Wyoming’s TeleStroke System

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WYOMING MEDICAL CENTER
Patient case
KB

77 RHF USOH 14:45
witnessed sudden
onset LHP and
dysarthria

911 activated,
neurologist
contacted by EMS
and code stroke
activated

NIHSS 15:
dysarthria, forced
gaze R, LHH, L
facial droop, LHP, L
sensory loss, L
hemineglect

Met by stroke
team WMC ER
15:10

Head CT negative
for hemorrhage
but calcified R
MCA

IV alteplase (tPA)
started at 15:29

Head CT negative
for hemorrhage
but calcified R
MCA
Patient case: KB stroke protocol CT

Mismatch volume: 34 ml
Mismatch ratio: 3.6
Patient case: KB Thrombectomy

After the device is withdrawn NIHSS 0 !!!
Patient case: KB follow-up MRI
Patient case: KB clinical outcome

Found to have paroxysmal atrial fibrillation so started apixiban 5 mg BID

PT/OT/SLP identified mild generalized weakness needing rehab

Discharged to inpatient on Day 3 with slight left facial droop

Discharged home 8 days after stroke with outpatient SLP for subtle executive function
# Stroke statistics

<table>
<thead>
<tr>
<th>795,000 new or recurrent strokes per year in the US</th>
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<tbody>
<tr>
<td>• 610,000 are first attacks, and 185,000 are recurrent attacks</td>
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<tr>
<td>• On average a stroke occurs every 40 seconds on average.</td>
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<tr>
<th>Stroke is the 5th leading cause of death in the US</th>
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<td>• 142,000 Americans die each year from stroke</td>
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<td>• 1 of every 19 deaths or 37.3 per 100,000</td>
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<td>• On average in 2016, someone died of stroke every 3 minutes 42 seconds.</td>
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<table>
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<th>Stroke is the leading cause of long term disability</th>
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<td>• Approximately 3% of males and 2% of females reported that they were disabled because of stroke.</td>
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### Time is brain - quantified

<table>
<thead>
<tr>
<th></th>
<th>Neurons Lost</th>
<th>Synapses Lost</th>
<th>Myelinated Fibers Lost</th>
<th>Accelerated Aging</th>
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<tbody>
<tr>
<td>Per Stroke</td>
<td>1.2 billion</td>
<td>8.3 trillion</td>
<td>4470 miles</td>
<td>36 years</td>
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<tr>
<td>Per Hour</td>
<td>120 million</td>
<td>830 billion</td>
<td>447 miles</td>
<td>3.6 years</td>
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<tr>
<td>Per Minute</td>
<td>1.9 million</td>
<td>14 billion</td>
<td>7.5 miles</td>
<td>3.1 weeks</td>
</tr>
<tr>
<td>Per Second</td>
<td>32,000</td>
<td>230 million</td>
<td>218 yards</td>
<td>8.7 hours</td>
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Time is brain!
But in Wyoming...

- 6 people per square mile
- ½ live > 1 hour from hospital
- Every 10 km from hospital increases mortality by 1%

- Our job is to build a system of care to overcome geographic barriers


Evolution of the Window of Time

1995–2013: IV alteplase up to 3 hours after symptom onset

2013–2015: IV alteplase up to 4.5 hours after symptom onset in most cases

2015–2018: Mechanical thrombectomy up to 6 hours for LVO stroke

2018: Mechanical thrombectomy up to 24 hours for LVO with mismatch

2019: IV alteplase up to 9 hours with mismatch... TNK vs alteplase...
RAPID assessment of CT Perfusion

- All stroke protocol CTs include CT-, CTP (RAPID), CTA, CT+
- <4.5 hr alteplase if no bleed
- +LVO <6 hr thrombectomy
- +LVO 6-24 hr thrombectomy if RAPID mismatch
How to ensure every person in Wyoming who has a stroke can be treated effectively

- Public education regarding symptoms of stroke and importance of calling 911
- EMS training for stroke recognition, severity assessment and management during transport
- System wide triage plan to ensure rapid transport to the nearest appropriate facility
Public Education

- F.A.S.T. Campaign
- Community Lectures
- Public Service Announcements
- Meals on Wheels Menu Ads
- Billboards
- Print Advertisement
- Social Media Campaigns

![Stroke Warning Signs and Symptoms](image-url)
Emergency Medical Services

- In person training programs
- On-line lecture series
- Department of Health Regulation
- Real time feedback
EMS Stroke Assessment: Stroke?  

Cincinnati Prehospital Stroke Severity Scale

- **Facial Droop**
  - Normal: both sides of face move equally
  - Abnormal: one side of face does not move

- **Arm Drift**
  - Normal: Both arms move equally or not at all
  - Abnormal: One arm drift or does not move compared to the other side

- **Speech**
  - Normal: patient uses correct words without slurring
  - Abnormal: Slurred or inappropriate words or mute

One abnormal finding associated with 72% probability of stroke
EMS Stroke Assessment: LVO?

Cincinnati Stroke Triage Assessment Tool (C-STAT)

- Arm weakness present = 1 point
- Decreased LOC = 1 point
  - Unable to state either age or current month and
  - Unable to follow command to either open/close eyes or squeeze/release fist
- Gaze deviation present = 2 points

C-STAT ≥ 2 reliably identifies patient with Large Vessel Occlusion (LVO) Stroke

Pre-hospital Notification by EMS

The stroke team should be activated by EMS ASAP

EMS or stroke team may consult directly with Neurologist by telephone or TeleStroke

Neurologist and/or Stroke Team triage to which facility patient should be taken
Code Stroke

EMS contacts Stroke Center and/or Stroke Doctor

EMS relays results of stroke assessment

EMS places 18g in AC checks FSBG and draws Rainbow

Code Stroke is activated

Page Alert: Stroke Doc, Stroke RN, Lab, CT, Admissions

Call for life flight or ACLS ambulance for expected transfer

Activate Telestroke System or call Neurologist
Upon arrival...

- Patient is registered
- Quick assessment by Stroke doc to ensure patient is stable
- Blood is taken to the lab
  - Required: INR, PLT, Cr
  - Optional: CBC, CMP, PT/PTT, trop, ESR, TSH
- Patient taken to CT
- Non-contrast head CT mandatory
- CTA head/neck if mandated by standard facility protocol
Consult Neurologist

- Early involvement with neurologist streamlines treatment\(^1\)
- Telephone consult with CT images pushed to WMC PACS
- TeleStroke allows direct patient assessment and immediate CT review
- Decide whether to give alteplase and whether patient needs to transfer
“Drip & Ship”

- Give alteplase with goal door to needle (DTN) less than 30 minutes
- If patient transfers goal door in-door out (DIDO) less than 60 minutes
- Alteplase may continue en route
- Blood pressure goal throughout <185/105 using 10-20 mg labetalol every 10 minutes prn as described in EMS Regulation
Wyoming TeleStroke
Growth of the TeleStroke Network

![Graph showing the growth of the TeleStroke network with current partners and anticipated growth.](image)
Number of Cases per Month
Acceleration of Utilization
WMC Primary Stroke Center

American Heart Association
- 2007 Bronze, 2008 Silver
- 2009-2010 Gold, 2011-2012 Gold +
- 2013-2014 Gold Plus and Target Stroke Honor Roll
- 2015-2018 Gold Plus and Target Stroke Honor Roll Elite Plus

The Joint Commission
- The Joint Commission Disease Specific Certification and Recertification: Primary Stroke Center in 2009-2018

Department of Health
- First designated Primary Stroke Center by the Wyoming Department of Health in November 2015