Today’s Objective

Optimize stroke patient outcomes by improving our ability to care for patients within the treatment window
Stroke Definition

- Stroke occurs when blood flow to any part of the brain is disrupted
  - Ischemic (80%)
  - Hemorrhagic (20%)
- Stroke is a ‘Brain Attack’ & should be treated with the same degree of urgency as a heart attack
Causes of Stroke
Causes of Stroke-Embolus

- Affected portion of the brain
- Embolus blocks blood flow to part of the brain
- Internal carotid artery
- Common carotid artery
- Atrial fibrillation in the left atrium
- Embolus (clot)
- Aorta
- Thrombus (clot)

Ischemic Stroke

Blood clot stops the flow of blood to an area of the brain

© Heart and Stroke Foundation of Canada
Causes of Stroke-Thrombus

- The majority of strokes (over 50%)
- Often occur at bifurcations
Causes of Stroke: Hemorrhage
Impact of Stroke

- 700,000 to 750,000 cases of new and recurrent strokes a year
- 2% of all 911 calls
- Third leading cause of death
- Up to two-thirds of strokes leaves patient with significant disability
- $90,000 per patient with ischemic stroke and $225,000 per patient with subarachnoid bleed
- 2006 annual economic cost of stroke is 57.9 billion dollars. 20.6 billion related to indirect healthcare costs including lost productivity
Prognosis

- In hospital mortality of 15%
- 30 day mortality of 20 to 25%
- 25 to 30% of survivors are permanently disabled
Myths & Reality of Stroke

**MYTH**
- Stroke is unpreventable
- Stroke cannot be treated
- Stroke only strikes the elderly
- Stroke happens to the heart
- Stroke recovery is immediate

**REALITY**
- Stroke is largely preventable
- Stroke requires emergency treatment
- Anyone can have a stroke
- Stroke is a brain attack
- Stroke recovery continues throughout life

St Joseph's Hospital of Atlanta, 2000.
Risk Factors

- High blood pressure
- High cholesterol
- Smoking
- More than 2 alcoholic beverages per day
- Abusing drugs
- Obesity
- Inactivity
- A-fib
- diabetes
- Age 65 or older
- Male
- African American
- Previous mini stroke (TIA)
- Family Hx of stroke or heart disease
Community education efforts include symptom recognition and dialing 9-1-1.

Does the face look uneven? Ask them to smile.

Does one arm drift down? Ask them to raise both arms.

Does their speech sound strange? Ask them to repeat a phrase.

Every second, brain cells die. Call 9-1-1 at any sign of stroke.

Call 9-1-1 at any sign of stroke.
Early interventions can reverse or minimize an acute stroke
First Medical Contact SARMC

EMS
Patients grouped by how they arrived at your hospital
Time Period: 01/01/2007 - 03/31/2010; Site: Saint Alphonsus Regional Medical Center (21006)

- EMS from home/scene
- Private transport/taxi/other from home/scene
- Transfer from other hospital
- ND or Unknown
- Blank (Missing Arrival Information)

Percent of Patients

Time Period

My Hospital - 01/01/2007 - 03/31/2010
Acute Stroke Management

- According to the NINDS:
  - Rapid identification of stroke
  - Stabilization and transport to stroke center
  - Pre-notification of receiving ED
  - Rapid specialized treatment
  - Comprehensive rehabilitation

Improve outcomes for stroke patients
Stroke Symptoms

- Sudden weakness, numbness or paralysis of face, arm or leg
- Sudden temporary loss of vision, especially in one eye
- Double vision, blurred vision in one or both eyes
- Slurred, garbled, absent speech
- Confusion
- Loss of balance, sudden fall
- “The worst headache of my life”
Differential Diagnosis

- Migraine
- Todd’s paralysis/post ictal-seizure
- Trauma-BI
- Metabolic abnormalities-hypoglycemia
- Bell’s Palsy
- Psychological-conversion disorder
Stroke Assessment

- Cincinnati Stroke Scale
  - Facial Droop
    - Normal: Both sides of face move equally
    - Abnormal: One side of face does not move at all
  - Arm Drift
    - Normal: Both arms move equally
    - Abnormal: One arm drifts compared to the other
  - Speech
    - Normal: Patient uses correct words with no slurring
    - Abnormal: Slurred or inappropriate words or mute
Stroke Assessment

- Cincinnati Stroke Scale
  - If one component is abnormal the sensitivity (positive predictor) for stroke is 66% and specificity (negative predictor) is 87%
  - Reproducible and consistent among health care providers
LOAD & GO
Pre-notification

- Most important piece of information: when was the patient last normal and how was this determined?
- Treatment clock starts from last known normal time, not when symptoms were noticed.
- According to the ASA, patients who were treated at a stroke center had better outcomes.
Timesavers

- Medications
- IV in right AC
- Able to clearly state last known normal
- Gather as much patient medical history as possible - including baseline mental status
- Contact info for family - cell number
- Leave written info in ED
ED Management

- Pre-notification activates Brain Attack Team
- Medical Access Center key to pre-notification
- Rapid evaluation
- Rapid head CT with CTA/CTP
- Assess candidacy for thrombolytics
- Specialists consult and treatment plan determined
ED Management

- NIHSS-determines severity of stroke
- Dysphagia screen-aspiration is number one complication from stroke
- Oxygenation, blood glucose, body temperature, blood pressure management provided
Timeliness

- Times we track
  - Door to ED MD-10 min
  - Door to CT-25 min
  - Door to drug-60 min

- First 20 min of ED visit-EKG done, labs are drawn, assessments by MD, RN
Key interventions

- Avoid hypotension or rapid decrease in BP
- Hypertension (>180 systolic) is treated with short acting agents
- Oxygenate
- Avoid hyperthermia
- Maintain normal blood glucose
- Keep patient NPO until swallow screening occurs
Acute Treatment Options

- Depends on
  - Time (last known normal must by less than 8 hours)
  - Stroke severity and rapidly resolving symptoms
  - Comorbidities
    - Anticoagulant medications
    - Uncontrollable hypertension
    - Recent surgery, MI, trauma
Treatment Options

- **IV alteplace**
  - Last known normal 0-3 hours
  - Last known normal 0-4.5 hours for a select group of patients
  - Dose is weight based

- **IA alteplace**
  - Last known normal 0-6 hours for those patients who do not meet IV criteria
  - Alteplace delivered via intra-arterial catheter to the clot

- **IA thrombectomy**
  - Last known normal 0-8 hours for select patients
  - Merci retriever and Penumbra device
Outcomes-IV rt-PA

- Patients treated with rt-PA were at least 30% more likely to have minimal or no disability at three months.
- The incidence of symptomatic brain hemorrhage within the first 36 hours was 6.4% in the rt-PA group vs 0.6%, but no significant difference in overall mortality between the two groups.
Outcomes-IA thrombolytics

- 40% of patients treated with IA r-proUK plus heparin had a modified Rankin Score of 2 or less vs. 25% of control.
- 60% relative improvement in outcomes vs. control.
- Increase in intracranial hemorrhage with neurologic deterioration within 24 hours occurred in 10% of IA r-proUK vs. 2% of control.
- Overall mortality at 90 days was 25% for IA r-proUK vs. 27% of control.
Outcomes-IA thrombolytics

- Despite increase frequency of early symptomatic hemorrhage, treatment with IA r-proUK within 6 hours of the onset of acute ischemic stroke caused by MCA occlusion significantly improved clinical outcomes at 90 days.
Merci Retrieval Device
Outcomes-Merci

- MERCI trials, Part 1
- Ongoing international, multicenter, prospective trial.
- Trial of patients with large vessel stroke within 8 hours of symptom onset. Patient were enrolled who received IV tPA but did not recanalize or patients who were not candidates for IV tPA.
- One hundred and eleven patients enrolled.
- Primary end point was recanalization.
- Treatment with Merci coil resulted in 54% successful recanalization
Case Studies
Case Study #1

- 52 year old male with sudden onset aphasia, numbness and weakness of right face, arm and leg. Patient ate lunch with his wife at 12:30, took a nap at 1:30 and woke up with symptoms at 3PM. Family called 911 and paramedics arrive at 330PM.
- Med Hx: HTN and Diabetes
- BP 220/120 RR 16 HR 100 irregular O2 sat 98%
- Right facial droop, slurred speech
- Pulmonary - Clear to auscultation
- Heart - Irregular, irregular heart rate
- Neurologic – weakness of right arm and leg
CT Perfusion

- Yellow arrow-area of decreased blood volume
- Green arrow-area of decreased blood flow with increased mean transit time that is oxygen deficient
- The difference between the two is salvageable brain
Case Study #2

- K.S. 64 y.o. female, sudden fall at 1930 with R hemiparesis aphasia
- No meds, PFO closure 20 years ago, other medical history unknown at presentation
- Known risk factors—overweight, smoking
- Arrival 2045, transport via Life Flight after rendezvous with Grandview EMS
- Hypertensive (170/100), agitated en route
- EKG and labs WNL, CTA showed L ICA occlusion and partial occlusion of L MCA
- IV t-PA administered
- Neurological improvement-stand by assist for ADL’s and ambulation
- Discovered undiagnosed A-fib-likely the source of stroke
- Discharged home after 2 weeks inpatient rehab
- **Keys:** last known normal time documented, ED physician and neurologist able to call daughter
Case Study #3

- K.M. 34 y.o. female who had a witnessed fall with flaccid paralysis L side and at 1620
- Transported by EMS, arrived within 30 min of last known normal
- No meds, neg PMH except for developmental delay
- 130/108, 103 nsr
- Risk factors-none
- Began to have projectile vomiting and was intubated in the ED
- CTA showed R MCA occlusion and carotid dissection
- Mechanical thrombectomy performed with successful recanalization
- Neurological improvement
- Placed on a heparin drip to treat carotid dissection
- Discharged home after a short rehab stay with return to neurological baseline
- Keys: EMS documentation (patient sedated) and knowledge of neurological baseline
Case Study #4

- G.H. 55 y.o. male with witnessed onset right sided weakness and ↓ LOC
- BP 222/111, with a history of untreated HTN
- Risk factor-smoker
- CTA showed obstruction of the L ICA, MCA & ACA
- BP lowered with labetolol
- IA t-PA and Merci retriever used to restore flow to L side of brain
- Minimal neurologic improvement
- PEG tube
- D/C to LTACH, readmitted for rehab with minimal improvement, D/C to LTC
Case Study #5

- J.V. 75 y.o. female with onset aphasia and R hemiparesis noted by friends via a phone call
- Hx A-fib, HTN, arthritis
- Taken by EMS to another ED
- 153/94, 120 (a-fib)
- CTA revealed L MCA occlusion
- No neurology or neurorad immediately available at other ED
- Transferred to Saint Al’s for IA t-PA (now outside of 3 hour window for IV t-PA)
- Some neurologic improvement, remains aphasic
- Continued cardioembolic events
- D/C home with 24 hour supervision
- Keys: information gathered by EMS from friends-pinpoint last known normal, more than 2 hours passed until treated, outcomes may have been improved by using IV t-PA (following ASA guidelines)