



**VA Center for Practice
Management & Outcomes Research**
Health Services Research & Development

Teleconsultation for Chronic Wound Care

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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.



Background

- 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” (HSR&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





Subject ID: 1010 **Age:** 67 **Gender:** Male **Institution:** MI

Spinal Injury? No **Level of Spinal Injury:** **Reenrolled?** No **Previous Subject ID(s):**

Visit Date	Wound Image	TMED Assessment	Visit Location	Treating MD	Wound Age @ Visit (days)	Bone Exposure?	Debridement Method	Dressing
13-Jul-1999		Browse Data	Nursing Home at VAMC	Rees	120	Yes	None	N.S. Wet to Dry
27-Jul-1999		Browse Data	Nursing Home at VAMC	Rees	134	No	None	Silvadene
07-Sep-1999		Browse Data	Nursing Home at VAMC	Rees	176	No	None	N.S. Wet to Dry



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

- [Summary of Visits](#)
- [Visit Assessment](#)
- [Clinical Detail](#)
- [Diet/Nutrition](#)
- [Diagnoses](#)

Treating Physician: Rees

Wound Stage: 4
Age of Wound (days): 120
Bone Exposure: Yes
Wound Undermined? No
Debridement Method: None

Dressing Type: N.S. Wet to

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.



No other images available.

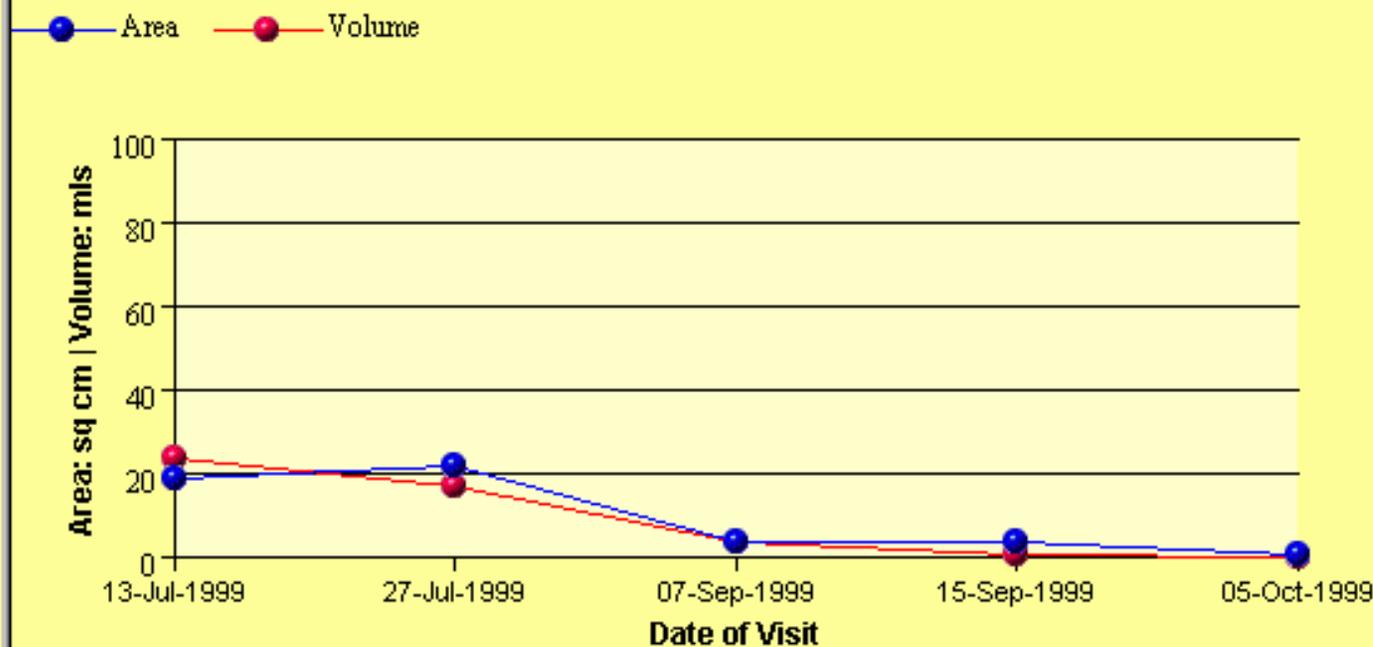
[Click to View Full Size Image](#)

[Click to View Full Size Image](#)



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





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

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- [Diagnoses](#)

Treating Physician: Rees

Wound Stage: 4
Age of Wound (days): 120
Bone Exposure: Yes
Wound Undermined? No
Debridement Method: None

Dressing Type: N.S. Wet to

ASSESSMENT COMPLETED ON 02-Dec-1999 BY wilkins

1 : Definitely Yes, 2 : Probably Yes, 3 : Not Sure, 4 : Probably No,
 5 : Definitely No,
 N/A : Not Applicable

Questions:

Is the wound getting smaller?	<input type="radio"/> 1 <input type="radio"/> 2 <input checked="" type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5
Is necrotic tissue present?	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input checked="" type="radio"/> 4 <input type="radio"/> 5
Is cellulitis suspected?	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input checked="" type="radio"/> 5
Is osteomyelitis suspected?	<input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5
If so, how was it determined?	Not suspected
If Wound is Post-Op, is the wound closed?	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> N/A

Physician's Orders/Treatment Plan:

This telemedicine demo is copyright © 1996 by the University of Michigan
 Contact [The Study Program Office](#) with questions or suggestions.

Background

- 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?



Background

- 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

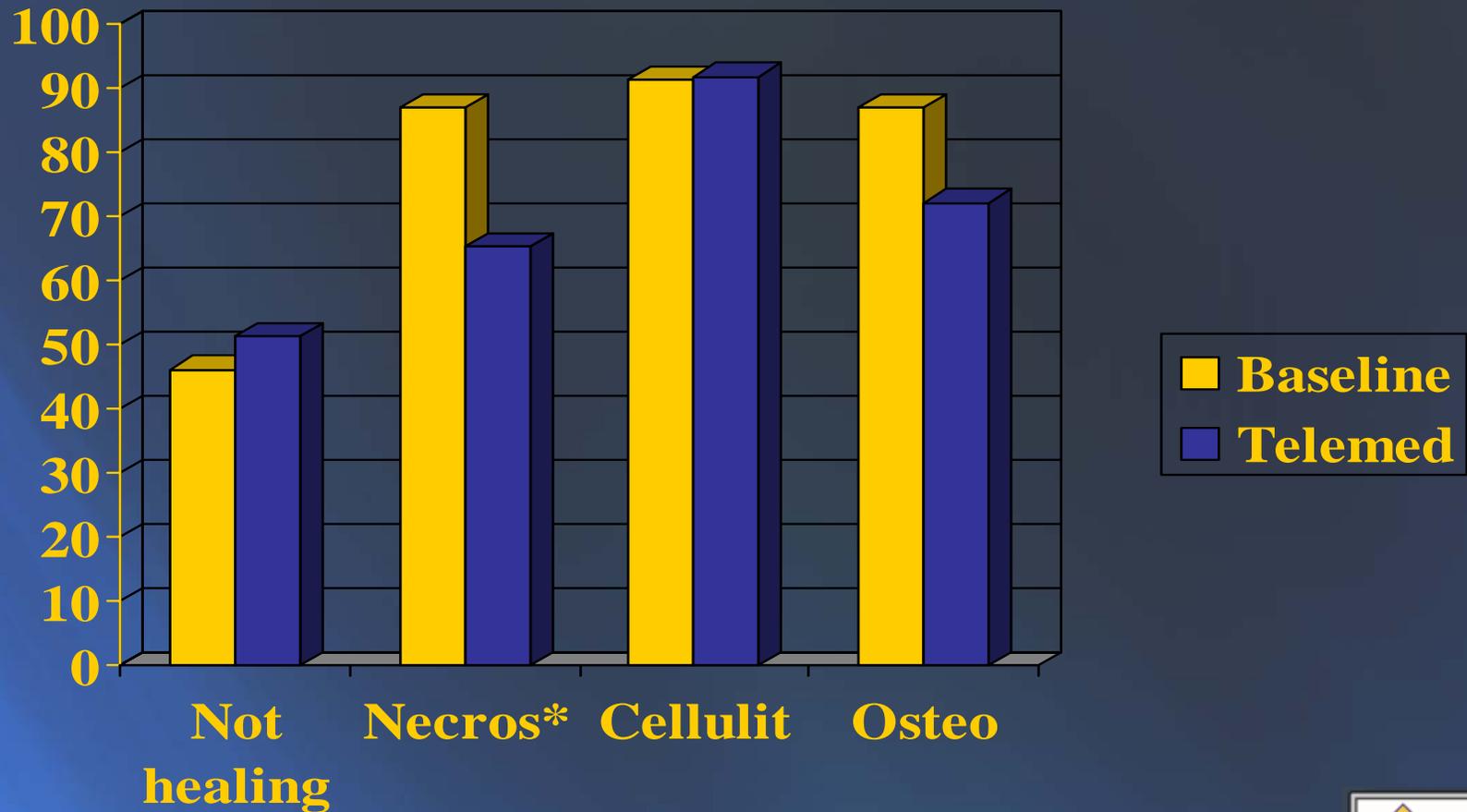


Background

- 430 visits
 - 25% visit 1
 - 20% visit 2
 - 17% visit 3
 - 15% visit 4
 - 13% visit 5
 - 11% visit 6



PM&R Physician Agreement

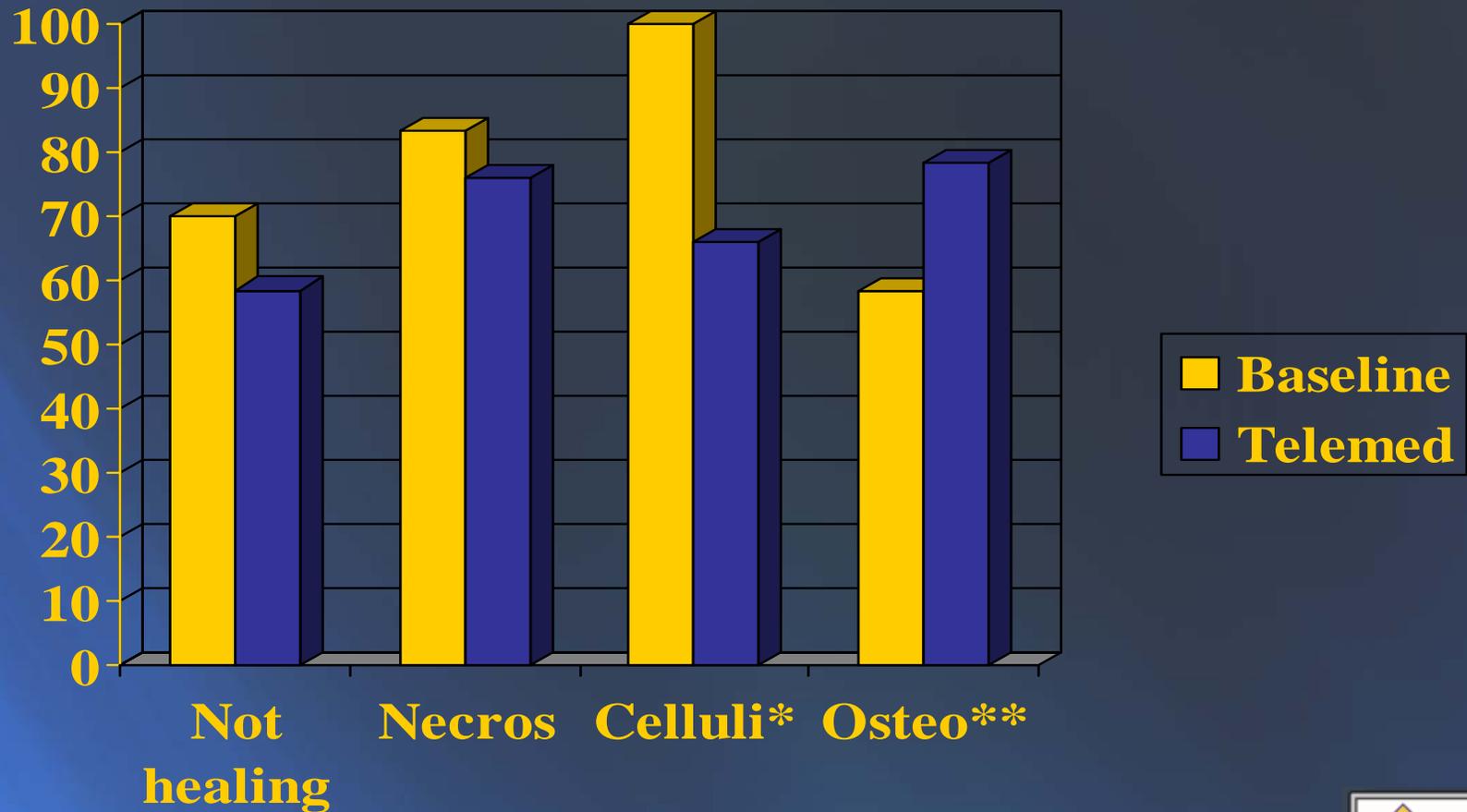


*p=0.089.

N=13/39 for not healing; 23/49 for others.



Plastic Surgeon Agreement



*p=0.001. **p=0.099.

N=10/29 for not healing; 24/50 for others.



Kappa

All visits/First visit

Not healing .22/.19

Necrosis .43/.47

Cellulitis .18/.15

Osteo .44/.50



Sensitivity, Specificity, AUROC

Sensitivity Specificity AUROC

(All visits/First visit)

Not healing	.45/.49	.81/.70	.70/.66
Necrosis	.63/.69	.80/.78	.80/.76
Cellulitis	.32/.50	.91/.83	.72/.68
Osteo	.56/.59	.84/.91	.80/.87



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



Pilot/Feasibility Study: Methods

- 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) \geq 1 year
- Mean wound surface area = 5.8 cm²
(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 %



Pilot/Feasibility Study: Results

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?

