Teleconsultation for Chronic Wound Care

Julie C. Lowery, PhD, MHSA
Edwin G. Wilkins, MD, MS

VA HSR&D Center of Excellence
University of Michigan Section of Plastic & Reconstructive Surgery
Ann Arbor, MI
Objectives

- Determine feasibility of store-forward telemedicine system for providing consultations on chronic wounds.

- Significance: Patients with chronic wounds have problems accessing specialized wound care centers.
• Two-stage process for evaluating telemedicine applications:
  1) Assessment of *accuracy* of remote diagnosis (digital images, video conferencing, telephone, patient self-report)
  2) Evaluation of *outcomes*
    - *Substitution* of remote for in-person care, or
    - *Supplementing* usual care with remote care (i.e., increased access)
Background

“Pressure Ulcer Assessment via Telemedicine”  
(HTS&D funded study)

• Evaluation of accuracy of Web-based, store-forward telemedicine system for monitoring status of patients with chronic wounds
Background

• Nurses collected and entered data onto laptops, then transmitted data to study database
  ▪ Digital photographs of wound
  ▪ Measures of ulcer area and volume
  ▪ Other wound and patient data (AHCPR guidelines)
• Data transmitted from database to Web site
• Telemedicine physicians reviewed data on Web site, entered assessments
<table>
<thead>
<tr>
<th>Visit Date</th>
<th>Wound Image</th>
<th>TMED Assessment</th>
<th>Visit Location</th>
<th>Treating MD</th>
<th>Wound Age @ Visit (days)</th>
<th>Bone Exposure?</th>
<th>Debridement Method</th>
<th>Dressing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-Jul-1999</td>
<td><img src="image1" alt="Wound Image" /></td>
<td><a href="#">Browse Data</a></td>
<td>Nursing Home at VAMC</td>
<td>Rees</td>
<td>120</td>
<td>Yes</td>
<td>None</td>
<td>N.S. Wet to Dry</td>
</tr>
<tr>
<td>27-Jul-1999</td>
<td><img src="image2" alt="Wound Image" /></td>
<td><a href="#">Browse Data</a></td>
<td>Nursing Home at VAMC</td>
<td>Rees</td>
<td>134</td>
<td>No</td>
<td>None</td>
<td>Silvadene</td>
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<tr>
<td>07-Sep-1999</td>
<td><img src="image3" alt="Wound Image" /></td>
<td><a href="#">Browse Data</a></td>
<td>Nursing Home at VAMC</td>
<td>Rees</td>
<td>176</td>
<td>No</td>
<td>None</td>
<td>N.S. Wet to Dry</td>
</tr>
</tbody>
</table>

**Subject ID:** 1010  
**Age:** 67  
**Gender:** Male  
**Institution:** MI  
**Spinal Injury:** No  
**Level of Spinal Injury:**  
**Reenrolled:** No  
**Previous Subject ID(s):**
Subject ID: 1010  
Age: 67  
Gender: Male  
Institution: MI  
Spinal Injury: No  
Level of Spinal Injury:  
Reenrolled: No  
Previous Subject ID(s):  

TELEMEDICINE ASSESSMENT FOR VISIT ON: 13-Jul-1999  

Most Recent Clinical Vignette for This Visit: 67 year old male, hx of Multiple sclerosis x 36 years. Recently admitted to Nursing Home after 30 lb. weight loss and worsening pressure ulcers.
Subject ID: 1010  
Age: 67  
Gender: Male  
Institution: MI  
Spinal Injury?: No  
Level of Spinal Injury:  
Reenrolled?: No  
Previous Subject ID(s):  

Area/Volume Chart  

Date of Visit:  
13-Jul-1999  
27-Jul-1999  
07-Sep-1999  
15-Sep-1999  
05-Oct-1999  
Area: sq cm, Volume: ml
Subject ID: 1010  Age: 67  Gender: Male  Institution: MI
Spinal Injury? No  Level of Spinal Injury:  Reenrolled? No  Previous Subject ID(s):

ASSESSMENT COMPLETED ON 02-Dec-1999 BY wilkins

Questions:

1. Is the wound getting smaller?
   - Definitely Yes, 2: Probably Yes, 3: Not Sure, 4: Probably No, 5: Definitely No,
   - N/A: Not Applicable

2. Is necrotic tissue present?
   - Definitely Yes, 2: Probably Yes, 3: Not Sure, 4: Probably No, 5: Definitely No,
   - N/A: Not Applicable

3. Is cellulitis suspected?
   - Definitely Yes, 2: Probably Yes, 3: Not Sure, 4: Probably No, 5: Definitely No,
   - N/A: Not Applicable

4. Is osteomyelitis suspected?
   - Definitely Yes, 2: Probably Yes, 3: Not Sure, 4: Probably No, 5: Definitely No,
   - N/A: Not Applicable

5. If so, how was it determined?
   - Not suspected

6. If Wound is Post-Op, is the wound closed?
   - Definitely Yes, 2: Probably Yes, 3: Not Sure, 4: Probably No, 5: Definitely No,
   - N/A: Not Applicable

This telemedicine demo is copyright © 1996 by the University of Michigan
Contact The Study Program Office with questions or suggestions.
• Study hypothesis: Rates of agreement for wound assessments by telemedicine and in-person physicians will not differ significantly from rates among in-person physicians.
Background

• Two participating VAMCs: Ann Arbor and Augusta
• Eligible subjects (inpatients and outpatients, one or more ulcers)
  – Pressure sores
  – Venous stasis ulcers
  – Diabetic ulcers
• Patients assessed up to six times (visits)
Background

• Assessment Criteria from AHCPR Guidelines (1994):
  ▪ Wound healing?
  ▪ Necrotic tissue present?
  ▪ Cellulitis suspected?
  ▪ Osteomyelitis suspected?
• In-person (base-line) assessments:
  - Wounds independently evaluated in person by pairs of plastic surgeons and PM&R physicians.
  - Inter-rater agreement among in-person physicians determined for each physician pair.
Background

• Telemed vs. in-person assessments:
  ▪ Wounds independently evaluated by one telemedicine and one in-person physician (plastic surgery and PM&R subgroups).
  ▪ Physicians traded off roles as telemedicine and in-person physician.
  ▪ Agreement of in-person and telemedicine assessments evaluated.
Background

• Analyses:
  ▪ % Agreement compared between baseline and study periods.
  ▪ Kappa statistics calculated for agreement between in-person and telemedicine assessments.
  ▪ In-person assessments considered “truth”.
    • Sensitivity
    • Specificity
    • AUROC
Background

- 70 patients
- 118 wounds
  - 8% stage 2 pressure ulcers
  - 14% stage 3 pressure ulcers
  - 37% stage 4 pressure ulcers
  - 16% post-op closures
  - 25% vascular ulcers
Background

• 430 visits
  ▪ 25% visit 1
  ▪ 20% visit 2
  ▪ 17% visit 3
  ▪ 15% visit 4
  ▪ 13% visit 5
  ▪ 11% visit 6
PM&R Physician Agreement

*p=0.089.
N=13/39 for not healing; 23/49 for others.
Plastic Surgeon Agreement

*Not healing*

- *p=0.001.
- **p=0.099.

N=10/29 for not healing; 24/50 for others.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Kappa All visits/First visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not healing</td>
<td>.22/.19</td>
</tr>
<tr>
<td>Necrosis</td>
<td>.43/.47</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>.18/.15</td>
</tr>
<tr>
<td>Osteo</td>
<td>.44/.50</td>
</tr>
<tr>
<td>Condition</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Not healing</td>
<td>.45/.49</td>
</tr>
<tr>
<td>Necrosis</td>
<td>.63/.69</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>.32/.50</td>
</tr>
<tr>
<td>Osteo</td>
<td>.56/.59</td>
</tr>
</tbody>
</table>
Background

• Is observed accuracy okay?

• Participating physicians would use the system for patients who do not currently have access to specialized wound care:
  - Teleconsultation
  - Tele-home care
Pilot/Feasibility Study: Methods

• March-November 2004
• Ann Arbor VAMC wound care team: plastic surgeon, vascular surgeon, ID specialist, PM&R physician, dietitian
• Referring centers: Battle Creek and Grand Rapids
  ▪ Wound care nurses requested consultations via e-mail
  ▪ Digital images e-mailed to plastic surgeon in Ann Arbor
  ▪ Additional clinical data entered into CPRS
• Team leader forwarded diagnostic and treatment recommendations back to nurses via e-mail

• Follow-up images and findings e-mailed to Ann Arbor
Pilot/Feasibility Study: Results

- 56 patients
- All male
- Mean age = 66 (range = 36 – 88)
- 56 initial visits, 152 follow-up visits
- 88 wounds (range = 1- 9 per patient)
Pilot/Feasibility Study: Results

- Wound type (N = 56 patients):
  - 57% (32) Diabetic lower extremity ulcers
  - 18% (10) Pressure ulcers
  - 12% (7) Non-diabetic PV lower extremity ulcers
  - 5% (3) Venous stasis ulcers
  - 7% (4) Misc (trauma, burn, surgical)
Pilot/Feasibility Study: Results

• Duration of wounds prior to study enrollment
  - 32% (18) < 3 months
  - 20% (11) 3-11 months
  - 48% (27) >= 1 year

• Mean wound surface area = 5.8 cm$^2$
  (range = 0.1 – 73.4)
Pilot/Feasibility Study: Results

• Average response time for diagnostic & treatment recommendations: 2.6 days (range = 1-11 days).

• Change in diagnosis or treatment plan recommended in 58.2 % (121) of 208 visits.

• Increases observed in use of debridements, biopsies for culture, topical antimicrobials, topical growth factors.
Pilot/Feasibility Study: Results

• Patient satisfaction: % concerned

I do not mind having photographs taken of my wound. 3.7 %
I have concerns about the privacy of my medical information. 18.5 %
I would be more confident in the quality of my treatment if I traveled to the Ann Arbor VAMC. 5.5 %
I would be more comfortable telling the doctors in Ann Arbor my problems in person. 3.7 %
It is more convenient to be seen here than to see the Ann Arbor doctors in person. 0.0 %
I received good care during my visit here for my wound. 0.0 %
Feedback from nurses:

- Helpful to have an expert available to confirm care provided and advise on treatment plan.
- Helpful to get a response back within 1-2 days.
- Helpful when wound care MD prescribed a treatment product that nurse could not prescribe.
- Difficult to send patients to Ann Arbor wound care clinic because of backlog.
- Most patients have transportation problems, for financial and/or physical reasons.
Pilot/Feasibility Study: Conclusion

Increasing access to specialty care via telemedicine:

- Increases probability of identifying a problem
- Increases likelihood of aggressive treatment, and provides this treatment sooner

Note: Telemedicine management takes place in collaboration with local clinician. It is designed to supplement—not supplant—existing care by local provider. (Important in cases where sensitivity of telemedicine diagnosis is only fair.)
Pilot/Feasibility Study: Challenges

• Cumbersome nature of transfer and management of clinical data (without Web site).

• RCT needed to evaluate whether increased access to specialty care actually improves outcomes, including wound healing, amputation rates, hospitalization rates, and costs.
Challenge to VA:

To improve access to high quality health care (with corresponding improvement in outcomes) within financial constraints.

Can telemedicine provide the solution?