

## Advances in Neuro-Endovascular Care for Acute Stroke

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## Financial Disclosures

- Clinical Research Support: Edge Therapeutics, Medtronic, MicroVention and Stryker Neurovascular
- Fellowship Support: Medtronic

## Overview

- **Stroke Facts**
  - Definition, demographics, types
- **Telestroke**
  - IV tPA delivery data
- **Thrombectomy for Large Vessel Occlusion (LVO)**
  - MR CLEAN, DEFUSE 3 and friends
- **The Future of Stroke Care**
  - What about mobile stroke units (MSUs)?

## STROKE FACTS

## Stroke

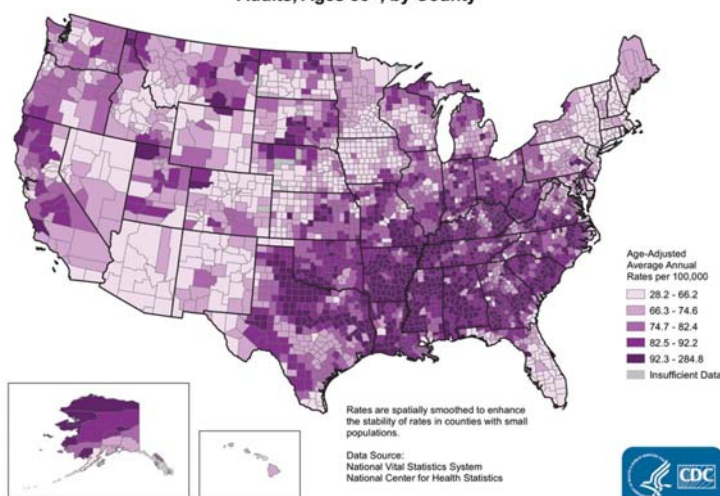
- Injury to the brain as a result of a blocked or ruptured blood vessel.
- Someone in the U.S. has a stroke about once every 40 seconds.
- Stroke accounts for 1 of every 20 deaths in the U.S. Stroke ranks 5<sup>th</sup> among all causes of death in the U.S., killing nearly 133,000 people a year.
- Each year, about 795,000 people suffer a new or recurrent stroke.
- Stroke is a leading cause of serious long-term disability in the U.S.

Benjamin et al., Heart disease and stroke statistics-2017 update. Circulation, Jan 25, 2017



### Stroke death rates, 2011 through 2013.

Stroke Death Rates, 2011-2013  
Adults, Ages 35+, by County



Dariush Mozaffarian et al. Circulation. 2016;133:e38-e360



## Cerebrovascular Disease: Pathogenesis

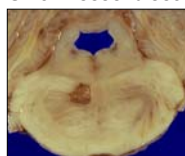
### Ischemic Stroke (87%)

Atherothrombotic Cerebrovascular Disease (20%) Cryptogenic (30%)



?

Lacunar (25%) Small vessel disease



Embolism (20%)

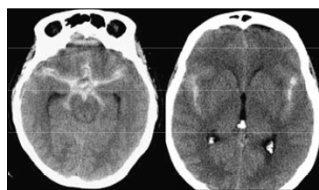



### Hemorrhagic Stroke (13%)



Intracerebral Hemorrhage (77%)

Subarachnoid Hemorrhage (23%)



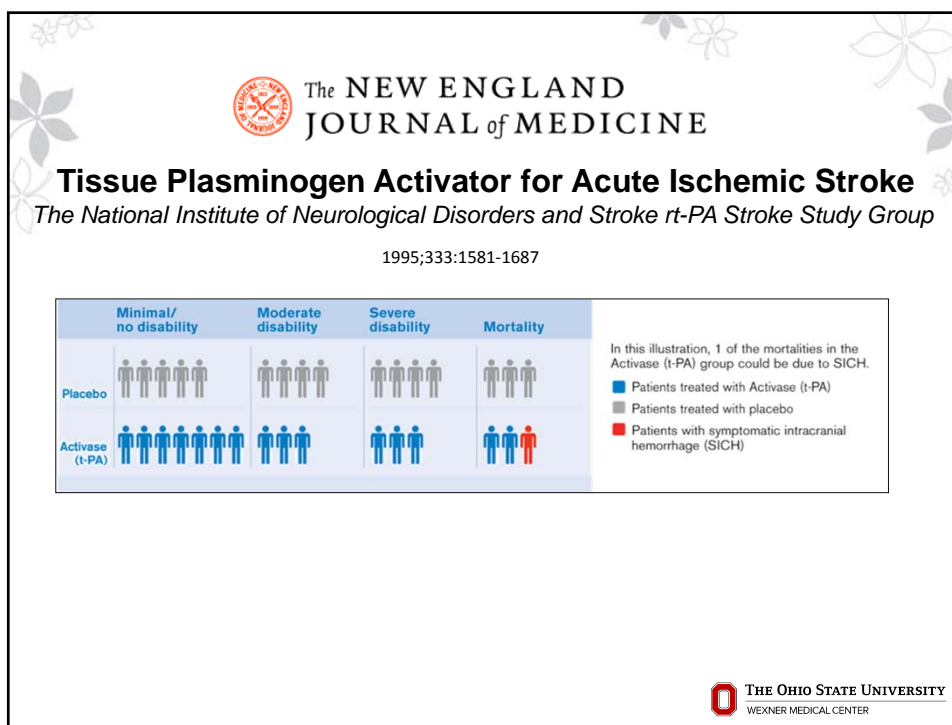
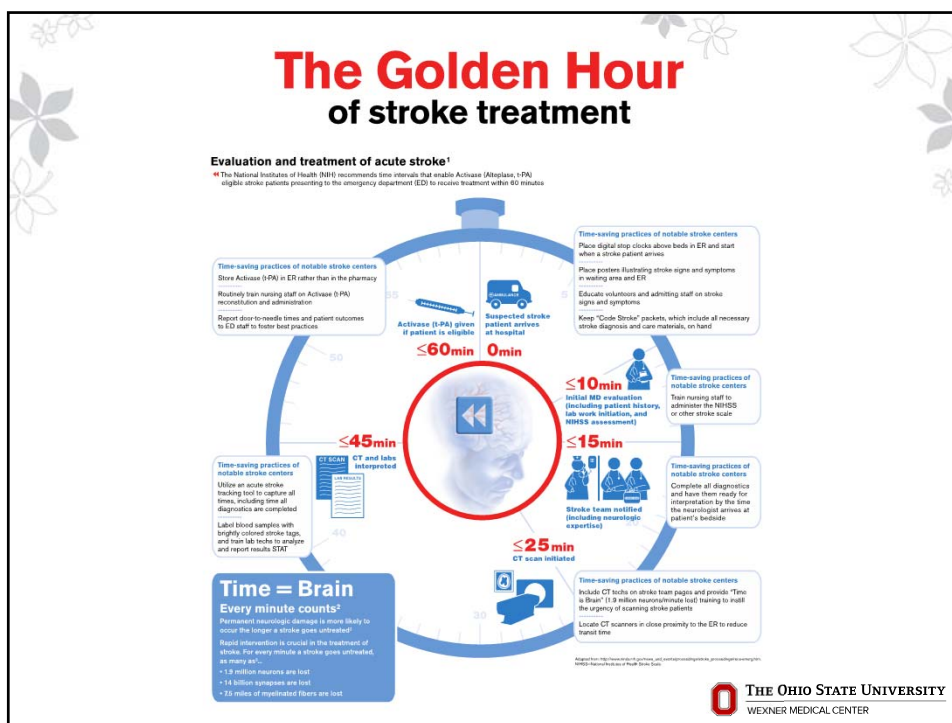
Albers GW, et al: Chest 114:683S-98S, 1998.  
Rosamond WD, et al: Stroke 30:736-43, 1999.  
Mozaffarian D, et al: Circulation 133:e38-e360, 2016.  THE OHIO STATE UNIVERSITY  
WEXNER MEDICAL CENTER

## Ohio State Horseshoe



Seating capacity = 106,000 per game  
Ischemic stroke = 690,000 per year  
Hemorrhagic stroke = 105,000 per year

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THROMBOLYTIC THERAPY CHECKLIST FOR ACUTE ISCHEMIC STROKE  
COMPLETED PRIOR TO/IN CONJUNCTION WITH NEUROLOGY CONSULT

PATIENT LABEL

Patient/family members understood potential risks and benefits from treatment.  
Information Source: ☐ Family ☐ Outside Medical Record

| Yes   | No | Eligibility for IV treatment with ALTEPLASE (Must answer YES to questions 1-3 to be eligible)   |
|---|----|---|
| 1   |    | Left known well established to be<br>EQUAL TO OR LESS THAN 3 hours (Plus Questions 1 – 24) OR<br>BETWEEN 3 and 4.5 hours (Plus Questions 1 – 25) before treatment would begin   |
| 2   |    | Clinical diagnosis of ischemic stroke causing a measurable neurologic deficit   |
| 3   |    | Age 18 years or older   |
| Contraindications (Must answer NO to questions 4-15 to be eligible)   |    |   |
| 4   |    | Evidence of intracranial hemorrhage or subarachnoid hemorrhage on pretreatment CT   |
| 5   |    | Clinical presentation suggestive of subarachnoid hemorrhage, even with normal CT  |
| 6   |    | CT shows multilobar infarction (hypodensity of > 1/3 cerebral hemisphere)   |
| 7   |    | Known intracranial neoplasms, arteriovenous malformation or aneurysm  |
| 8   |    | Significant head trauma (with sustained loss of consciousness), intracranial or intraspinal surgery within last 3 months  |
| 9   |    | *Blood pressure elevated (systolic > 185 mm Hg or diastolic > 110 mm Hg)  |
| 10  |    | *Abnormal blood glucose (< 50 or > 400 mg/dL)   |
| 11  |    | Active internal bleeding  |
| 12  |    | Known bleeding risk (including but not limited to 13 – 15 below)  |
| 13  |    | heparin, argatroban, or bivalirudin received within 48 hours with PTT > upper limit of normal   |
| 14  |    | Platelet count < 100,000/mm <sup>3</sup>  |
| 15  |    | *Current or recent use of anticoagulants including but not limited to:<br>Warfarin (Coumadin®) within 5 days or INR > 1.7<br>Apixaban (Eliquis®) within 48 hours**<br>Dabigatran (Pradaxa®) within 72 hours**<br>Dalteparin (Fragmin®) within 24 hours**<br>Edoxaban (Savaysa®) within 48 hours**<br>Enoxaparin (Lovenox®) within 24 hours**<br>Fondaparinux (Arixtra®) within 72 hours**<br>Rivaroxaban (Xarelto®) within 48 hours** |
| *Remains thrombolytic eligible if BP/SG corrected while in treatment window.<br>**Note: if medical and medication history can be confirmed and all other criteria are met, alteplase may be initiated prior to availability of platelet count, PTT, and INR if patient has no history of thrombocytopenia or IV/PO anticoagulant use. Alteplase should be discontinued if results are outside criteria once resulted. |    |   |
| Warning/Precaution Considerations<br>Use careful consideration and risk vs. benefit analysis. Patient may receive thrombolytic therapy despite 2-1 of the below.  |    |   |
| Check all that apply:   |    |   |
| 16  |    | Prior ischemic stroke within last 3 months  |
| 17  |    | Recent history of intracranial hemorrhage   |
| 18  |    | Pregnancy   |
| 19  |    | Current or recent use of: Ticagrelor (Brilinta®) within last 5 days or Prasugrel (Effient®) within last 7 days  |
| 20  |    | Arterial puncture at non-compressible site or lumbar puncture within last 7 days<br>Note: Patients undergoing LP within last 24 hours may be at higher risk. Assess for signs of traumatic or repeated punctures.   |
| 21  |    | Major surgery or serious trauma within last 14 days   |
| 22  |    | Gastrointestinal or urinary tract hemorrhage within last 21 days  |
| 23  |    | Myocardial infarction involving left anterior myocardium within last 3 months   |
| 24  |    | Suspected or known infective endocarditis or pericarditis   |
| Additional Warning/Precaution Considerations for Last Known Well THREE (3) to FOUR AND ONE-HALF (4.5) HOURS   |    |   |
| 25  |    | Taking any oral anticoagulant (apixaban, dabigatran, edoxaban, rivaroxaban) other than warfarin regardless of time since last dose. Note: This does NOT include warfarin. A patient on warfarin remains eligible if INR ≤ 1.7.  |

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TELESTROKE

## Regional thrombolysis use 2007 to 2010.

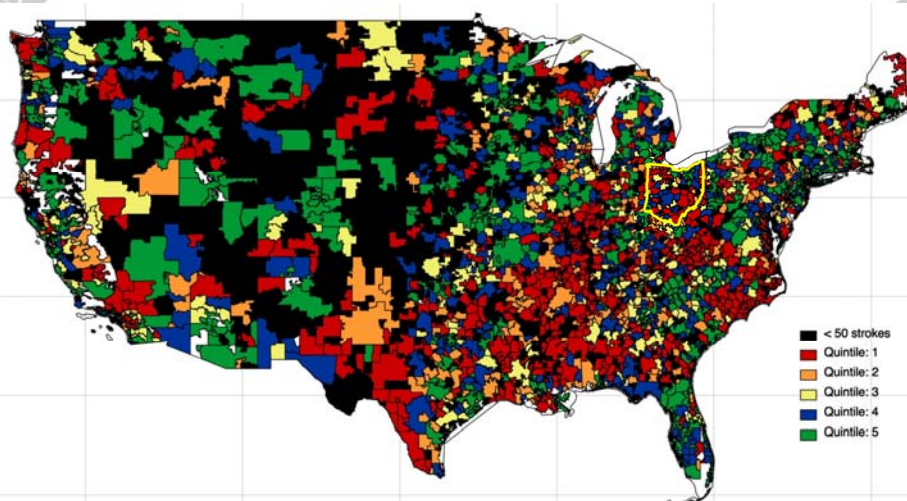
Lesli E. Skolarus et al. *Stroke*. 2015;46:1890-1896

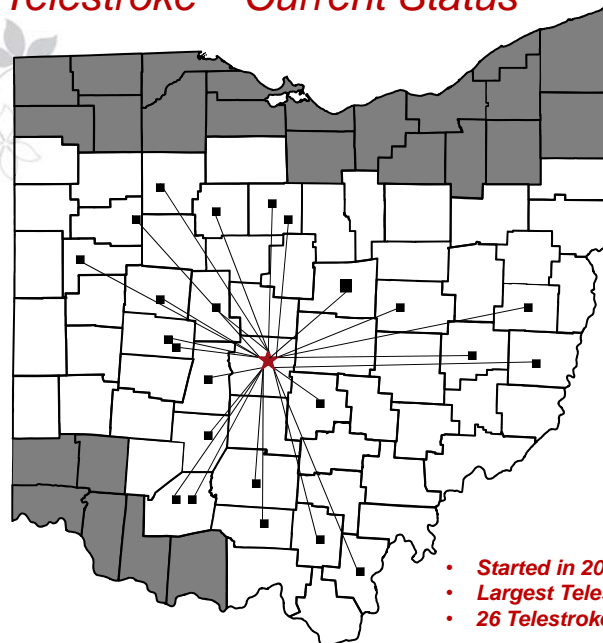
Table 2. The 20 Regions With the Highest Proportion of Ischemic Stroke Patients Treated With Thrombolysis From 2007 to 2010

| Rank | Annual Mean Treatment Rate, % | Lower CI, % | Upper CI, % | City          | State | Total Strokes | Untreated | Intravenous | IAT | Intravenous+IAT |
|------|-------------------------------|-------------|-------------|---------------|-------|---------------|-----------|-------------|-----|-----------------|
| 1    | 14.3                          | 11.0        | 18.3        | Stanford      | CA    | 317           | 266       | 43          | 2   | 6               |
| 2    | 13.8                          | 11.7        | 16.1        | Asheville     | NC    | 910           | 779       | 113         | 1   | 17              |
| 3    | 12.9                          | 9.1         | 18.1        | Waconia       | MN    | 183           | 154       | 24          | 1   | 4               |
| 4    | 11.9                          | 10.0        | 14.2        | Langhorne     | PA    | 862           | 754       | 106         | 1   | 1               |
| 5    | 11.2                          | 7.2         | 17.0        | Brevard       | NC    | 127           | 108       | 17          | 0   | 2               |
| 6    | 11.2                          | 8.6         | 14.4        | Iowa City     | IA    | 422           | 370       | 47          | 4   | 1               |
| 7    | 11.1                          | 7.0         | 17.0        | Hastings      | NE    | 120           | 102       | 18          | 0   | 0               |
| 8    | 10.8                          | 8.0         | 14.5        | Wheat Ridge   | CO    | 317           | 278       | 37          | 0   | 2               |
| 9    | 10.7                          | 7.8         | 14.7        | Provo         | UT    | 274           | 240       | 19          | 3   | 12              |
| 10   | 10.7                          | 7.5         | 15.0        | Holyoke       | MA    | 228           | 199       | 27          | 1   | 1               |
| 11   | 10.7                          | 6.4         | 17.4        | Hutchinson    | MN    | 88            | 74        | 12          | 1   | 1               |
| 12   | 10.7                          | 7.0         | 16.0        | Marion        | NC    | 145           | 125       | 19          | 0   | 1               |
| 13   | 10.6                          | 8.1         | 13.7        | St Louis Park | MN    | 430           | 380       | 46          | 0   | 4               |
| 14   | 10.5                          | 8.5         | 12.9        | Cedar Rapids  | IA    | 716           | 636       | 68          | 4   | 8               |
| 15   | 10.3                          | 7.2         | 14.6        | Encinitas     | CA    | 219           | 192       | 23          | 1   | 3               |
| 16   | 10.3                          | 8.9         | 11.7        | San Francisco | CA    | 1790          | 1602      | 169         | 3   | 16              |
| 17   | 10.1                          | 5.7         | 17.4        | Southbridge   | MA    | 66            | 55        | 10          | 1   | 0               |
| 18   | 10.0                          | 7.0         | 14.2        | Pekin         | IL    | 236           | 208       | 25          | 0   | 3               |
| 19   | 10.0                          | 8.9         | 11.3        | Denver        | CO    | 2396          | 2152      | 222         | 5   | 17              |
| 20   | 9.8                           | 6.3         | 15.0        | American Fork | UT    | 141           | 123       | 10          | 2   | 6               |

CI indicates confidence interval; and IAT, intra-arterial treatment.

Lesli E. Skolarus et al. *Stroke*. 2015;46:1890-1896

## Telestroke – Current Status



Adena Medical Center  
Adena Greenfield Medical Center  
Adena Pike Community Hospital  
Avita Ontario (new in FY17)  
Barnesville Hospital  
Blanchard Valley Hospital  
Bluffton Hospital  
Bucyrus Community Hospital  
Coshocton County Memorial Hospital  
Fairfield Medical Center  
Fayette County Memorial Hospital  
Gallion Community Hospital  
Grand Lake Health System  
Harrison Community Hospital  
Highland District Hospital  
Holzer Medical Center Gallipolis  
Holzer Medical Center Jackson  
Knox Community (new in FY17)  
Madison County Hospital  
Mary Rutan Hospital  
Memorial Hospital of Union County  
Mercy Memorial Hospital  
Southeastern Med  
Springfield Regional Medical Center  
University Hospital East  
Wyandot Memorial Hospital

- **Started in 2011 with an ODH grant and 3 sites.**
- **Largest Telestroke Network in Ohio.**
- **26 Telestroke sites to date**



## Comprehensive Stroke Center: Telestroke Consults

### Within our 25 spoke hospital network:

3173 telestroke consultations performed

1557 patients transferred from the originating spokes

712 patients (22%) received t-PA

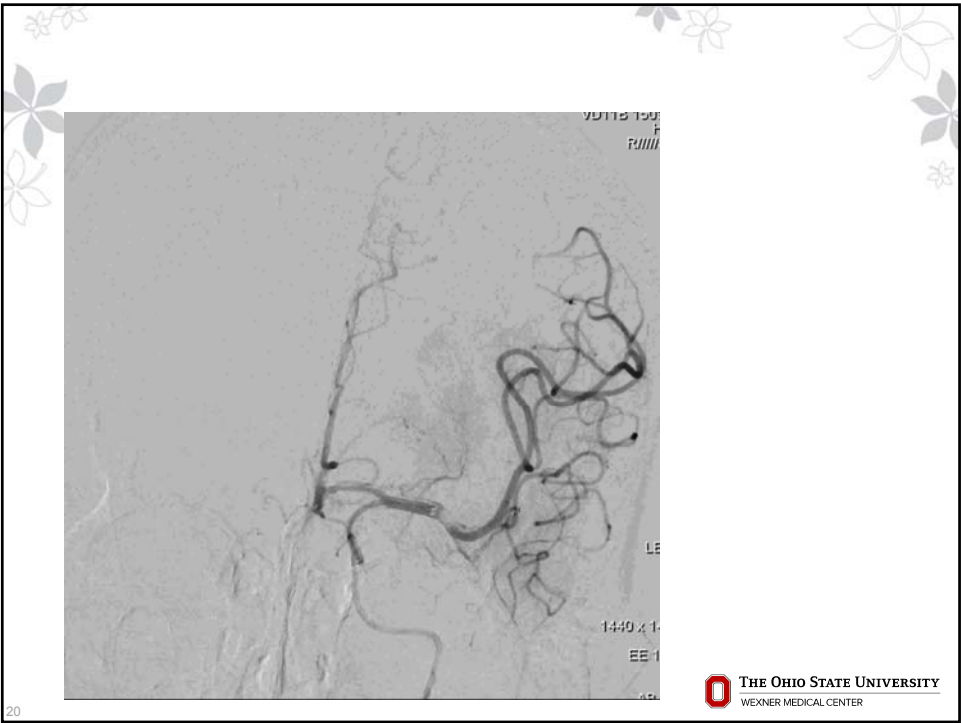
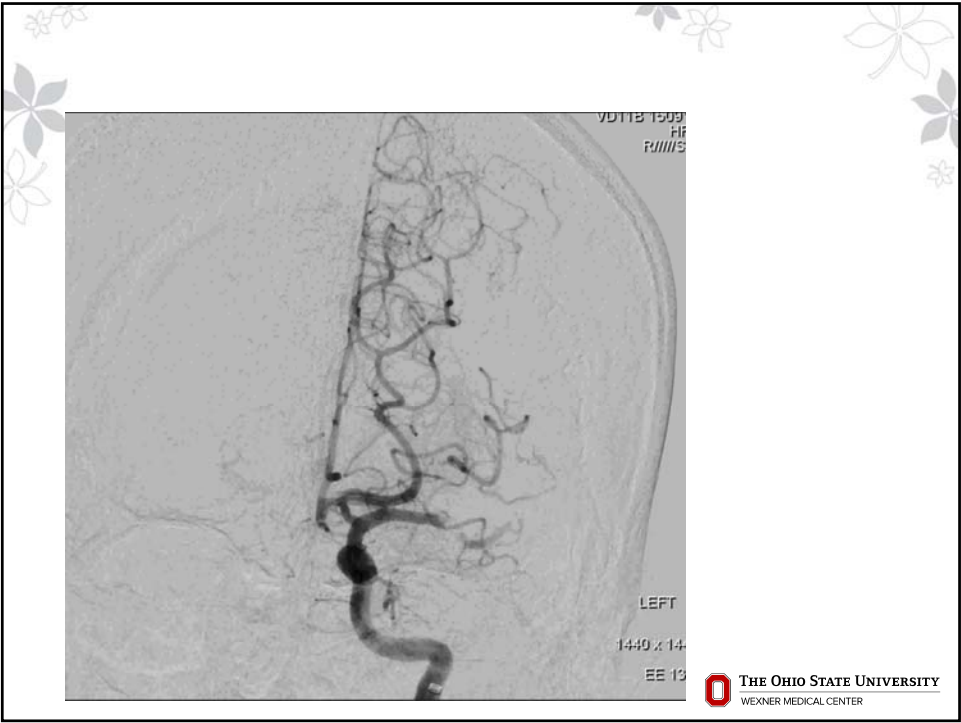
51% of patients stayed at their local hospital

Data from (first go-live) 05/18/11 through 10/31/16.



# THROMBECTOMY FOR LVO







## TICI

- Grade 0 = No perfusion.
- Grade 1 = Perfusion past the initial obstruction, but limited distal branch filling with little or slow distal perfusion.
- Grade 2a = Perfusion of less than  $\frac{1}{2}$  of the vascular distribution of the occluded artery (e.g., filling and perfusion through 1 M2 division).
- Grade 2b = Perfusion of  $\frac{1}{2}$  or greater of the vascular distribution of the occluded artery (e.g., filling and perfusion through 2 or more M2 divisions).
- Grade 3 = Full perfusion will filling of all distal branches.

## STUDIES SUPPORTING THROMBECTOMY

### *The* NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JANUARY 1, 2015

VOL. 372 NO. 1

#### A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

- Patient population
  - Greater than 18 years with no upper age limit
  - NIHSS greater than or equal to 2
- Imaging
  - Exclude hemorrhagic stroke by CT
  - Occlusion by CTA, MRA or DSA
- Intervention
  - Intra-arterial thrombectomy within 6 hours with or without IV rtPA in patients with intracranial occlusion in anterior circulation artery (ICA, M1, M2, A1 or A2)
- Primary outcome
  - Modified Rankin scale (mRS) at 90 days
- Secondary outcome
  - NIHSS 24 hours, 5 and 7 days
  - ADL measured by Barthel index
- Imaging outcomes
  - CTA or MRA 24 hours to measure persistence of recanalization
  - CT 5-7 days to measure final infarct volume

## MR CLEAN

Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands

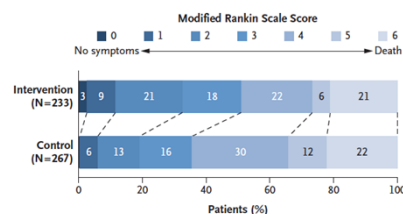


## Study Stats

- Size: 500 study participants
  - Mean age: 65 years (23 to 96 years)
  - Men: 58.4%
  - 95% of patients in both groups had pre-stroke mRS 2 or better
  - Mean NIHSS: 17
- 267 patients (53.4%) assigned to control
- 233 patients (46.6%) assigned to intervention
  - 196 underwent IA therapy
    - 195 patients underwent mechanical thrombectomy
      - **190 with stent-retriever**
    - 88 patients (37.8%) had general anesthesia
    - 30 patients (12.9%) underwent concurrent carotid stent
    - 24 patients (10.3%) received additional IA thrombolytic
    - 1 patient (0.4%) underwent IA tPA only

## Results

- Primary
  - Median mRS at 90 days: 3 in Intervention and 4 in Control.
- Secondary
  - mRS 0-3 at 90 days: 51% in Intervention and 35% in Control.
  - Persistent vessel patency: 75% in Intervention and 33% in Control.



|                           | Intervention    | Control        |
|---------------------------|-----------------|----------------|
| mRS 0-1 90 days           | 27 (12%)        | 16 (6%)        |
| mRS 0-2 90 days           | 76 (33%)        | 51 (19%)       |
| mRS 0-3 90 days           | 119 (51%)       | 95 (36%)       |
| NIHSS 24 h median         | 13 (6-20)       | 16 (12-21)     |
| NIHSS 5-7 days median     | 8 (2-17)        | 14 (7-18)      |
| Persistent vessel patency | 141/187 (75.4%) | 68/207 (32.9%) |
| Infarct volume median     | 49ml (22-96)    | 79ml (34-125)  |

## Safety

- 13 patients (5.6%) had clinical evidence of new ischemic stroke in different vascular territory in 90 days in intervention group, compared to 1 patient (0.4%) in control group
- Procedure-related complications
  - Embolization to new territory in 20 patients (8.6%)
  - Vessel dissection in 4 patients (1.7%)
  - Vessel perforations in 2 patients (0.9%)

## Serious adverse events

Table 3. Safety Variables and Serious Adverse Events within 90 Days after Randomization.

| Variable   | Intervention<br>(N=233)<br>no. of patients (%) | Control<br>(N=267)<br>no. of patients (%) |
|--|--|---|
| <b>Safety variables</b>  |  |   |
| Death  |  |   |
| Within 7 days  | 27 (11.6)                                      | 33 (12.4)                                 |
| Within 30 days   | 44 (18.9)                                      | 49 (18.4)                                 |
| Hemicraniectomy  | 14 (6.0)                                       | 13 (4.9)                                  |
| <b>Serious adverse events<sup>a</sup></b>                          |  |   |
| Any serious adverse event  | 110 (47.2)                                     | 113 (42.3)                                |
| <b>Symptomatic intracerebral hemorrhage</b>                        |  |   |
| Any type   | 18 (7.7)                                       | 17 (6.4)                                  |
| Parenchymal hematoma <sup>†</sup>                                  |  |   |
| Type 1   | 0  | 2 (0.7)                                   |
| Type 2   | 14 (6.0)                                       | 14 (5.2)                                  |
| Hemorrhagic infarction <sup>‡</sup>                                |  |   |
| Type 1   | 1 (0.4)  | 0   |
| Type 2   | 1 (0.4)  | 1 (0.4)                                   |
| Subarachnoid hemorrhage  | 2 (0.9)  | 0   |
| New ischemic stroke in a different vascular territory <sup>§</sup> | 13 (5.6)                                       | 1 (0.4)                                   |
| Progressive ischemic stroke  | 46 (19.7)                                      | 47 (17.6)                                 |
| Pneumonia  | 25 (10.7)                                      | 41 (15.4)                                 |
| Other infection  | 16 (6.9)                                       | 9 (3.4)                                   |
| Cardiac ischemia   | 1 (0.4)  | 4 (1.5)                                   |
| Extracranial hemorrhage  | 0  | 2 (0.7)                                   |
| Allergic reaction  | 1 (0.4)  | 0   |
| Other complication   | 22 (9.4)                                       | 33 (12.4)                                 |

<sup>a</sup> Only first events of a type are listed. Patients having multiple events of one type were counted once.

<sup>†</sup> For parenchymal hematoma, type 1 was defined by one or more blood clots in 30% or less of the infarcted area with a mild space-occupying effect, and type 2 was defined by blood clots in more than 30% of the infarcted area with a clinically significant space-occupying effect.

<sup>‡</sup> For hemorrhagic infarction, type 1 was defined by small petechiae along the margins of the infarction, and type 2 was defined by more confluent petechiae within the infarction area.


<sup>§</sup> P<0.001.

**ORIGINAL ARTICLE**

## Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection

# EXTEND IA

Extending the Time for Thrombolysis in Emergency Neurological Deficits—Intra-Arterial



After MR CLEAN published, study arrested

- Patient population
  - Greater than 18 years with no upper age limit
  - NIHSS no lower limit
  - Pre-stroke mRs less than 2 (functional independence)
- Imaging
  - Exclude hemorrhagic stroke by CT
  - Ischemic core of less than 70 ml with salvageable tissue
  - Occlusion by CTA, MRA or DSA
- Intervention
  - Solitaire thrombectomy started within 6 hours and completed in 8 hours in patients who had received IV tPA within 4.5 hours of stroke onset with ICA, M1 or M2 occlusion
- Primary outcome
  - Reperfusion at 24 hours defined by percent reduction in perfusion-lesion volume between initial and 24-hour CT perfusion studies
  - Early neurological improvement defined by decrease in NIHSS by 8 or more or a score of 0 or 1 3 days after intervention
- Secondary outcome
  - mRs at 90 days
  - Symptomatic hemorrhage
    - SAH
    - Parenchymal hematoma within 36 hours after treatment with increase in NIHSS by 4 or more points
  - Death due to any cause


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**ORIGINAL ARTICLE**

## Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

# ESCAPE

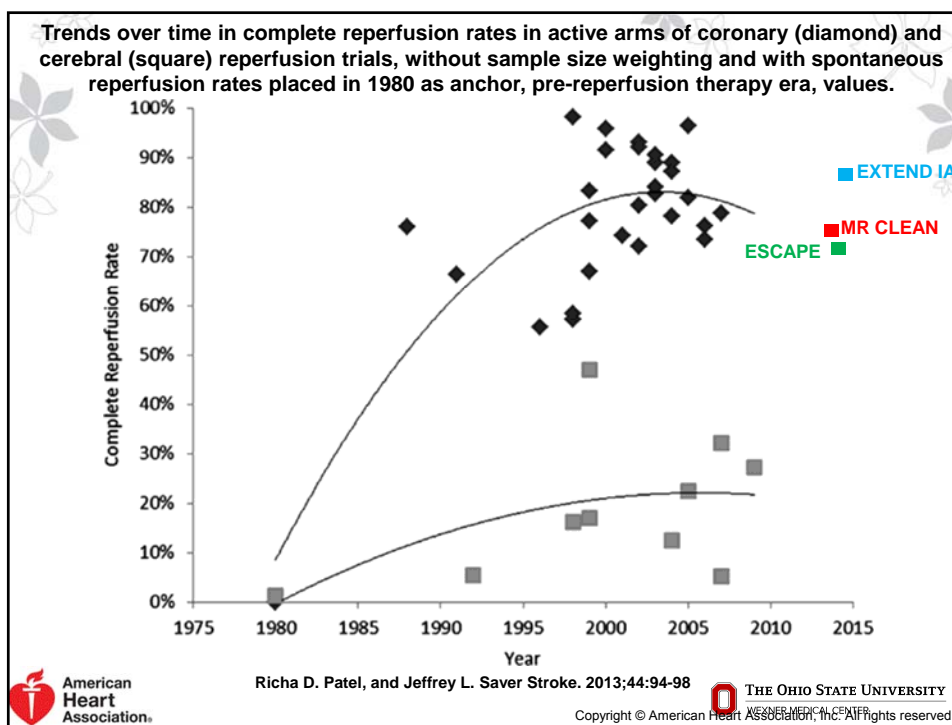
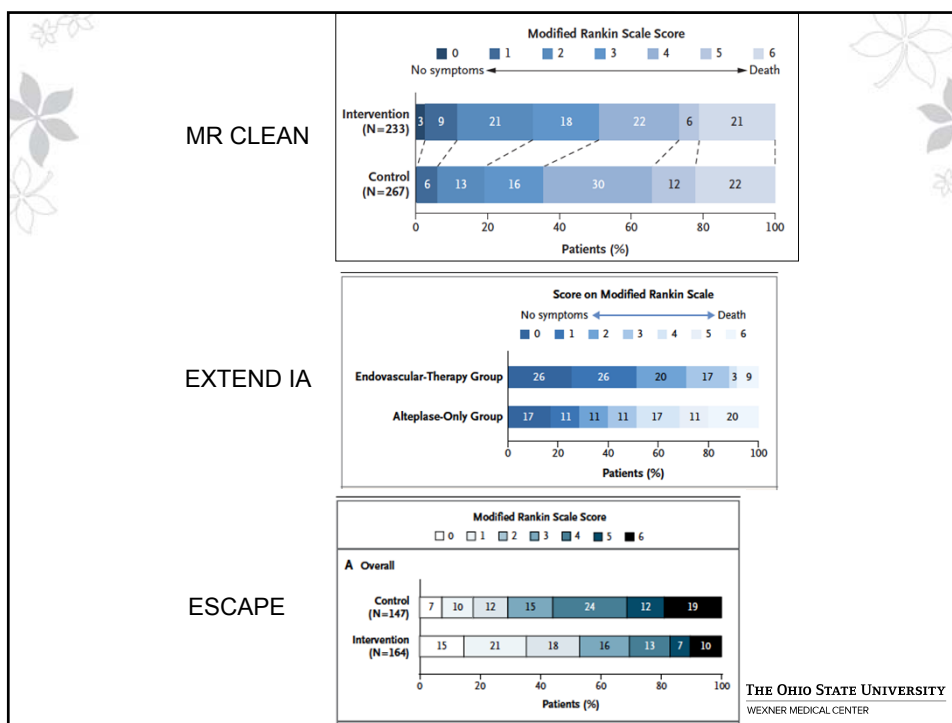
Endovascular Treatment for Small Core and Anterior Circulation Proximal Occlusion with Emphasis on Minimizing CT to Recanalization Times



After MR CLEAN published, study arrested

- Patient population
  - Greater than 18 years with no upper age limit
  - Functional independence before stroke onset
- Imaging
  - CT
    - Exclude hemorrhagic stroke
    - ASPECTS (Alberta Stroke Program Early Computerized Tomography Score), used in ASPECTS to identify patients with small infarct core defined by ASPECT score 6-10
  - CTA evaluated for occlusion AND also assess for moderate-to-good vascular collateralization in setting of LVO, which was defined as filling of at least 50% of the MCA pial artery circulation
- Intervention
  - Intra-arterial thrombectomy within 6 hours with or without IV tPA in patients with intracranial occlusion in anterior circulation artery (ICA, M1, M2)
- Primary outcome
  - Modified Rankin scale (mRS) at 90 days
- Secondary outcome
  - Early recanalization and reperfusion
  - Intracranial hemorrhage
  - Angiographic complications
  - Neurological disability at 90 days
  - Death
- Imaging outcomes

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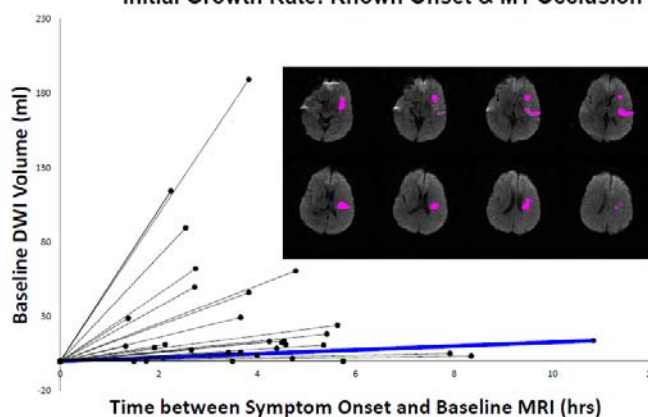


## ENDOVASCULAR THERAPY FOLLOWING IMAGING EVALUATION FOR ISCHEMIC STROKE 3 (DEFUSE 3)

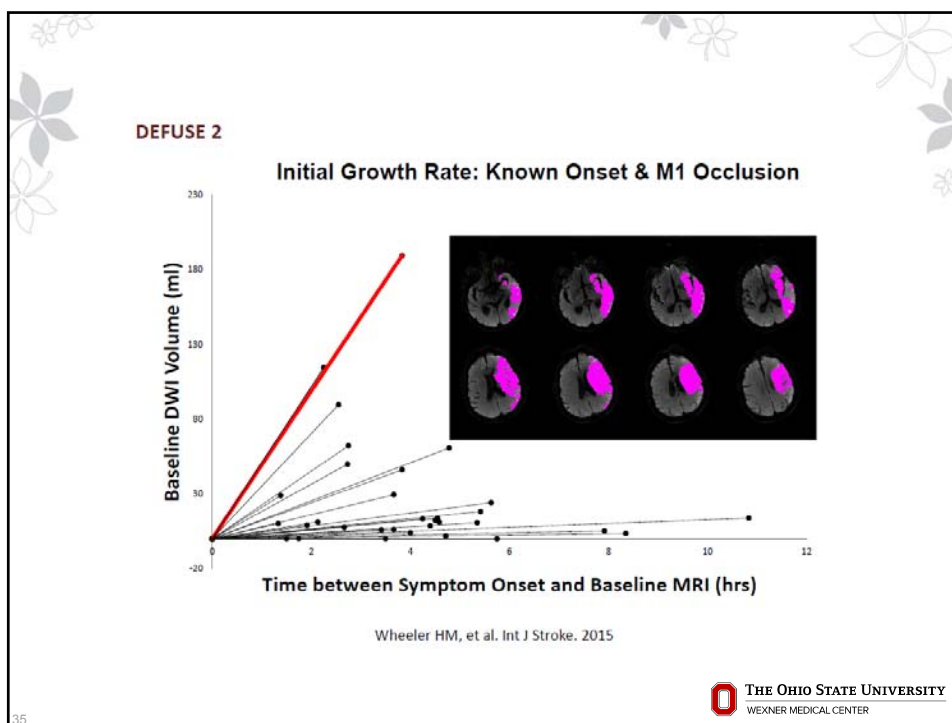
- Prospective randomized Phase III multicenter controlled trial for patients with acute ischemic anterior circulation strokes due to large artery occlusion treated between 6-16 hours of stroke onset with endovascular therapy versus control.
- Primary endpoint is modified Rankin Score at 3 months.

## DEFUSE 2

### Initial Growth Rate: Known Onset & M1 Occlusion



Wheeler HM, et al. Int J Stroke. 2015



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**DEFUSE 3: NIH-funded, prospective, randomized, multi-center, adaptive, blinded endpoint trial**

- Paradigm shift
  - From time-based selection to imaging-based selection
- Target population
  - Anterior circulation ischemic stroke; ICA or M1 occlusions (CTA/MRA)
  - Salvageable tissue on CT perfusion or MR diffusion / perfusion
  - Endovascular therapy within 6-16 hours of last known well
- Design
  - 1:1 randomization; standard medical therapy vs. endovascular
  - 45 sites

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## Neuroimaging Inclusion Criteria

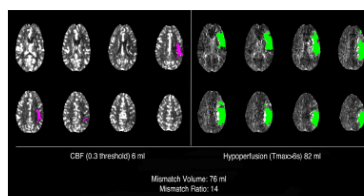
MRA / CTA reveals

- M1 segment MCA occlusion, or
- ICA occlusion (cervical or intracranial; with or without tandem MCA lesions)

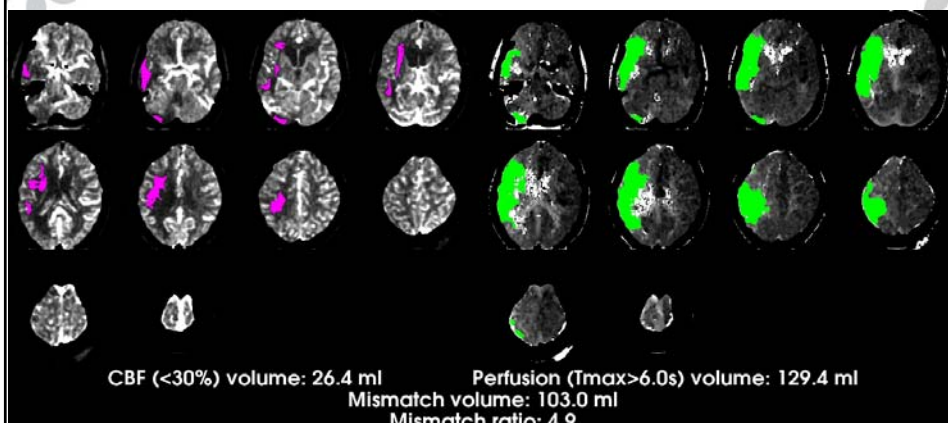
AND

Target Mismatch Profile on  
CT perfusion or MRI (RAPID)

- Ischemic core volume < 70 mL  
and
- Mismatch ratio > 1.8  
and
- Mismatch volume ≥ 15 mL



## RAPID Imaging



## What does the future hold?



## Benefits of Stroke Treatment Using a Mobile Stroke Unit Compared With Standard Management The BEST-MSU Study Run-In Phase

Ritvij Bowry, MD; Stephanie Parker, RN; Suja S. Rajan, PhD; Jose-Miguel Yamal, PhD;  
Tzu-Ching Wu, MD; Laura Richardson, BS; Elizabeth Noser, MD; David Persse, MD;  
Kamilah Jackson, RT; James C. Grotta, MD

**Background and Purpose**—Faster treatment with intravenous tissue-type plasminogen activator (tPA) is likely to improve outcomes. Optimizing prehospital triage by mobile stroke units (MSUs) may speed treatment times. The Benefits of Stroke Treatment Delivered Using a Mobile Stroke Unit (BEST-MSU) study was launched in May 2014 using the first MSU in the United States to compare stroke management using an MSU versus standard management (SM). Herein, we describe the results of the prespecified, nonrandomized run-in phase designed to obtain preliminary data on study logistics.

**Methods**—The run-in phase consisted of 8 MSU weeks when all-patient care occurred on the MSU and 2 SM weeks when the MSU nurse met personnel on scene or at the emergency department to ensure comparability with MSU patients. Telemedicine was independently performed in 9 MSU cases.

**Results**—Of 130 alerts, 24 MSU and 2 SM patients were enrolled. Twelve of 24 MSU patients received tPA on board; 4 were treated within 60 minutes of last seen normal, and 4 went on to endovascular treatment. There were no hemorrhagic complications. Four had primary intracerebral hemorrhage. Agreement on tPA eligibility between the onsite and telemedicine physician was 90%.

**Conclusions**—The run-in phase provided a tPA treatment rate of 1.5 patients per week, assured us that treatment within 60 minutes of onset is possible, and enabled enrollment of patients on SM weeks. We also recognized the opportunity to assess the effect of the MSU on endovascular treatment and intracerebral hemorrhage. Challenges include the need to control biased patient selection on MSU versus SM weeks and establish inter-rater agreement for tPA treatment using telemedicine. (*Stroke*. 2015;46:3370-3374. DOI: 10.1161/STROKEAHA.115.011093.)

| Table 2. Baseline Characteristics of Enrolled Patients During the Run-In Phase   |           | Table 3. Characteristics of Patients Receiving tPA on the MSU (n=12)  |               |
|--|-----------|---|---------------|
| All patients (n=26)  |           |   |               |
| Age, y, mean   | 64        | Distance from base station, miles, mean   | 6.7           |
| Sex, male/female, n  | 13/13     | MSU on scene to tPA time, min, mean (range)   | 25 (18–42)    |
| Hypertension, n  | 16        | LSN to tPA time, min, mean (range)  | 98 (47–265)   |
| Diabetes mellitus, n   | 4         | Baseline NIHSS, mean (range)  | 10 (3–19)     |
| Hyperlipidemia, n  | 9         | Baseline mRS, n (%)   |               |
| Atrial fibrillation, n   | 5         | 0   | 7 (58)        |
| Baseline NIHSS, mean (range)   | 11 (3–25) | 1   | 1 (8)         |
| Baseline mRS, n (%)  |           | 2   | 0 (0)         |
| 0  | 15 (57)   | 3   | 2 (17)        |
| 1  | 1 (4)     | 4   | 2 (17)        |
| 2  | 2 (8)     | 5   | 0 (0)         |
| 3  | 3 (11)    | 90-day mRS, n (%)   |               |
| 4  | 4 (15)    | 0   | 2 (18)        |
| 5  | 1 (4)     | 1   | 2 (18)        |
| Final diagnosis, n   |           | 2   | 1 (9)         |
| Acute ischemic stroke  | 11        | 3   | 1 (9)         |
| TIA  | 1         | 4   | 2 (18)        |
| ICH  | 4         | 5   | 2 (18)        |
| Seizure  | 4         | 6   | 1 (9)         |
| Other  | 6         | Total endovascular interventions  | 4             |
| ICH indicates intracerebral hemorrhage; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; and TIA, transient ischemic attack. |           | LSN to groin puncture time, min, mean (range)   | 175 (140–224) |
|  |           | Door to groin puncture time, min, mean (range)  | 101 (77–124)  |
|  |           | LSN indicates last seen normal; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; MSU, mobile stroke unit; and tPA, tissue-type plasminogen activator. |               |

## Summary

- **Stroke Facts**
  - Almost 800,000 patients suffer stroke a year in the U.S.
- **Telestroke**
  - Patients who receive Telestroke consult are much more likely to get IV tPA
- **Thrombectomy for Large Vessel Occlusion (LVO)**
  - Patients with LVO benefit from thrombectomy
  - The window for thrombectomy may be determined by functional imaging
- **The Future of Stroke Care**
  - MSUs may play a role in expediting stroke care



Thank you!

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