

Telemedicine in a Large Group Practice



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- Definitions of telemedicine
- Types of telemedicine
- Mayo's telemedicine experiences
 - General
 - Occupational medicine
- Future of telemedicine in occupational medicine

Definitions

- **Tele-Imaging**
 - Electronic transmission of images for interpretation
 - Telepathology, teleradiology, tele-echo
- **Telemedicine:**
 - A consultation between healthcare providers, regarding a specific patient, conducted in geographically separate locations, through electronic media
- **Telehealthcare:**
 - Telemedicine PLUS tele-imaging, PLUS distance medical education, remote monitoring, and other healthcare activities done remotely

Types of Telemedicine

1. **Non-physician to physician / clinic / HQ**
e.g. nurse practitioner, RN, etc. at remote site communicating with physician at clinic or corp. office.
2. **Physician to a more specialized physician,**
e.g. Local physician to cardiologist, cardiologist to echocardiology specialist, physician to radiologist or pathologist, occupational health physician to corporate medical director, etc.
3. **Patient to physician**
e.g. use of emerging technology, esp. social media, to transmit pictures or video electronically to physician

Origins of Telehealthcare at Mayo Clinic

- Mayo relationship with Northwest Airlines in 1960s
- Mayo spirometry program for Occidental Petroleum and other employers in 1970s
- Development of the Mayo Regional Practice Network (MN, WI, IA) in the 1980s
- Mayo expansion beyond Rochester, MN in 1986 to Jacksonville, FL and in 1987 to Scottsdale, AZ
- International Telemedicine to Jordan, UAE developed in the 1990s
- Neurology use of Telemedicine in managing stroke patients in 2000s
- Mayo pioneering social media in 2010s

Some of the Challenges

- Connectivity – hardware and software may not be compatible (less of a problem today)
- Connection speed must be high to transmit images, particularly radiological data and video
- Availability of professional staff at the sending and receiving end at the same time
- Time zones present challenges internationally
- Physicians and patients may find the use of technology stressful

Mayo Link with Northwest Airlines

- Started in 1964 to respond to in-flight passenger and crew emergencies
- Link from airline medical director to aircraft FA handled by NWA dispatch
- Volume grew to over 200 calls per year by 1995, when responsibility for program was transferred to the Mayo Transportation Desk
- No record transfer or images

Mayo Spirometry Program

- Mayo Pulmonary Services Industrial Program established 1982 with standardized equipment, technician training, procedures, calibration, QC review, feedback
- Program was cost-efficient, improved quality, centralized data collection and analysis



Intra-Clinic Telemedicine Program

- Bi-directional, full-motion, broadcast-quality Ku-Band satellite system
- On-campus analog fiber/coax network
- Multi-camera telemedicine exam rooms
 - Virtually identical to standard exam room
- Technician operated



Over Time

- > 1,500 consultations in numerous specialties and sub-specialties
- Image quality excellent, but sufficient only for consultation/second opinion, not diagnosis
- Ultimately fell into disuse due to logistical difficulties

Amman, Jordan

- Developed in 1993 at the request of King Hussein
- Full-motion, analog, encrypted, bi-directional satellite link
- Expensive to use, difficult to schedule
- Handful of consults (<5/yr)

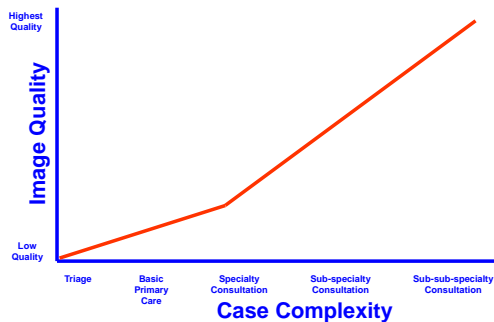
What we initially learned about the practice of telemedicine at Mayo

- Videoconference-based telemedicine did not work effectively in Mayo's practice model, which is best suited to specialty and sub-specialty telemedicine
- It was difficult to coordinate M.D. schedules
- Time-zones presented significant hurdles
- Physicians did not want to leave their practice area to go to a telemedicine room
- There must be a knowledge gap between referring and consulting providers

What we initially learned about the practice of telemedicine at Mayo

- There must be tangible benefits for telemedicine ON BOTH ENDS OF THE LINK
- Live, real-time telemedicine consultations took 3-5 times longer than an in-person encounter
- Absence of electronically-delivered medical records resulted in poor communication of critical medical data
- Diagnostic image quality was poor in the early stages of telemedicine, with particular impact on specialty and subspecialty consults

Complexity vs. Image Quality



What we initially learned about the practice of telemedicine at Mayo

- All data must be encrypted for secure transmission
- A “workflow engine” to handle up- and downstream needs had to be developed

Elements needed for successful Telemedicine at Mayo Clinic

- Highest possible data quality/security
 - Both still and motion images
 - History, patient info, current illness, meds, etc.
- Integrated workflow engine
 - Virtual-patient model
- Delivered to the physician's desktop
 - No need for M.D. to leave practice area
- Cost-effective for all parties

The Workflow Engine



Mayo Clinic - United Arab Emirates Project

- Initiated and funded by the UAE Ministry of Health in 1997
- Store-and-forward, second-opinion consults
- Cardiology, neuro, surgery, trauma
- Follow standard procedures as if patient were physically at Mayo
- 72-hour turnaround, 24-hours for emerg.
- Videoconference capability ONLY AFTER store-and-forward

Detailed Workflow Process



Mafraq, UAE Telemedicine Room



Basic Elements of System

- Electronic distribution on consulting end
 - All radiographs go digitally into PACS (Picture Archiving and Communication System) for radiologist review
 - Angio's, echo's go to Cardiology
 - Final reports and results, along with all images go to consulting physician's desktop computer for review
 - Results returned electronically to UAE

Case Example

- 15 y.o. out-of-hospital cardiac arrest after acute asthmatic attack
 - Resuscitated, intubated, comatose
 - Full neurological exam, labs, CT head scan transmitted to Mayo
 - Immediate review by senior Mayo neurologist and Chief of ICU department
 - Multiple subsequent recommendations for supportive care returned same day

Case Example

- 6 y.o. with progressive blindness
 - MRI scan - optic nerve glioma
 - Mayo neuro-radiologist reviewed films
 - Senior Mayo neurosurgeon reviewed and recommended surgical management

Project Results

- Over 100 cases handled per year
- Positive impact on patient care
- Improved patient/family satisfaction
- Has avoided unnecessary transport of patients
- Reduced UAE medical cost (surgery, referral, travel, etc.)

Telestroke and Teleneurology

Telestroke:

- On-call vascular neurology support for acute stroke – 24/7/365
- First Telestroke network operational in Arizona
- Established in 2007 - 10 hospital network expanding to 18 in 2012



Telestroke and Teleneurology

Teleneurology:

- Neurohospitalist telemedicine consultations – all neurological emergencies
- Optional Tele-EEG monitoring service – remote reads of EEG
- Established in 2011 – 3 hospital network



TeleDermoscopy

- Remote and real time medical assessment of suspicious skin lesions
- Images taken by Primary Care practice are wirelessly sent to a Dermatologist using the camera system
- Dermatologist reports back findings within a few minutes from when the images were uploaded



Primary Care Telemedicine

- Interactive healthcare services between employee patients located at a different campus from the primary care provider
- Telemedicine Appointments
 - Acute care (cough, fever, sore throat, etc.) appointments
 - Follow-up appointments
- Saves employee time from having to travel from their campus to their provider's location

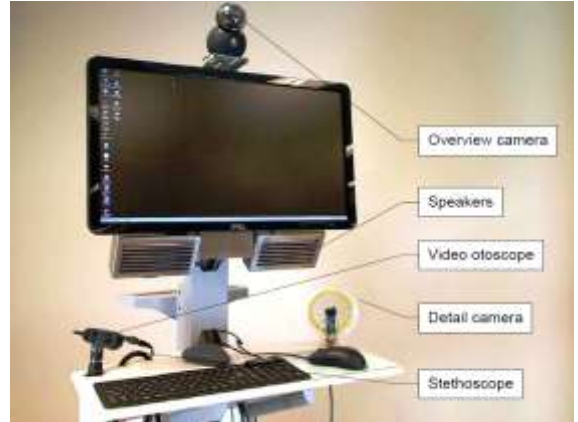


- Flyer to promote the telemedicine service among employees



Mayo Occupational Medicine Telemedicine Project

- Prospective study of 100 patients conducted over a four-month period in a work site that housed 700 employees.
- For most visits, clinicians felt that the telemedicine visit felt similar to a face-to-face visit and patient satisfaction was high
- Physicians, nurses and patients were capable of using the technology with little training.



In Summary, What has Mayo Learned

- For telemedicine to succeed there must be:
 - A strong practice need
 - A disparity of knowledge/experience
 - Buy-in on both ends of the link
 - High level of integration into the practice model & workflow design
 - Communications infrastructure sufficient for effective information transference – i.e. high quality, fast, and secure data transmission

The Future of Telemedicine in Occupational Health

- Sufficient communications infrastructure now exists for effective and efficient information transfer, particularly within corporations
- Many applications of telemedicine have been and will be developed
- Your creativity and problem solving skills will be needed to develop innovative and effective projects and programs in your work environments

Resources



<http://www.telehealthresourcecenter.org/> (US)



<http://www.telemedicine.com/> (international)

Resources



Thank you!

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