

The Future of Remote Care in Neurology

Eric R Anderson MD PhD

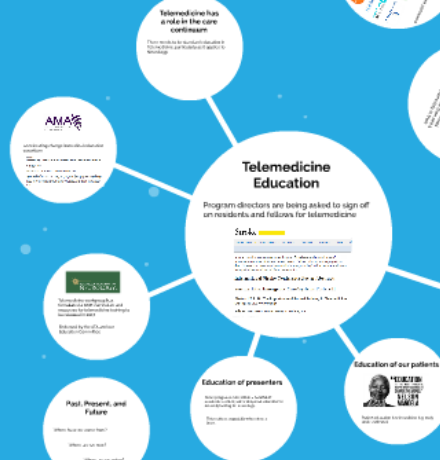
@Teleneurology

Limitations



Telemedicine Education

Program directors are being asked to sign off on residents and fellows for telemedicine



Neurology:

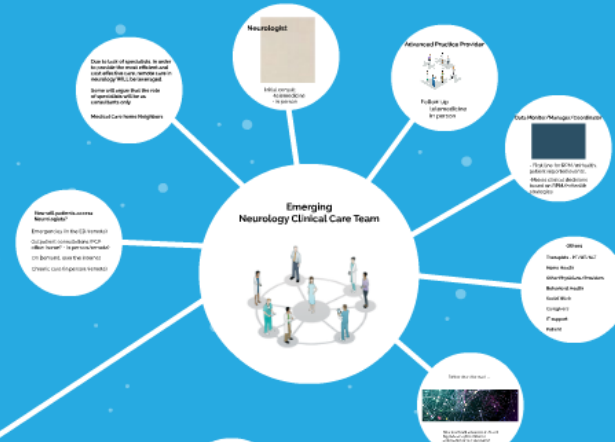
What are neurologists?
Neurologists are specialists for the brain, muscles, and nerves. We treat strokes, seizures, dementia, parkinsons, dizziness, multiple sclerosis, etc. Due to complexity and low reimbursement, fewer people entering and more people retiring.



Where did it all begin for neurology?



Emerging Neurology Clinical Care Team



Telemedicine for stroke



Telemedicine: Emerging care paradigms



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Limitations



Telemedicine Education

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Source: [Image of a document]

Program directors are being asked to sign off on residents and fellows for telemedicine

Education of presenters

Program directors are being asked to sign off on residents and fellows for telemedicine

Education of our patients

Program directors are being asked to sign off on residents and fellows for telemedicine

Past, Present, and Future

Program directors are being asked to sign off on residents and fellows for telemedicine

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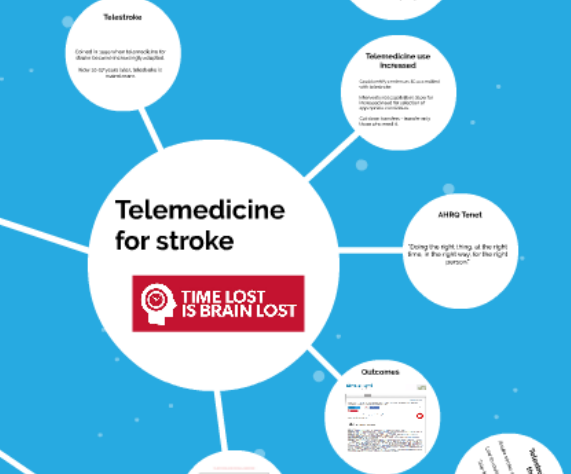
History of neurology
45 years of history in the 1900s



Emerging Neurology Clinical Care Team



Telemedicine for stroke



Emerging care paradigms

Where we are going



The Future of Remote Care in Neurology

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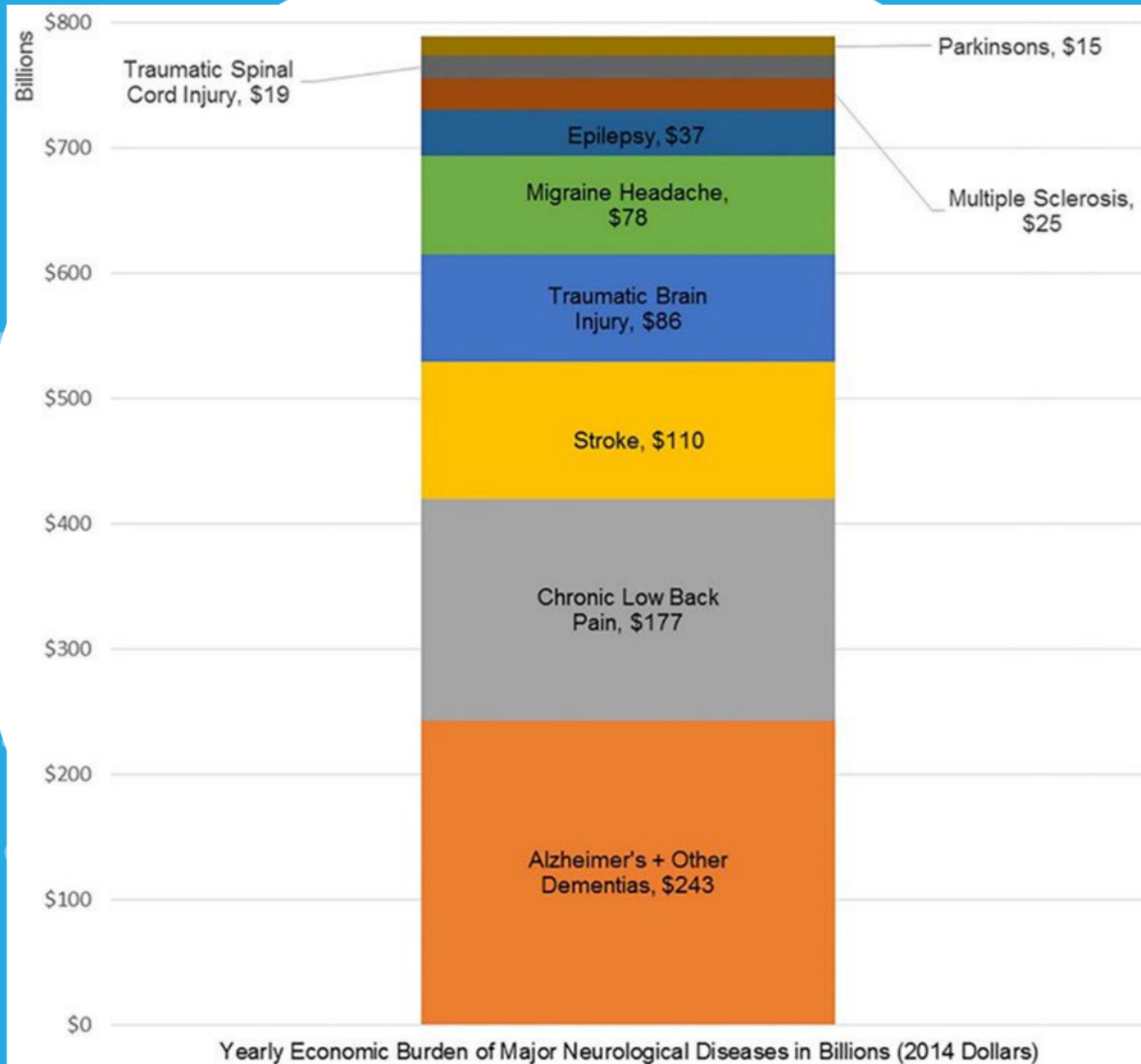
Neurology:

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Timely neurologic care is important

Many patients are undiagnosed and untreated

Earlier detection can lead to improved outcomes

Past, Present, and Future

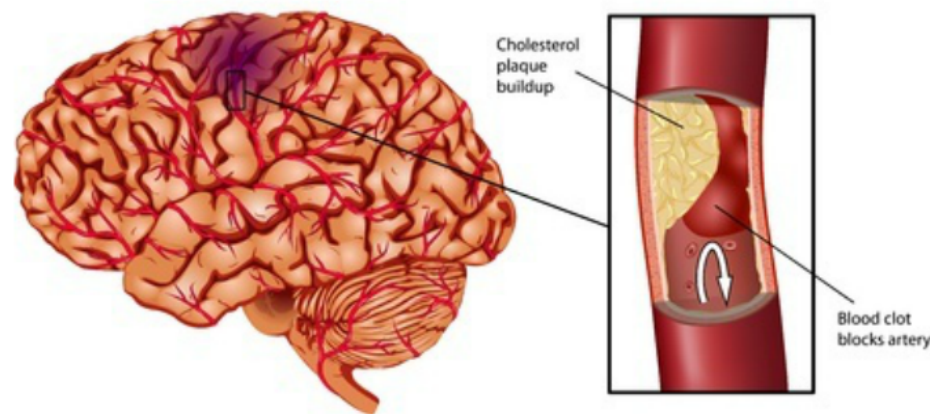
Where have we come from?

Where are we now?

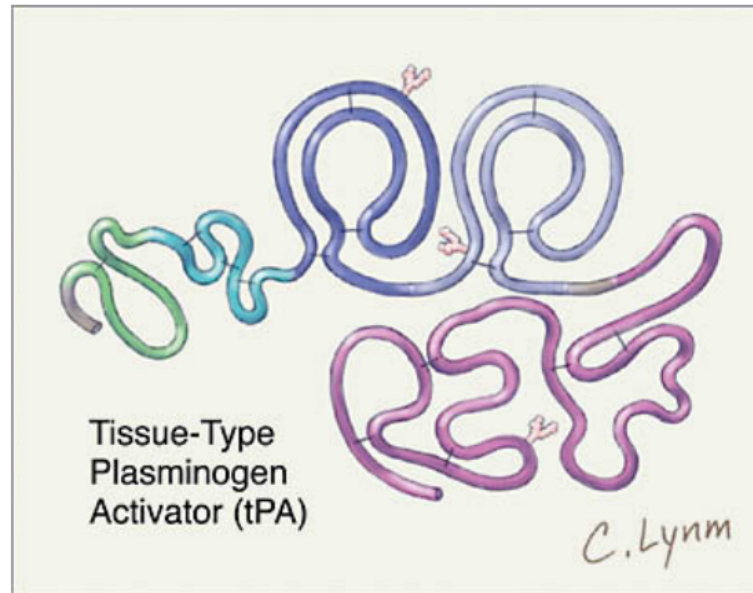
Where are we going?

Where did it all begin for neurology?

Ischemic Stroke

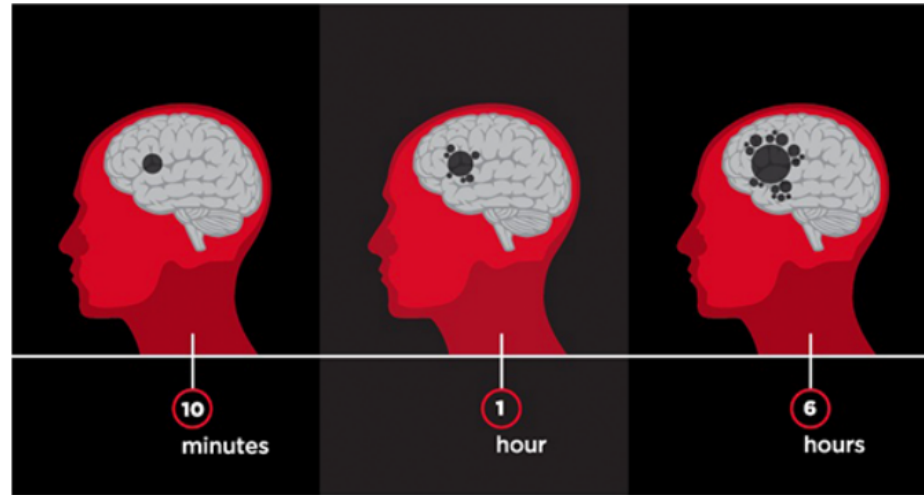


#3 cause of mortality in the 1990s



Tissue Plasminogen Activator

FDA approved in 1996



1.9 MILLION **BRAIN CELLS**
DIE EVERY MINUTE AFTER STROKE

Suddenly, stroke was an **emergency**

The sooner we could give TPA within the window, the better the outcome

Medicare provider analysis and review (MEDPAR) Database

64% of US hospitals did not use TPA in
2005-2007

Huge geographic disparities - worse in
midwest and southeast

Hospitals with <100 beds and low
population density

Most medical professionals
were **uncomfortable** using
this life saving medication!

Stroke is its own science

The screenshot shows the NIH website header with the logo and name. Below the header is a navigation bar with a search box and social media links. A yellow banner displays the alphabet for disorders. The main content area is titled "NINDS Stroke Trials Network" and includes a detailed paragraph about the network's purpose, a list of links on the left, and a list of network members on the right.

NIH National Institute of Neurological Disorders and Stroke

Disorders A - Z: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

You Are Here: [Home](#) » [Research](#) » Office of Clinical Research »

[Home](#)
[Disorders A - Z](#)
[News From NINDS](#)
[Funding Information](#)
[Training & Career Awards](#)
[Research Programs](#)
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[About NINDS](#)

NINDS Stroke Trials Network

The Stroke Trials Network (NIH StrokeNet) is designed to maximize efficiencies to prioritize, harmonize and streamline the development of high-quality, multi-site clinical trials focused on key interventions in stroke prevention, treatment, and recovery. Early phase 1-2 exploratory and confirmatory phase 3 clinical trials as well as biomarker-validation studies that are immediately preparatory to trials will be coordinated through Regional Coordinating Stroke Centers, the National Clinical Coordinating Center, and the National Data Management Center. The network provides centralized infrastructure and support for data management and integration as well as opportunities for data sharing. Finally, strong multidisciplinary collaboration within and among sites will ensure successful trial completion. A steady pipeline of new trials developed outside as well as within StrokeNet, along with international and private-public partnerships facilitated through this program, will all serve to enhance the public health impact of the NINDS's investment in stroke clinical trials.

Network website: <http://www.nihstrokenet.org/>

StrokeNet Network

- › National Coordinating Center: University of Cincinnati
- › National Data Management Center: Medical University of South Carolina
- › [Clinical sites](#)
- › [StrokeNet Executive Committee membership](#)

Subspecialty training

Hospitals that see infrequent cases of TPA annually had **worse** outcomes

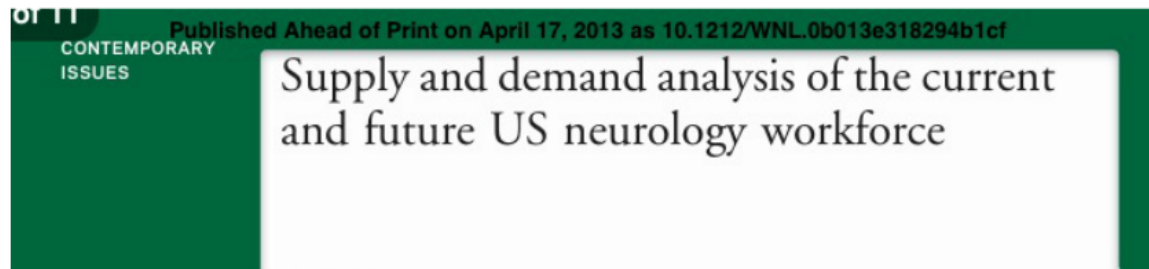
JC approved stroke centers

So the key to treating Stroke emergencies was:



Getting a trained neurologist to bedside as soon as possible!

Seems simple enough, right?



Timothy M. Dall, MS
Michael V. Storm, BA
Ritashree Chakrabarti,
PhD
Oksana Drozan, MS
Christopher M. Keran,
BA
Peter D. Donofrio, MD
Victor W. Henderson,
MD, MS
Henry J. Kaminski, MD
James C. Stevens, MD
Thomas R. Vidic, MD

Correspondence to
Mr. Dall.
tim.dall@ihs.com

ABSTRACT

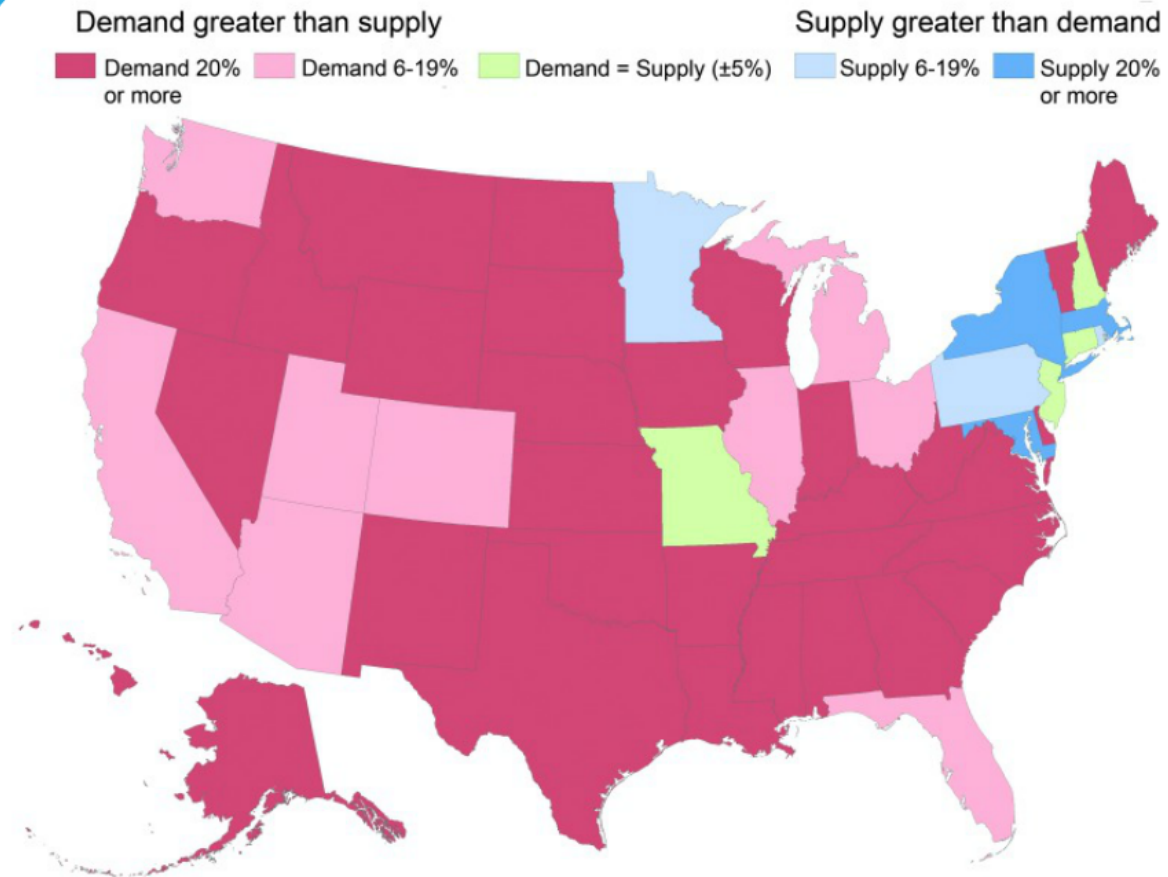
Objective: This study estimates current and projects future neurologist supply and demand under alternative scenarios nationally and by state from 2012 through 2025.

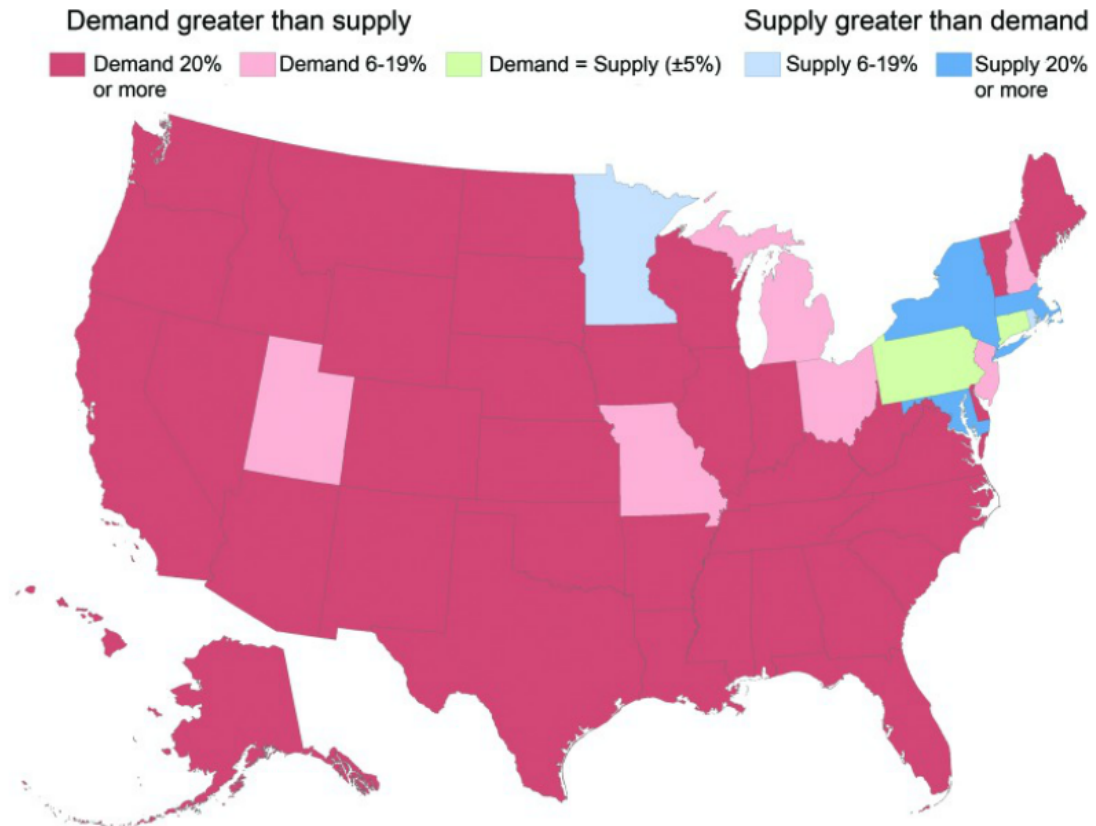
Methods: A microsimulation supply model simulates likely career choices of individual neurologists, taking into account the number of new neurologists trained each year and changing demographics of the neurology workforce. A microsimulation demand model simulates utilization of neurology services for each individual in a representative sample of the population in each state and for the United States as a whole. Demand projections reflect increased prevalence of neurologic conditions associated with population growth and aging, and expanded coverage under health care reform.

Results: The estimated active supply of 16,366 neurologists in 2012 is projected to increase to 18,060 by 2025. Long wait times for patients to see a neurologist, difficulty hiring new neurologists, and large numbers of neurologists who do not accept new Medicaid patients are consistent with a current national shortfall of neurologists. Demand for neurologists is projected to increase from ~18,180 in 2012 (11% shortfall) to 21,440 by 2025 (19% shortfall). This includes an increased demand of 520 full-time equivalent neurologists starting in 2014 from expanded medical insurance coverage associated with the Patient Protection and Affordable Care Act.

Conclusions: In the absence of efforts to increase the number of neurology professionals and retain the existing workforce, current national and geographic shortfalls of neurologists are likely to worsen, exacerbating long wait times and reducing access to care for Medicaid beneficiaries. Current geographic differences in adequacy of supply likely will persist into the future. *Neurology*® 2013;•:•••

Lack of Neurologists





Not just for stroke!

Telemedicine for stroke



**TIME LOST
IS BRAIN LOST**

Telestroke

Coined in 1999 when telemedicine for stroke became increasingly adopted.

Now 16-17 years later, telestroke is mainstream.

Telemedicine use increased

Could certify centers as JC accredited with telestroke

Interventional capabilities allow for increased need for selection of appropriate candidates.

Cut down transfers - transfer only those who need it.

AHRQ Tenet

"Doing the right thing, at the right time, in the right way, for the right person."

Outcomes

The
Permanente Journal
*a peer-reviewed journal of medical science,
social science in medicine, and medical humanities*

Indexed in
PubMed, and
National Lib

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Emergency Care of Patients with Acute Ischemic Stroke in the Kaiser Permanente Southern California Integrated Health System

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Kori Sauser-Zachrisson, MD, MSc; Ernest Shen, PhD; Zahra Ajani, MD;
William P Neil, MD; Navdeep Sangha, MD; Michael K Gould, MD, MS;
Adam L Sharp, MD, MS

Perm J 2016 Spring;20(2):10-13

<http://dx.doi.org/10.7812/TPP/15-124>

CME credits available for this article

ABSTRACT

Context: Tissue plasminogen activator (tPA) is underutilized for treatment of acute ischemic stroke.

Objective: To determine whether the probability of tPA administration for patients with ischemic stroke in an integrated health care system improved from 2009 to 2013, and to identify predictors of tPA administration.

Design: Retrospective analysis of all ischemic stroke presentations to 14 Emergency Departments between 2009 and 2013. A generalized linear mixed-effects model identified patient and hospital predictors of tPA.

Main Outcome Measures: Primary outcome was tPA administration; secondary outcomes were door-to-imaging and door-to-needle times and tPA-related bleeding complications.

Results: Of the 11,630 patients, 3.9% received tPA. The likelihood of tPA administration increased with presentation in 2012 and 2013 (odds ratio [OR] = 1.75; 95% confidence interval [CI] = 1.26-2.43; and OR = 2.58; 95% CI = 1.90-3.51), female sex (OR = 1.27; 95% CI = 1.04-1.54), and ambulance arrival (OR = 2.17; 95% CI = 1.76-2.67), and decreased with prior stroke (OR = 0.47; 95% CI = 0.25-0.89) and increased age (OR = 0.98; 95% CI = 0.97-0.99). Likelihood varied by Medical Center (pseudo-intraclass correlation coefficient 13.5%). Among tPA-treated patients, median door-to-imaging time was 15 minutes (interquartile range, 9-23 minutes), and door-to-needle time was 73 minutes (interquartile range, 55-103 minutes). The rate of intracranial hemorrhage was 4.2% and 0.9% among tPA- and non-tPA treated patients ($p < 0.001$).

Conclusion: Acute ischemic stroke care improved over time in this integrated health system. Better understanding of differences in hospital performance will have important quality-improvement and policy implications.

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REVIEW ARTICLE

Edward W. Campion, M.D., *Editor*

State of Telehealth

E. Ray Dorsey, M.D., M.B.A., and Eric J. Topol, M.D.

TELEHEALTH IS THE PROVISION OF HEALTH CARE REMOTELY BY MEANS OF a variety of telecommunication tools, including telephones, smartphones, and mobile wireless devices, with or without a video connection. Telehealth is growing rapidly and has the potential to transform the delivery of health care for millions of persons. Although several reviews have examined the historical use and effects of telehealth,¹⁻³ few articles have characterized its current status. Here we examine the trends of telehealth, its limitations, and the possibilities for future adoption.

"... the largest care provider for patients with stroke in the country is now not a major medical center but a telemedicine company."

Teleneurology: Emerging care paradigms



Where we are going

Telestroke paved the way

Acute stroke was seen, but then what?

Led to routine consults and follow ups

Tele-Neurohospitalists

additional diagnostic
services - EEG

Tele EEG & ICU monitoring



Increasing evidence shows greater ability to prognosticate and manage

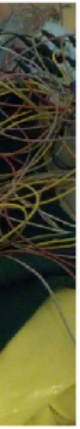
Increased survival in ventilated patients without increase in LoS

Ney et al. Continuous and routine EEG in intensive care: utilization and outcomes, United States 2005-2009. Neurology 2013 Dec 3;81(23):2002-8.

Growing role for outpatient care

Remote care is being integrated into the care continuum

- pre hospital stroke care (ambulance)
- follow up care in rehab or home
- chronic care at home



Average wait to see a
neurologist in 2012:

NV: 34.8 business days up from 28.1 in 2010

FU: 30.0 business days up from 25.6 in 2010

-NSGY: 24.1 -FP: 20.3 -Ortho: 16.8 -Cards: 15.5

Peds Neuro: 45 business days
with 39% of childrens hospitals
reporting no vacancies for 12
months or longer.

A huge need is identified with a possible solution



Neurology has the most immobile patients.

Mobile health/ Digital health (remote monitoring)

Current paradigm is fragmented care

Wearables generate data - which we now react to, but will become predictive

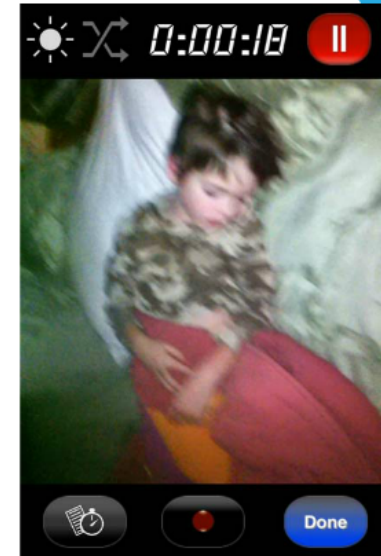
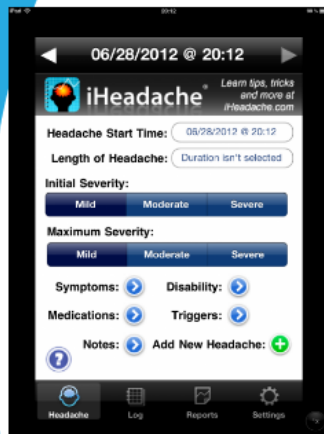
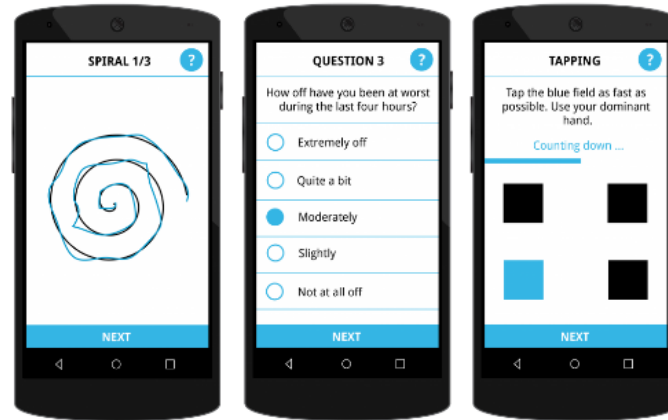
True continuity of care

NHS to offer free devices and apps to help people manage illnesses

Health service seeks to use of technology to help patients manage conditions such as diabetes and heart disease



📌 New heart monitors will be able to detect irregular rhythms that are a key cause of sudden cardiac death, which kills 100,000 people in the UK every year. Photograph: Graham Turner for the Guardian



ons

Multimodal Remote Monitoring Applications

Multiple Sclerosis

- Activity Monitoring
- Tasks

Parkinsons Disease

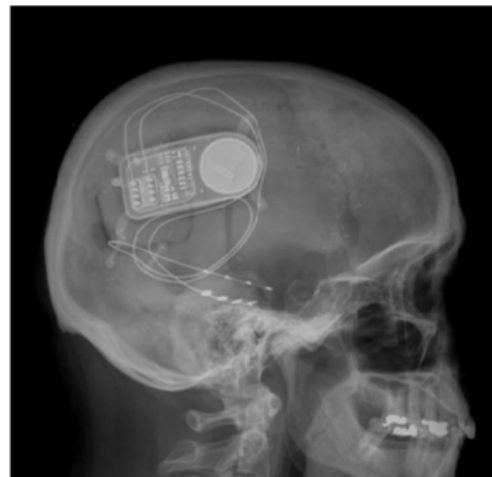
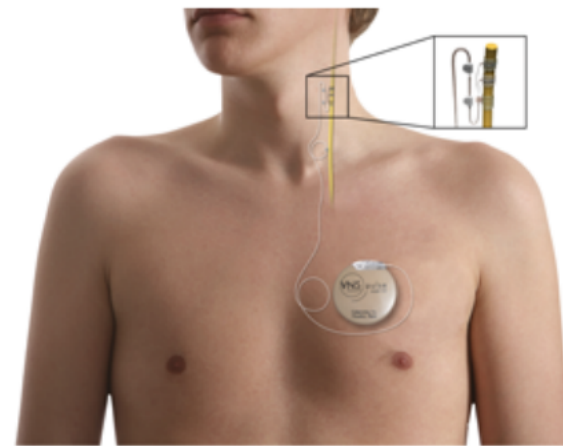
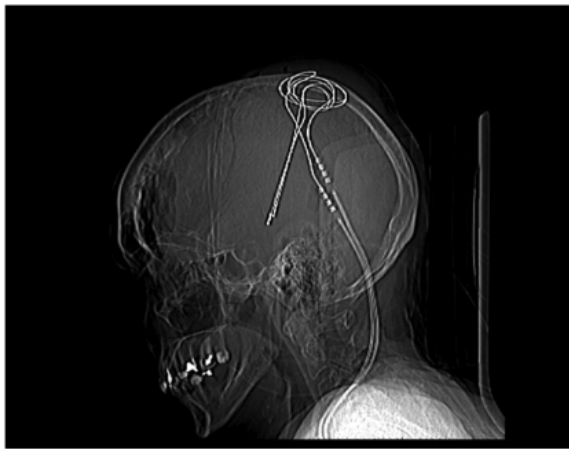
- Activity Monitoring
- Accelerometer
- Tasks

Dementia

- Activity Monitoring
- Sleep Monitor
- Heart Rate Monitor
- Tasks



Remote Neurostimulator Management



FDA News Release

FDA allows marketing of first direct-to-consumer tests that provide genetic risk information for certain conditions

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For Immediate
Release

April 6, 2017

Parkinsons Disease

Alzheimers disease

Primary Dystonia

Emerging Neurology Clinical Care Team



How will patients access Neurologists?

Emergencies (In the ED/remote)

Outpatient consultations (PCP office, home? - In person/remote)

On Demand, over the internet

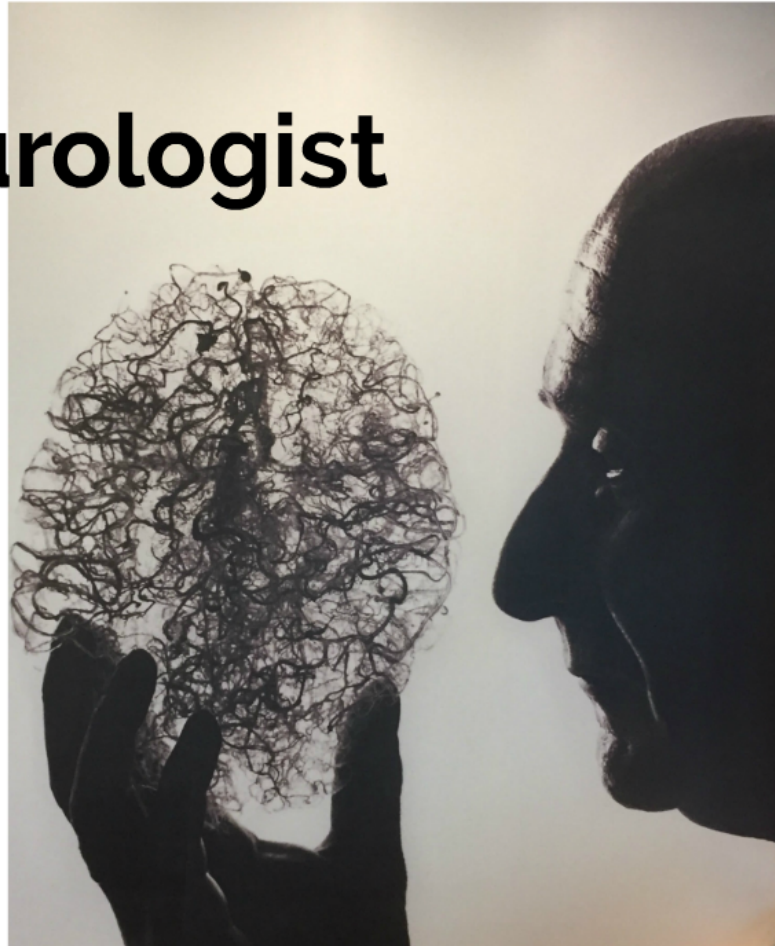
Chronic care (In person/remote)

Due to lack of specialists, in order to provide the most efficient and cost effective care, remote care in neurology WILL be leveraged.

Some will argue that the role of specialists will be as consultants only

Medical Care home Neighbors

Neurologist



Initial consult
-telemedicine
- in person

Advanced Practice Provider



Follow up
telemedicine
in person

Data Monitor/Manager/Coordinator



- First line for RPM/mHealth , patient reported events,
- Makes clinical decisions based on RPM/mHealth strategies

Others

Therapists - PT/OT/SLT

Home Health

Other Physicians/Providers

Behavioral Health

Social Work

Caregivers

IT support

Patient

Further down the road . . .



How much will advances in AI and
big data analytics influence
automation of our speciality?

ice, but not
eat changes in
convince other

Limitations



Physical Exam



Lack of Evidence outside of Stroke



Growing body of evidence, but not enough yet to make great changes in insurance payments or convince other physicians to use it.

Some visits are not appropriate for telemedicine

Neuromuscular - or requiring the elicitation of more subtle exam findings

Brain death examination

Vestibular/neuroophthalmology

...YET

DTC telemedicine needs to be defined



Financial impetus is clear

Still need to eliminate silos
between the patients and the
physicians who care for them

DTC can fragment care



"To fully diagnose a patient you have never seen face to face is dangerous, and while we believe these kinds of visits are appropriate, it should only be with an established patient that we have actively seen in our practice before." - Dr. Reid Blackwelder AAFP

Several Insurance providers are partnered with specific DTC companies.



Currently, most have no plan to change current workflow.

Health systems tend to operate in the interest of Health Systems

Transfer patients within the health system, often times despite other areas being closer.

Would rather have the patient travel hours to their main hospital than see a different neurologist remotely in their community.

Telemedicine Education

Program directors are being asked to sign off on residents and fellows for telemedicine

Stroke

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Abstracts and presentations are embargoed for release at date and time of presentation or time of AHA/ASA news event. Failure to honor embargo policies (<http://newsroom.heart.org/newsmedia/embargo-policy>) will result in the abstract being withdrawn and barred from presentation.

International Stroke Conference Poster Abstracts

Session Title: Emergency Care/Systems Posters II

Abstract T P198: The Importance of Formal Training in Telemedicine During Stroke Fellowship

Judy Jia; Sean Savitz; Amrou Sarraj; Tzu-Ching Wu

Telemedicine has a role in the care continuum

There needs to be standard education in Telemedicine, particularly as it applies to Neurology



Accelerating change in medical education consortium

June 15, 2016

AMA Encourages Training in Telemedicine for Medical Students and Residents

For immediate release:
June 15, 2016

New policy builds upon the AMA's efforts to create the medical school of the future

CHICAGO - Recognizing that formalized training in telemedicine is not widely offered to physicians-in-training, the American Medical Association (AMA) today adopted policy during its Annual Meeting aimed at ensuring medical students and residents learn how to use telemedicine in clinical practice. The new policy specifically encourages the accrediting bodies for both undergraduate and graduate medical education to include core competencies for telemedicine in their programs. The new policy also reaffirms existing AMA policy, which supports reducing barriers to incorporating the appropriate use of telemedicine into the education of physicians.



Telemedicine workgroup has formulated a GME curriculum and resources for telemedicine training to be released in 2017

Endorsed by the ATA and our Education Committee

Education of presenters

Some programs exist within a handful of academic centers, but widespread education is severely lacking for neurology.

This matters, especially when time is brain.

Education of our patients



“EDUCATION
IS THE MOST POWERFUL
WEAPON WHICH YOU CAN USE TO
CHANGE THE WORLD.”
NELSON
MANDELA

Patient education is telemedicine is grossly underestimated.

A Neurologist in every community

Teleneurology is increasingly recognized as a component of team based healthcare.

**The best way to
predict the future
is to create it.**

Many of us are doing our part to be able to do the right thing for the right person, regardless of where.