Fast and Furious: Stroke Update 2019

Mary Kay Bader

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Fast and Furious: Stroke Update 2019

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Objectives
- Identify the major recommendations from the AHA/ASA 2018 Ischemic Stroke Guidelines
- Develop a hospital based guideline to direct the team on priorities in managing acute ischemic stroke
- Apply key interventions to optimize patient outcomes in the ischemic stroke patient population

Disclosures
- Neuro Critical Care Society
  - Board of Directors/Vice President
- Hanarain
  - Board
- Neuroptics/Cerebrotech/Ceribell
  - Medical Advisory Board
  - Stock Options

Case
- 59 year old female is talking on the phone with her friend when she develops speaking difficulty
  - Friend calls 911 and gives address to EMS system
- EMS arrives
  - Patient is unable to move right arm and leg, no sensation to right side and has a droopy mouth on the right
  - Unable to speak

Stroke Chain of Survival
- Detection: Patient or bystander recognizes stroke S/S
- Dispatch: 911 and EMS dispatch
- Delivery: Triage & Tx to Primary Stroke Center
- Door: Immediate triage to acute area
- Data: Prompt ED evaluation, stroke team activation, lab and brain imaging
- Decision: Diagnosis and determination of Tx
- Drug: Administer drugs as indicated (tPA)
- Disposition: Timely admission to stroke unit or ICU or Transfer to stroke center

What is a stroke?
- Sudden development of a focal neurologic deficit caused by blockage in an artery feeding the brain or a rupture of the artery in the brain
Ischemic Stroke

- 87% – Thrombotic/atherosclerotic disease
- 20% – Embolic
- 20% – Lacunar or subcortical stroke
- Small vessel disease
- Cryptogenic: cause unknown – 30%

Numerous Guidelines AIS 2009-2018

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Ischemic Stroke Guidelines

- **Major sections**
  - Prehospital Stroke Management and Systems of Care
  - Emergency Evaluation and Treatment
  - General Supportive Care and Emergency Treatment
  - In Hospital Management of AIS: General Supportive Care
  - In Hospital Management of AIS: Treatment of Acute Complications

- **Integrate into lecture only topics pertinent to nursing practice**
- **Approach the patient as they move through the system**

Prehospital Stroke Management and Systems of Care = 30 Recommendations

- Prehospital/EMS Recommendations (9)
  - Public education programs emphasizing calling 911
  - Dispatchers should make stroke a top priority and transport times minimized
  - Educational stroke programs for physicians, hospital personnel and EMS recommended
  - Use of a stroke assessment system by providers is recommended
  - EMS personnel should notify receiving hospital prior to arrival
  - EMS leaders should develop triage paradigms and protocols using validated and standardized instruments for stroke screening (FAST, LA, Cincinnati PHS)
  - Regional systems of stroke care should be developed
  - Patients with positive stroke screen should be transported to closest facility capable of giving IV alteplase.

Prehospital Stroke Management and Systems of Care = 29 Recommendations

- Hospital Stroke Teams (5)
  - Organized protocol for emergent evaluation of patient
  - Establish DTN (alteplase) goals: Within 60 minutes>50% time
  - Establish Secondary DTN (alteplase) goal: Within 45 minutes in >50% time
  - Designate a multidisciplinary stroke team (include neuro evaluation)
  - Multicomponent Quality Improvement Initiatives

- Telemedicine (6)
  - US FDA Telestroke for timely review of imaging
  - Telestroke evaluation is effective
  - IV tPA by Telestroke is safe
  - Telephone consultation to community MDs is safe
  - Telestroke networks triage AIS for possible transfer to thrombectomy centers

Telestroke provides fast review of imaging and helps guide tPA in centers without neurology
Prehospital Stroke Management and Systems of Care = 29 Recommendations

- Organizational & Integration of Components (5)
  - PSC gives tPA, then evaluates for thrombectomy
  - Mechanical Thrombectomy done at CSC
  - Centers should develop, adopt & adhere to care protocols that reflect current care guideline
  - Establish hand off and transfer protocols and procedures for safe efficient transfer for thrombectomy patients
  - Government develop and implement reimbursement schedules for patients with AIS

- Establishment of Data Repositories (1)
  - Participate in Data Stroke Registry

Stroke Systems Care QI Process (3)

- Organize a MD QI committee to review and monitor stroke quality benchmarks etc
- Continuous QI processes can improve patient outcomes
- Stroke outcome measures should include adjustments for baseline severity

Emergency Evaluation and Treatment = 17 Recommendations

- Stroke Scale (1): Use one (NIHSS)
- Brain Imaging (12)
  - Do it fast (NCCT) within 20 minutes
  - Hypodensities (3 statements)
  - Do not do an MRI (delays tPA)
  - Awoke with stroke: imaging to give tPA still investigational
  - CT/MRI Perfusion should not delay tPA
  - Thrombectomy candidates: CT or MRI Perfusion may help in windows 6-24 hrs

- Other Diagnostic Tests (4)
  - Only BG needed prior to tPA
  - ECG and troponin should not delay tPA
  - Chest x-ray value unclear

General Supportive Care & Emergency Tx = 70 Recommendations

- Airway, Breathing, Oxygenation (4)
  - Monitor airway/oxygenation
  - O2 only if SpO2 < 94%
  - Hyperbaric is not recommended

- Circulation (3)
  - Correct hypotension/hypovolemia
  - Correct BP (IV tPA < 185/110)
  - Drug induced hypertension unclear

- Temperature (2)
  - T>38 C // Do not use hypothermia
  - Blood Glucose (2)
  - Tx elevated BG (Target 140-180 mg/dL)
  - Treat hypoglycemia (< 60 mg/dL)

- IV Alteplase (16)
  - Give IV tPA if indicated < 3h or 3-4.5 h
  - 0.9 mg/kg 10% bolus 90% drip over 1 hour
  - Indications
    - Measurable deficit
    - Age ≥ 18
    - Non-total stroke symptoms
  - Exclusions listed
    - Sickle cell is not a contraindication
    - Discuss Pros/cons
    - Do not wait for INR if they aren’t on drug
    - Time benefit: Faster Better
    - Control BP < 180/105
    - Monitor for bleeding/angiodyema

- Other IV Thrombolitics and Sonothrombolysis (3)
  - Tenecteplase administered as a 0.4mg/kg single IV bolus has not been proven superior to or noninferior to alteplase in patients with minor neuro impairment and no major intracranial occlusion
  - Sonothrombolysis with IV tPA not recommended
General Supportive Care & Emergency Tx = 70 Recommendations

- Mechanical Thrombectomy (18)
  - Give tPA if indicated
  - Go directly to thrombectomy if indicated
  - Stent Retrievers for less than 6 hours
  - Thrombectomy recommended in patients
    - LKN with LVO 6-16 hours (DEFUSE 3 trial)
    - Faster is better
    - Consider usefulness of Anesthesia
    - Keep BP < 180/105 for 24 hours

- Other EVTs (3)
  - Intraarterial thrombolysis in < 6 hours if indicated

Give tPA if indicated
Thrombectomy indications have changed 24 h window
Faster is better
Keep BP < 180/105

General Supportive Care & Emergency Tx = 70 Recommendations

- Antiplatelet Treatment (6)
  - ASA within 24-48 hours (delay 24 if tPA)

- Anticoagulants (5)
  - Do not use early anticoagulation to reduce stroke impact
  - Not enough evidence to use DTI/Xa inhibitors
  - Do not use near infrared laser

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  - ASA within 24-48 hours (delay 24 if tPA)

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In-Hospital Management of AIS: Supportive Care = 38 Recommendations

- Stroke Unit (2): Unit/Order Sets Good!
- Supplemental O2 (3): Same as before
- BP (6):
  - Lowering BP co-morbid conditions (aortic dissection) by 15%
  - Tx BP > 220/120 if not tPA 1st 48-72 hours
  - Use labetalol, Nicardipine, Clevidipine, Hydralazine, enalapril
  - Get BP down 140/90 by discharge
  - Avoid hypotension/hypovolemia
- Temperature (2): Same
- Glucose (2): Same

Stroke Unit Order Sets BP as indicated
Normothermia
Normotension
Normoglycemia

In-Hospital Management of AIS: Treatment of Acute Complications = 14 Recommendations

- Cerebellar/Cerebral Edema (12)
  - Ventriculostomy (ICP) for obstructive hydro
  - May need decompressive sub-occipital craniectomy
  - Malignant edema: talk to family options
  - Should be managed in Neuro ICU/tertiary
  - Craniectomy for Unilateral/MCA infarct: risky
  - Can try in patients > 60 to reduce mortality
  - Trigger: decreasing LOC
  - Use Osmotic Medications for CE
  - Use brief period of PaCO2 30-34 mm Hg for CE
  - Do not use sedatives
  - Do not use Barbs/Barbieres/Hypothermia
In-Hospital Management of AIS: Treatment of Acute Complications = 14 Recommendations

• Seizures (2)
  – Recurrent seizures after stroke should be treated with anti-seizure drugs
  – Prophylactic use of anti-seizure drugs is not recommended

Real World Application of Stroke Guidelines

Real World!

• Patient’s friend calls 911
• EMS arrives
  – Prehospital General Stroke
    □ Cincinnati Prehospital Stroke Scale (CPSS)
    □ LA Prehospital Stroke Scale (LAPSS)
    OUR PATIENT=CPSS 1+2+3= STROKE

EMS Assessment of LVO

Prehospital LVO scales

Rapid Arterial Occlusion Evaluation (RACE): ≥ 5 significant

OUR PATIENT RACE IS 2+2+2+0+2=8!

EMS Notifies MH of patient prior to transport!

Entry of Stroke Patient

• Hospitals must have an organized Stroke Intervention Program
  – rapid identification and triage
  – organized stroke response team
  – protocols for emergent work-up
  – nursing protocols for preparing, administering, and monitoring drug therapy

Time is Brain

• 911
• Door to ED Physician exam 10 minutes
• Door to Stroke expertise 1.5 minutes
• Door to CT scan of brain 20 minutes
• Door to CT interpretation 35 minutes
• Door to drug (tPA) 45 minutes
• Door to groin (embolectomy) 90 minutes
Arrival of Stroke Patient in the ED @1028

• Rapid identification and work-up
  – Key symptoms
  – Time of symptom onset is crucial
  – Triage to stroke area: Closely as emergent
  – ED MD at bedside with Stroke Team
  – Neurologist on their way
• Primary & secondary survey
  – Neurologic assessment with NIHSS = 16
  – Start IV and draw labs
  – Check Blood glucose
  – Monitor: ECG, SpO2, and serial manual BP assessments

Urgent Diagnostics: CT-NECT 1040

• CT-NECT (non-contrast enhanced CT) and contrast-enhanced CT of brain
  – Early signs of ischemia can be detected on NECT
  – Decision for IV tPA in CT while CTA and CT perfusion continues!

Urgent Diagnostics: CTA/Perfusion

• CT: Contrast-enhanced CT of brain (CTA)
  – Non-invasive vessel imaging is recommended if intra-arterial (IA) thrombolysis or mechanical thrombectomy are being considered
  – Advanced imaging should not delay IV tPA if indicated
• Large vessel occlusion – IR Team arriving

IV tPA Indications & Tx Windows

• Indications
  – Diagnosis of ischemic stroke causing measurable neurologic deficit
  – Onset of symptoms < 3 hours
  – Age ≥ 18 years of age
  – May be given in 3-4.5 hours after stroke onset except
    – Age > 80, History Diabetes/Stroke, NIHSS > 25, Taking any anticoagulant
Exclusions updated 2015

General exclusions for tPA

• Unknown time of onset
• Acute or history of intracranial hemorrhage
• Subarachnoid hemorrhage
• Active internal bleeding
• Recent (within 3 months) intracranial or intra-spinal surgery or serious head trauma
• GI malignancy or GI bleed within 21 days
• Presence of intracranial conditions that may complicate the procedure (i.e., AVM, Aneurysm, certain neoplasms)
• Coagulopathy
  – Platelet count < 100,000
  – Current use of anticoagulant with an INR > 1.7 or PT > 15 seconds, aPTT > 40 s.
• Current severe uncontrolled hypertension (SBP > 180 or DBP > 110, current use of more anticoagulation within 48 hours)
• Use of tPA in patients with prior IS within 3 months may be harmful
• Infections
  – Endocarditis
  – Aortic arch dissection
• Intracranial neoplasms – Cerebral arteriovenous malformation

tPA administration @ 1058

• Administration
  – IA-PA box at bedside in CT
  – Clinical pearls
    – Assessing patient weight
    – Bed scale Required
    – 70 kg
  – 0.9 mg/kg maximum dose of 90mg
    – 10% of total dose administered in IV bolus over 1-2 minutes = 6.3 mg IVP @ 1058
    – Remaining 90% of dose administered over 1 hour = 56.7 mg @1100

But we are going to IR....
Solitaire™ FR Revascularization Device - Clot Retrieval

- A mechanical thrombectomy device combining the ability to restore blood flow, administer medical therapy, and retrieve clot in patients experiencing acute ischemic stroke.
- Swift deployment for fast reperfusion.
- Optimal radial force for all clot types.


2015 AHA/ASA Guideline Update

- 2013 guidelines updated to include endorsement of endovascular treatment in ischemic stroke.

DAWN Study 2017

- The results of the DAWN trial was presented at the 3rd European Stroke Organization Conference (ESOC) 2017
  - patients arriving after 6 hours from symptom onset for inclusion in the trial by using imaging and clinical scores to identify those with "target mismatch"
  - Results showed a 2-point difference in the 90-day weighted modified Rankin Scale (mRS) score in favor of the thrombectomy group, which translated into a 73% relative reduction of dependency in activities of daily living and a number needed to treat for any lower disability of 2.0

Job 4: Consider Interventional Options

Intraarterial tPA
Mechanical Thrombectomy Devices
Intracranial stents

Time Window Changing....

In patients under consideration for mechanical thrombectomy, observe after IV alteplase to assess for clinical responses should not be performed.

DAWN Study 2017

We randomized patients with occlusion of the intracranial internal carotid artery or proximal middle cerebral artery who had last been known to be well 6 to 24 hours earlier and who had a mismatch between the severity of the clinical deficit and the infarct volume, with mismatch criteria defined according to age (<60 years or ≥60 years) and proximal middle cerebral artery occlusion. Patients were randomly assigned to thrombectomy plus standard care arm or control group. The primary outcome was the weighted modified Rankin Scale score at 90 days.
Publication 1-26-2018

- 38 US centers: Thrombectomy 6-16 hours
- 182 patients (52 endovascular and 90 standard medical therapy only)
  - Mortality 14% ENDO vs 26% tPA
- Endovascular thrombectomy 6-16 hours after last known well

CONCLUSIONS

Among patients with acute stroke who had last been known to be well 6 to 24 hours earlier and who had a mismatch between clinical deficit and infarct, outcomes for disability at 90 days were better with thrombectomy plus standard care than with standard care alone. (Funded by Stryker Neurovascular; NIH/NIH ClinicalTrials.gov number, NCT02132683)

Neurointerventional Clinical Pearls

- Patients eligible for IV tPA should receive IV tPA
- Additional reperfusion strategies may be considered for patients out to 6 hours of symptom onset
  - IA therapy should be considered if large artery occlusion is suspected and patient is not responding to IV tPA
  - IA treatment should be considered at any time in treatment window if IV tPA is contraindicated
- Newer devices may decrease time and number of passes to retrieve clot, decrease complications
- Time is of the essence

Team Interventions in Interventional Suite

- MD/Tech
  - Concentrating on cerebral angiogram, administration of contrast, localizing pathology and preventing accumulation of clot on catheters
- Interventional RN + RRT/ICU RN (if possible)
  - Providing supplies to team
  - Administering sedation/analgesia to patient
  - Assessing BP/administering BP medications
  - Assessing neuro status and alerting team of improvement or worsening
  - Assessing peripheral perfusion

Table 1: Efficacy Outcomes

| Outcome                        | Thrombectomy Group (n=26) | Control Group (n=90) | Absolute Difference (95% CI) | Adjusted Difference (95% CI) | Percentage of Patients
|--------------------------------|---------------------------|----------------------|-----------------------------|-----------------------------|------------------------
| Primary endpoint               | 5.1 (4.0)                 | 3.6 (2.1-4.2)        | 2.2 (1.3-3.1)              | 0.08                        | 2.0 (0.0-0.19)         |
| Functional independence at 90 days | 3.1 (2.0)                 | 2.0 (1.0-3.0)        | 1.1 (0.0-2.2)              | 0.05                        | 3.1 (2.0-4.1)         |
| Mortality                     | 3.6 (4.3)                 | 9.1 (8.0-10.2)       | -5.5 (-7.5 to -3.5)        | -1.9 (1.6-2.6)             | 3.6 (4.3-5.0)         |

Figure 2: Score on the Modified Rankin Scale at 90 Days
Neurointerventional Clinical Pearls

- Post-tPA administration monitoring
  - Clock starts over if tPA administered and IR Tx occurred

- Additional monitoring
  - Post-angio care
  - Groin assessment
  - Pedal pulse assessment
  - Neuro assessment
  - Vital sign assessment
  - Recovery from anesthesia

Team Interventions in IR Suite @ 1124

- MD/Tech
  - Concentrating on cerebral angiogram, administration of contrast, localizing pathology and preventing accumulation of clot on catheters

- Interventional RN + RRT/ICU RN (if possible)
  - Providing supplies to team
  - Administering sedation/analgesia to patient
  - Assessing BP/Administering BP medications
  - Assessing neuro status and alerting team of improvement or worsening
  - Assessing peripheral perfusion

Our Patient @ 1300

- ICA/MCA opened with complete reperfusion
- CT post Intervention
- Admit to ICU
- Monitor neuro checks/VS
  - every 15 minutes x 2 hours, every 30 minutes x 6 hours then every hour

Post Infusion Guidelines tPA

- Maintain systolic BP < 180 mm Hg or diastolic BP < 105 mm Hg
  - Use labetalol or nicardipine
- No invasive tubes for 24 hours
- If neuro condition worsens, notify MD, and prepare for stat CT of brain
- Do not give
  - ASA, heparin, warfarin, ticlid, lovenox, plavix, aggrenox, fragmin, or antithrombotic/antiplatelet
- Keep NPO until swallow assessment done
- Check blood glucose levels q 4 hours x 2

Interventions

- Temperature: Goal Normothermia at 37-38°C
- IPC on admission with mobility planned to begin within 24 hours
- Check orthostatic vital signs
- Aggressive pulmonary toilet
- Skin/mobility issues
- Consult PT/OT/St/Rehab and physiatrist

Hospitalization Priorities in Acute Stroke Tx

- Supportive Care
  - Reduce the risk of Infection
    - Pneumonia
    - UTIs
    - Bloodstream infections
Hospitalization Priorities in Acute Stroke Tx

• Supportive Care
  – Detection of Dysphagia and prevention of aspiration
  – NPO
  – Swallow assessment completed by trained professional
    – Safe to swallow with or without observation
    – Modified diet/fluids
    – Track calories and nutritional intake

Safety Measures: Infection Prevention

• Urinary Tract Infection
  – Due to stroke induced immunosuppression, bladder dysfunction, and increased use of bladder catheters
  – Post stroke UTI most common complication (25%)
  – How to reduce UTI?
    • Decreased use of catheters
    • Monitor for urinary retention with bladder scanner
    • If need foley, antibiotic impregnated catheters and remove asap

Safety Measures: Elimination

• Constipation common problem
  – Decreased mobilization, use of opioids, dehydration

• Bowel Care
  – Assess normal patterns
  – Establish routine
  – Adequate hydration
  – Stool softeners, laxatives, and enemas

Safety Measures: Mobilization/Positioning

• Supportive Care
  – Mobility
    – Bedrest
      – Position items on side of bed
        – Left hemisphere place on left side of bed
        – Right hemisphere place on right side of bed
      – Consult PT/OT

• Early rehabilitation services
  – Initial mobilization
    – Transfer from bed to upright position
    – Monitor for neurologic worsening with mobilization
    – Careful positioning of joints on paretic side
      – Shoulder adduction
      – Subluxation of shoulder
    – Range of motion and positioning techniques
      – Aimed to prevent joint contractures and atrophy

• Post-stroke shoulder subluxation
  – Present in 84% of hemiparetic stroke patients
  – Vulnerable - flaccid hemiparesis stage
  – Weight of arm (unsupported) pulls and stretches shoulder capsule and ligaments
  – May lead to chronic shoulder injury and pain
### Safety Measures: Mobilization/Positioning

- Shoulder subluxation treatment/prevention
  - Shoulder supports
  - Electrical stimulation
    - TENS
    - FES
  - Range of motion exercises
  - Positioning support

### Hospitalization Priorities in Acute Stroke Tx

#### Supportive Care
- Prevent complications
  - Supportive Care
    - PE and DVT
      - Ambulation if possible
      - If on bedrest
        - Pneumatic compression devices
        - Anticoagulation
    - Skin Care
      - Clean and dry skin
      - Avoid incontinence of urine/stool
      - Reposition patient frequently
        - At least every 2 hours
        - Check pressure points
      - Assess skin using scale
      - Pressure relief mattresses may be useful
    - Falls
      - At risk for hip fractures from falls which can increase mortality
      - Fall prevention program
      - Assess risk
      - Implement interventions to reduce falls

#### Patient DC Education Requirements

- Written Stroke Education materials given to pt/family
- Required Stroke Education topics
  - Activation of EMS
  - Follow-up Post D/C
  - Med Prescribed @ D/C
  - Risk Factors for Stroke
  - Warning S/S Stroke

#### Preparing for DC/Transfer

- Make a connection with Patient & their Care Partner
  - Involve family in decision making
  - Family and team meetings to discuss progress
  - Conduct a pre-discharge needs assessment of the home before D/C (OT or PT)
  - Caregiver training if aphasic, positioning, handling shoulder care, how to promote independence, and mobility
Preparing for DC/Transfer

- Make a connection with Patient & their Care Partner
- Provide education for patient's family/Care Partner on stroke pathology, prevention, stroke vs. actions to take, follow-up appointments, treatment plan, and community resources
- Liaison with community providers
- Review individual patient and care partner psychosocial needs and support needs
- Provide information on discharge plans and post discharge management to primary care MD/community

Outcome

- Discharged home 3 days after admit
- No residual symptoms or signs of stroke
- Completely independent
- NIHSS 0
- Great teamwork
- Share the success

Stroke Patient 360°

ADMISSION

- On 07/19/2018, a 50 y/o female arrive in MVED via EM S presenting with sudden R facial drool and aphasia for an NIH score of 13. CTA showed L ICA terminus occlusion with distal reconstitution of the L MCA. TPA was administered in CT and patient was sent to IR for thrombectomy.

Mission Hospital is a Joint Commission certified COMPREHENSIVE STROKE CENTER!

Thank you for making it count when minutes matter!

Please contact Diana Tai (Stroke Coordinator) at Mission.StrokeCenter@stjoe.org if you have any questions.

DISCHARGE

- Once patient was stable for transfer she was transferred to her in-network hospital on 07/21 with an NIHSS of 0 via ACLS transport.

Quality: Sustainability

St. Joseph's Hospital Stroke Dashboard - RRT Data Through 2018 (Jan-Apr)

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<th>Actual Time (in minutes)</th>
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Summary

It takes an entire system and hospital to make it work!

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