Telehealth/Telemedicine evolution - Driven by Technology or Need?

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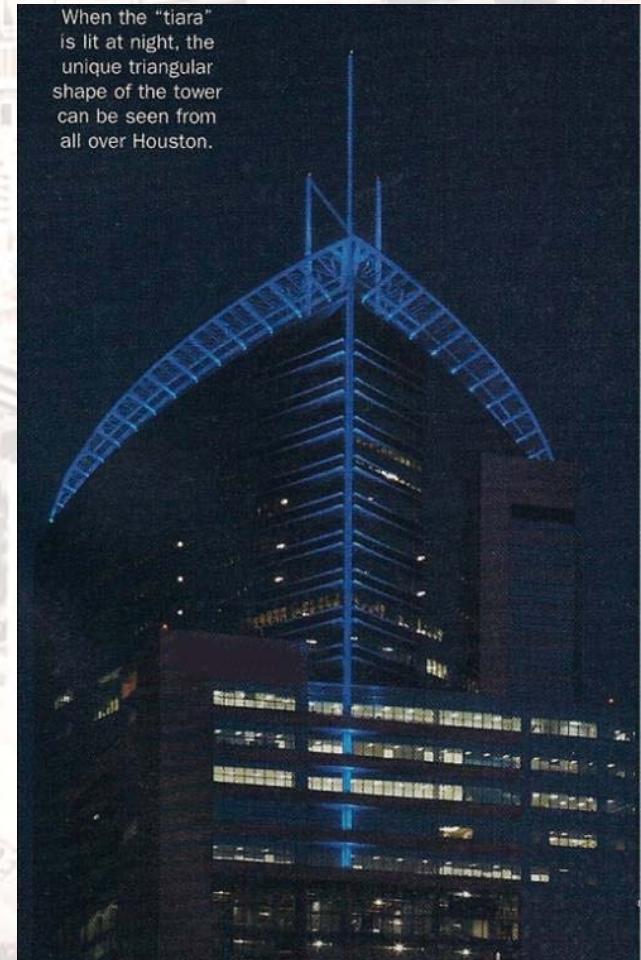Biomedical Engineering Consultants, LLC
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Y. David

Greeting from the Texas Medical Center

- Largest medical center
- Global medical services
- Density of healthcare technology
- Integration of Cross discipline care
- Evolution technological tools and
  patient outcomes

When the "tiara" is lit at night, the unique triangular shape of the tower can be seen from all over Houston.

outline

- Telehealth, Telemedicine and e-Health

- Barriers to development & deployment

- Why is it prime time for remote services

- Mobile health as disruptive technology & collaboration challenges

- Conclusion

Newsworthy event

or

core medical service?

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Everest 2010: Extreme Telemedicine

Book a Professional

(E3 99) Everest Extreme Expedition Begins Mission To Establish Telemedicine Clinic And Research Lab On Rooftop Of The World

Research To Enhance Quality of Medical Care in Space Exploration and Anywhere on Earth

Carabiners
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CMI
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Edelweiss ropes
Eureka Tents
Exofficio

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The Health Care Delivery System

Policy

Organization management

Resources: drugs, infrastructure, facilities, technology, devices, personnel

(1) Health status

Health Services

(2) Improved health outcomes

Responsiveness to people's expectations

1924

1965

1988

Center for TeleHealth

Texas Medical Center - 1994

Texas Children's Hospital + Baylor College of Medicine

TeleHealth

- An opportunity to address maldistribution of health professionals.
- Coordination of infrastructure.
- Expand clinical research collaboration.
- Advance education and competencies

Pediatric Specialties

- Infectious Diseases
- Cardiology
- Renal Diseases
- Hematology - Oncology
- Allergy/Immunology
- Asthma
- Audiology
- Biomedical Engineering
- Genetics
- Developmental Pediatrics
- Nutrition

- Plastic Surgery
- Dermatology
- Endocrinology
- Diagnostic Imaging
- Eating Disorders
- Epidemiology
- Gastroenterology
- Surgery
- Home Care
- Intensive Care
- Neonatal Care
- Neurology
- Neurosurgery
- Nuclear Medicine

- Nursing
- Ophthalmology
- Orthopaedic Surgery
- Otorhinolaryngology
- Ambulatory Care
- Critical Care
- Molecular Medicine
- Psychiatry
- Pulmonary Medicine
- Rheumatology
- Urology
- Pathology
- Renal Dialysis

Are We Ready?

Education & scientific review (Hippocrates/MD –Patient relationship)

Integrated   Technological   Systems (EMI)

New knowledge ⟶ New tools ⟶ potential for systematic
New process   New materials   breakthrough

NATIONAL INSTITUTES OF HEALTH
National Institute of Biomedical Imaging and Bioengineering
General Information

- NIH Home
- NIBIB Home

Information available in this section includes reports of bioengineering and bioimaging review and steering committees, bioengineering and bioimaging efforts at other federal agencies and foundations, journal articles on biomedical engineering and bioimaging, texts of lectures on directions in biology and medicine, and links to other Web sites of possible interest to the bioengineering and bioimaging communities (e.g., societies, acedemic and research opportunities, etc.)

Bioengineering at the NIH

- NIH Bioinstrumentation Interest Group
- NIH Biophysics Interest Group
- NIH Image Processing Interest Group
- Biomaterials and Medical Implant Science Coordinating Committee
- Report Of The NIH Working Group On Review Of Bioengineering and Technology and Instrumentation Development Research, the Huntsman Report, May 1999
- Science Article - Multidisciplinary Research: NIH Plans Bioengineering Initiative, June 1998
- New Directions In Biology and Medicine - Lecture by Dr. Harold Varmus to AAAS - February 1998
- Support for Bioengineering Research - External Consultants' Report, 1995
- Support for Bioengineering Research - NIH Report, 1994
- Trans-NIH Scientific Initiatives Web Site
- NIH Consensus and Technology Assessment Web Site
- Office of Research Services - Bioengineering and Physical Science Program
- National Library Of Medicine - National Center for Biotechnology Information
- Recommendations For Change At The NIH's Center For Scientific Review, the Boundaries Report
- Phase 2 of the Panel on Scientific Boundaries for Review Report, October 2000

Evolution

NATIONAL INSTITUTES OF HEALTH
National Institute of Biomedical Imaging and Bioengineering

NIBIB

● NIH Home   ● NIBIB Home

Welcome to the Web Site for the National Institute of Biomedical Imaging and Bioengineering (NIBIB) - Your Gateway for Information about Biomedical Imaging and Bioengineering at the National Institutes of Health (NIH).

About NIBIB   For Investigators   For Students   News & Events

BECON   NIBIB   General Information
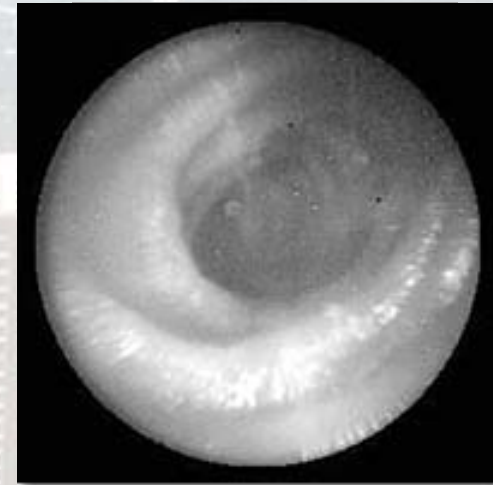
A GUIDE TO THE NIH

The National Institute for Biomedical Imaging and Bioengineering (NIBIB) is the newest of the research institutes at the National Institutes of Health (NIH). The NIBIB is authorized by law H.R. 1795 (P.L. 106-580) which was signed by President William Clinton on December 29, 2000.

The mission of the NIBIB is to "improve health by promoting fundamental discoveries, design and development, and translation and assessment of technological capabilities. The Institute coordinates with biomedical imaging and bioengineering programs of other agencies and NIH institutes to support imaging and engineering research with potential medical applications and facilitates the transfer of such technologies to medical applications."
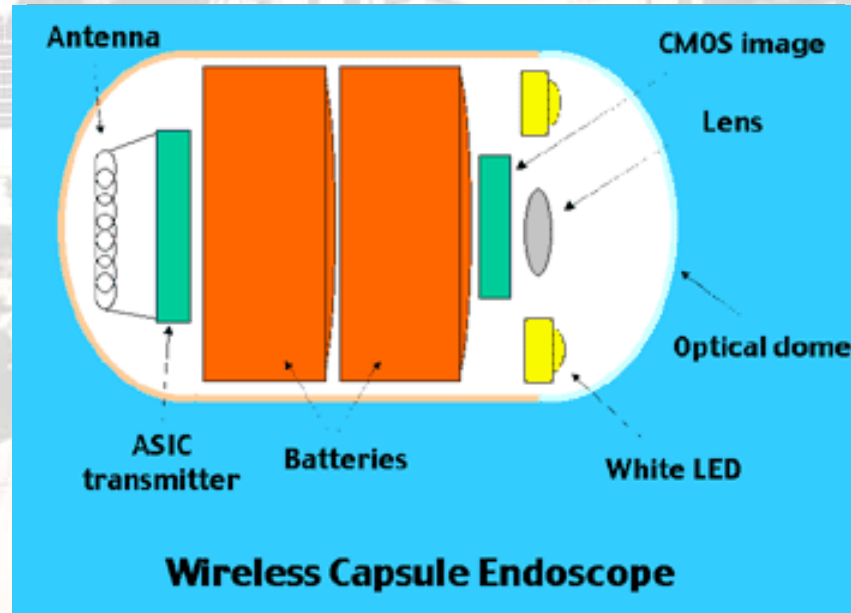
What's New?

▸ Deadline for BECON 2002 Abstracts Extended Until May 8

▸ Second Annual BRP Grantee Meeting Presentations and Summary Posted

▸ NIBIB Announces Award of First Research Grants

▸ NIBIB Announces T32 and F32 Training Opportunities

▸ NIH and NSF Announce the new Bioengineering and Bioinformatics Summer

Local intranet

Start | Inbox - ... | Venezuela | National ... | http://... | Ven Con... | [1] 00:0... | telemetic...   3:30 PM

Tiny camera in a pill extends limits of endoscopy

Figure 1. A wireless endoscopy system in a capsule provides real-color images of the GI tract after the patient swallows the device.

Image of the inside of the small intestine produced by Given Image's capsule-size camera.

Antenna
CMOS image
Lens
Optical dome
ASIC transmitter
Batteries
White LED

Wireless Capsule Endoscope

Figure 2. The capsule incorporates the imaging system at one end, the UHF telemetry system at the other, and batteries in between.

Telehealth, Telemedicine & e-Health

TeleHealth - the use of electronic communication networks to transmit information and data focused on health promotion, disease prevention and public's overall health. Telehealth includes community and patient education and information, data collection and management, as well as linkage to health care resources and referrals.

Definition

Telemedicine is the use of electronic information and communications technologies to provide and support health care when distance or time separates the participants.

- Telemedicine: A Guide to Assessing Telecommunications in Health Care, Institute of Medicine, National Academy Press. 1996.

Definitions

e-Health information and education exchange dealing with health and medicine through structured electronic media such as internet.

m-Health is the practice of medical and public health, supported by mobile device. The term is most commonly used in reference to using mobile communication devices, such as mobile phones and PDAs, for health services and information.
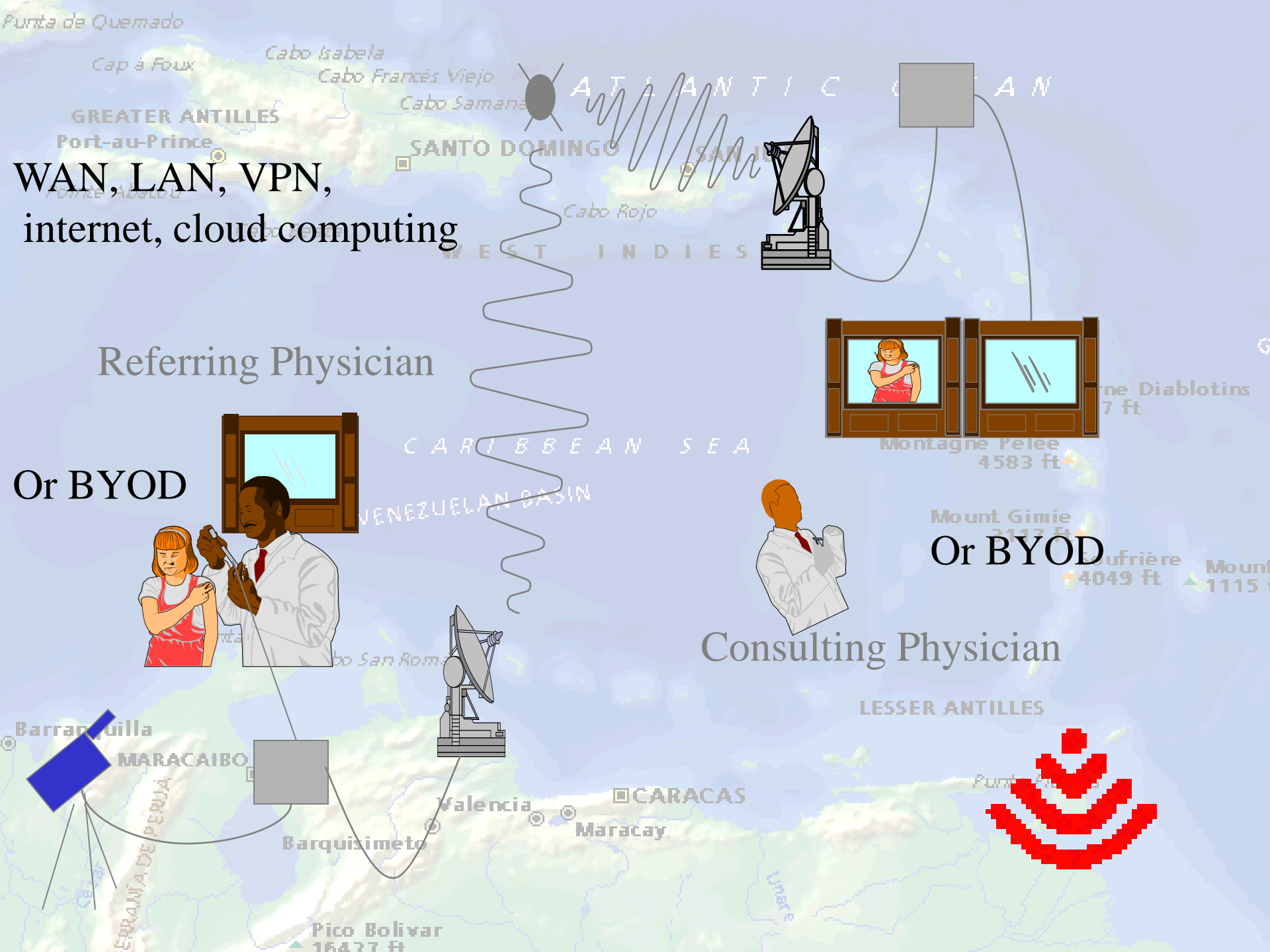
WAN, LAN, VPN,
 internet, cloud computing

Referring Physician

Or BYOD

Or BYOD

Consulting Physician

Applications

- Medical Consultations
- Patient Evaluations
- Medical Education
- Allied Health Education
- Patient Education
- Administration
- Clinical Research Organizations
- Disaster recovery

Modalities

- Real time interactive audio video
  - Room based
  - Desk top
- Store-and-forward
 - Internet
  - Dial-up

Store-and-Forward

- "Patient e-mail"
- Acquire patient data
- Package patient data electronically
- Ensure privacy
- Send patient data
- Receive and analyze patient data
- Prepare and send consulting report

Store-and-Forward Telehealth

- Allows for diagnostic data sets to be taken by trained staff and then forwarded digitally to physicians and specialists who can review and diagnose those data sets.

- Types:
  - Tele-dermatology
  - Tele-retinal Imaging
  - Tele-pathology
  - Tele-radiology (PACS)

Store-and-Forward Patient Data Package
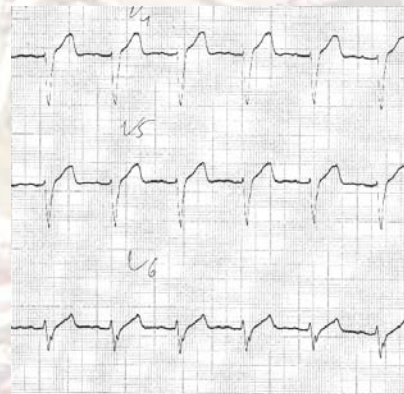
1998

Neonatal Examination Telemedicine Study

REMOTE

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http://www.vidimedix.com/

VA Telehealth Program

- VA Telehealth program started in 2004
- Patient Access
  - Office of Telehealth Services plans and tracks telehealth use
- Technical System Support
  - Joint support though Clinical Engineering and IT Services

Telehealth and the VA (contd.)

- 3 Subsections:
  - Home (Remote-Monitoring) Telehealth
  - General (Real-Time) Telehealth
  - Store-and-Forward Telehealth

- Office of Telehealth Services
 - "Right time, right place, right care"

General (Real-Time) Telehealth

- Real time videoconferencing technologies, with supportive peripheral devices allow for care and consultation between clinics and medical centers, and medical centers to outside hospitals
- Number of Veteran visits conducted via telehealth since October 2005 (includes all disciplines):
  - National = 328,976
  - VISN 1 = 5,619
- Examples include:
  - Tele-mental Health
    - This is the most prevalent application of telehealth in the VA system
  - Tele-rehabilitation Consultation (Post Procedure)
  - Tele-surgery Consultation (Post Operative)
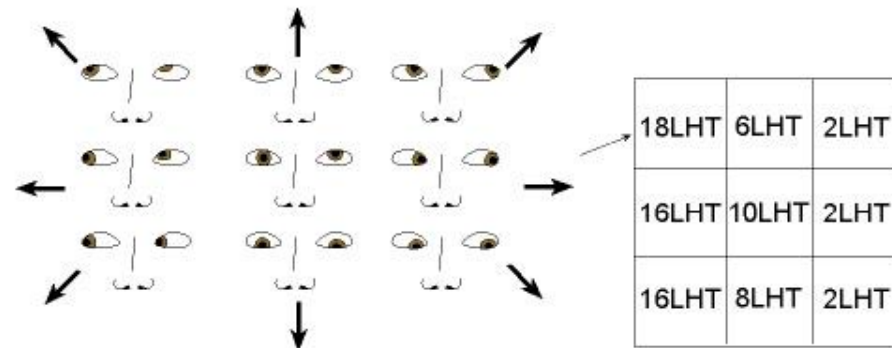
Tele-Retinal Care

- As of October 2009, 284 cameras deployed nationwide

- Number of Veterans screened since October 2005:
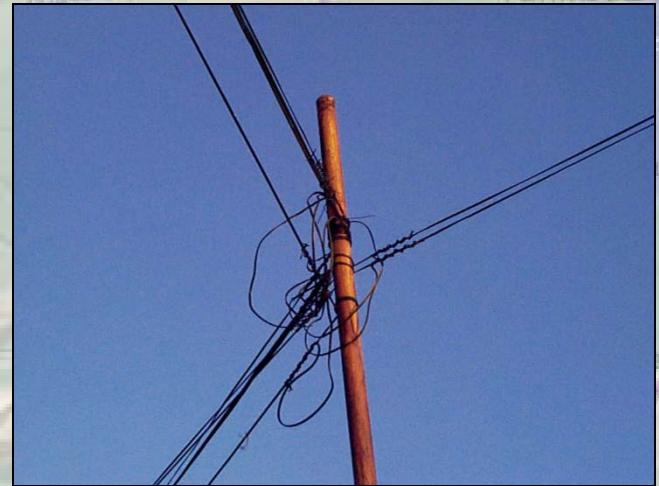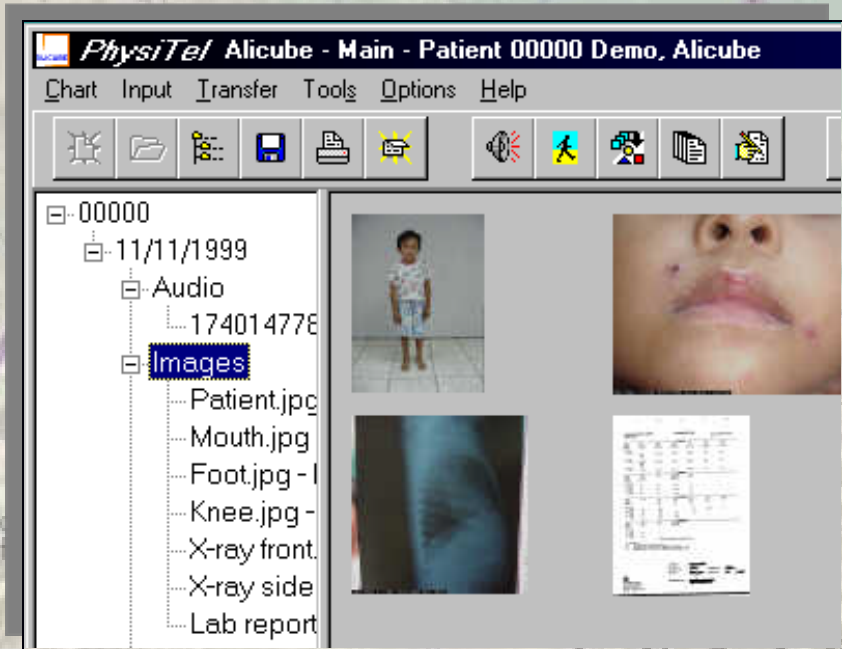 - National = 462,568
  - VISN 1 =   17,657
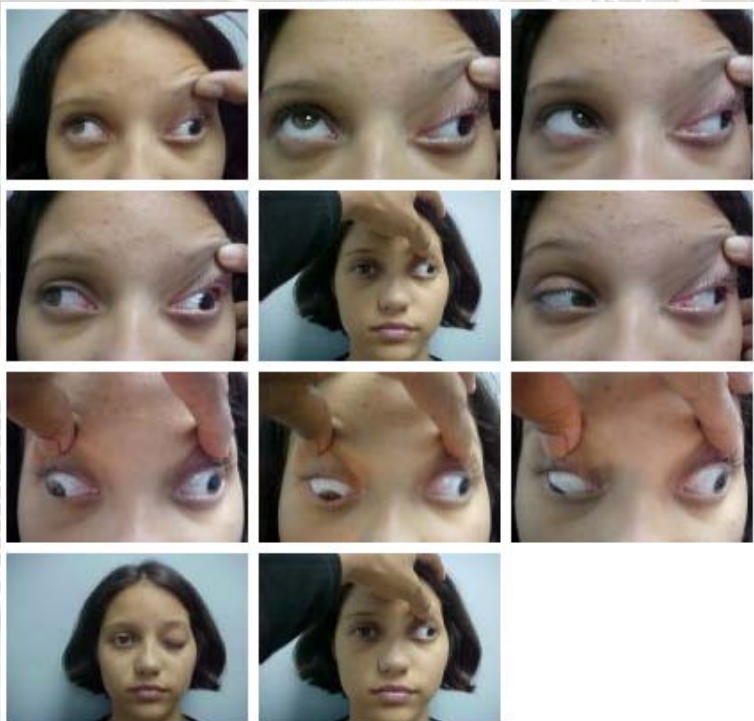
An instrument such as this deviometer can be used to control the point of fixation resulting in more reproducable findings.

18LHT	6LHT	2LHT
16LHT	10LHT	2LHT
16LHT	8LHT	2LHT

Zacapa, Guatemala

Chart   Input   Transfer   Tools   Options   Help

Zoom   Auto

- 11
  - 10/5/99
    - Images
      - 10172540.j
      - 10192489C
      - 1019412C
      - 10195370.j
      - 1020044C
      - 1020168C
      - 10203210.j
      - 1020436C

Chart   Input   Transfer   Tools   Options   Help

Zoom   Auto

- 11
  - 10/5/99
    - Images
      - 10172540.

zxcvbnm   10-05-1999   10:17:25   11   Test, Demo 535   Garcia, Victor Hugo

Tele-Dermatology

- VISN 1 flagship healthcare system in VA to initiate tele-dermatology
  - Started in '97 from Providence, RI to Togus, ME

- Number of Veterans cared for since October 2005:
  - National = 17,220
  - VISN 1 = 4,099

Home (Remote-Monitoring) Telehealth

- Home monitoring systems allow a care team to continuously monitor a patient while they enjoy the comforts of their own home.
  - Self management skills are required for home telehealth to be successful.
- Types:
  - Vital Sign Monitoring
    - Blood pressure
    - Heart rate
    - Blood Sugar Levels
    - Weight
   - Pulse-oximetry

Telehealth for Home Care

- Homecare systems allow for long term monitoring:

  – Patient retrieved information is forwarded to clinicians for review

  – Clinicians can respond either via telephone, email or base module.

VA Telehealth Home Care

Care Coordination Home Telehealth

- As of November 2009:
  - National Enrollment = 40,111 Veterans
  - VISN 1 Enrollment =   2,050 Veterans
- VISN 1 point prevalence enrollment growth since inception of program in FY 2006:
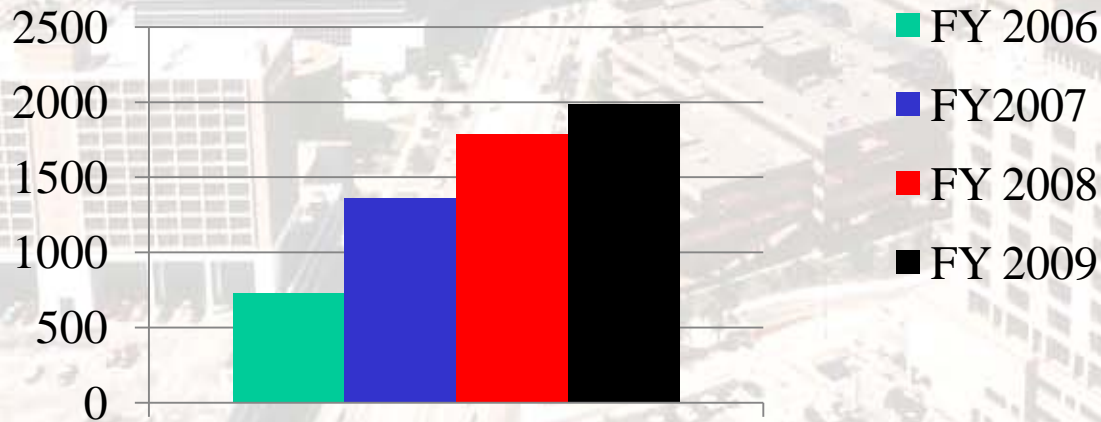
FY 2006 =   727   FY 2008 = 1789
FY 2007 = 1359   FY 2009 = 1986

PACS Telehealth

- Most traditional "store-and-forward" telehealth service
  - PACS
    1. Images taken
    2. Digital Version (either via computed radiography or digital radiography) sent to networked system
    3. Image pulled from networked system and read by the radiologist at a separate location

Tele-Pathology

- Allows for images to be taken and then reviewed at another location.

    1. Samples are taken
    2. Slides are prepared
    3. Images are recorded
    4. Images reviewed via
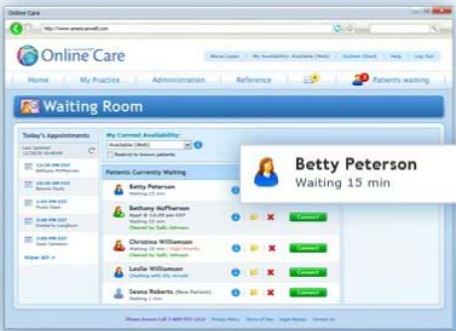   networked connection

Tele-Mental Health

- Tele-mental health is most similar to video conferencing
    - Allows for patients continuity with their therapist
    - Provides access to specialists for various types of care and council

Integrated system

On-line relationship
Who is the patient
What to keep in the record
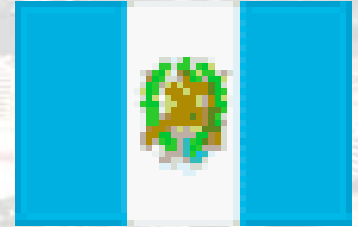
International
Telemedicine

Y. David
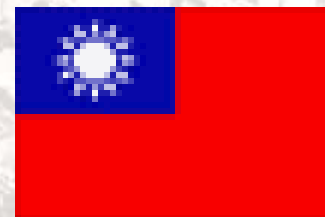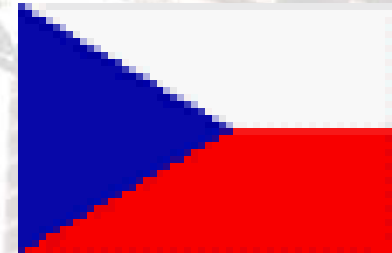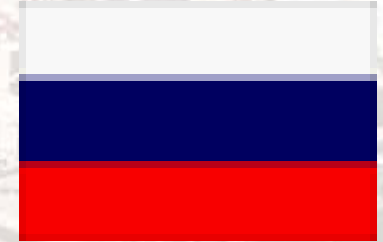
Benefits

- Timely access, early & appropriate intervention
- Local hospitalization
- Fast, convenient access to specialists
- Continuum of care - follow-up
- Efficient use of resources
- Market differentiation/options/2nd opinion
- Extend the standards of care
- Integration of care

Considerations

- Culture/standard of care
- **Privacy**
- Local **legal** issues
- Informed consent?
- **Licensure/credentials**
- Language
- Ease of use
- Systems integration

- Insurance
- **Record keeping**
- Reporting
- **Infrastructure**

These technologies will allow us to improve the standards of health care around the world. The Internet provides an important opportunity for distance learning and the dissemination of medical knowledge in support of this goal.

- M. E. DeBakey, M.D.
October 22, 1996

Why now?

mobi health news
Where Remote Healthcare Meets the Cloud
medapps.com

News   About   Contact   Advertise   Research

Wireless, smartphones to make telemedicine a $3.6B market

By: Brian Dolan | Oct 12, 2009   Tweet 0   Share 0   Share 0

1

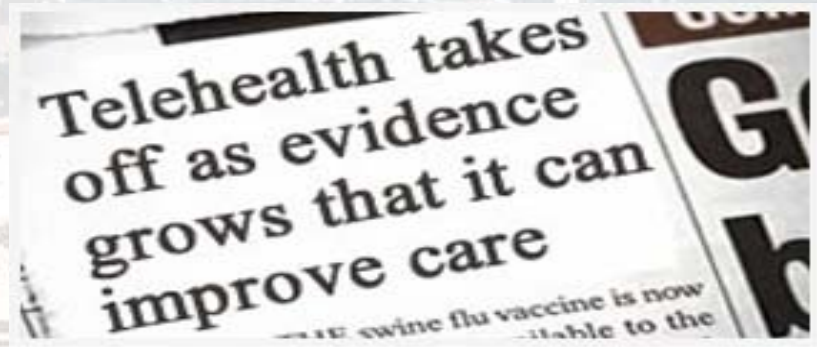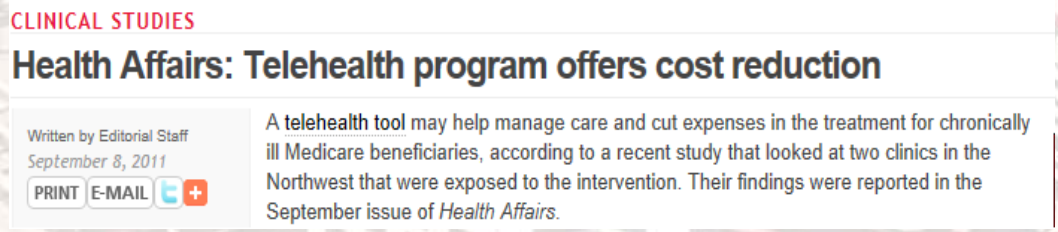Telehealth takes off as evidence grows that it can improve care

swine flu vaccine is now

2

4 Medicine accepts mobility

A-F   MENU   REC
G-L
M-R
T-Z
Log Entry: 0010
RESEARCHER ID: 4492   00:1509:1963 - Input signal-OK - Connection Time: 00:03:45
Connection status

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CLINICAL STUDIES

Health Affairs: Telehealth program offers cost reduction

Written by Editorial Staff
September 8, 2011
PRINT E-MAIL

A telehealth tool may help manage care and cut expenses in the treatment for chronically ill Medicare beneficiaries, according to a recent study that looked at two clinics in the Northwest that were exposed to the intervention. Their findings were reported in the September issue of *Health Affairs*.

FDA regulates telemedicine on smart phones

Food and Drug Administration (FDA) has draft guidance on mobile medical applications for telemedicine health applications on smart phones.

The FDA's draft guidance document is entitled ``Mobile Medical Applications:''

Email This
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6

"Seeking expertise on telemedicine to develop desktop and smartphone delivery of healthcare"

I am tasked with scoping out a project for health care where we develop and implement a PC and Smartphone-Based Videoconferencing Solution. I am hoping someone can direct me to the latest expertise on this area. Any ideas where to find more info? Thanks

TOPICS: Health Care   Health Care IT   Information Technology   Mobile Wireless   Mobile and Wireless
Phone Systems   Smartphones   Video Collaboration   Video Conferencing Systems

5

Lessons Learned

- News events assist introduction not sustainment
- Funding for large scale clinical studies that address technical infrastructure, tools and operational issues.
- Match needs, systems capabilities, and service outcomes (partnership building).
- Platforms are different (i.e. real-time mobility) and should be supported by benchmarks and risk assessment (technology assessment & integration).
- Focus on system integration critical for successful implementation (establish training center)
- Have a contingency plan (risk management) Y. David

Responsibility

- Telehealth systems are **highly networked medical systems**. They are used in the diagnosis, monitoring and therapy of various medical conditions.

- There is a need for **collaborative responsibility** of end-to-end engineering, integrators, institutions, clinicians, industry and policy makers. Framing **new relationship**.

- Healthcare services should have **service and resiliency priorities**.

Clinician Responsibility

Patient interaction, including in all areas of telehealth, is the clinician responsibility. Understanding of the responsibility, tools and its limitations is a major area of concern:

- Deploy the right tool and system for patient assessment & outcomes planning. Understand the impact of application (home, video conferencing, store and forward) on their clinical management. Understand the differentiation between consumer and regulated device.

- Engage in patient education, self management of chronic disease conditions, and record consolidation as focus for telehealth programs.

- Design of programs to impact patient outcomes or utilization of services
    - *When do you employ telehealth applications within care venues?*

- Monitor and evaluate the effectiveness of telehealth programs – performance improvement plan and reporting to executive staff within the organization.

- Commit to communicate needs, adoption barriers and collaborate .

Industry Responsibility

- Develop & provide reliable, intuitive and interoperable tools.
- Declare true QoS, Latency, throughput, compression/processing loss and performance of consumer vs. medical product or apps.
- Risk & Value-added when ▲ networking components, infrastructure, service provider or data broadcasting and storage:
  - systems between patient or patient room and the clinicians diagnostic tool is the responsibility of the technology provider/integrator.
- Open secure interface between EMR and the telehealth system(s).
- Single solution may still not address every medical service needs.
- Any requirements for safe, accurate and secure remote accessable data is the joint responsibility of the vendor, provider and the patient.

Thank You!!!

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