

Clinical Applications

Ronald S. Weinstein, M.D.
Director, Arizona Telemedicine Program

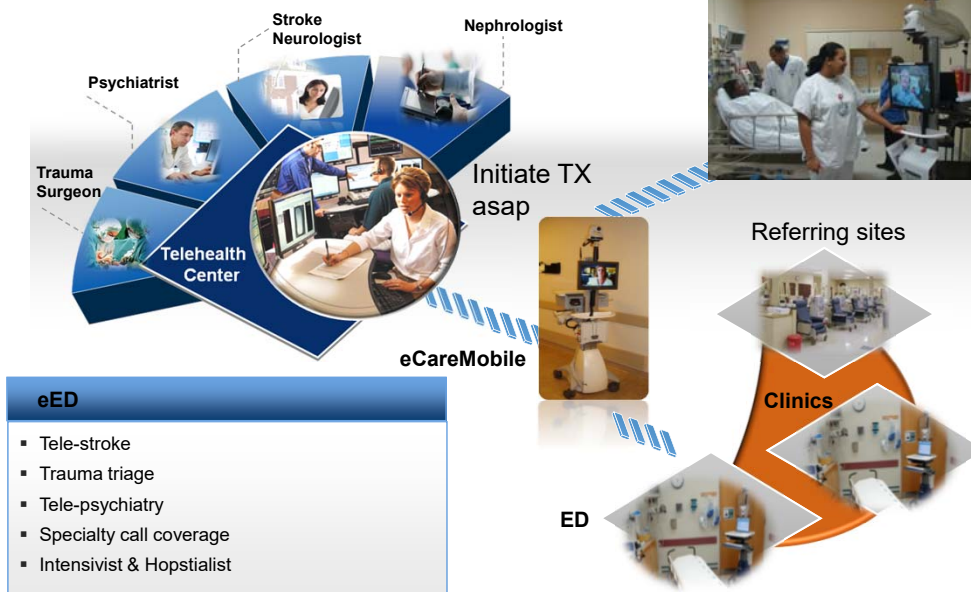
Major Categories of Services in General Usage

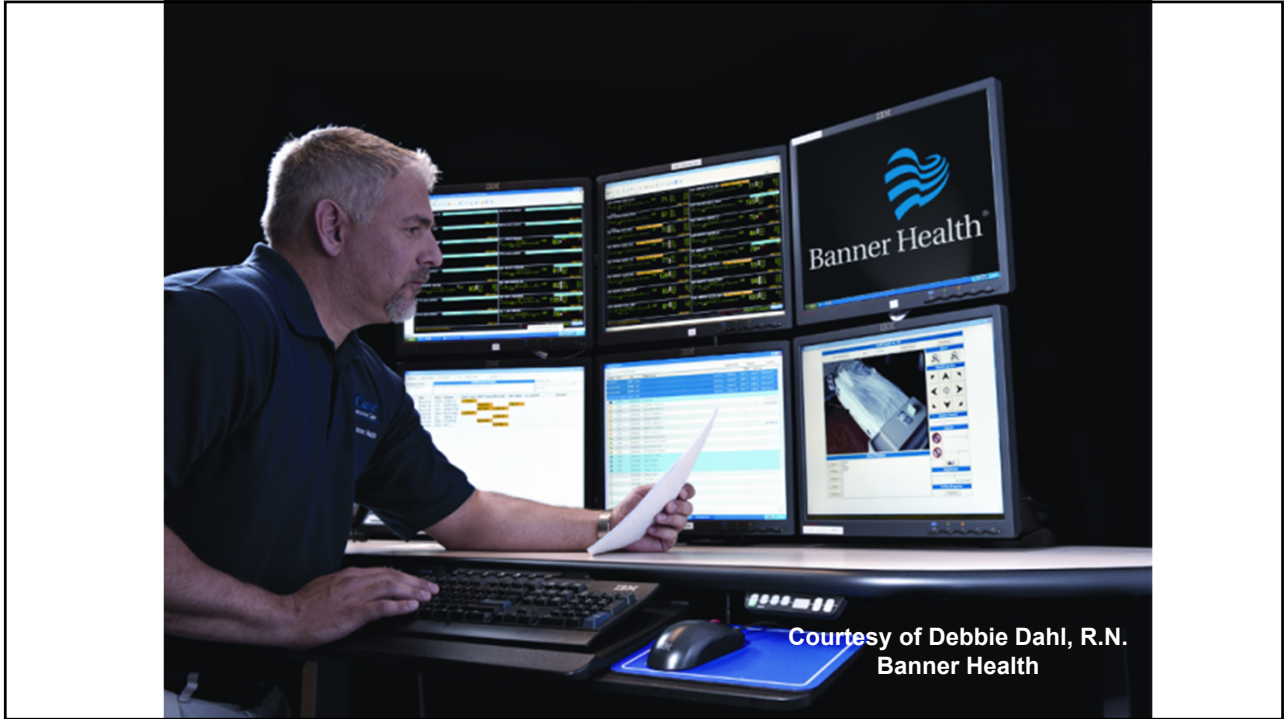
- Gap Services
- Urgent Services
- Mandated Services

Teleradiology – 1,300,000+ cases

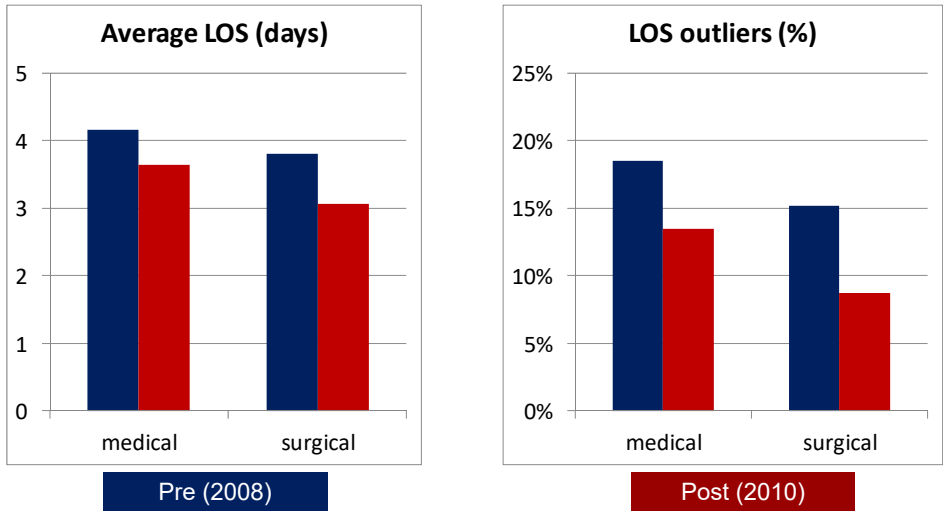


Emergency Medicine – Banner Health Courtesy, Debbie Dahl, EE

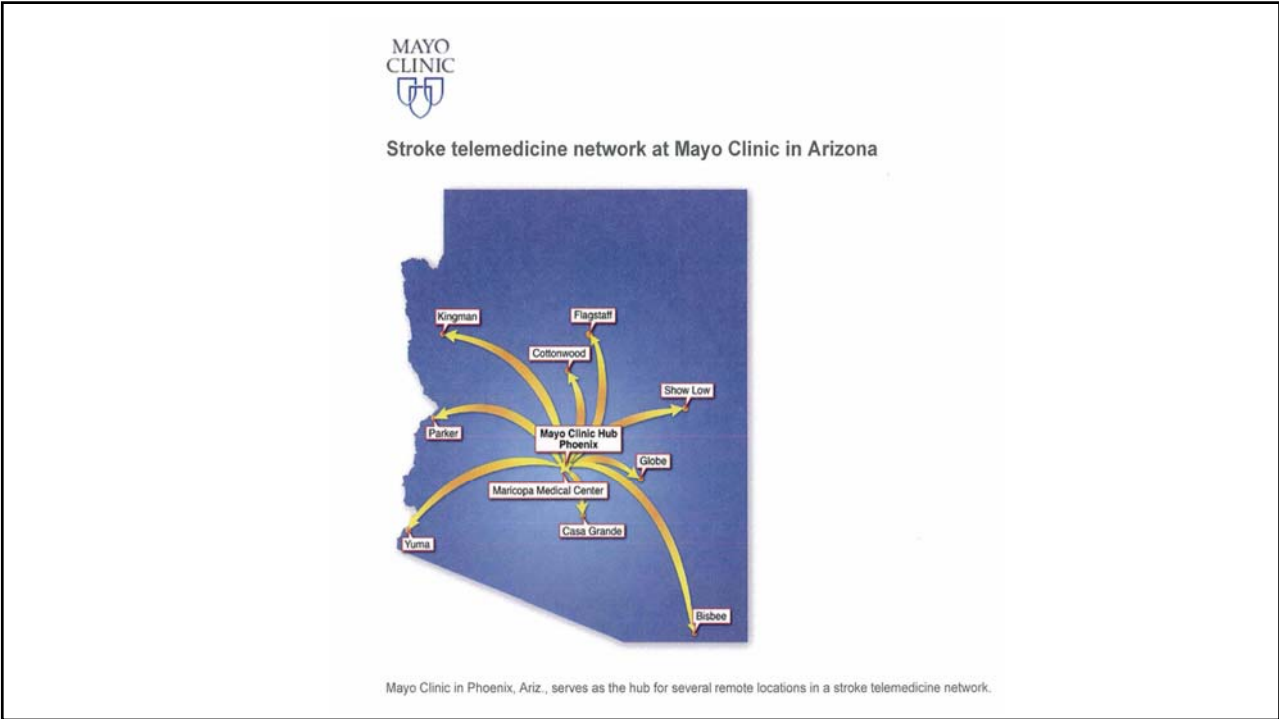




iCare BGMC MedSurg LOS



Courtesy of Debbie Dahl, E.E
Banner Health





Background and Purpose

- ResolutionMD mobile application runs on a Smartphone and affords vascular neurologists access to radiological images of patients with stroke from remote sites in the context of a telemedicine evaluation.
- Although reliability studies using this technology have been conducted in a controlled environment, this study is the first to incorporate it into a real-world hub and spoke telestroke network.
- The study objective was to assess the level of agreement of brain CT scan interpretation in a telestroke network between hub vascular neurologists using ResolutionMD, spoke radiologists using a Picture Archiving and Communications System, and independent adjudicators.



© 2015 ARIZONA TELEMEDICINE PROGRAM



Stroke. 2012; 43:3271-3277

Reliability of Real-Time Video Smartphone for Assessing National Institutes of Health Stroke Scale Scores in Acute Stroke Patients

Bart M. Demaerschalk, MD, MSc, FRCP(C); Sravanthi Vegunta, BS;
Bert B. Vargas, MD; Qing Wu, ScD; Dwight D. Channer, MS; Joseph G. Hentz, MS

Background and Purpose—Telestroke reduces acute stroke care disparities between urban stroke centers and rural hospitals. Current technologies used to conduct remote patient assessments have high start-up costs, yet they cannot consistently establish quality timely connections. Smartphones can be used for high-quality video teleconferencing. They are inexpensive and ubiquitous among health care providers. We aimed to study the reliability of high-quality video teleconferencing using smartphones for conducting the National Institutes of Health Stroke Scale (NIHSS).

Methods—Two vascular neurologists assessed 100 stroke patients with the NIHSS. The remote vascular neurologist assessed subjects using smartphone videoconferencing with the assistance of a bedside medical aide. The bedside vascular neurologist scored patients contemporaneously. Each vascular neurologist was blinded to the other's NIHSS scores. We tested the inter-method agreement and physician satisfaction with the device.

Results—We demonstrated high total NIHSS score correlation between the methods ($r=0.949$; $P<0.001$). The mean total NIHSS scores for bedside and remote assessments were 7.93 ± 8.10 and 7.28 ± 7.85 , with ranges, of 0 to 35 and 0 to 37, respectively. Eight categories had high agreement: level of consciousness (questions), level of consciousness (commands), visual fields, motor left and right (arm and leg), and best language. Six categories had moderate agreement: level of consciousness (consciousness), best gaze, facial palsy, sensory, dysarthria, and extinction/inattention. Ataxia had poor agreement. There was high physician satisfaction with the smartphone.

Conclusions—Smartphone high-quality video teleconferencing is reliable, easy to use, affordable for telestroke NIHSS administration, and has high physician satisfaction. (*Stroke*. 2012;43:3271–3277.)

© 2015 ARIZONA TELEMEDICINE PROGRAM

Stroke 2012; 43; 3095-3097

CT Interpretation in a Telestroke Network Agreement Among a Spoke Radiologist, Hub Vascular Neurologist, and Hub Neuroradiologist

Bart M. Demaerschalk, MD, MSc; Bentley J. Bobrow, MD; Rema Raman, PhD; Karin Ernstrom; Joseph M. Hoxworth, MD; Ameet C. Patel, MD; Terri-Ellen J. Kiernan, MSN; Maria I. Aguilar, MD; Timothy J. Ingall, MD, PhD; David W. Dodick, MD; Brett C. Meyer, MD; for the Stroke Team Remote Evaluation Using a Digital Observation Camera (STROKE DOC) in Arizona—The Initial Mayo Clinic Experience (AZ TIME) Investigators

Background and Purpose—The American Stroke Association guidelines emphasized the need for further high-quality studies that assess agreement by radiologists and nonradiologists engaged in emergency telestroke assessments and decision-making. Therefore, the objective of this study was to determine the level of agreement of baseline brain CT scan interpretations of patients with acute stroke presenting to telestroke spoke hospitals between central reading committee neuroradiologists and each of 2 groups, spoke hospital radiologists and hub hospital vascular neurologists (telestrokeologists).

Methods—The Stroke Team Remote Evaluation Using a Digital Observation Camera Arizona trial was a prospective, urban single-hub, rural 2-spoke, randomized, blinded, controlled trial of a 2-way, site-independent, audiovisual telemedicine and teleradiology system designed for remote evaluation of adult patients with acute stroke versus telephone consultation to assess eligibility for treatment with intravenous thrombolysis. In the telemedicine arm, the subjects' CT scans were interpreted by the hub telestrokeologist and in the telephone arm by the spoke radiologist. All subjects' CT scans were subsequently interpreted centrally, independently, and blindly by 2 hub neuroradiologists. The primary CT outcome was determination of a CT-based contraindication to thrombolytic treatment. Kappa statistics and exact agreement rates were used to analyze interobserver agreement.

Results—Fifty-four subjects underwent random assignment. The overall agreement for the presence of radiological contraindications to thrombolysis was excellent (0.91) and did not differ substantially between the hub telestrokeologist to neuroradiologist and spoke radiologist to neuroradiologist (0.92 and 0.89, respectively).

Conclusions—In the context of a telestroke network designed to assess patients with acute stroke syndromes, agreement over the presence or absence of radiological contraindications to thrombolysis was excellent whether the comparisons were between a telestrokeologist and neuroradiologist or between spoke radiologist and neuroradiologist.

Clinical Trial Registration—URL: <http://www.clinicaltrials.gov>. Unique identifier: NCT00623350. (Stroke. 2012;43:3095-3097.)

Key Words: computed tomography ■ randomized controlled trials ■ rural health ■ rural hospitals ■ stroke ■ telemedicine ■ telestroke

Photograph depicting the bedside National Institutes of Health Stroke Scale (NIHSS) assessment scenario.



Demaerschalk B M et al. Stroke 2012;43:3271-3277

American Heart Association
Learn and Live

Copyright © American Heart Association



Stroke

JOURNAL OF THE AMERICAN HEART ASSOCIATION



Smartphone Teleradiology Application Is Successfully Incorporated Into a Telestroke Network Environment

Bart M. Demaerschalk, Jason E. Vargas, Dwight D. Channer, Brie N. Noble, Terri-Ellen J. Kieman, Elizabeth A. Gleason, Bert B. Vargas, Timothy J. Ingall, Maria I. Aguilar, David W. Dodick and Bentley J. Bobrow

Stroke. 2012;43:3098-3101; originally published online September 11, 2012;

doi: 10.1161/STROKEAHA.112.669325

Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Copyright © 2012 American Heart Association, Inc. All rights reserved.

Print ISSN: 0039-2499. Online ISSN: 1524-4628



The cost-effectiveness of telestroke in the treatment of acute ischemic stroke

R.E. Nelson, PhD
G.M. Saltzman, PhD
E.J. Scalabrini, MD
B.M. Demaerschalk,
MD, MSc, FRCP(C)
J.J. Majersik, MD, MS

Address correspondence and
reprint requests to Dr. Jennifer J.
Majersik, Stroke Center,
Department of Neurology,
University of Utah School of
Medicine, Salt Lake City, UT
84132
jennifer.majersik@hsc.utah.edu

ABSTRACT

Objective: To conduct a cost-effectiveness analysis of telestroke—a 2-way, audiovisual technology that links stroke specialists to remote emergency department physicians and their stroke patients—compared to usual care (i.e., remote emergency departments without telestroke consultation or stroke experts).

Methods: A decision-analytic model was developed for both 90-day and lifetime horizons. Model inputs were taken from published literature where available and supplemented with western states' telestroke experiences. Costs were gathered using a societal perspective and converted to 2008 US dollars. Quality-adjusted life-years (QALYs) gained were combined with costs to generate incremental cost-effectiveness ratios (ICERs). In the lifetime horizon model, both costs and QALYs were discounted at 3% annually. Both one-way sensitivity analyses and Monte Carlo simulations were performed.

Results: In the base case analysis, compared to usual care, telestroke results in an ICER of \$108,363/QALY in the 90-day horizon and \$2,449/QALY in the lifetime horizon. For the 90-day and lifetime horizons, 37.5% and 99.7% of 10,000 Monte Carlo simulations yielded ICERs <\$50,000/QALY, a ratio commonly considered acceptable in the United States.


Conclusion: When a lifetime perspective is taken, telestroke appears cost-effective compared to usual care, since telestroke costs are upfront but benefits of improved stroke care are lifelong. If barriers to use such as low reimbursement rates and high equipment costs are reduced, telestroke has the potential to diminish the striking geographic disparities of acute stroke care in the United States. *Neurology* 2011;77:1590-1598

Reduced Costs



The efficient use of available health care resources is of paramount concern for all health care centers. And, the costs associated with establishing a comprehensive stroke care system may prevent smaller or more rural facilities from implementing effective stroke management.

Resource constraints no longer need to be an obstacle to acute stroke services. For community hospitals and other facilities that cannot afford 24/7 coverage by a neurologist, the TeleStroke program is a cost-effective way to deliver round-the-clock specialty stroke care to more patients.





ACTIVASE FOR ACUTE ISCHEMIC STROKE
Pulmonary Embolism

Log In > | Register > |  

Activate for Acute Ischemic Stroke

Stroke Centers and Telestroke

Resource Center

Reimbursement

Patients and Families

Home > Stroke Centers and Telestroke > Telestroke Networks

Stroke Centers and Telestroke

Stroke Centers

Certification Information

Joint Commission Primary Stroke Center Certification

Acute Stroke Process

t-PA Training

Mock Stroke Codes

Outcomes

Comprehensive Stroke Centers

Stroke Center Best Practices

Time-Saving Practices

Stroke Center Fundamentals

Telestroke Networks

What Is Telestroke?

Hub and Spoke Model

Third-Party Consult Model

Key Elements of a Telestroke System

Equipment and Personnel

Common Challenges

Best Practices

Telestroke Resources

Telemedicine Providers

Link to Organizations

Telestroke Network Map


Telestroke Networks

The American Heart Association/American Stroke Association (AHA/ASA) recommends the use of telemedicine, or telestroke, to improve stroke care in rural, remote, or underserved areas.²¹

Discover how telestroke allows for specialized stroke care in underserved areas.

▶ What Is Telestroke?	Learn about the different telestroke models.
▶ Key Elements of a Telestroke System	Find out about equipment, challenges, and best practices associated with telemedicine.
▶ Telestroke Resources	Explore resources on telestroke.
▶ Telestroke Network Map	View telestroke networks on a national scale.

Education and Training




Free access to educational materials and training on acute ischemic stroke and Activase for your stroke center.

[Learn More](#) ▶

Dosing and Administration


View videos and instructions for the appropriate dosing and administration of Activase for acute ischemic stroke.



[View Now](#) ▶

Register for Updates



Receive updates and gain free access to order educational resources.



[Register Now](#) ▶ [Already registered? Log In >](#)

Acute Ischemic Stroke Indication

Activase is indicated for the management of acute ischemic stroke in adults for improving neurological recovery and reducing the incidence of disability. **Treatment should only be initiated within 3 hours after the onset of stroke symptoms, and after exclusion of intracranial hemorrhage by a cranial computerized tomography (CT) scan or other diagnostic imaging method sensitive for the presence of hemorrhage (see CONTRAINDICATIONS in the full prescribing information).**

Stroke

is the third leading cause of death in the United States and the leading cause of adult disability.

Approximately 795,000 strokes occur each year, and delays in diagnosis contribute to the mortality and disability associated with stroke.

TeleStroke

supports community hospitals by providing:

- 24-hour on-call stroke specialist
- Emergency department acute stroke consultation
- Bedside follow-up (depending on site needs)
- Stroke follow-up appointments (depending on site needs)



WHEN STROKE BEGINS, EVERY SECOND COUNTS

Stroke is a medical emergency that requires early assessment and early treatment. Rapid identification of acute stroke patients enables the timely administration of effective and appropriate stroke therapies that can improve patient outcomes. It also allows for initiation and coordination of strategies to prevent stroke progression, recurrent stroke, and common complications.

and transportation barriers with reliable technology that allows immediate access to stroke experts who can provide consultation with on-site providers to manage acute stroke as needed.

Keep stroke patients close to home.

With TeleStroke, community hospitals can provide stroke care to

HOW TELESTROKE WORKS

COMMUNITY HOSPITAL

- 1 Doctor reviews patients status, determining need for stroke evaluation
- 2 Telestroke mobile unit brought in to patient
- 3 Patient speaks directly to the telestroke doctor and follows examination instructions
- 4 If necessary, hospital staff prepares patient for AirMed transport

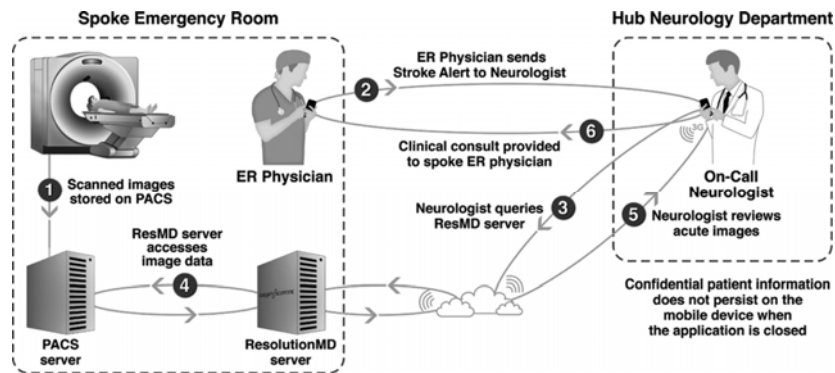


TELESTROKE DOCTOR

- 1 24/7 on-call TeleStroke doctor receives call or page
- 2 Doctor begins video conferencing and evaluates patient data
- 3 Exam given via TeleStroke system to evaluate presence or severity of stroke
- 4 Consultation with community hospital on best treatment plan for patient



ResolutionMD mobile infrastructure and algorithm.



Demaerschalk B M et al. Stroke 2012;43:3098-3101





ResolutionMD mobile.



Demaerschalk B M et al. Stroke 2012;43:3098-3101

American Heart
Association 
Learn and Live



Conclusions

- Telectroke is cost-effective (cost-savings)
- Telectroke by smartphone is possible

Demaerschalk B M et al. Stroke 2012;43:3271-3277

Major Categories of Services in General Usage

- Gap Services
- Urgent Services
- Mandated Services

- **Direct-to-Consumer**




© 2015 ARIZONA TELEMEDICINE PROGRAM



TELE-HOME HEALTH CARE:

‘Care Beyond Walls and Wires’ Enhances Life for Patients with Congestive Heart Failure



More than 5 million people in the U.S. suffer from congestive heart failure (CHF), according to the Centers for Disease Control and Prevention (CDC). The annual cost is estimated at more than \$32 billion in health care services, medications, and lost earnings, the CDC says. Northern Arizona Healthcare’s “Care Beyond Walls and Wires” can improve CHF patients’ health and reduce health care costs.

Worley Smith and his daughter, Rita Yazzie, used to drive an often as much a month from their home on the Navajo Reservation to Flagstaff Medical Center, nearly two hours away. Mr. Smith is living with congestive heart failure, with symptoms so severe he required frequent hospitalizations.

But Mr. Smith can no longer drive without the hospital. His has resulted for called Care Beyond Walls and Wires telemedicine program that he improves the health of those with congestive heart failure.

The program allows for remote visits and readmissions, a stay for those who are hospitalized.

“It’s phenomenal,” registered nurse for Flagstaff East Healthcare, said. “Walls and Wires” at Flagstaff Medical Center.

Ms. Yazzie says “Wires” is the best thing for me. I’ve had two hospitalizations since the program more than a year ago.

And at 90, Mr. Smith has been able to return to his favorite activity: riding his horse.

Care Beyond Walls and Wires provides patients with a backpack containing the equipment they need to check their blood pressure, measure their oxygen level, and check their weight daily; the latter because patients with CHF can gain and drop weight suddenly. The data are automatically transmitted to a smart phone that transmits the information to Northern Arizona Healthcare’s care coordination office, which provides the smart phone, monitoring equipment and backpack to every patient enrolled in Care Beyond Walls and Wires.

Some of the program’s patients have no insurance.

The San Diego telecommunications company Quakomms was chosen to lead the project, with Maryland-based Zephyr Technology and Verizon providing software, smart phones and remote monitoring hardware.

Northern Arizona Healthcare agreed to conduct a pilot project involving 50 patients. The program cost under way in the study if you lived nearby support.” Ms. Yazzie lives in Segood and Camp or on. Our patients require, and while, to early 90s.”

Care Beyond Walls and Wires ended on Arizona Healthcare. The program, around \$650, Ms. Sorrenson says, of phone charges.

“With the investment,” patients benefiting, including are readmitted discharged.


“About patient like the feeling that they have more control over their health,” Ms. Sorrenson says. “We couldn’t have asked for anything more. It’s a global win.”

“Care Beyond Walls and Wires is the best thing ever for me, and the best thing for my dad.”

Rita Yazzie

© 2018 ARIZONA TELEMEDICINE PROGRAM

Tucson Daily Star January 6, 2019



TALK TO A DOCTOR NOW

Get it on the App Store or Google Play.

Download the app FREE TODAY!

Access care anywhere, any place, any time.

The TMC Now app gives you 24/7 access to physicians that are licensed to practice in Arizona through the convenience of phone, video or mobile app visits. It's an affordable option for quality medical care.

Talk to a doctor for only \$49.
Use promo code **STAR10** for **10% OFF** your first visit. Expires 1/31/19. One code per person.

Download on the App Store | GET IT ON Google Play

tmcaz.com/tmcnow

DOWNLOAD THE APP FREE TODAY!

Tucson Medical Center

© 2018 Tucson Medical Center. All rights reserved. Apple and the Apple logo are trademarks of Apple Inc., registered in the U.S. and other countries.

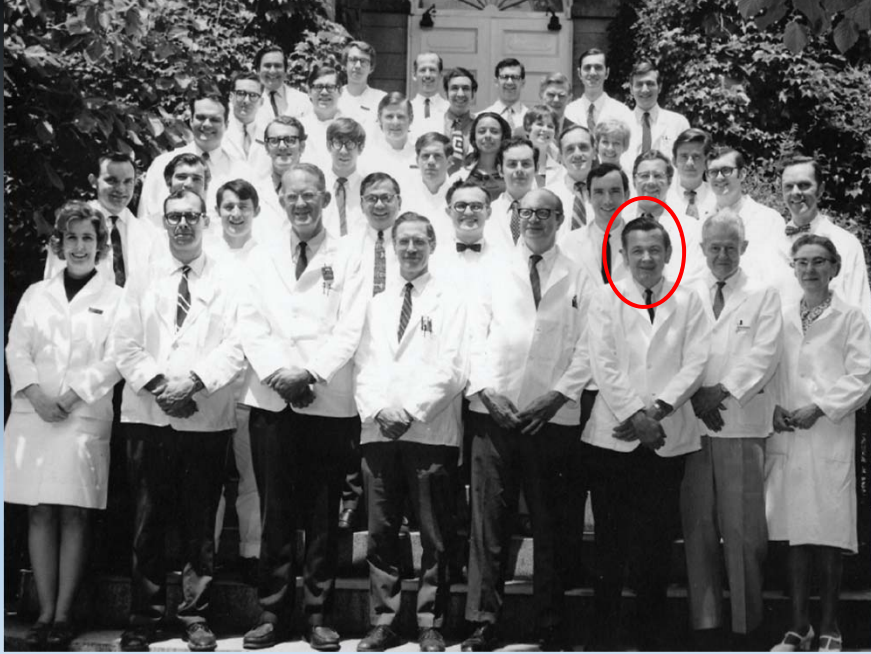
GET GREAT CARE YOU NEED

- Cold & flu symptoms
- Allergies
- Pink eye
- Ear infection
- Respiratory infection
- Sinus problems
- Skin problems
- ... and more

© 2015 ARIZONA TELEMEDICINE PROGRAM



Massachusetts General Hospital – Department of Pathology – 1960s



Massachusetts General Hospital – Department of Pathology – 1960s



"Pioneers in Telemedicine & Telehealth"
American Telemedicine Association



Rashid L. Bashshur, PhD, Ronald S. Weinstein, MD, Jay Sanders, MD

Thank you!

Ronald S. Weinstein, M.D.
rweinstein@telemedicine.arizona.edu