Mobile Telemedicine in Action – thinking outside and *inside* the box

Andrew M. Southerland, MD, MSc

MATRC Summit

March 31, 2015

University of Virginia Health System

Disclosures

U.S. Provisional Patent Application Serial No. 61/867,477

Research Support

- HRSA GO1RH27869-01-00
- Virginia Alliance of Emergency Medicine Research
- UVA Neuroscience Center of Excellence
- American Academy of Neurology, American Board of Psychiatry and Neurology

Additional

- Deputy Editor, Neurology Podcast®
- Legal expert review

UNIVERSITY of VIRGINIA HEALTH SYSTEM

Burden of Acute Stroke…*Time is Brain*

- Stroke is a leading cause of death and long term disability worldwide
  - 15 million new strokes/year:
    - 5 million deaths
    - 5 million permanently disabled
- Efficacy of life saving reperfusion therapy is **TIME DEPENDENDENT**
- Every minute a large vessel ischemic stroke is untreated, the average patient loses
  - 2 million neurons
  - 14 billion synapses
  - 12 km (7 miles) of axonal fibers

UNIVERSITY of VIRGINIA HEALTH SYSTEM

WHO statistics, Saver JAMA 2013

Prehospital Stroke Care – *No Time to Wait*

Numerous initiatives calling for innovative approaches to prehospital stroke care to improve time-to-treatment

- American Heart Association/American Stroke Association (AHA/ASA) *Target:Stroke*

Patients living in rural and underserved areas suffer a *geographic disparity* of distance to primary stroke centers and access to neurological expertise

In the acute stroke setting, this geographic disparity includes prolonged EMS transport times

- **UVA Stroke onset-ED arrival 2012: 2 hr. 45 min**

UNIVERSITY of VIRGINIA HEALTH SYSTEM

Mullen Stroke 2013, Lin Circulation 2012, Garnett Int J Stroke 2010

Stroke Telemedicine and Tele-education Program (STAT)

Va Senate Bill 675: April 2010

§ 38.2-3418.16. Coverage for telemedicine services.

STAT
STROKE TELEMEDICINE & TELE-EDUCATION

UNIVERSITY OF VIRGINIA
TELESTROKE CENTER
UNIVERSITY of VIRGINIA HEALTH SYSTEM

Thinking outside the box?…

UNIVERSITY of VIRGINIA HEALTH SYSTEM

UVA's first mobile cardiac unit – 1971

- Cardiologist, Richard Crampton develops one of first mobile coronary care units in U.S.
  - Equipped with ECG, defibrillator, oxygen, and cardiac treatments during transport
- Deployed to treat President LBJ during a visit to Charlottesville in 1972

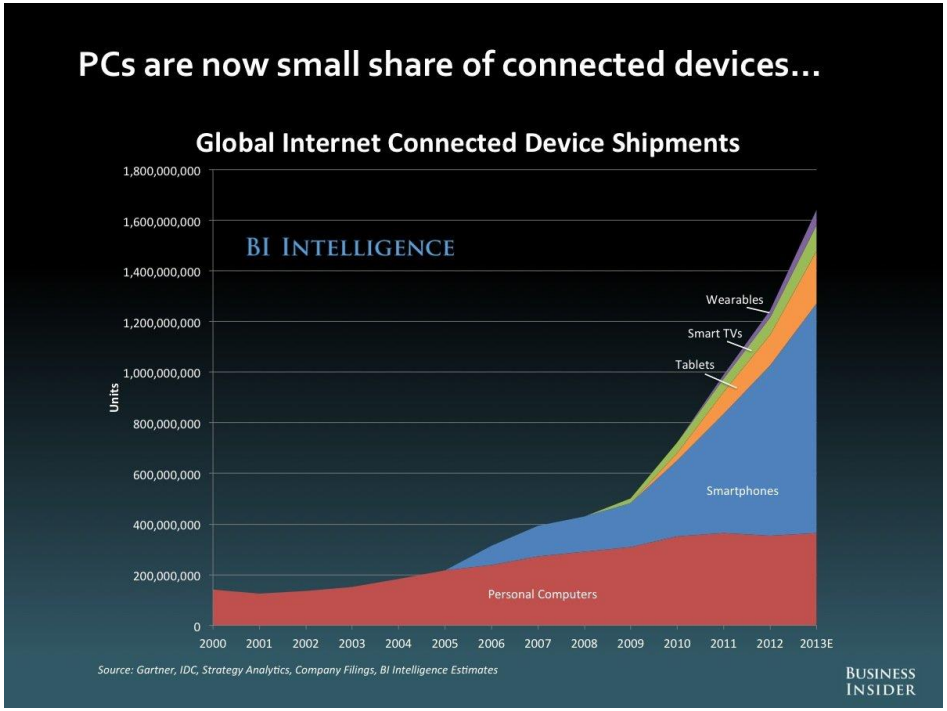
UNIVERSITY of VIRGINIA HEALTH SYSTEM

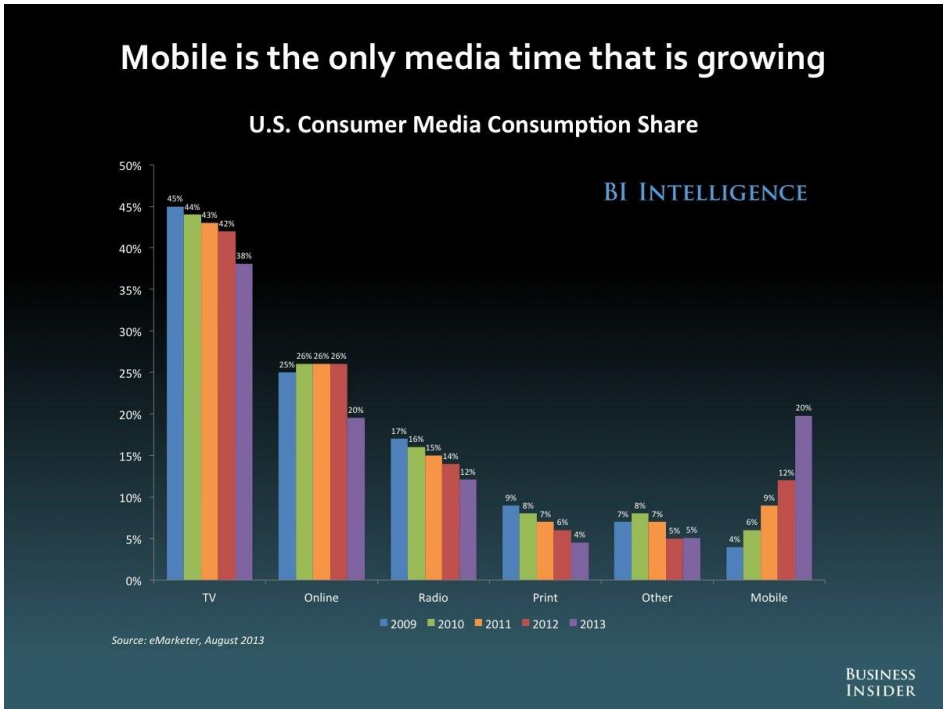
Going Mobile

Mobile devices have far surpassed desktop computers worldwide 2009-13

2014: 58% of the U.S. population own a smartphone and 42% own a tablet device

2009: 35% and 8% respectively





Blodget H www.businessinsider.com

Mobile Telestroke

- Integrating telestroke model with mHealth technology
- Purpose: facilitate mobile videoconferencing between a stroke physician, patient and transporting EMS provider:
  - Improve accuracy of prehospital stroke diagnosis
  - Facilitate appropriate patient triage
  - Reduce stroke onset-to-treatment time
  - Assist in prehospital stroke research

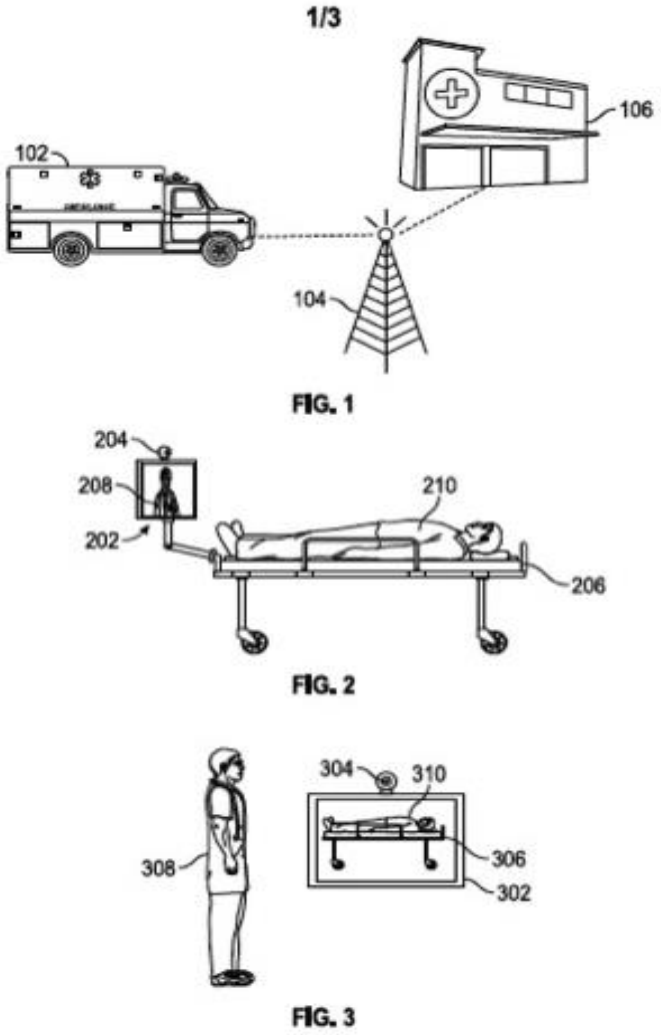
- Mobile telestroke pilot studies
  - Telebat – LaMonte et al 2004
  - Europe - Aachen (Bergrath), Berlin (Liman), and Brussels (Van Hooff)
  - Wu et al. UT Houston 2014 (InTouch Health)

UNIVERSITY of VIRGINIA HEALTH SYSTEM

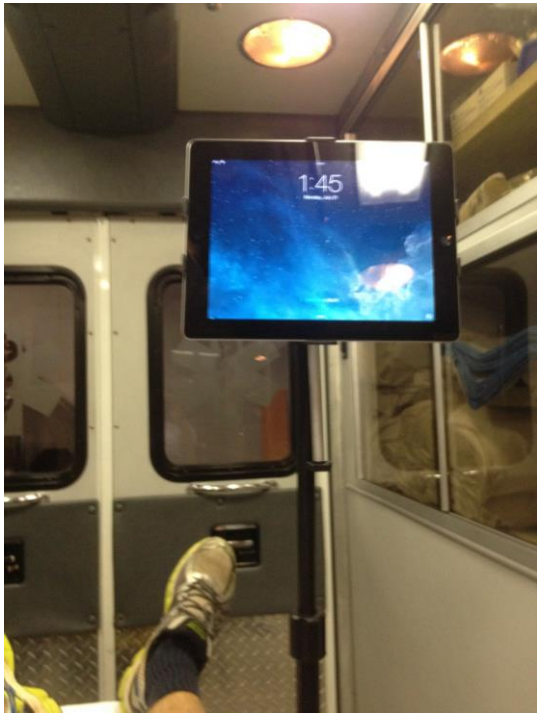
iTREAT

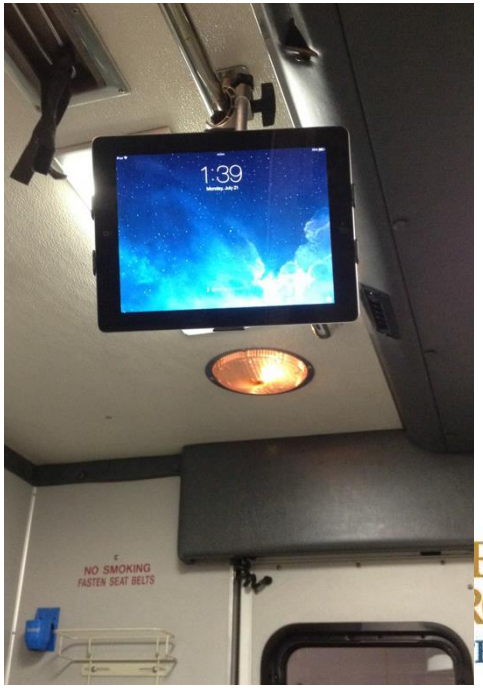
Improving Treatment with Rapid Evaluation of Acute stroke via mobile Telemedicine

- Apple iPad® with retina display
- Cisco Jabber (Movi)™ video conferencing application (HIPAA compliant)
- 4G LTE CradlePoint© modem
- External magnetic-mount antennae
- Portable tablet mounting apparatus
- Verizon Wireless© 4G Mini SIM card
- Durable Pelican case



UNIVERSITY of VIRGINIA HEALTH SYSTEM

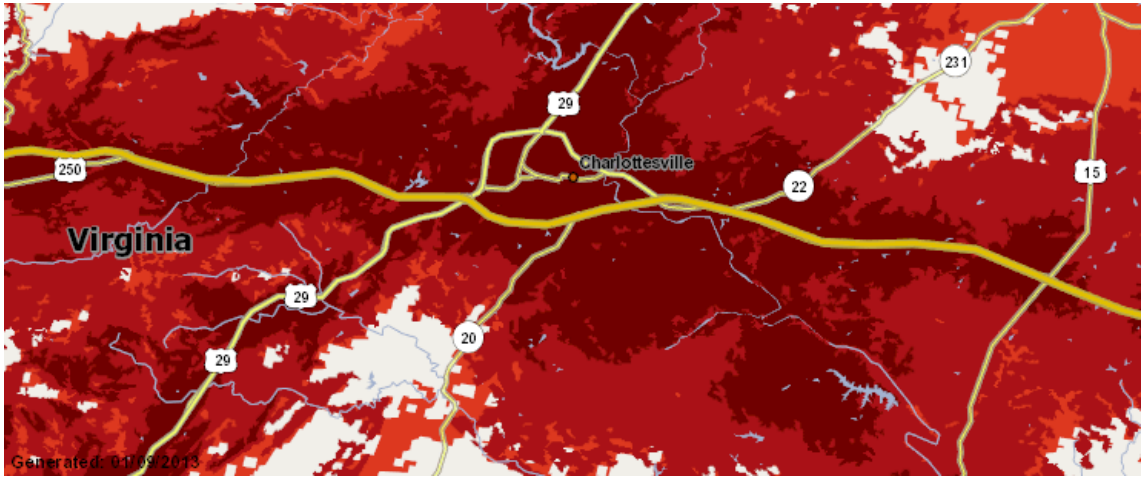




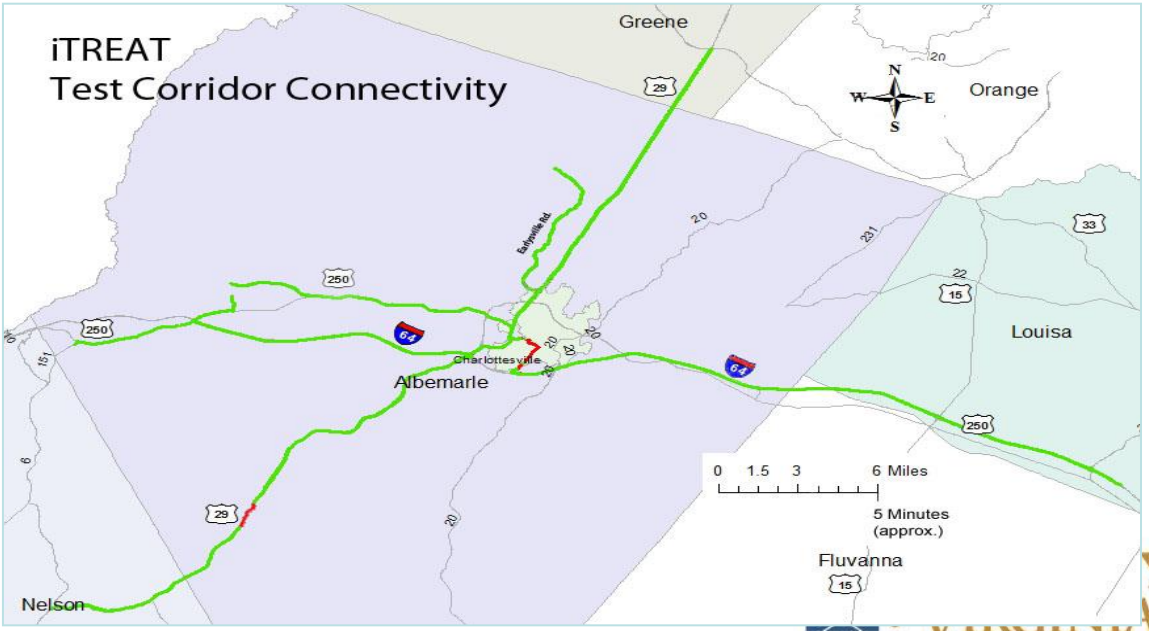
ERSITY
RGINIA
H SYSTEM

Connectivity Mapping – Feasibility Aim

Verizon© Map



Connectivity Map

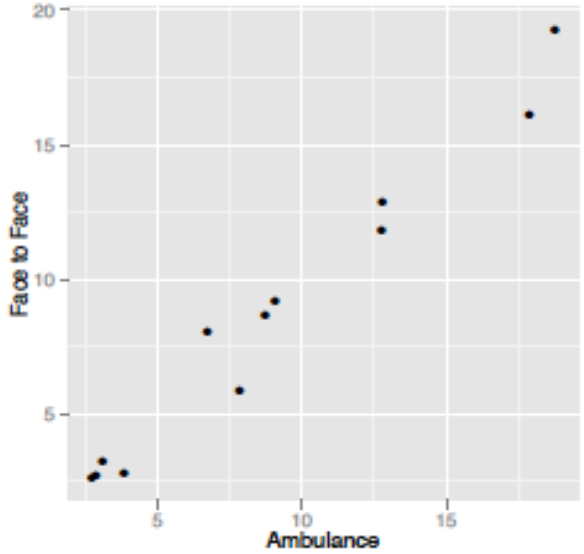


Lippman, Chapman et al. ISC, AAN 2014

HEALTH SYSTEM

iTREAT – Feasibility Results

- 93% of all runs achieved at least 9 minutes of continuous connectivity between all raters
  - Mean: 18 minutes
- Good AV quality without technical interruption
- Excellent correlation of neurological examination compared to face to face encounters (0.98)
- IRB approved for a Phase II clinical trial to evaluate diagnostic accuracy and time-to-treatment in live patient encounters
  - Virginia, St. Louis, San Francisco



UNIVERSITY of VIRGINIA HEALTH SYSTEM

What's next…
Mobile CT?

Median call-to-needle:
62 vs 98 min

http://www.youtube.com/watch?v=gIHJNBlwNXk

http://www.youtube.com/watch?v=OvXNUYBczhw

Audebert et al., Int J Stroke 2012, *Neurology* 2012

UNIVERSITY of VIRGINIA HEALTH SYSTEM

What's next…
Handheld Diagnostics

http://infrascan.agencystudy.com

http://tricorder.xprize.org

Leon-Carrion Brain Inj 2010, Bressan Child Nerv Sys 2014

University of Virginia Health System

What's next…
Wearable Platforms?

PRISTINE

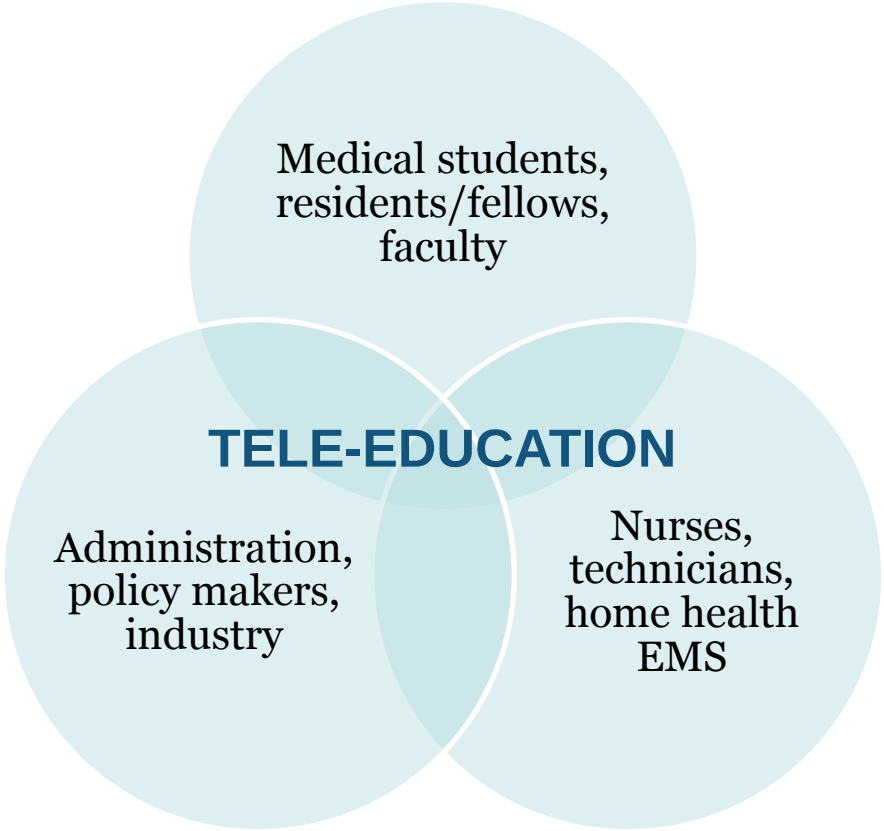
NeuroEGG STUDY:

- **Neurology Resident Evaluation using Google Glass**

*Sponsored by the American Academy of Neurology and American Board of Psychiatry and Neurology

University of Virginia Health System

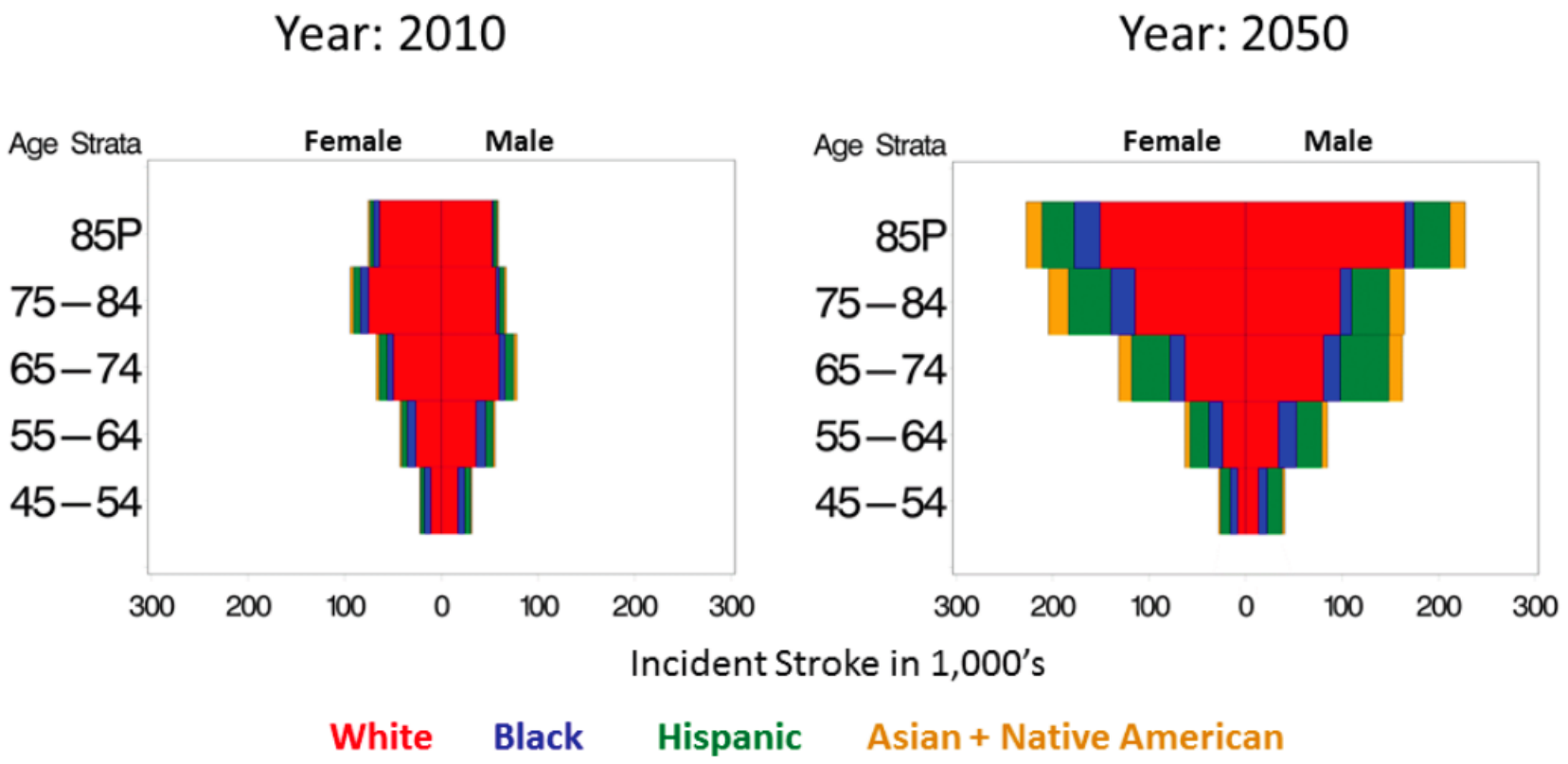
What's next…
Telecorps?



Medical education must parallel the tele-revolution in healthcare

UNIVERSITY of VIRGINIA HEALTH SYSTEM

STROKE…on the horizon



Howard 2014

UNIVERSITY of VIRGINIA HEALTH SYSTEM

THANK YOU

Contact:
Andy Southerland
as5ef@virginia.edu
@asouth01

Sponsors:
HRSA
NINDS CTMC
VAEMR
UVA Neuroscience CoE

Mid-Atlantic Telehealth Resource Center

UVA Stroke Team

Sherita Chapman Smith
Nina Solenski
Brad Worrall
Heather Turner
Timothy McMurry
Jack Cote
Max Padrick
Jason Lippman

UVA Emergency Medicine

- Debra Perina
- Donna Burns
- TJEMS Council

Business Partners

- Verizon Wireless©
- Cisco systems ©

UCSF

- Prasanthi Govindajaran

UVA Center for Telehealth

- Karen Rheuban
- David Cattell-Gordon
- Brian Gunnell
- Charles Lewis
- Richard Rose
- Virginia Burke
- Kathy Wibberly
- Lara Otkay
- Regina Carlson

Thomas Jefferson Emergency Medical Services Council

University of Virginia Health System