STROKE CARE FROM A NURSING PERSPECTIVE

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OBJECTIVES

Participant will:

• Review nursing interventions in acute stroke management and discuss the current available evidenced based research.
• Critically evaluate the findings in the literature and analyze the evidence for or against changing practice.
• Discuss the impact of acute nursing care interventions and patient’s outcome.
STROKE FACTS

- Stroke dropped from No. 4 killer to No. 5, yet it still kills more than 130,000 (every 40 seconds)
  - Stroke is No. 2 cause of death worldwide
  - More than 690 stroke have and AIS due to a blood clot
    - One third of these result from a large vessel occlusion LVO which increases the chance of severe brain damage and death
- “That’s why the AHA/ASA hasn’t rested in its determination to treat and beat Acute Ischemic Stroke (AIS)”
PREHOSPITAL SYSTEMS

• Public Education Revised
  • Programs should be sustained over time and designed to reach racially/ethnically, age, and sex diverse populations
    • Blacks and Hispanics particularly have lower stroke awareness than the general population and are at increased risk of prehospital delays in seeking care

• US based analysis (184179 cases)
  • On-scene 15 minutes – longer in patients 65–74, whites, and women in nonurban areas
  • 52% of cases were identified by dispatch as stroke
EMS ASSESSMENT AND MANAGEMENT

Stroke Identification

• FAST scale
• Cincinnati Prehospital Stroke Scale
• Los Angeles Prehospital Stroke Screen

<table>
<thead>
<tr>
<th>Cincinnati Prehospital Stroke Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face</strong></td>
</tr>
<tr>
<td>Both sides move normally</td>
</tr>
<tr>
<td>One side is weak or is flaccid</td>
</tr>
<tr>
<td><strong>Arm</strong></td>
</tr>
<tr>
<td>Both arms have equal normal strength</td>
</tr>
<tr>
<td>One arm is weak or doesn't move at all</td>
</tr>
<tr>
<td><strong>Speech</strong></td>
</tr>
<tr>
<td>Speech is normal and appropriate</td>
</tr>
<tr>
<td>Speech is slurred, inappropriate words or mute</td>
</tr>
</tbody>
</table>
Los Angeles Prehospital Stroke Screen (LAPSS)

Screening Criteria

1. Age over 45 years
2. No prior history of seizure disorder
3. New onset of neurologic symptoms in last 24 hours
4. Patient was ambulatory at baseline (prior to event)
5. Blood glucose between 60 and 400

Exam: look for obvious asymmetry

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial smile / grimace:</td>
<td></td>
<td>_Droop</td>
<td>_Droop</td>
</tr>
<tr>
<td>Grip:</td>
<td></td>
<td>_Weak Grip</td>
<td>_Weak Grip</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_No Grip</td>
<td>_No Grip</td>
</tr>
<tr>
<td>Arm weakness:</td>
<td></td>
<td>_Drifts Down</td>
<td>_Drifts Down</td>
</tr>
<tr>
<td></td>
<td></td>
<td>_Falls Rapidly</td>
<td>_Falls Rapidly</td>
</tr>
</tbody>
</table>

6. Based on exam, patient has only unilateral weakness:

If Yes (or unknown) to all items above LAPSS screening criteria met:
If LAPSS criteria for stroke met, call receiving hospital with “code stroke”, if not then return to the appropriate treatment protocol. (Note: the patient may still be experiencing a stroke if even if LAPSS criteria are not met.)
EMS ASSESSMENT AND MANAGEMENT

• Pre-notification
  • Increased likelihood of alteplase treatment within 3 hours (82.8% versus 79.2%)
  • Shorter door-to-imaging times (26 versus 31 minutes)
  • Shorter DTN times (78 versus 80 minutes)
  • Shorter symptom onset-to-needle times (141 versus 145 minutes)
FASTER STROKE TREATMENT IS BETTER TREATMENT

Patients treated within 60 minutes experience improved outcomes, including lower in-hospital mortality and reduced long-term disability.

Did you Know?
Quicker treatment for stroke adds healthy days to your life.

1 minute saved = 1.8 days of healthy living*

15 minutes saved = 1 month of healthy living*

Learn how to recognize a stroke.
If you think you are having a stroke, call 9-1-1 immediately!

GC Fonarow et al. JAMA. 2014;311(16):1632-1640
Saver et al. JAMA. 2013;309(23):2480-8
REGIONAL SYSTEMS OF CARE

• Identify regional hospital that can give IV alteplase and those that can perform thrombectomy

• Transported to closest health care that can administer IV alteplase

• Benefit of bypassing the closest to bring the patient to one that offers a high level of stroke care is uncertain
  • Customization of proposed algorithm to account for local factors is needed
Why Doesn't EMS Just Triage the Right Patient to the Right Hospital?

**Systems of Care**

- Primary Stroke Centers
- Acute Stroke Ready Hospitals
- Thrombectomy-Capable Stroke Centers (TSC)
- Comprehensive Stroke Centers
LOCATION OF VESSEL OCCLUSION IS IMPORTANT

Small Vessel Occlusions

Large Vessel Occlusions
Which Stroke Scale Should EMS Use?

**Cincinnati Prehospital Stroke Scale**

- **Face**
  - Both sides move normally
  - One side is weak or is flaccid

- **Arm**
  - Both arms have equal normal strength
  - One arm is weak or doesn't move at all

- **Speech**
  - Speech is normal and appropriate
  - Speech is slurred, inappropriate words, or mute

**Los Angeles Motor Scale (LAMS)**

- **Face**
  - 0 Both sides move normally
  - 1 One side is weak or flaccid

- **Arm**
  - 0 Both sides move normally
  - 1 One side is weak
  - 2 One side is flaccid/doesn't move

- **Grip**
  - 0 Both sides move normally
  - 1 One side is weak
  - 2 One side is flaccid/doesn't move

**Test Item** | **RACE** | **NIHSS Equivalent**
--- | --- | ---
Facial Palsy | 0-1 | 0-3
Arm Motor Function | 0-2 | 0-4
Leg Motor Function | 0-2 | 0-4
Head Gaze Deviation | 0-1 | 0-2
Aphasia (R side) | 0-2 | 0-2
Agnosia (L. side) | 0-2 | 0-2
REGIONAL SYSTEMS OF CARE

• AHA Mission: Lifeline proposed a severity based triage algorithm
  • Uncertainty exists over optimal algorithm and optimal prehospital LVO screen

• No single Stroke Severity Tool that predicts LVO perfect
  • Turc G et al demonstrated published numbers would result in loss of opportunity for ≥20% of patients with LVO to be inappropriately sent to a center lacking EVT, conversely reducing the false-negative rate to 10% would result in sending almost every patient to CCS. (Stroke. 2016;47:00–00)
REGIONAL SYSTEMS OF CARE

SEVERITY-BASED STROKE TRIAGE ALGORITHM FOR EMS

EMS Dispatch notified responding EMS unit of possible stroke call. EMS crew dispatched per regional stroke protocol or on scene suspicion of acute stroke by EMS providers.

Upon arrival: Provide any needed ABC interventions, request dispatch at higher level of provider if necessary for unstable patients and interview patient, family and other witnesses.

Perform and document results of pre-hospital stroke identification screen (CRSS, LAPSS, etc.) and POC blood glucose.

STROKE SCREEN POSTNET STROKE SUSPECTED?

YES

NO

LVO SUSPECTED?

YES

NO

Perform and document results from severity tool used to assess potential LVO (ELAMS, HACE, CSIAAT, FAST ED, etc.)

LOH LESS THAN 6 HOURS?

YES

NO

Identity and document Time Last Known Well & Time of symptom discovery.

DIRECT TRANSPORT TO CSC WILL BE LESS THAN OR EQUAL TO 15 MINUTES?

YES

NO

Call stroke alert, prenotify receiving facility and transport to the closest appropriate stroke center (AGSRH, PSC, TSC, CSC) per your regional stroke systems of care policy.

TRANSPORT TO CSC WILL NOT PRECLUDE USE OF FNA PLACE?

YES

NO

Call stroke alert, pre-notify receiving facility and transport directly to nearest CSC if appropriately certified and within an acceptable transport time. If no CSC meets criteria, then transport to the nearest thrombectomy-capable stroke center (TSC), if appropriately certified and within an acceptable transport time. Otherwise go to nearest PSC or ASRH per your regional stroke systems of care plan.

Treat and transport as indicated per patient presentation.

Stroke not suspected.
EVT FOR AIS
SAVE A MINUTE—SAVE A WEEK

• Each minute saved in onset–to–treatment time granted on average 4.2 days of extra healthy life.
• Stroke Scale score above 10 gained more than a week per each minute saved.
• In the whole cohort, every 20 minutes decrease in treatment delays led to a gain of average equivalent of 3 months of disability–free life.

• Meretoja et al. Neurology® 2017;88:2123–2127
Healthy Days Gained Per Minute of Faster Treatment

A. Male

B. Female

Meretoja et al. Neurology® 2017;88:2123–2127
Choosing a highly sensitive threshold will avoid missing potentially treatable patients, but will lead to more transfers of patients without LVO.
Choosing a highly specific threshold will avoid unnecessary transfers of patients without LVO, but will result in more cases where a patient with LVO was not transferred.

- NIH Stroke Scale
- Rapid Arterial Occlusion Evaluation (RACE)
- Los Angeles Motor Scale (LAMS)
- Cincinnati Pre–hospital Stroke Severity Scale (CPSSS)
Published Studies of Severity Scale Application in the Prehospital Setting

Table IV. Nonrandomized Studies of Emergency Medical Services Use of Prehospital Stroke Severity Scales

<table>
<thead>
<tr>
<th>Study Acronym; Author; Year Published</th>
<th>Study Type/Design; Study Size</th>
<th>Patient Population</th>
<th>Primary End Point and Results (P value; OR or RR; &amp; 95% CI)</th>
<th>Summary Conclusions &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrera E, et al. 2017 27720528</td>
<td>Study type: Reanalysis of observational data Size: N=341</td>
<td>Inclusion criteria: Previously enrolled in original RACE derivation Exclusion criteria: No prehospital RACE score available</td>
<td>1st end point: Receiver operating characteristics of test performance Results: • Seven simpler versions of RACE scale developed • Original RACE scale had an AUC of 0.82 for detecting LVO • The 7 simpler RACE versions generated slightly lower AUC for detecting LVO • The use of simplified versions of the original RACE scale reduced performance • No direct comparison to other scores was feasible, and biases of patient selection in the original cohort persist</td>
<td></td>
</tr>
<tr>
<td>Kim JT, et al. 2017 32069307</td>
<td>Study type: Secondary analysis of prospective data from the FAST-MAG trial Size: N=1632</td>
<td>Inclusion criteria: Confirmed cerebrovascular disease, transported by EMS and enrolled in FAST-MAG Exclusion criteria: Non-FAST-MAG transports</td>
<td>1st end point: Correlation of prehospital LAMS with early ED NIHSS Results: • ED LAMS score correlated with concurrently performed NIHSS in all cerebrovascular cases (r=0.89) • Prehospital LAMS correlated moderately with ED NIHSS (r=0.45) • Although the ED LAMS correlated moderately with 3-month mRS, r=0.55, the association of prehospital LAMS with 3-month mRS was less strong (r=0.34) • LAMS score correlates well with NIHSS and outcomes when performed in the ED, but only moderately when performed by prehospital personnel. This paper did not address the utility of LAMS for LVO detection and triage</td>
<td></td>
</tr>
<tr>
<td>McMullan JT, et al. 2017 25112229</td>
<td>Study type: Observational study Size: N=48</td>
<td>Inclusion criteria: Prehospital suspected stroke (FAST-positive), C-STAT scored, and transported to a comprehensive stroke center or having a stroke team consult note Exclusion criteria: FAST-negative</td>
<td>1st end point: C-STAT sensitivity and specificity Results: C-STAT sensitivity and specificity for each outcome were: • NIHSS ≤ 15, 77% (66% CI, 68–86) and 84% (96% CI, 69–90) • NIHSS &gt;15, 84% (21% CI, 61–93) and 91% (95% CI, 75–96) • LVO, 71% (56% CI, 29–53) and 70% (55% CI, 55–83) • Among FAST-positive prehospital suspected stroke patients, C-STAT could be readily performed and incorporated into the prehospital workflow. The small study sample size and regional restriction preclude meaningful conclusions on test characteristics for predicting LVO to inform prehospital triage</td>
<td></td>
</tr>
</tbody>
</table>

At this time, there is insufficient evidence to recommend one scale over the other, or a specific threshold of additional travel time for which bypass of a PSC or ASRH is justifiable.

Smith et al. Stroke. 2018;49:00–00
HOSPITAL STROKE TEAMS

• New Recommendations
  • Should be imaged ≤ 20 mins of ED arrival in at least 50% of patients who may be candidate for IV alteplase and/or endovascular therapy (EVT)
EMERGENCY EVALUATION
STROKE SCALE

- National Institute of Health Stroke Scale
  - Preferred severity scale: rapid, accurate, reliable and can be performed by broad spectrum of providers
  - Accuracy of predicting LVO -
    - $\geq 10$ shows sensitivity of 73% and specificity of 74%
    - $\geq 6$ shows sensitivity of 87% and specificity of 52% – low threshold misses some cases with LVO, but low specific indicates false-positives will be common
EMERGENCY EVALUATION AND TREATMENT

- Blood Glucose only lab that must proceed IV alteplase administration (don’t wait for coag testing)
  - Treat if < 60 mg/dl
  - Reasonable to maintain BG in range of 140–180 during first 24 hours
- Do not delay IV alteplase
  - Baseline ECG and baseline troponin
  - Usefulness of chest x-ray in absence of acute pulmonary or cardiac disease is unclear
- ABC and supplemental oxygen unchanged
EMERGENCY TREATMENT BLOOD PRESSURE

• Hypotension and hypovolemia should be corrected to maintain systemic perfusion levels to support organ function

• SBP lowered to < 185 mm HG and DBP < 110 prior to alteplase
  • If EVT planned and no alteplase administered it is reasonable to maintain <185/110
  • Use of drug induced hypertension not well established

• Labetalol, Nicardipine, Clevidipine
  • Only use sodium nitroprusside if BP > 140
Recent studies indicated fewer than 30% of IV alteplase treated acute ischemic stroke patients in the United States were meeting this goal.
Faster Stroke Treatment is Better Treatment

TIME IS BRAIN

Importance of Reducing Door to Needle Time

Improved Outcomes per 15 Minute Decrease in Door to Needle Time

<table>
<thead>
<tr>
<th>Reduced In-hospital Mortality</th>
<th>Reduced Symptomatic Intracranial Hemorrhage</th>
<th>Increased Achievement of Independent Ambulation at Discharge</th>
<th>Increased Discharge to Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.96</td>
<td>0.96</td>
<td>1.04</td>
<td>1.03</td>
</tr>
</tbody>
</table>

HOSPITAL STROKE TEAMS

• New Recommendations
  • It may be reasonable to establish a secondary DTN time goal of achieving DTN times within 45 minutes in ≥50% of patients with AIS who were treated with IV alteplase
  • Multicomponent quality improvement initiatives, which include ED education and multidisciplinary teams with access to neurological expertise, are recommended to safely increase IV thrombolytic treatment
**Improving Door to Needle Time**


<table>
<thead>
<tr>
<th>Table 2. List of hospital and patient factors that lead to prolonged DNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient factors</strong></td>
</tr>
<tr>
<td>Management of hypertension</td>
</tr>
<tr>
<td>Emergent medical condition</td>
</tr>
<tr>
<td>Inability to determine eligibility (other than time of onset)</td>
</tr>
<tr>
<td>Seizure</td>
</tr>
<tr>
<td>Unclear time of onset</td>
</tr>
<tr>
<td>Initial patient refusal</td>
</tr>
<tr>
<td>Hypoglycemia</td>
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<td></td>
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</table>

DNT: door-to-needle time; CT: computed tomography.
Frequency of Hospital Strategies Used

- Advanced hospital notification by EMS*: 95%
- Stroke tools+: 97%
- Rapid triage protocol and stroke team notification*: 100%
- Single-call activation system*: 100%
- Transport of patients by EMS directly to the CT/MRI scanner first*: 40%
- Rapid brain imaging+: 95%
- Rapid central laboratory testing+: 88%
- Pre-mix of tPA ahead of time*: 25%
- tPA stored in emergency department+: 70%
- Initiation of IV-tPA bolus while patient is still in the brain imaging suite*: 0%
- A team-based approach to stroke care+: 99%
- Prompt patient-specific data feedback to the ED staff and stroke team*: 95%
- Prompt patient-specific data feedback to EMS providers*: 60%

*Percent of the time (median). †Yes.


Timer or clock attached to chart, clipboard, or bed

HOSPITAL STRATEGIES AND DTN TIMES

- 16 strategies associated with significant reductions in DTN times
  - On average, 1.25 minutes could be saved for each strategy implemented
  - This represents a potential to reduce DTN times by as much as 20 minutes (95% CI 15–25 minutes) if all strategies were used

- At the patient level, a reduction of 20 minutes in DTN times would save 36 million neurons, reduce the risk of mortality and sICH, and increase the chance of functional independency

- At the national level, a reduction of 20 minutes could bring the median DTN times towards 30 minutes
THINK OUT OF THE BOX
INNOVATIVE IDEAS
POST ALTEPLASE MANAGEMENT ED–ICU

- BP and neurological assessments every 15 min during and after IV alteplase infusion for 2 h, then every 30 min for 6 h, then hourly until 24 h after IV alteplase treatment (NIHSS – sections)

- Increase the frequency of BP measurements if SBP is $>180$ mmHg or if DBP is $>105$ mmHg; administer antihypertensive medications to maintain BP at or below these levels

- New onset severe headache, acute hypertension, nausea, or vomiting or has a worsening neurological examination, discontinue the infusion and obtain emergency head CT scan
POST ALTEPLASE MANAGEMENT

- Delay placement of nasogastric tubes, indwelling bladder catheters, or intra-arterial pressure catheters if the patient can be safely managed without them
  - If patient appears to be a LVO and going for EDV we place a catheter if at all possible prior to alteplase
- Obtain a follow-up CT or MRI scan at 24 h after IV alteplase before starting anticoagulants or antiplatelet agents
- Post 24 hours BP monitoring and neurological assessment
MANAGEMENT OF OROLINGUAL ANGIOEDEMA

- Maintain airway
  - Intubation may not be necessary if edema is limited to anterior tongue and lips
  - Edema involving larynx, palate, floor of mouth, or oropharynx with rapid progression (within 30 min) poses higher risk of requiring intubation.

- Awake fiberoptic intubation is optimal. NT intubation may be required but poses risk of epistaxis

- Discontinue IV alteplase infusion and hold ACEIs
- Administer IV methylprednisolone 125 mg
- Administer IV diphenhydramine 50 mg
- Administer ranitidine 50 mg IV or famotidine 20 mg IV
- If there is further increase in angioedema, administer epinephrine (0.1%)
  - 0.3 mL subcutaneously or by nebulizer 0.5 mL
NURSING MANAGEMENT IN ENDOVASCULAR LAB

- BP management with alteplase vs non-alteplase
- Airway Compromise
  - Angioedema from IV thrombosis
- Allergy to IVP Dye
- Early hemorrhagic conversion post IV alteplase
  - Monitor for neurological decline
  - Monitor BP
- Conscious sedation versus anesthesia
- Head stabilization
  - Arterial perforation
## TIME MEASUREMENT SET FOR EVT

### EVT Measure Set:

<table>
<thead>
<tr>
<th>#</th>
<th>Measure Name</th>
<th>TJC CSTK</th>
<th>GWTG® - Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mechanical Endovascular Reperfusion Therapy for Eligible Patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Median Door to Puncture (DTP) Time</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Door to Puncture Time within 90 minutes</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Median Door to Start of Revascularization (DTSR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Door to Start of Revascularization within 120 minutes</td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>6</td>
<td>Door to Recanalization/Reperfusion (DTRp) within 120 minutes</td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>7</td>
<td>Picture to Puncture (PTP) Time within 60 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Median Puncture to Recanalization/Reperfusion (PTRp) Times</td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>9</td>
<td>TICI Post-Treatment Reperfusion Grade (0,1,2a, 2b, 3)</td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>10</td>
<td>Rate of Substantial Reperfusion (TICI 2b or 3)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Thrombolysis in Cerebral Infarction (TICI) Post-Treatment Reperfusion Grade (2b vs. 3)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Discharge Disposition following MER (EVT)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>90-Day Modified Rankin Scores (mRS) following MER (EVT)</td>
<td>✔️</td>
<td></td>
</tr>
</tbody>
</table>
STROKE UNIT CARE

- Significantly reduces death and disability and improves process care as grouping patients together by clinical specialty is associated with improved outcomes

- Standardized Stroke Orders
NEURO ICU PATIENTS VS STEP DOWN

- AIS with IV alteplase – frequent monitoring
- SAH or ICH
- Large cortical infarct that are at risk for cerebral edema
- Patients with significant co-morbidities
- Patients who need BP augmentation to achieve optimal cerebral perfusion pressure

- No clinical trials
  - Patients with non-ruptured aneurysms
  - Mild strokes post IV thrombolysis
  - Those requiring insulin infusion monitoring
  - The ratio of patients to nurse on those units should be no more than 3:1
Consecutive alteplase patients admitted to an acuity-adaptable stroke unit (SU)

- No differences NIHSS score (9.0 versus 9.5)
- sICH rate was 3.3% (n = 10) and SH rate was 2.9 (n = 9), with no difference in patients
- No alteplase related deaths occurred and none required transfer to the ICU
- Estimated hospital cost savings were $362,400 for ‘avoided’ ICU days, and hospital LOS decreased significantly from 9.8 ± 15.6 days (median 5) in year 1, to 5.2 ± 4.8 days (median 3) by year 3
MANAGEMENT OF SYMPTOMATIC ICH WITHIN 24 HOURS

- **Diagnostic**
  - CBC, PT (INR), aPTT, fibrinogen level, and type and cross-match
  - Emergent head CT

- **Management**
  - Cryoprecipitate (includes factor VIII): 10 U infused over 10–30 min (onset in 1 h, peaks in 12 h); administer additional dose for fibrinogen level of <200 mg/dL
  - Tranexamic acid 1000 mg IV infused over 10 min OR ε-aminocaproic acid 4–5 g over 1 h, followed by 1 g IV until bleeding is controlled (peak onset in 3 h)
  - Supportive therapy, including BP management, ICP, CPP, MAP, temperature, and glucose control

- **Consultations**
  - Hematology and neurosurgery consultations
TIMING OF SYMPTOMATIC FATAL ICHs

WHAT WE DO KNOW

Asymptomatic ICHs During First 36 Hours Associated with NIHSS

<table>
<thead>
<tr>
<th>NIHSS</th>
<th>no</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td>6-10</td>
<td>68</td>
<td>3</td>
</tr>
<tr>
<td>11-15</td>
<td>66</td>
<td>5</td>
</tr>
<tr>
<td>16-20</td>
<td>72</td>
<td>4</td>
</tr>
<tr>
<td>&gt;20</td>
<td>63</td>
<td>17</td>
</tr>
</tbody>
</table>

Group, T. N. t-P. S. S. Stroke 1997;28:2109-2118
POST PROCEDURAL CARE

Sheath Site Complications:
- May occur within first 24 – 48 hours post sheath removal

Monitor site for:
- Bruising, groin hematoma/excessive bleeding
- Retroperitoneal Bleed
- Pseudo-aneurysm or arteriovenous fistula
- Arterial occlusion– peripheral Pulses first 24 – 48 hours
- Infection

POST PROCEDURAL CARE

- Monitor Kidney Function:
  - Patient has received CT contrast for CTA & during procedure so monitor kidney function post procedure
- IV to flush contrast from kidneys
- Monitor for Fluid Overload/CHF
- Watch for fluid overload especially in patients with cardiac co-morbidities
- Monitor for Cardiac Arrhythmias
GENERAL NURSING MANAGEMENT

- BP management and neurological assessment every 15 min during and after IV alteplase infusion for 2 h, then every 30 min for 6 h, then hourly until 24 h after IV alteplase treatment
  - There is no evidence to support the frequency, but it is the current standards

- No standards for BP with no alteplase
  - Every 2 hours on admission for 8 hours followed by every 4 hours – some protocols
BUT WILL IT BE THAT WAY FOREVER

Optimal Post Tpa-Iv Monitoring in Ischemic Stroke (OPTIMIST)
- Prospective safety clinical trial to establish whether patients with a low NIHSS (9 or less) can be safely monitored in a non–ICU
- May improve cost–effective utilization of ICU resources and reduce the length of hospitalization for stroke patients.
- Patients treated with IV alteplase monitored in a non–ICU setting following the "Hopkins" post alteplase monitoring protocol
- Vital signs and neurochecks every 15 minutes for 2 hours, every hour for 2 hours, then every 2 hours for 8 hours and then every 4 hours until 24 hours post alteplase
- Currently No LOE
Neurological assessment

- The National Institute of Health Stroke Scale (NIHSS) is used for the initial neurological assessment and if deterioration
- Higher weighted bias toward anterior circulation (cortical) strokes, often underestimates degree of right hemisphere injury
- NIHSS Zero – does not mean absence of stroke
- NIHSS of 1 considered “excellent” outcome
- Hemianopia could preclude driving and necessitate loss of employment

**GENERAL NURSING MANAGEMENT**
EXPANDED NIHSS (E–NIHSS)

- Background: The clinical evaluation on posterior circulation stroke with NIHSS is limited
- Methods: Added elements in existing items to explore s/s of posterior circulation stroke
- Results: Patients with e–NIHSS had an average of 2 points higher than patients evaluated with classical NIHSS and was statistically significant
- Conclusions: The e–NIHSS could improve the sensitivity of NIHSS in posterior stroke and further studies are needed
EXPANDED NIHSS (E-NIHSS)

Comparison: Item 4

**Horizontal eye movements**
- 0 = normal
- 1 = partial gaze palsy (gaze is abnormal in 1 or both eyes, but forced deviation or total gaze paresis is not present)
- 2 = forced deviation or total gaze (paresis not overcome by the oculocephalic maneuver)

**Horizontal and vertical eye movements**
- 0 = normal
- 1 = partial gaze palsy (gaze is abnormal in 1 or both eyes, but forced deviation or total gaze paresis is not present)
- 1 = nystagmus and/or Horner’s syndrome
- 2 = forced deviation or total gaze (paresis not overcome by the oculocephalic maneuver)
**Comparison: Item 6**

<table>
<thead>
<tr>
<th>Facial palsy</th>
<th>Facial, hypoglossal and glossopharyngeal palsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 0 = normal</td>
<td>• 0 = normal</td>
</tr>
<tr>
<td>• 1 = minor paralysis (flattened nasolabial fold, asymmetry on smiling)</td>
<td>• 1 = minor paralysis (flattened nasolabial fold, asymmetry on smiling)</td>
</tr>
<tr>
<td>• 2 = partial paralysis (total or near-total paralysis of the lower face)</td>
<td>• 2 = partial paralysis (total or near-total paralysis of the lower face)</td>
</tr>
<tr>
<td>• 3 = complete paralysis of 1 or both sides (absence of facial movement in the upper and lower parts of the face)</td>
<td>• 3 = deficit of IX nerve (soft palate paralysis)</td>
</tr>
<tr>
<td></td>
<td>• 3 = deficit of XII nerve</td>
</tr>
</tbody>
</table>
EXPANDED NIHSS (E-NIHSS)

Comparison: Item 11

**Limb ataxia**
- 0 = absent or untestable
- 1 = present in 1 limb
- 2 = present in 2 limbs

**Limb and trunk ataxia**
- 0 = absent or untestable
- 1 = present in 1 limb
- 1 = imbalance in Romberg position
- 2 = present in 2 limbs
- 2 = trunk ataxia or retro- or lateropulsion
NIHSS Scores in Posterior Strokes

- Patients with relatively low NIHSS have high probability of poor outcome at 3 months.
- Cranial nerve signs and ataxia receive fewer points on the NIHSS.
- Ataxia frequently excluded from scoring due to coexistence of motor deficits.
- Patients with “mild” symptoms based on NIHSS excluded from thrombolysis were unable to be discharged to home.
COMMON POSTERIOR STROKE

Deficits not Captured by the NIHSS
- Diplopia
- Vertigo
- Nystagmus
- Cranial Nerves
A large controlled clinical trial in AIS showed no benefit of receiving supplemental oxygen.

Supplemental oxygen should be provided to maintain O2 sat >94%

Supplemental oxygen is not recommended in nonhypoxic patients with AIS
QUALITY IN ACUTE STROKE CARE (QASC) TRIAL

- Evidence of the impact of a nurse–led multidisciplinary intervention on outcomes in acute stroke
- Implementation of 3 clinical protocols for the management of fever, hyperglycemia, and swallowing dysfunction in first 72 hrs
- Significantly decreased death and dependency by 16% and also significantly reduced temperature, blood glucose level and improved swallowing management

**QUALITY IN ACUTE STROKE CARE (QASC) TRIAL**

- 1076 (intervention n=600; control n=476) were followed for a median of 4.1 years of whom 264 (24.5%) had died.

- The QASC intervention group had improved long-term survival (>20%).
  - Older age (75–84 years) and increasing stroke severity were associated with increased mortality.

Middleton et al, Stroke. 2017 May;48(5):1331–1336
Numerous studies have shown that hyperglycemia exacerbates neuronal damage after stroke.

- Yet, despite the marked occurrence of neurologic or medical complications and overall clinical deterioration associated with both high or low post-stroke blood glucose levels.
- There are still no precise guidelines regarding a gold standard euglycemic management after stroke.
- Current guidelines utilize the ADA recommendations of maintaining glucose range of 140 to 180 mg/dL and to closely monitor to prevent hypoglycemia.
  - Nurses important in monitoring and following protocol.
TEMPERATURE

- Fever independently associated with poor outcomes
  - Identify sources of hyperthermia (temperature >38°C) and treat with antipyretic medications
  - Hypothermia is a promising neuroprotective strategy, but its benefit in patients with AIS has not been proven
    - Most studies suggest that induction of hypothermia is associated with an increase in the risk of infection, including pneumonia
**Dysphagia Screening**

- **Post stroke dysphagia**
  - Very common (37–78%)
  - Risk factor for pneumonia
  - Associated with worse patient outcomes

- **Screening**
  - Insufficient data whether screening protocol decreases death or dependency, but that does not mean screening is ineffective
  - Early screening is reasonable
  - Those who fail screening are older, more comorbidities, transfer from facility, presenting with weakness and speech difficulties, lower level of consciousness and higher stroke severity
# Dysphagia Screening

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysphagia screening before the patient begins eating, drinking, or receiving</td>
<td>IIA</td>
<td>C-LD</td>
</tr>
<tr>
<td>oral medications is reasonable to identify patients at increased risk for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aspiration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is reasonable for dysphagia screening to be performed by a speech-</td>
<td>IIA</td>
<td>C-LD</td>
</tr>
<tr>
<td>language pathologist or other trained healthcare provider.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>An instrumental evaluation is reasonable for those patients suspected of</td>
<td>IIA</td>
<td>B-NR</td>
</tr>
<tr>
<td>aspiration to verify the presence/absence of aspiration and to determine the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>physiological reasons for the dysphagia to guide the treatment plan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is not well established which instrument to choose for evaluation of</td>
<td>IIB</td>
<td>C-LD</td>
</tr>
<tr>
<td>swallowing with sensory testing, but the choice may be based on instrument</td>
<td></td>
<td></td>
</tr>
<tr>
<td>availability or other considerations (i.e. fiberoptic endoscopic evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of swallowing, videofluoroscopy, fiberoptic endoscopic evaluation).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dysphagia – Nutrition

Dennis et al. Food Trial Collaboration: A multicentre RCT trial evaluating feeding policies in patients admitted to hospital with a recent stroke

- Early (first 2–3 weeks) NG tube feeding was associated with an absolute reduction in risk of death of 5.8% and a reduction in death or poor outcome of 1.2%
- PEG feeding was associated with an absolute increase in risk of death of 1.0% and an increased risk of death or poor outcome of 7.8%
- PEG is associated with fewer treatment failures, less GI issues, and higher food delivery

GAP – Evidence from Trial done in the UK does not translate to our health care in US
THE HEAD POSITION IN ACUTE STROKE TRIAL, OR HEADPoST

- Largest randomized nursing care trial ever, with more than 11,000 patients from 114 hospitals in nine countries.
- Neither head position had an impact on serious side effects or the rate of pneumonia.
  - The Head Position in Stroke Trial compared effectiveness of lying flat (0°) compared to sitting up (≥30°) head positioning, initiated within 24 h of hospital admission for patients with acute stroke
  - Neither head position had an impact on serious side effects or the rate of pneumonia

  - June 22, 2017
NURSING DRIVEN STROKE MANAGEMENT

Mobility

- The results of the RCT showed patients in high dose, very early mobilization group had less favorable outcomes (46% vs 50%) than those in the usual care group
  - 8% vs 7% of patients died in the very early mobilization group
  - 19% vs 20% had a non-fatal serious adverse event with high dose, very early mobilization
Venous Thrombosis Prophylaxis

- CLOTS 3 (Clots in Legs Or stockings after Stroke) comparing the use of IPC (IPC) with routine care (routine care was defined as the use of ASA for non–hemorrhagic stroke, hydration and compression stocking).
  - Results: IPC statistically significant in VTE prevention as compared to routine care
- No compression stockings – ineffective in preventing DVT

## REHAB

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is recommended that early rehabilitation for hospitalized stroke patients be provided in environments with organized, interprofessional stroke care.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>It is recommended that stroke survivors receive rehabilitation at an intensity commensurate with anticipated benefit and tolerance.</td>
<td>I</td>
<td>B-NR</td>
</tr>
<tr>
<td>High-dose, very early mobilization within 24 hours of stroke onset should not be performed because it can reduce the odds of a favorable outcome at 3 months.</td>
<td>III (Harm)</td>
<td>B-R</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is recommended that all individuals with stroke be provided a formal assessment of their ADLs and IADLs, communication abilities, and functional mobility before discharge from acute care hospitalization and the findings be incorporated into the care transition and the discharge planning process.</td>
<td>I</td>
<td>B-NR</td>
</tr>
<tr>
<td>A functional assessment by a clinician with expertise in rehabilitation is recommended for patients with an acute stroke with residual functional deficits.</td>
<td>I</td>
<td>C-LD</td>
</tr>
<tr>
<td>The effectiveness of fluoxetine or other SSRIs to enhance motor recovery is not well established.</td>
<td>IIb</td>
<td>C-LD</td>
</tr>
</tbody>
</table>
LARGE SUPRATENTORIAL INFARCTIONS

• Palliative care
• At high risk for cerebral edema and increased ICP. Discussion and care options with possible outcomes should take place quickly and be patient centered
• Nurses monitoring for increased ICP, neurological decline
  • Important in making decision on EVD placement and decompressive craniectomy
WHAT WE KNOW FOR SURE

THERE IS A GAP BETWEEN WHAT OUR SCIENCE BASED EVIDENCE AND WHAT WE DO
WHAT WE KNOW FOR SURE

- Evidence regarding optimal management will continue to evolve
- Highly specialized nursing input is of paramount importance in achieving optimum patient outcomes
- Acute nursing research is in its infancy
- We must continue to review clinical guidelines and protocols updated (standardized approach is the best)
- We have a pivotal role in conducting research and examining methods to increase evidence update for stroke nursing management and protocols updated.
The world is moving from a time clock to a tissue clock

“It's no longer just a time clock, it's also a tissue clock.” Jeff Saver