WHY TIMELINESS MATTERS

W&M Wren Association Lecture Series

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Stroke: How Big Of A Problem Is It?

A stroke is a sudden interruption in the blood supply of the brain.

1 in 6 people will have a stroke in their lifetime.

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STROKE—Preventable, Treatable, Beatable

- Americans paid about $73.7 billion in 2010 for stroke-related medical costs and disability.
- On average, every 4 minutes someone dies of stroke.
- A leading cause of long-term disability among adults in the U.S.
- 5th cause of death among adults in the U.S.
- Every 40 seconds, someone has a stroke.
- About 40% of stroke deaths occur in males.
- About 60% of stroke deaths occur in females.
- 80% of stroke deaths can be prevented.
- About 795,000 Americans each year suffer a new or recurrent stroke.
STROKES ARE PREVENTABLE: UPTO 80% OF THEM!
TYPES OF STROKE

- Ischemic Stroke: Area deprived of blood
  - A thrombus or embolus blocks blood flow to part of the brain.
  - Approximately 293,000 Virginians
  - Approximately 62,000 in Hampton Roads

- Hemorrhagic Stroke: Area of bleeding
  - Blood spills out from break in blood vessel in brain.
  - Approximately 43,000 Virginians
  - Approximately 9,300 in Hampton Roads

Legend:
- Ischemic
- Hemorrhagic
KEY PRINCIPLES IN ISCHEMIC STROKE:

1.9 million neurons are lost/minute of lack of blood flow

Brain ages 3.6 years for each hour without treatment

Core = dead brain tissue
Penumbra = Brain at risk for infarct, salvageable brain
Does the brain age more quickly after a stroke?

YES!

3.6 years for each hour without treatment
STROKE: NEUROLOGIC EMERGENCY

TIME IS BRAIN
LEARN HOW TO RECOGNIZE STROKE

B E F A S T

BALANCE: Loss of balance, headache or dizziness
EYES: Blurred vision
FACE: One side of the face is drooping
ARMS: Arm or leg weakness
SPEECH: Speech difficulty
TIME: Time to call for ambulance immediately
Systems of care: Stroke patient

DTN ≤60 min: the “golden hour” for evaluating & treating acute stroke

- T=0: Suspected stroke patient arrives at stroke unit
- ≤10 min: Initial MD evaluation (including patient history, lab work initiation, & NIHSS)
- ≤15 min: Stroke team notified (including neurologic expertise)
- ≤25 min: CT scan initiated
- ≤45 min: CT & labs interpreted
- ≤60 min: rt-PA given if patient is eligible
Are All Strokes Equal in Severity?

77 M Slurred speech, left face, and arm weakness, NIHSS 12

Improved to NIHSS 9 after iv tPA at 52 min

RRMC 2016
iv tPA SUCCESS IN OPENING UP A BLOCKED BRAIN ARTERY?

IV t-PA Re-canalization at One Hour (Angiographic Data)

- All: 31%
- ICA: 8%
- MCA Stem: 24%
- MCA Divsn: 35%
- MCA Branch: 40%

Del Zoppo et al, Ann Neurol 1993

Courtesy: Dr. Peter Rasmussen
LARGE VESSEL OCCLUSION RECANALIZATION

2004 - MERCI

2007 - Penumbra (original)

2010 - Trevo, Solitaire

2012 - “stent-retrievers”

2013 - large bore aspiration

Courtesy: Dr. Josser Delgado
CEREBRAL ANGIOGRAM BEFORE THROMBECTOMY

Groin Access to reperfusion: 20 min
1 month later, patient seen in follow up, no deficits!
CEREBRAL ANGIOGRAM AND THROMBECTOMY

BEFORE

AFTER

NIHSS 13 to 0 at the time of discharge

RRMC Oct 2016
CEREBRAL ANGIOGRAM AND THROMBECTOMY

77 W with L ICA T occlusion; Recent back surgery precluded iv tPA use. NIHSS 22.

Groin Access to reperfusion: 45 min, NIHSS 2!
MECHANICAL THROMBECTOMY TRIALS FOR ELVO

NNT = 2.6
TICI 2b/3 ~ 70%
Median OTG 228'

LANCET NEUROLOGY 2015, 14(8): 846-854
LANCET 2016, 387 (10029): 1723-31
MECHANICAL THROMBECTOMY

Overwhelming data that mechanical thrombectomy of ischemic stroke due to LVO

ACHIEVES SUCCESSFUL REPERFUSION

IMPROVES OUTCOMES

DECREASES MORTALITY

NO DIFFERENCE IN SICH
ELVO STROKE EPIDEMIOLOGY

Conservatively, 10-15% of all ischemic strokes due to ELVO

No treatment, or ineffective treatment of LVO strokes is associated with a higher level of disability and mortality (75-80%)

Timely endovascular intervention can lower rates of mortality and improve rates of independence (60%)

However, 90% of all ELVO currently do not reach an endovascular capable center in a timely fashion
DO STROKE PATIENTS DESERVE LESS?

Like Trauma, Stroke Patients Need a System That Helps Them Survive

TRAUMA PATIENT

TIAGUE
Patients evaluated according to standardized criteria.

TRANSPORT
Patient taken to life-saving trauma center (required by state law).

TREATMENT
Patients receive the right care as rapidly as possible.

SEVERE STROKE PATIENT

TIAGUE
Patient evaluation is not standardized.

TRANSPORT
Patient taken to nearest hospital.

TRANSFER
Nearest hospital is not equipped to treat severe stroke. Patient requires transfer to a neurointerventional-ready center.¹

TREATMENT
Patient arrives at neurointerventional-ready hospital, but hours have been lost in transfer, jeopardizing recovery.²

¹Less than 10 percent of severe stroke patients get the most effective treatment.
²Due to time lost, 1 in 3 severe stroke patients who are transferred become ineligible for specialized stroke surgery.
For severe strokes, rapid access to ENDOVASCULAR TREATMENT IS CRITICAL.

#SURVIVESTROKE

GETAHEADOFSTROKE.ORG
78 W 2 weeks of headache, who on the 3rd visit to the ED was lethargic and with L side weakness

In recent follow up remains wheelchair bound, hemiplegic, slurred speech
IMPACT OF DELAYED REPERFUSION ON OUTCOMES

A Functional independence (mRS 0-2) by time from emergency department arrival to actual substantial reperfusion

- 91% at 150 min
- 10% at 210 min
- 20% at 270 min

Time From Emergency Department Arrival to Reperfusion, min

Percentage of Patients With Functional Independence at 90 d
TREATMENT AFTER INTERFACILITY STROKE TRANSFERS

For every minute after 46 min, there is a 3% less chance of IAT
14.7 miles $\rightarrow$ 104 min

(Stroke. 2011; 42:1626-1630.)
ELVO STROKE

We know how to treat these patients

We have highly effective tools

But we need to get them to the right place the first time to actually help them

How can we do this?
WHAT IF YOU COULD IDENTIFY SEVERE STROKES IMMEDIATELY?

USE A SEVERITY SCORE BY EMS

IF MEETS or EXCEEDS SEVERITY THRESHOLD

TAKE THE PATIENT TO THE HIGHEST LEVEL STROKE HOSPITAL

aka

A COMPREHENSIVE STROKE CENTER

TIME IS BRAIN
TURNING COMMON SENSE INTO COMMON PRACTICE

PEMS - Already implementing a 15 min bypass to CSC for severe strokes

Stake holder participation is essential to its success

TIME IS BRAIN
CONCLUSION

1. Acute ischemic stroke is a neurologic emergency.

2. In addition to iv tPA, mechanical thrombectomy is a powerful treatment option for patients with emergent large vessel occlusion (ELVO).

3. Timeliness in identifying these patients and prompt triage to the nearest endovascular facility offers the best chance at minimizing disability and improving outcomes.

4. Infield stroke severity based assessment can play a crucial role in the timely identification and treatment of patients with ELVO.
Intracerebral hemorrhage:
STROKE: NEUROLOGIC EMERGENCY

TIME IS BRAIN
COMPREHENSIVE STROKE CENTER CERTIFICATION

Equipped to treat the most complex stroke cases

Advanced imaging: MRI/A, CTA, DSA, TCD

24/7 personnel, imaging, OR and endovascular facilities

ICU/ Neuroscience ICU

Experience and expertise in treating ischemic and hemorrhagic strokes
Riverside Regional Medical Center
Comprehensive Stroke Center

Neurovascular Team available 24/7 x 365

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THANK YOU!