Technology and Health: Innovations in Home Telehealth

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Nursing Research: Looking to the Future
October 11, 2006
Push To Adopt Telehealth In Home Health Will Continue In 2006
(from Medical News Today, January 15, 2006)

• during 2006, CMS will continue a push toward telehealth for home health agencies

• HHAs have found that telehealth complements - but does not replace – their other services. It facilitates more timely visits based on patient need

• the effectiveness of telehealth, combined with skilled nurse management and evidence based best practices, is demonstrated by a dramatic decrease in the number of hospitalizations and emergency room visits and in reduced hospital length of stay

Home Telehealth Market Could Reach $2.1 Billion by 2010
According to New Study (from: eWeek, June 30, 2006)

• technological advances are making over the home health industry

• still, home health technology faces triple hurdles: health plans often don't cover it; caregivers don't advocate for it; and most current products are too expensive and hard to use

• many insurers ….want manufacturers to provide evidence of savings. …. But many home technology companies are undercapitalized.. Many small companies have the expertise but not the financial resources to sponsor large-scale studies
What is home telehealth?

- **Remote** care delivery between a health care provider/system and a patient in her/his place of residence, which may include:
  - physiological **monitoring**
  - two-way audio-video interaction (**virtual visits**)
  - environmental monitoring (**smart homes**)

- Using POTS or broadband **connectivity**
Home TeleHealth “Equipment”

- Monitoring devices
- Camera
- CODEC/MODEM
- Computer/Monitor
- Transmission media
- Internet provider

Home telehealth programs may use some or all of the above equipment to achieve their goals
Potential for Home TeleHealth

- Improved access to care
  - Continuity of care
  - Self-care training
- Disease prevention and management
  - Observation
  - Monitoring
  - Treatment
- Health education
- Socialization
Is the time right for home telehealth?

- **Pushing** the issue – a problem in need of a solution
  - Aging population
  - Looming provider shortage
  - Costly centralized healthcare
  - Move toward patient empowerment
  - Outsourcing health management to patients at home

- **Pulling** the issue – potential solutions to identified problems
  - Information technology
  - Fast, secure telecommunications
  - Inexpensive, easy to use monitoring devices
  - Mounting evidence of benefits-cost, access, quality
Telemedicine Integrated Home Monitoring Solution from American Telecare, Inc

Patient Video Monitoring Station

camera

blood pressure

electronic stethoscope

 glucometer, pulse ox, other

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Telemedicine – Integrated Home Monitoring Solution from American Telecare, Inc

Central Nursing Station
Case Study 1 - LTHMP

Lung Transplant Home Monitoring Program
Timely information
  > Early detection
    > Early intervention
      > Improved status
    > Lower cost

- University of Minnesota, Minneapolis MN
- Supported in part by NIH Grant R01 NR02128
Home Monitoring

- Spirometry (FVC maneuver): FVC, FEV1, MEFR, PEFR
- Vital signs: BP, temp, HR, wt
- Symptoms: cough, sputum, wheeze, dyspnea
- Status: well being, stress, exercise
  - Measurements recorded daily
  - Transmitted/reviewed weekly

Home Spirometer from QRS Diagnostic
Typical Data

Home and clinic FEV$_1$ for one subject
# Lessons learned

<table>
<thead>
<tr>
<th>Success</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Patients can do it</td>
<td>• More data, more often</td>
</tr>
<tr>
<td>• Provider acceptance</td>
<td>• Adherence – long term</td>
</tr>
<tr>
<td>• Patient satisfaction</td>
<td>• Provider acceptance</td>
</tr>
<tr>
<td>• Early detection</td>
<td>• Reimbursement</td>
</tr>
<tr>
<td>• Decision algorithms</td>
<td></td>
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</tbody>
</table>
Case Study 2 - TeleHomeCare

A randomized controlled trial to determine if a program using POTS combining videoconferencing, Internet access, and physiological monitoring within a home health care setting can:

- increase access to care
  - improve patient satisfaction with care
    - improve quality of care
    - reduce cost of care

- University of Minnesota, Minneapolis MN
- Supported by Grant # 27-60-98031 from the TOP, Dept of Commerce and matching funds from program clinical and industry partners
TeleHomeCare RCT

**Subjects**

Home Health Care patients with:
- congestive heart failure
- chronic obstructive pulmonary disease
- chronic wound care
- other qualifications
- av age (72 - C, 79 - V, 73 - M)
- 12 mo. study + 6 mo. follow-up

**Study Groups**

- Control (19)
  - Home Health Care
- Video (14)
  - Home Health Care
  - Video conferencing (+ Internet access)
- Monitor (20)
  - Home Health Care
  - Video conferencing (+ Internet access)
  - Monitoring equipment
TeleHomeCare at Home
Results
Access ↑ Satisfaction ↑
Quality ↑ Cost down ↓

Discharge to a higher level of care

Average cost of visits

<table>
<thead>
<tr>
<th>Group</th>
<th>Cost (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>$48.2</td>
</tr>
<tr>
<td>Video</td>
<td>$32.1</td>
</tr>
<tr>
<td>Monitor CHF</td>
<td>$38.6</td>
</tr>
<tr>
<td>Monitor (COPD)</td>
<td>$22.1</td>
</tr>
</tbody>
</table>

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Case Study 3 - VALUE

Virtual Assisted Living Umbrella for the Elderly

A randomized controlled trial to determine if a program using broadband to deliver health care virtual visits, physiological monitoring, an assisted living service ordering portal, and Internet access provide an

- assisted living alternative that will enable frail elderly to remain living independently in their own home

- University of Minnesota, Minneapolis MN
- Supported by Grant # 27-60-03010 from the TOP, Dept of Commerce and matching funds from program clinical and industry partners
VALUE RCT

Subjects

- >60 years
- living independently
- limited mobility
- chronic disease
- broadband available
- 9 months in study

Study Groups

- Controls (50)
  - usual independent living arrangements
- Intervention (50)
  - VALUE workstation
  - AL service portal
  - home monitoring
  - health care virtual visits
VALUE Workstation: PC, monitoring devices (eg Spirometer, Pulse Oximeter)

From PolyCom PVX

Broadband: DSL, cable
Other monitors: glucometers, BP cuff, scale
VALUE – Service ordering portal

Dear Len: Welcome to your personal VALUE Portal!

Your VALUE project nurse is Kristi.

You have 0 new messages. To send a message, select "Message" on the left.

Select "Service" on the left for service options and orders.

Select "Coupon" on the left to request some available coupons. NEW!

Select "Education" on the left for educational materials.

Select "Contact" on the left for contact information of Tri-County Hospital Home Health Care.

Select "Welcome" on the left to return to this page at any time.

Now you can request Prescription Refill from the "Service" on the left. NEW!

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VALUE – Available services
Lessens learned (to date)

**Success**
- Frail elderly can do it
- Portal design
- VVs are highlights
- Nurse buy-in
- Client satisfaction
- Supports independent living ??? (Study not completed until June 2007)

**Concerns**
- Computer anxiety
- Vision, manual dexterity
- Measurement complexity
- Changing ordering behaviors
- Broadband availability
- Cost
- Sustainability
Home Telehealth Challenges

Technical
- What variables
- Simple, inexpensive, unobtrusive instrumentation
- Wireless standards
- Telecommunication service
- Data overload
- Clinical decisions
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- Patient satisfaction
- Tech anxiety
- Adherence (short, long term)
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- Licensure
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- Reimbursement
- Sustainability

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Business Plans
- Models
  - Revenue generation
  - Cost avoidance
- Payer source
  - Reimbursement -insurance
  - Out-of-pocket
  - Provider
Monitoring Pulmonary Function

- Progression of devices for home monitoring of pulmonary function in our studies

Voldyne Exercise
Inspirometer
1980s

Home Spirometer
by QRS Diagnostic
1990s

SpiroCard by QRS Diagnostic
2000s

Next ?

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Thank You

Primary co-investigators:

- LTHMP: Marshall Hertz, MD; Mariah Snyder, PhD, Ruth Lindquist, PhD; William Robiner, PhD;
- TeleHomeCare: Stuart Speedie, PhD, George Demiris, PhD; Sandra Potthoff, PhD
- VALUE: Stuart Speedie, PhD, Edward Ratner, MD, Sandra Potthoff, PhD

Many graduate research assistants

Contact: stan@umn.edu
HOME TELEHEALTH

Where the patient is

Wearable or implanted instrumentation

Clinics and Hospitals

Other Specialists and Clinicians

Databases/ Applications/ Web Server

Primary Care Provider

Emergency Room

Adapted from Yongmin Kim, PhD
Univ Washington

Home, nursing home, work or vacation

Physiological sensors

Handheld station

Assay modules

Intelligent Controller

2-way audio/video link

INTERNET

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Equipment - Subject’s Home

Internet Home Equipment
Also includes telephone and TV

Monitoring Equipment
Also includes a scale and blood pressure cuff

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Patient Satisfaction

 TMPQ

 Pre | Post

 TeleHomeCare (Video + Monitor) | Control

 Max score = 85

 HCCSI

 Control | Video | Monitor

 47.7 | 50.3 | 52.2

 Max score = 60

 p < 0.001

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TMPQ Issues

*Patient can explain problem over TV
*Nurse can understand problem over TV
*Equipment difficulties; trust equipt
*Increases patient access to care
*Exam not as good over TV
*Able to monitor patient’s condition
*Patient/nurse discussion OK over TV
*Can improve pts general health

*Saves nurse time
*Saves patient time
*Reduces patient costs
*Missing physical contact
*Threatens confidentiality
*Violates patient privacy
*Easier to contact nurse
*Convenient hlth care

Note: **BOLD**>perception increased; *italic*>perception decreased
HCCSI Questions

- Attention to concerns
- Dependability of staff
- Respect shown by staff
- Knowledge of health problems
- Choices about care
- Feeling safe
- Know contact person
- Ability to meet needs
- Response to concerns
- Scheduling
- Consistency in staffing
VALUE – Ordering meals

Request Home Delivered Meal - Please answer the following 3 questions:

1. Day of Meal:
   - This Friday
   - This Saturday
   - This Sunday
   - Next Monday
   - Next Tuesday

2. Dietary Choices:
   - Regular Meal
   - Diabetic Meal
   - Low Sodium Meal

3. Mechanical Soft (Ground Meat/Soft Vegetable):
   - Yes
   - No

Continue >>>
VALUE – Full Study Preliminary Results
Portal use during one typical week of activity (Feb 27 – March 5, 2006)

- 25 active subjects (17 F, 8 M; avg 80.3 yo, 62-93 yo range) had 222 log-ins
- 20 virtual visits
  - 5 VVs missed (2 tech problems, 3 subj cancellations)
- 15 messages (to/from nurse – portal orders, VV scheduling, hlth issues, training/testing)
- 23 service order testing/placing
- 16 access resource links (health & aging, specific disease, local news/area resources, personal interests)
- Remainder for general web browsing
VALUE – Preliminary conclusions

- There is community need and acceptance of the VALUE concept
- Nurses and patients can successfully interact in a virtual visit
- Portal design is acceptable
- Elderly subjects can use Web portal
- Elderly concerns about computer use/training
- Difficult to change established ordering habits
- Broadband access can be a problem
Areas where technology can help:

- Emergency help
- Assistance with hearing and visual impairment
- Prevention and detection of falls
- Temperature monitoring
- Automatic lighting
- Monitoring of physiological parameters
- Stove and oven safety control
- Property security
- Intruder alarm
- Reminder system announcing upcoming appointments or events
- Timely and accurate information on adverse drug events and contra-indications

Case Study 4 – Smart Homes

Smart Home Residences
- equipped with unobtrusive technology that enhances safety of patients at home by monitoring health, activity level, and environment
- monitors are part of the structure, not subject specific.

Tiger Place (field study site), MU Sinclair School of Nursing, University of Missouri, opened in April 2004, is built on the Aging in Place concept. Investigators are studying smart home technology related to

- gait analysis
- prevention of falls
- activity levels
- sleeping patterns

Adapted from George Demiris, PhD, University of Missouri
Results – Smart homes

Themes
- Positive attitude towards smart home technologies in general
- Focus on detection rather than prevention (reactive vs. proactive)
- No interference with daily activities
- Appreciation of the value of detection and response to emergencies
- Falls major concern
- Privacy issues (balance between safety and privacy)
- Customizing how the information is being handled
- Concern about false alarms

from George Demiris, PhD, Univ Missouri
Integrated Sensor Network

From G. Demiris, PhD
University of Missouri