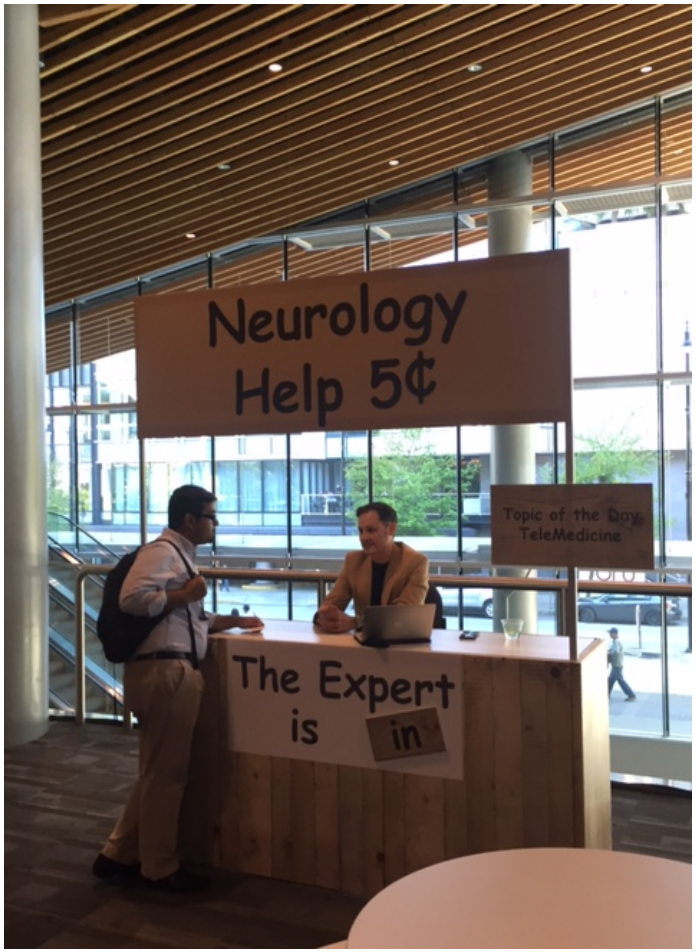
# Telestroke and Teleneurology

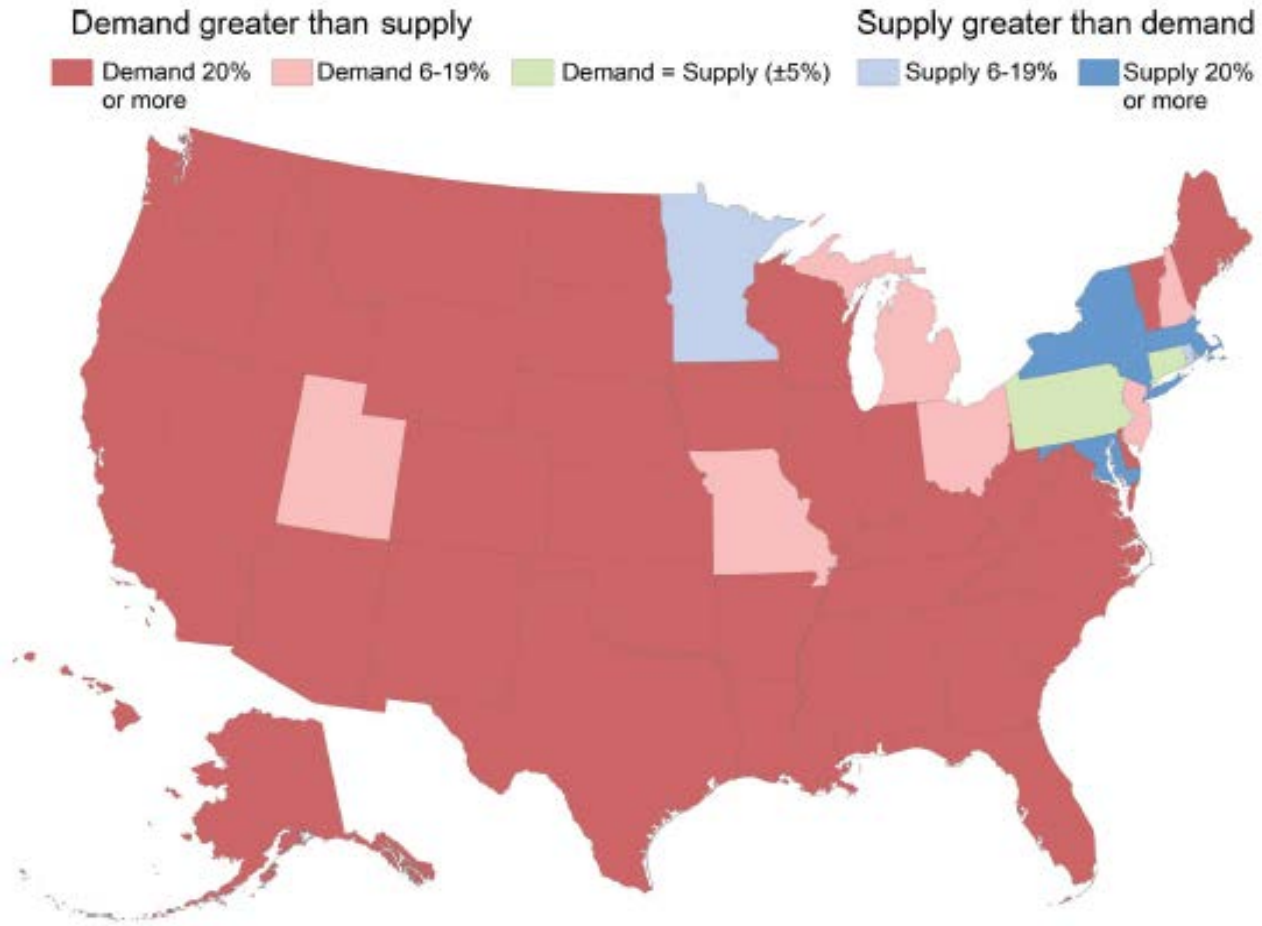
Lawrence R. Wechsler, M.D.
Chairman, Department of Neurology
Vice President, Telemedicine
University of Pittsburgh Medical Center

# Outline

- Telestroke
- Teleneurology
- Challenges
- Compensation



# Estimated Demand for Neurology 2025




Dall et al. Neurology 2013

UPMC LIFE CHANGING MEDICINE

# Demand for Vascular Neurology

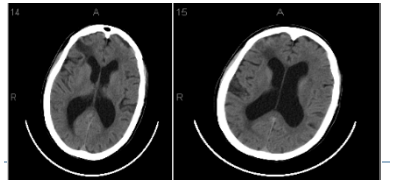
| | |
|---|---|
| Number of new strokes per year in US | 795,000 |
| Number of vascular neurologists | 1100 |
| Primary stroke centers | 1092 |
| Comprehensive stroke centers | 110 |
| Stroke Fellowship programs (2016) | 74 |
| Stroke fellowship positions | 123 |
| % Fellowship positions unfilled | 34% |

Culebras A. Neurology Today 2015

# Teleneurology

Consult → IP over Internet → Remote control of PTZ camera – Hx, PE → History, exam, recommendations, documentation

Imaging



UPMC LIFE CHANGING MEDICINE

# Teleneurology Anywhere

# International Teleneurology

# Advantages of Teleneurology

- Direct history by neurological provider
- Observe critical elements of examination
- Order specific tests – done locally
- Review results
- Speak directly to patient regarding assessment and plan
- Team based care

# Why Teleneurology in an Academic Dept?

- Better care for patients
- Protect referral relationships
- Endovascular transfers
- Income for faculty
- Alternative work models
- Research potential
- Clinical trials

# Components of Teleneurology Program

- Bidirectional real time video and audio
- Protocols / order sets
- In service training
- Stroke/neurology team
- Community education
- EMS awareness

# Reliability of Telestroke Exam - NIHSS

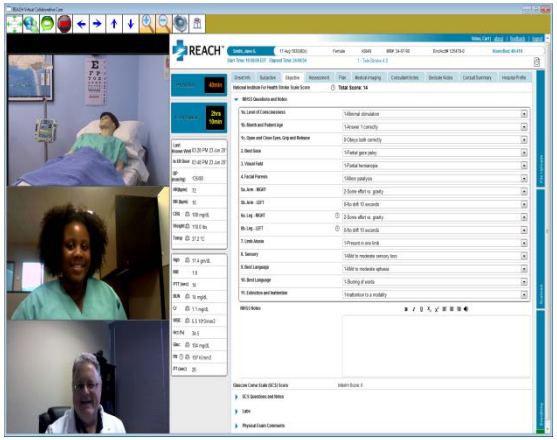
| | Craig J Telemed Telecare 1999 | Shafqat Stroke 1999 | Meyer Neurology 2005 | Anderson JSCVD 2011 | Wang Stroke 2003 | Handschu Stroke 2003 | Lamonte JSCVD 2004 |
|---|---|---|---|---|---|---|---|
| Pts | 17 | 20 | 25 | 20 | 20 | 41 | 2 actor pts / 12 scenarios |
| Setting | General Neuro exam | Non-acute stroke | Non-acute stroke | Non-acute stroke | Acute stroke | Acute stroke | Ambulance |
| Comparison | ISDN v. bedside | ISDN v. bedside | Web based v. bedside | iPhone 4 v. bedside | Web based v. bedside | Web based v. bedside | Ambulance v. NIHSS training |
| Result | Kappa r=.21-1.00 | Kappa r=.97 | Kappa r=.94 | Corr coef r=.98 | Pearson r=.95 | Kappa r=.85-.92 | Kappa r >.5 |

# Teleneurology Examination - Limitations

- Visual fields
- Strength gradation
- Tone / rigidity
- Sensory examination
- Reflexes
- Stethoscope
- Ophthalmoscope

# Teleneurology – IT and technology

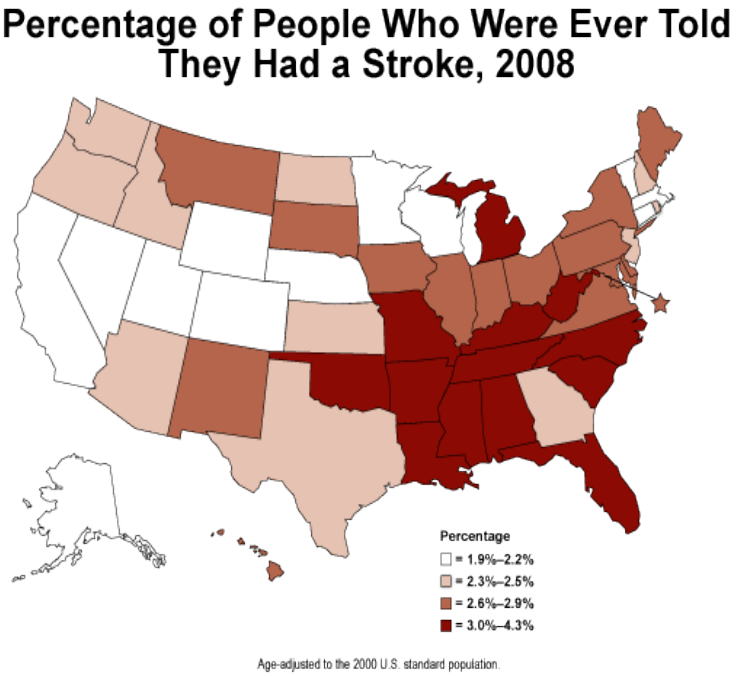
- Purchased services
  - REACH
  - InTouch
  - $$$
- Self supported
  - Vidyo
  - Polycom
  - 24/7 coverage
  - Response time
  - $





# Why Telestroke?

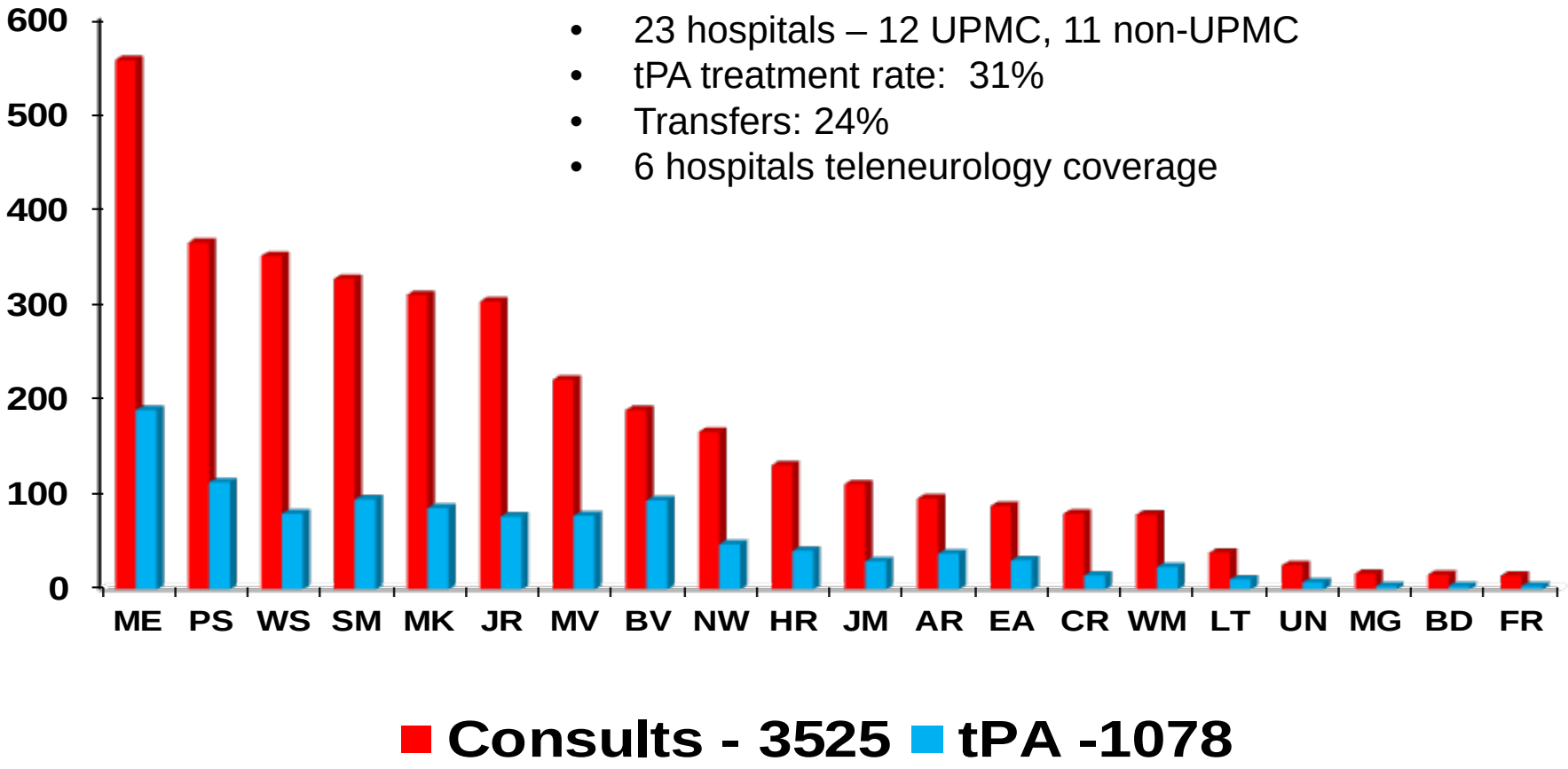
- Only 2-8% of stroke patients receive IV tPA
- Many hospitals don't have stroke protocols and have never treated a patient with tPA
- 64% of hospitals in US did not give IV tPA *
- Lack of available stroke specialist in rural hospitals major impediment to emergent treatment




* Kleindorfer et al Stroke 2009

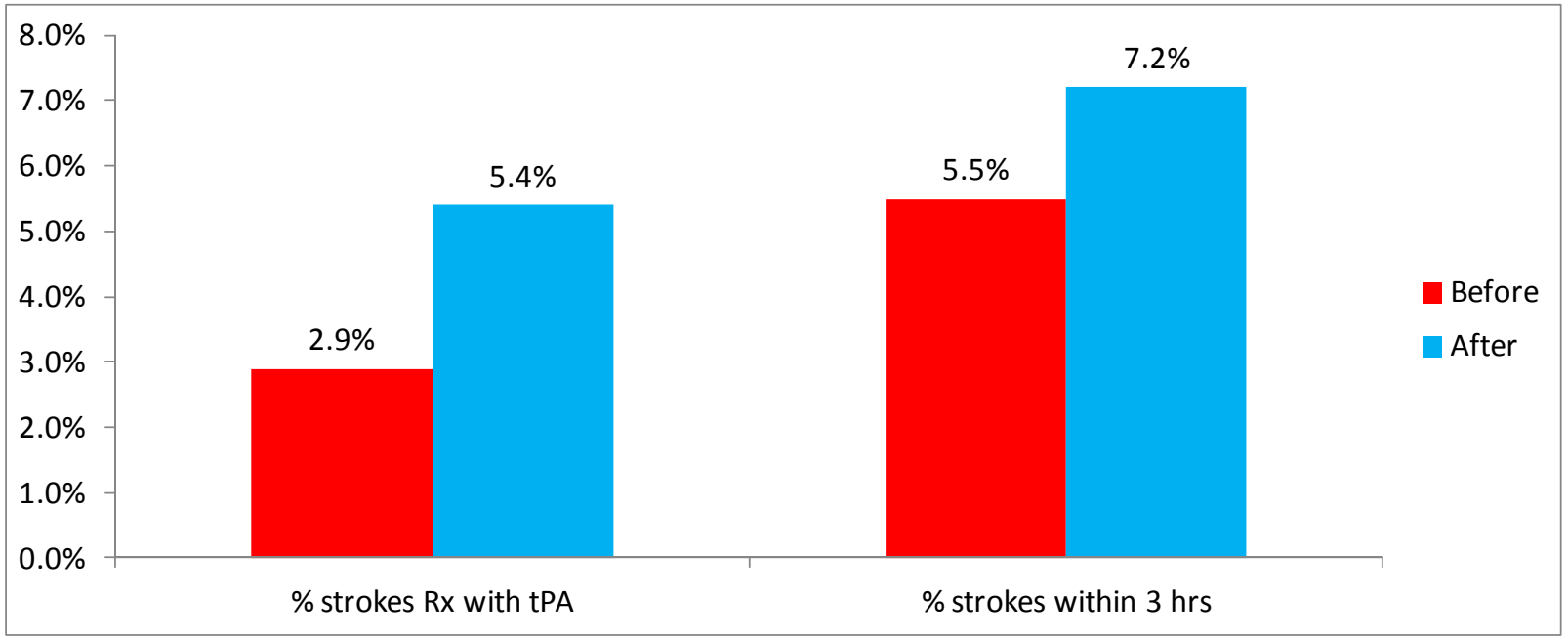
# UPMC Telestroke

- 23 hospitals – 12 UPMC, 11 non-UPMC
- tPA treatment rate:  31%
- Transfers: 24%
- 6 hospitals teleneurology coverage



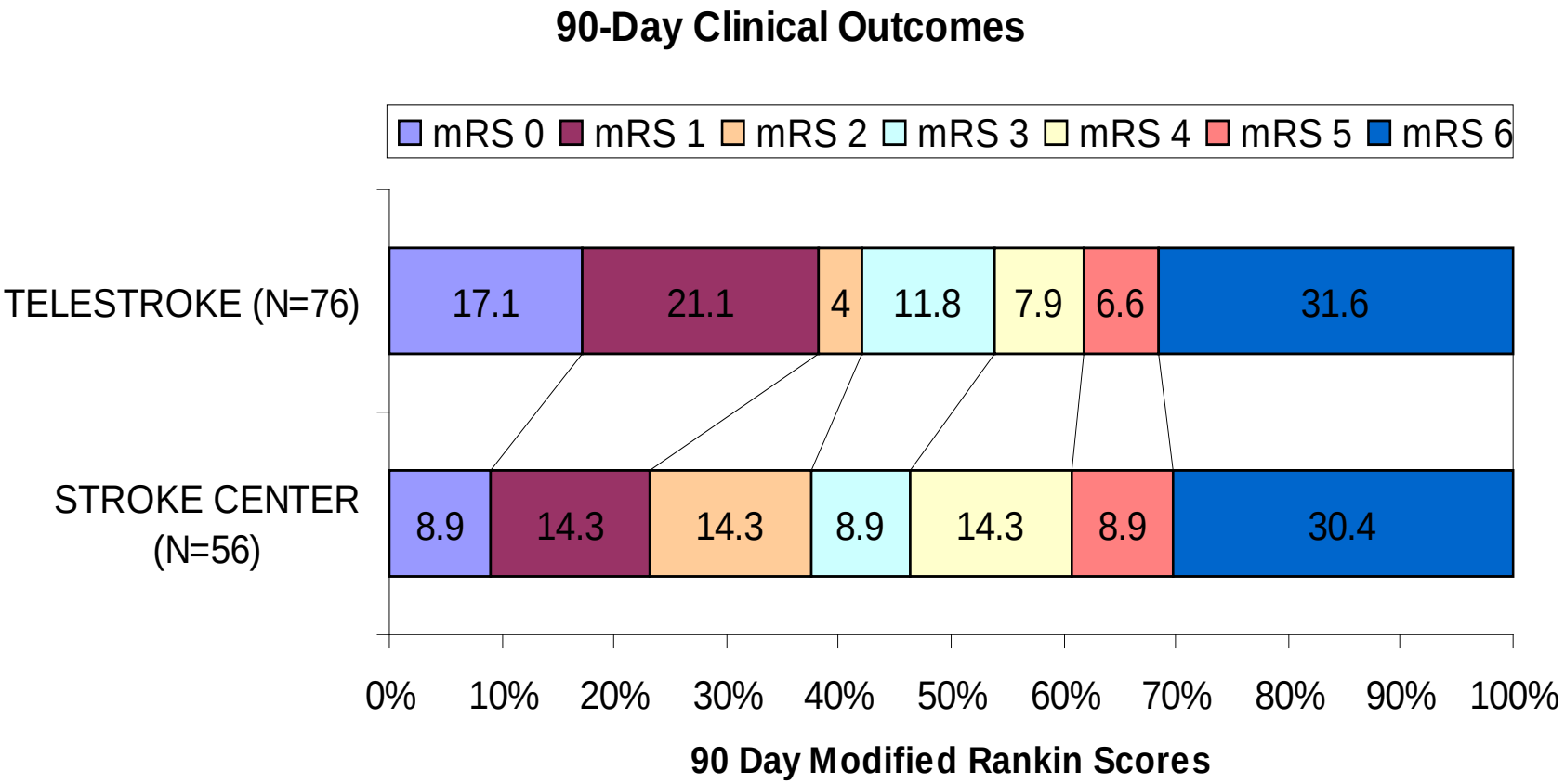
# Telestroke Before and After:
## All UPMC Hospitals

**1235 Pts Before**
**2175 Pts After**



# Telestroke v. SC Patients Treated with IV tPA

## 90 day Outcomes




Zaidi et al. Stroke 2011

UPMC LIFE CHANGING MEDICINE

# Telestroke: Post tPA care

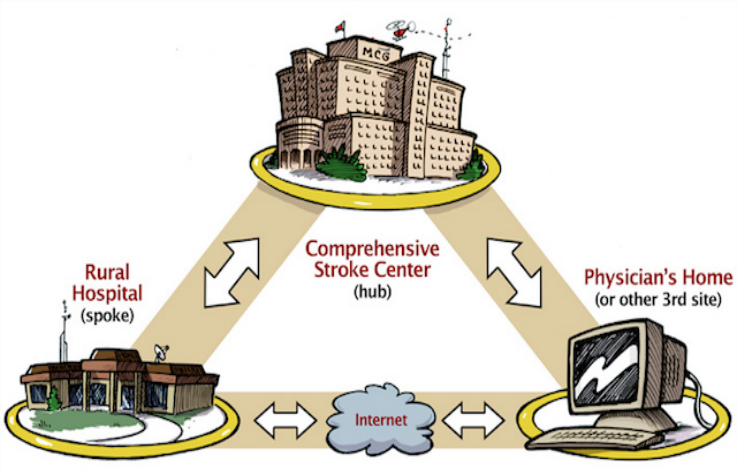
## tPA Treated Pts – Hub v. Spoke

| | Hub | Drip and ship | Drip and stay | P value |
|---|---|---|---|---|
| Patients | 272 | 73 | 134 | |
| Median NIHSS | 11 | 11 | 8 | >0.001 |
| Mean age | 72 | 71 | 76 | 0.008 |
| Onset to needle | 156 min | 134 | 148 min | 0.072 |
| Door to needle | 72 min | 75 | 77 min | 0.151 |
| Sx ICH | 5% | 7% | 2% | 0.79 |
| LVO | 36% | 33% | 12% | >0.001 |
| LOS (days) | 6.2 | 4,6 | 7.2 | 0.56 |
| Pneumonia | 14% | 10% | 8% | 0.077 |
| Intubation | 19% | 19% | 2% | >0.001 |
| In-hosp death | 11% | 11% | 10% | 0.859 |

- Heffner et al. Stroke 2015

# Reorganization of System Stroke Care

- Stroke neurology evaluation by telemedicine:
  - Initial hospital evaluation
  - 2 day follow-up
  - Hospital pre-discharge visit
  - Outpatient follow-up
- Outcomes to be monitored
  - Mortality
  - Readmissions
  - LOS
  - Patient Transfers

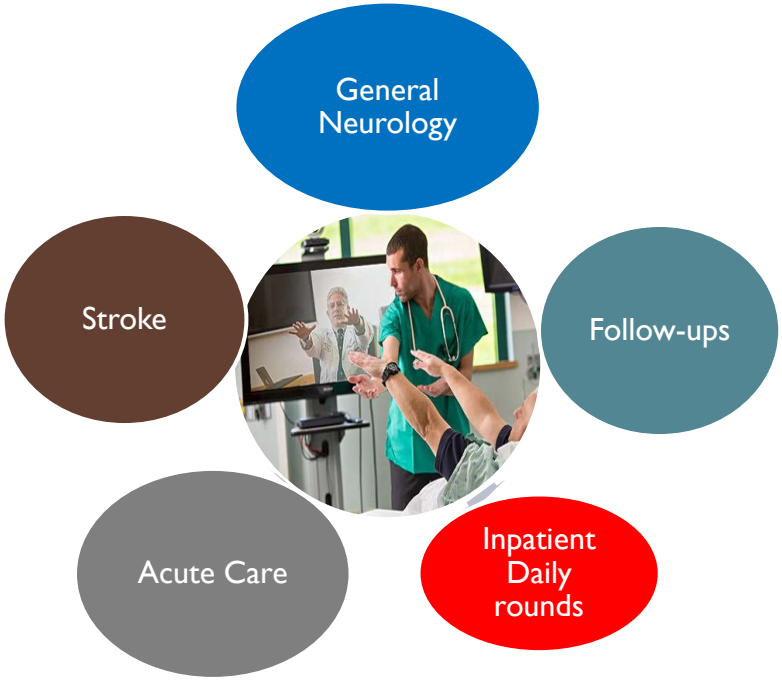


# Telestroke Workflow

- Portal for calls from originating site
- Receiving calls and response time
- Time of onset, stroke severity, tPA exclusions
- Telephone discussion and triage
- Activation of video
- Confirmation of history
- NIHSS exam
- Consent
- tPA orders
- Transfer decision
- CTA

# Teleneurology

- Stroke
- TIA
- Seizures
- Confusion
- Dizziness



# Teleneurology Issues

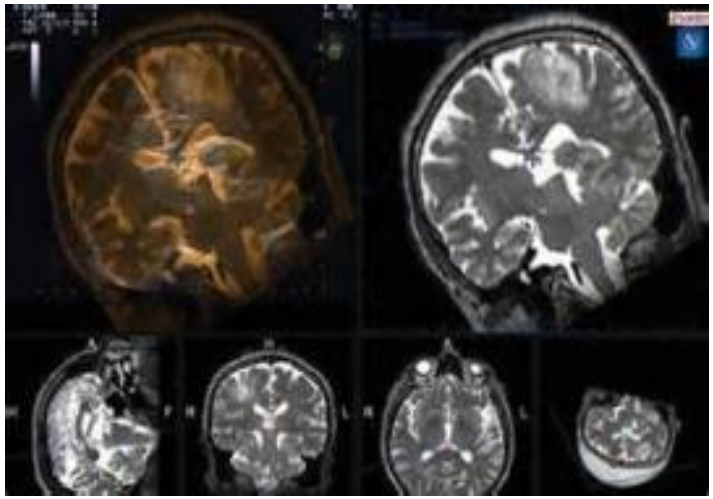
- EMR access
- Immediate v. scheduled
- Imaging review
- Documentation
- Guidelines for acute stroke calls
- Telepresenter
- Follow-up: new v. same problem
- Communication with originating team
- Transfer agreements (stroke, non-stroke)

# Staffing Models

- On call physician
- Dedicated physician
- Stroke v. general neuro
- Triage by fellow/NP
- Call center
- Urgent v. Non urgent
- Backup and surge coverage

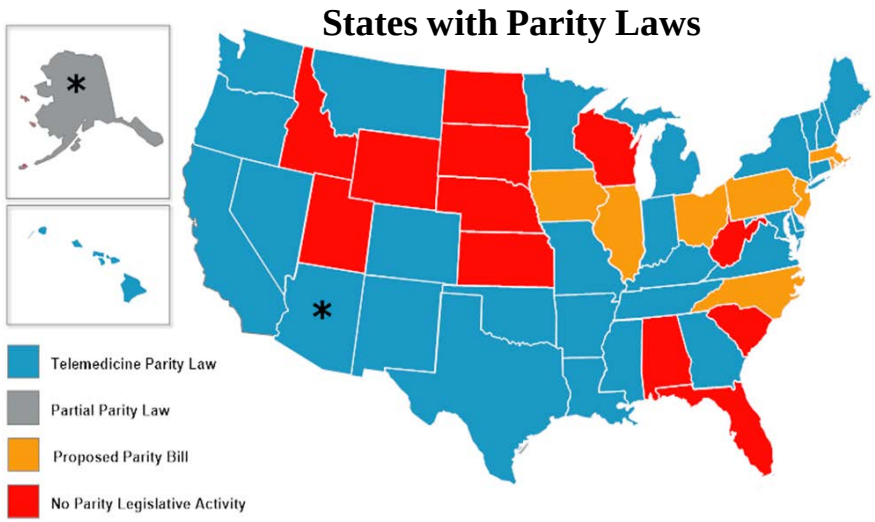
# Imaging Access

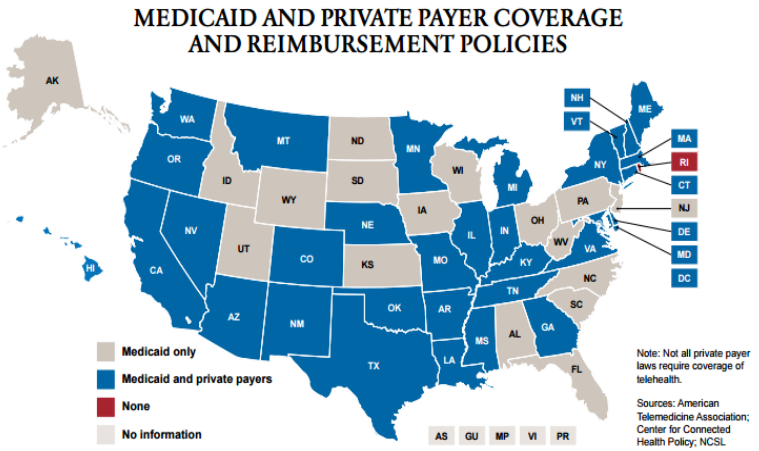
- Direct spoke PACS signin
- Push imaging studies to central hub PACS
- Push imaging to teleneurology software
- 3rd party cloud based imaging solutions



# Reimbursement for Teleneurology

- E&M codes with GT modifier
- Most require real time video conferencing
- Medicare – rural areas only
- Medicaid – state mandates with variable definitions
- National insurers - limited
- Other private insurers
- 32 states with parity laws



# Billing Models

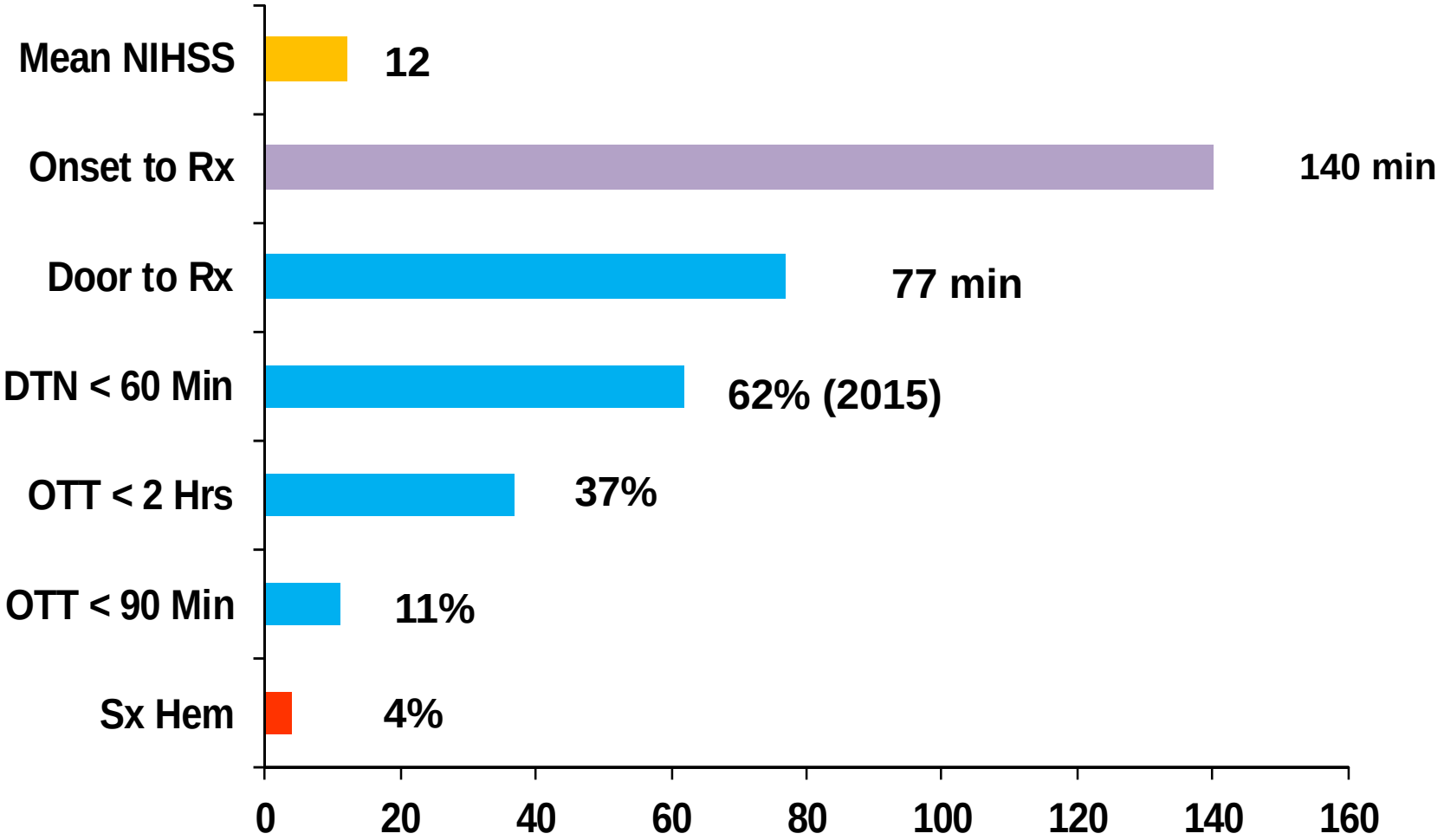
- Flat monthly fee – unlimited consults
- Tokens
- Monthly fee plus per case fee
- Tiered charges based on ED volume
- Who pays for equipment and software
- Hub hospital support

# Compensation

- Physician Salary
- Per case fee
- Coverage fee per day, per night or per shift
- Combinations

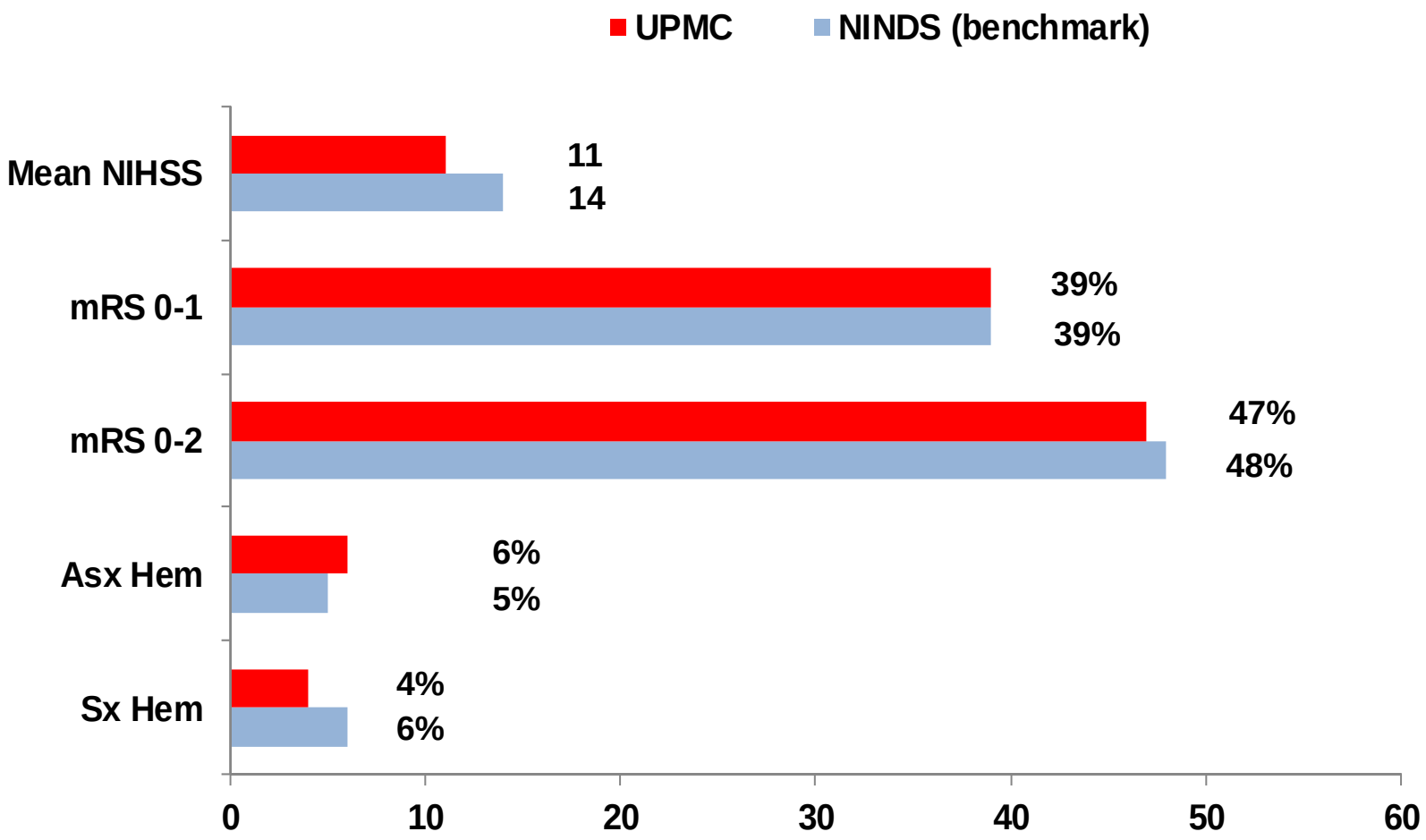
# Reporting: Process Measures

## 849 tPA Treatments

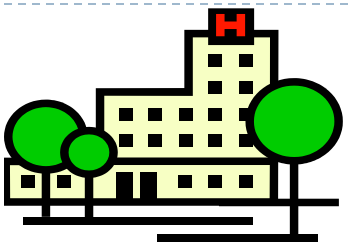


# Reporting: 90 Day Outcomes

## 711 tPA Treatments



# ROI of Teleneurology: Hub and Spoke




| Hub Hospital | Spoke Hospital | Societal |
|---|---|---|
| + Neurology transfers | + Avoid transfers | + Improved outcomes: tPA |
| + Endovascular and surgery | + No EMS bypass | + Reduced disability |
| - Network support | + High quality patient care | + Return to work |
| - Neurology support | - Greater cost of care | + Less caregiver burden |
| - IT costs | - Quality monitoring | - Higher upfront costs |

# Summary

- Telestroke and teleneurology bring expertise to areas without stroke and neurology coverage
- Network models vary and several technologies available
- Staffing and compensation are challenging issues
- Insurance reimbursement limited
- Telemedicine now routine component of systems of care