Telehealth/Telemedicine evolution - Driven by Technology or Need?

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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
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?
The Health Care Delivery System

(1) Health status

Health Services

(2) Improved health outcomes

Policy

Organization management

Responsiveness to people’s expectations

Resources:
- drugs, infrastructure,
- facilities, technology,
- devices, personnel
1988
Center for TeleHealth

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
- Pathology
- Renal Dialysis
Are We Ready?

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

Integrated Technological Systems (EMI)

New knowledge → New tools → potential for systematic breakthrough

New process New materials
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, academic 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
- New Directions In Biology and Medicine - Lecture by Dr. Harold Yarmus 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
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).

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

About NIBIB

For Investigators

For Students

News & Events

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."
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.

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

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.
Referring Physician

Or BYOD

WAN, LAN, VPN, internet, cloud computing

Consulting Physician

Or BYOD
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
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 reproducible findings.
Zacapa, Guatemala
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:

0 500 1000 1500 2000 2500

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

Talking to a Patient

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

http://www.americanwell.com/practice_anytime_anywhere.html
International Telemedicine
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
Wireless, smartphones to make telemedicine a $3.6B market

By Brian Dolan | Oct 12, 2009

1. Why now?

2. Medicine accepts mobility

3. Telehealth takes off as evidence grows that it can improve care

4. FDA regulates telemedicine on smart phones

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

I am tasked with scope out a project for healthcare 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
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)
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 accessible data is the joint responsibility of the vendor, provider and the patient.
Thank You!!!

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