYDRALAZINE	-	Bolus 5 – 20 mg over 1 min, No Infusion
ENALAPRIL	-	Bolus 0.625 – 5 mg over 5 minutes Q6H, No Infusion
GTN	-	No Bolus, Infusion 5 – 200 mcg/ min
NITROPRUSSIDE	-	No Bolus, Infusion 0.5- 10mcg/ kg/ min, maximum 10 mcg/ kg/ min, for a minimum of 10 min.

Treatment of ICP

Patients with a GCS score of < 8, those with clinical evidence of transtentorial herniation, or those with significant IVH or hydrocephalus might be considered for ICP monitoring and treatment. A cerebral perfusion pressure of 50 to 70 mm Hg may be reasonable to maintain depending on the status of cerebral auto regulation. Various measures include:

1) Elevate head of bed to 30 degrees
2) Analgesia and sedation as needed
3) Osmotic therapy:
    - Inj. Mannitol - Bolus 0.5 – 2.0 gm /kg over 10 –15 minutes and 0.25 - 0.5gm, Q 6th hourly, IV for two to three days
    - Inj. Lasix - 20 mg 6 hourly
    - Hypertonic saline - 3% saline (Na- 513 meq/L)
4) Hyperventilation once patient is intubated (pCO2 35 mm Hg)
5) Corticosteroids are not recommended

Management of Glucose

1) High blood glucose on admission predicts an increased risk of mortality and poor outcome in patients with and without diabetes and ICH (Target blood sugar level is 140-180mg/dl)
2) Use of insulin infusion is controversial. Hypoglycemia should be avoided

Temperature management

1) Fever has been related to worsening outcome
2) Rigorous monitoring is required
3) Antipyretics should be given to maintain core body temperature at around 33 degrees

Surgical intervention

Patients with cerebellar hemorrhage who are deteriorating neurologically or who have brainstem compression and/ or hydrocephalus from ventricular obstruction should undergo surgical removal of the hemorrhage as soon as possible. Ventricular drainage as treatment for hydrocephalus is reasonable in patients with decreased level of consciousness.

Intracranial Hemorrhage

<30 ml : Medical
30-60 ml : Surgical (Lobar hemorrhages 2cms close to cortex)
> 60 ml : Medical

Indications for surgery in Cerebellar Hematoma

- 3 cm size
- Acute Hydrocephalus
- Worsening of symptoms

Surgical procedures

- Craniotomy
- Decompressive hemicraniectomy
- Ventricular drainage, in case of hydrocephalus
  Endoscopic Hematoma evacuation
- Coil embolization for occlusion of aneurysms
  Neurosurgical clipping

NATIONAL HEALTH MISSION - TAMIL NADU
No.359,Anna Salai, 5th Floor, DMS Annex Building,
DMS Complex, Teynampet, Chennai – 600 006