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**Stroke and TIA Patients in the  
Prehospital and ED Settings:  
*Should EMS Triage and  
Inter-hospital Transfer to Stroke  
Centers Take Place?  
Why? When?***

Andy Jagoda, MD, FACEP




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**Emergency Medicine  
Associates**

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**2006 Advanced Emergency  
& Acute Care Medicine and  
Technology Conference**

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**Andrew Jagoda, MD, FACEP**

**Professor and Vice Chair  
Department of Emergency Medicine  
Mount Sinai School of Medicine  
New York, NY**

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**Disclosures**

- Astra Zeneca, King Pharmaceuticals, NovoNordisk, UCB Pharma Advisory Boards
- Eisai Speakers' Bureau
- Chair, ACEP Clinical Policies Committee
- Executive Board, Brain Attack Coalition
- Executive Board, Foundation for Education and Research in Neurologic Emergencies

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**Case Study**

- 52 yo man with a history of HTN developed severe headache, vomiting, and diplopia
- EMS was called and found the patient appearing anxious
- BP 190 / 100: oriented but slow
- No face droop, no UE drift, speech fluent, gait not tested. Left pupil dilated

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### Where should this patient be transported?

- Closest hospital regardless of capabilities
- Primary stroke center
- Comprehensive stroke center

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### NINDS Multidisciplinary National Conference "Choosing your level of care in acute stroke" 2002 / 2003

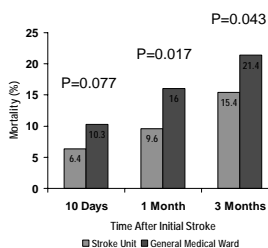
- **Basic Stroke Center - all EDs**
  - Resuscitation and stabilization; BP, glucose, temp
  - Not prepared / able to provide timely CT and lab evaluation
  - Not prepared to administer t-PA
  - Transfer protocols
- **Primary Stroke Center**
- **Comprehensive Stroke Center**

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### Solution: Organized Stroke Care

- 21% reduction in early mortality
- 18% reduction in 12 month mortality
- Decreased length of hospital stay
- Decreased need for institutional care



Ronning, *Stroke* 1998; 29:58-62  
Jorgensen, *Stroke* 1994

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### Acute and Subacute Stroke Care

- North East Melbourne Stroke Incidence Study
- Of 306,631 patients; 645 incident strokes
- Extrapolated number of patients saved from death or dependency for every 1,000 cases:
  - 46 (95% CI 17–69) with stroke unit management
    - 6 (95% CI 1–11) by using aspirin
    - 11 (95% CI 5–17) by using tPA at 3 hrs
    - 10 (95% CI 3–16) by using tPA at 6 hrs
- "Although tPA is the most potent intervention, management in stroke units has the greatest population benefit and should be a priority"

Gilligan, *Cerebrovasc Dis* 2005;20:239–244

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### Solution: Stroke Unit NB: Stroke Center vs Stroke Unit

- Distinct facility staffed by physicians, nurses, and rehabilitation personnel or mobile stroke service with similar components
- Monitoring capabilities providing close observation for neurological worsening or other complications
- Regular communication and coordinated care
- Neurologist or stroke specialist involvement improves outcome

van der Walt, *Med J Aust* 2005 Feb 21;182(4):160-3  
Adams HP, *Stroke* 2003;34:1056-1083  
Goldstein, *Neurology* 2003;61:792–796

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### 11 elements of a Primary Stroke Center JAMA 2000; 283:3102-3109

- EMS integrated into the acute stroke response
- Stroke team available 24 / 7
- Written care protocols
- ED integrated into the acute stroke team
- Stroke unit OR protocol to transfer to hospital with unit
- Neurosurgical services available within 2 hours
- Commitment from the institution
- Neuroimaging interpreted within 45 min of arrival
- Laboratory services with rapid turn around of tests
- CQI program including a database or registry
- Continuing education program

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## Community Education: TLL Temple Foundation Stroke Project

- Aggressive multilevel stroke education program in rural Texas led to:
  - Decreased time to arrival
  - Increased treatment in eligible patients
  - Increased rt-PA utilization overall (1.4% to 5.8% vs 0.5 to 0.55% in control community)

Morgenstern, *Stroke* 2002 Jan;33(1):160-6

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## Stroke Centers

- Improves outcomes?
  - Newell et al. clinical efficiency tools improve stroke management in a rural southern health system. *Stroke* 1998; 29:1092-1098
  - Wentworth et al. Implementation of an acute stroke program decreases hospitalization cost and length of stay. *Stroke* 1996; 27:1040-1043.
  - Douglas et al. Do the brain attack coalition's criteria for stroke centers improve care for ischemic stroke? *Neurology* 2005; 64: 422-427
    - Implementation increased incidence of t-PA use

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## AHRQ #127: Acute Stroke

- Are designated centers effective in reducing stroke related disability and mortality?
  - No studies were identified
  - Studies have shown that stroke teams decrease the time to evaluation
  - Lattimore et al showed that creation of stroke team increased tPA use from 1.5% to 10.5% of acute stroke patients seen

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## IV tPA Utilization Cleveland Clinic Health System

July 1997 - June 1998	July 1999 - June 2000
70 pts treated with IV tPA: 1.8% ischemic strokes	53 pts treated with IV tPA: 2.4% ischemic strokes
11.1% of ischemic strokes arriving < 3 hrs	23.4% of ischemic strokes arriving < 3 hrs (53/226)
31% selected protocol deviations	17% selected protocol deviations
16% symptomatic intracranial hemorrhage	6.5% symptomatic intracranial hemorrhage

Katzan et al, *Stroke* 2003;34:799-800

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## JCAHO Disease-Specific Care Certification

- Joint initiative between ASA and JCAHO
- Voluntary participation
  - > 100 accredited hospitals
  - > 50 site visits in progress
  - > 1000 applications pending
- Premise is that accreditation process will drive quality measures and improve outcomes
- No emergency medicine society has endorsed this initiative
  - t-PA controversy
  - Overcrowding
  - Medical legal implications

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## JCAHO Standardized Stroke Measures

1. Deep vein thrombosis (DVT) prophylaxis
2. Atrial fibrillation anticoagulation therapy
3. Tissue plasminogen activator (t-PA) considered
4. Antithrombotic medication within 48 hours
5. Lipid profile during hospitalization
6. Screen for dysphagia
7. Stroke education
8. Smoking cessation
9. Discharge on antithrombotics
10. Plan for rehabilitation

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## Comprehensive Stroke Centers

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- Concept – not implemented
- Provide advanced diagnostics
  - MRI
  - Functional Imaging
- Provide advanced interventions
  - Intra-arterial t-PA
  - Clot retrieval devices
  - Coils
- Research protocols

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## Case Outcome

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- Patient was transported to the closest hospital which did not have NS services
- CT showed a large subarachnoid bleed
- It took 8 hours to arrange transfer to a hospital with neurosurgical services
- While waiting for transfer, patient deteriorated and was intubated
- Patient had a large PCA aneurysm and several smaller aneurysms which were clipped

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## Conclusions / Key Points

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- Acute stroke care requires a multi-disciplinary approach coordinating EMS through rehab
- Protocols and pathways can facilitate efficient and effective acute stroke care
- There are three categories of acute stroke care
  - Basic
  - Primary
  - Comprehensive
- Public education regarding hospital capabilities and hospital CQI programs are key features of successful stroke programs

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## Questions?

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[www.FERNE.org](http://www.FERNE.org)

[Andy.Jagoda@msnyuhealth.org](mailto:Andy.Jagoda@msnyuhealth.org)

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