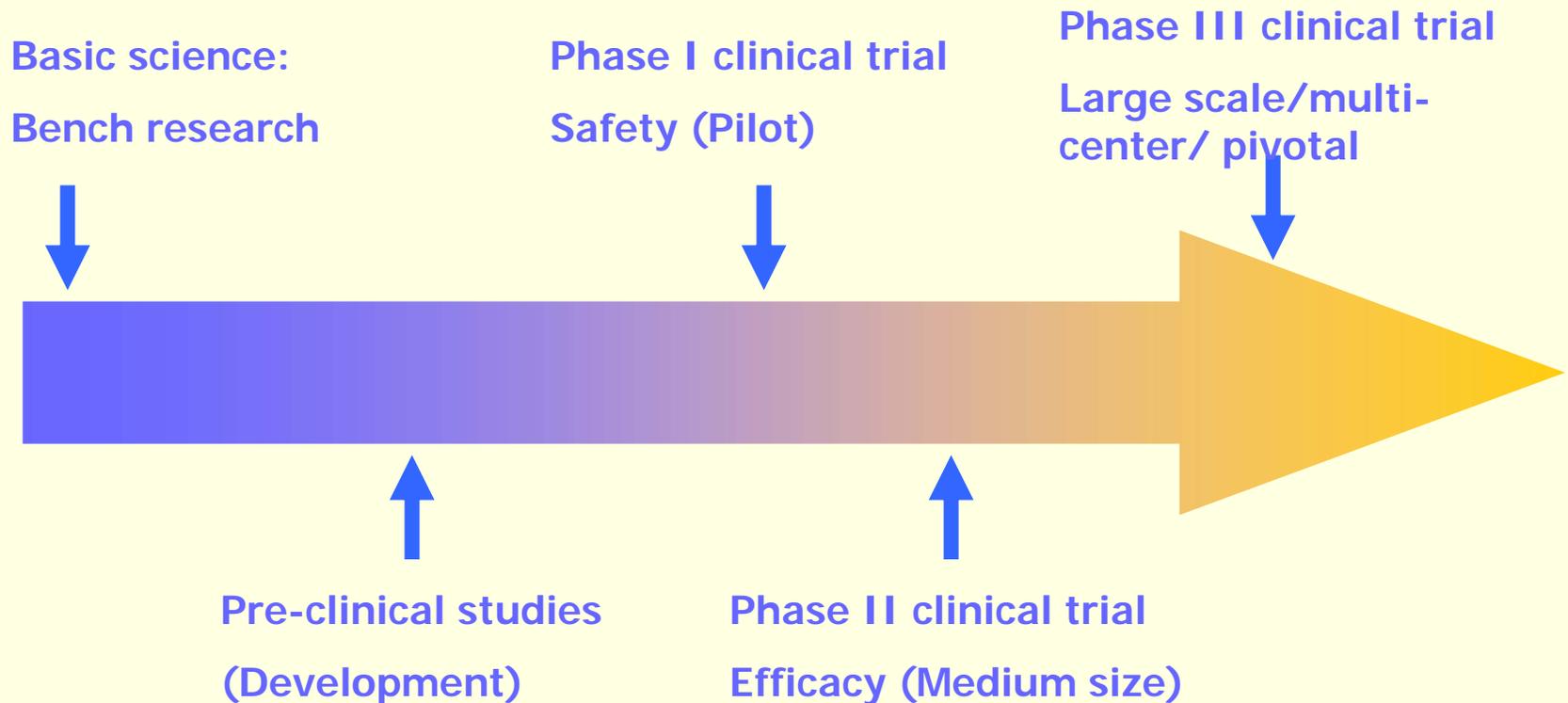


Wound care: Novel programs for clinical care and early intervention

Kath Bogie, D.Phil
Cleveland VA Medical Center
and
Case Western Reserve University

Continuum of research

- Bench to bedside.



Improving clinical care

Multidisciplinary teams are key to research and development.

Include the end user: Clinicians

Nursing personnel

Non-professionals

e.g. carers/patients

Pressure Ulcer Research Program

Examples to be discussed: Research studies enhanced by this approach

1. Clinical care delivery

2. Pressure ulcer prevention

Clinical care delivery

Challenges

Clinical:

Patient need is complex and on-going

Pragmatic:

Transportation

Education of end users

Telehealth/ Telemedicine

Addresses many challenges in clinical care delivery

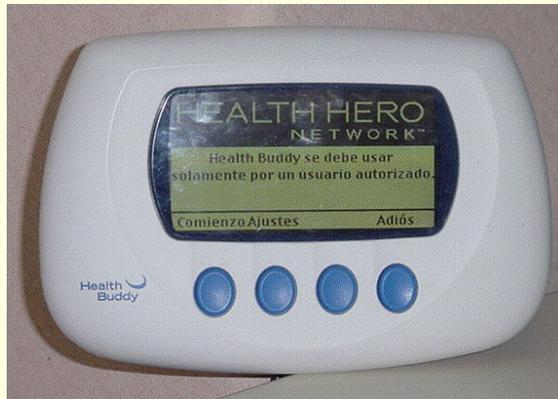
Additional motivation:

- **Clinical outcomes**
- **Cost benefit to health care system**

VA Telehealth Initiative

VHA populations often rural and/or large geographical area

Centers of expertise serve large areas



Health Buddy



Audio/Videophone

VA Telehealth Initiative

Office of Care Coordination

- **Home-based Telehealth**
 - Care of veterans in the home
- **Clinic Telehealth**
 - Inter-facility videoconferencing

Real-time or Store-and-Forward

San Juan PR VAMC:

Home Telehealth for Wound Care

Home Telehealth

**Serves veterans living in Puerto Rico,
Vieques and U.S. Virgin Islands**

Team members

Clinicians

Nurse

Dietician

Administrative support

Cleveland VAMC: Telehealth programs/research projects

- **Home Telehealth**

- Reliability of Digital Photography for Wound Evaluation
- Store-and-forward

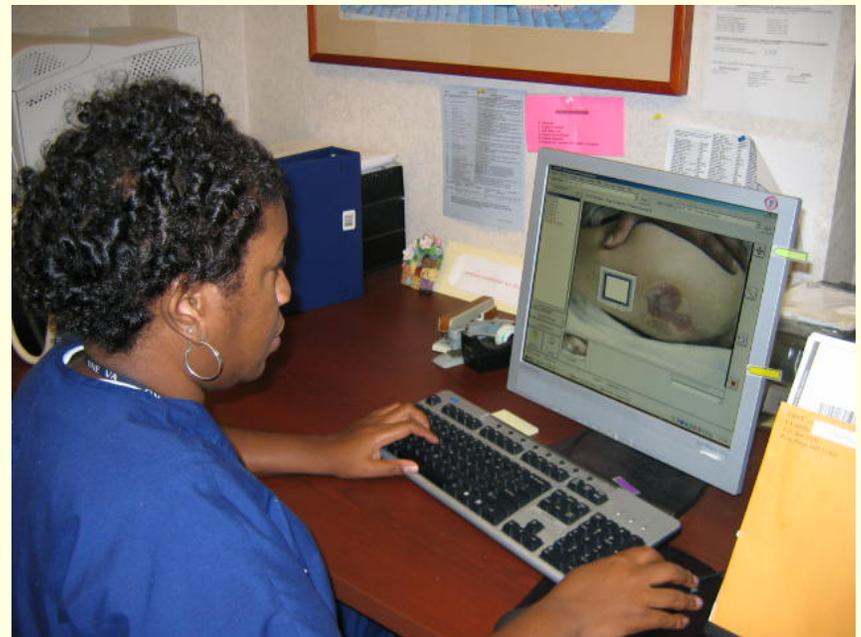
- **Clinic Telehealth**

- Inter-facility videoconferencing
- Real-time

Reliability of Digital Photography for Wound Evaluation – feasibility study

Two raters of similar experience & training assessed pressure ulcers using:

- a) Digital photos
- b) In-person assessment

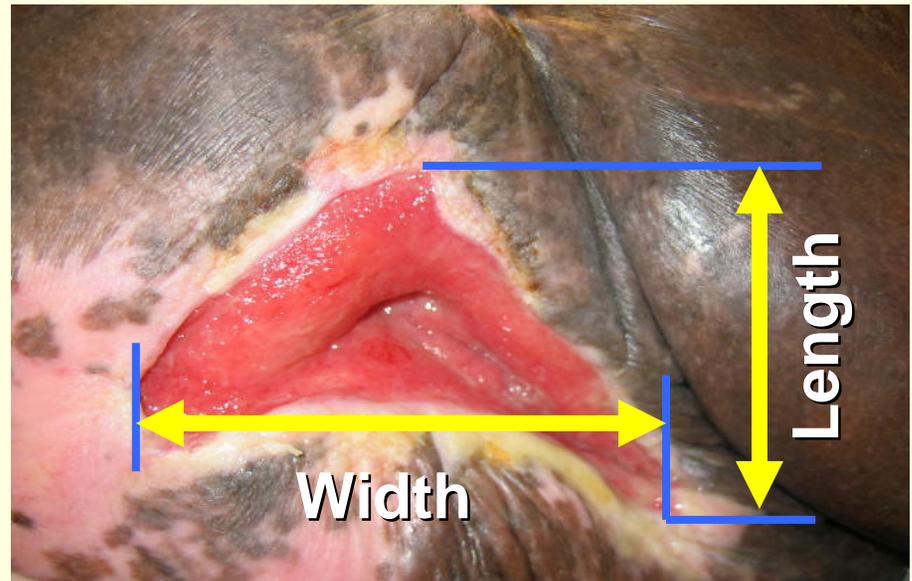


Reliability of Digital Photography for Wound Evaluation

In-person assessments completed within 24hrs of digital imaging

Wound Descriptors

- Wound length
- Wound width
- Wound bed description
- Exudate type and color
- Peri-wound tissue description
- Peri-wound tissue color



Reliability of Digital Photography for Wound Evaluation

Intra-method agreement of wound descriptors

Substantial agreement

- Wound bed description
- Peri-wound tissue color

Fair agreement

- Exudate type and color
- Peri-wound tissue description

Significant difference ($p < 0.01$)

- Wound length
- Wound width

Reliability of Digital Photography for Wound Evaluation

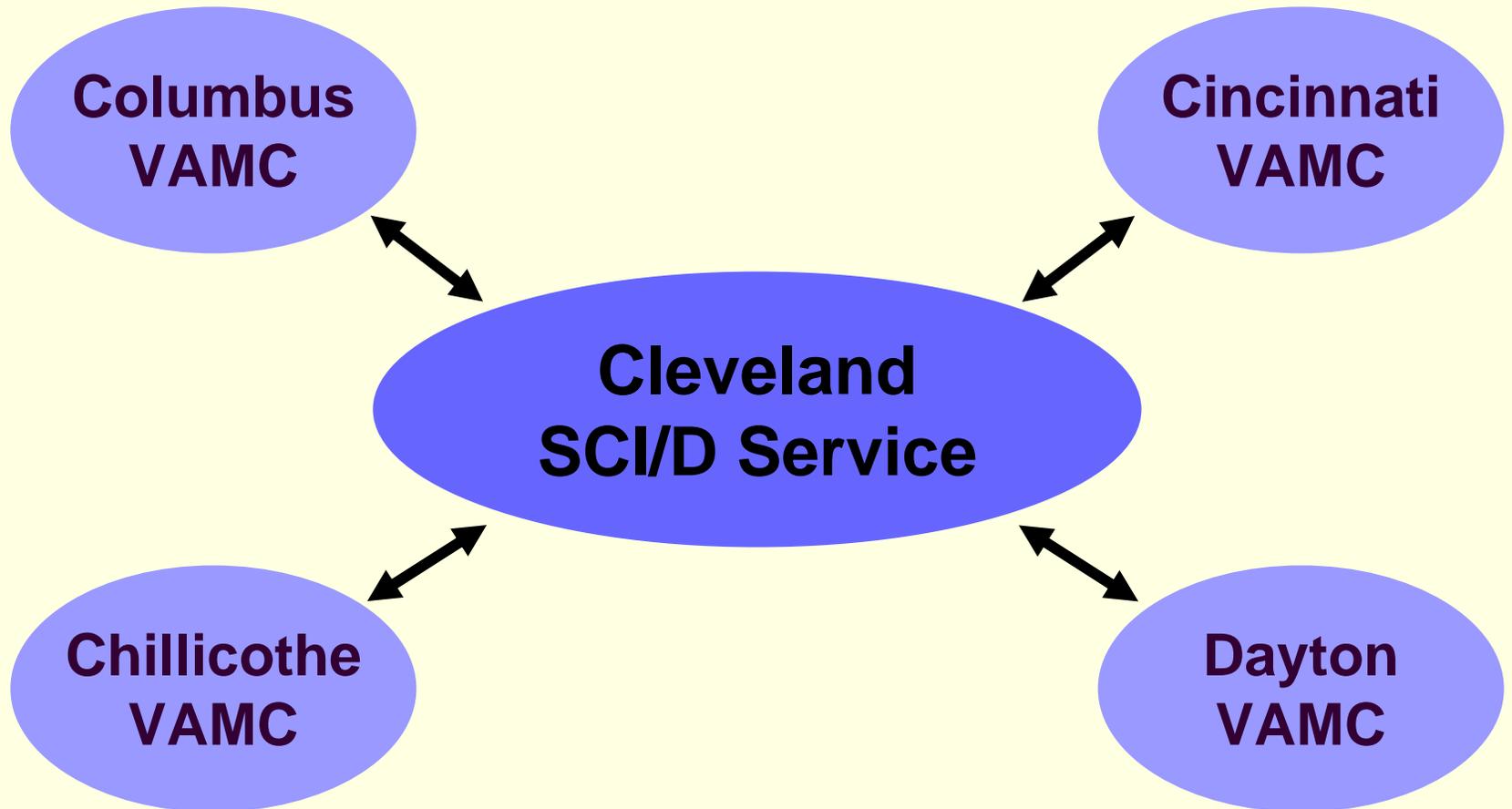
Conclusion

- **Persistent variation in intra-method agreement persists, despite involvement of two similarly trained and experienced raters.**
- **Intra-method variation observed highlights a need for improved wound measurement techniques**

Caveat:

Likelihood of a different process or outcome of care occurring as a result of the observed differences has not been assessed.

VISN10 SCI Telehealth Clinics- (pilot clinical studies)



VISN10 SCI Telehealth Clinics

Cleveland SCI/D Service

Team members

SCI specialist physician
Nurse
Therapist
Biomedical engineer
Epidemiologist/statistician
Administrative support

Remote sites

Team members

Clinician
Nurse
Therapist

Pressure ulcer care: Tele-consultation

- **Live viewing of pressure ulcers during videoconference**
- **Viewing of stored images from digital cameras during videoconference**
- **Recommendations for future prevention & treatment**



VISN10 SCI Telehealth Clinics

Outcomes measured

- **Clinical variables**
- **Utilization of health care system**
- **End user satisfaction evaluations**
Patient and provider

Pressure ulcer prevention: Wheelchair Tele-Consultation

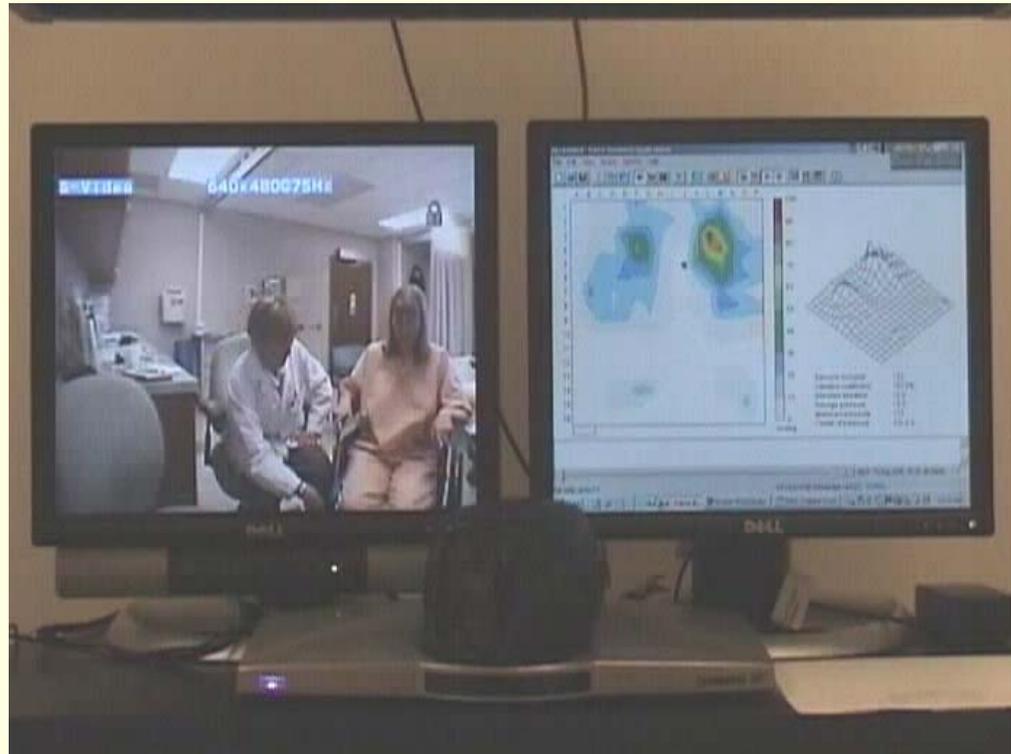
**Real-time
static and
dynamic
evaluation of
seating
interface
pressures**



**Pressure mapping provides visual feedback to
veteran for pressure relief method**

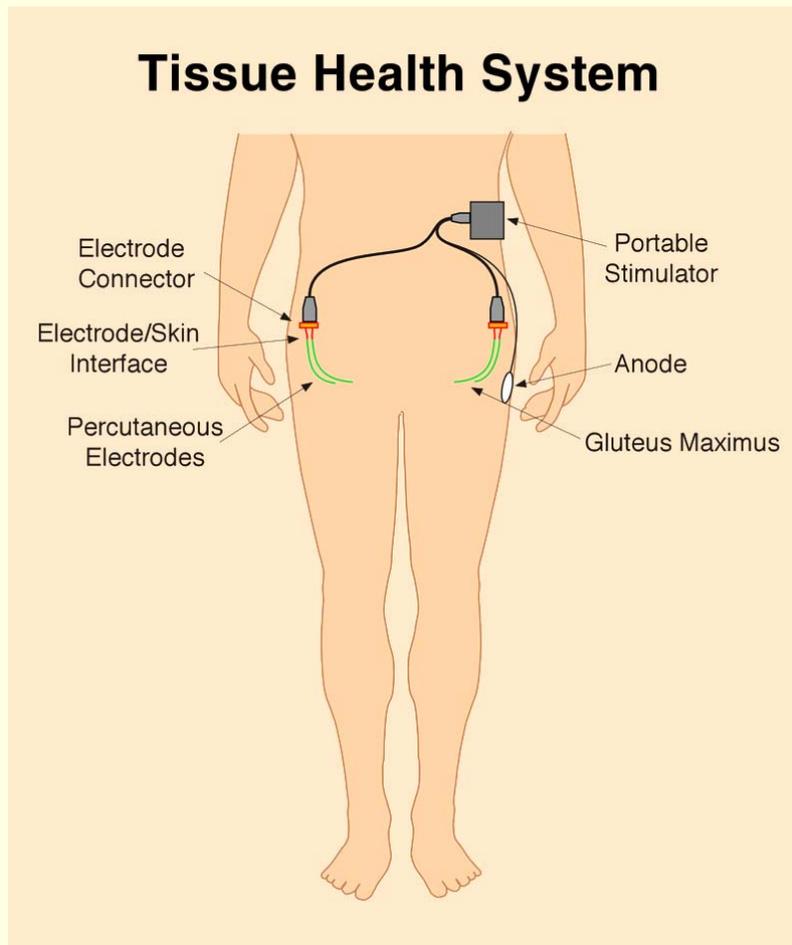
Pressure ulcer prevention: Wheelchair Tele-Consultation

**Direct viewing
of wheelchair
and seating
posture**



**Recommendations for wheelchair prescription,
pressure relief method and posture**

Pressure ulcer prevention: Neuromuscular electrical stimulation (NMES)



- NMES provides at-risk individuals with a method for achieving an independent pressure relief regime.
- Dynamic alternating bilateral stimulation (left/right) provides weight-shifting.
- Used daily for a long period (over 6 months).

Pressure ulcer prevention using NMES: hypothesis driven research

Primary hypotheses

- **Long term exercise of paralyzed gluteal muscles will improve the intrinsic health of the tissue at the seating interface.**
- **Dynamic weight shifting produced by the gluteal stimulation system will augment the efficacy of conventional pressure relief maneuvers**

Pressure ulcer prevention using NMES

Subject inclusion criteria

- Individuals with SCI over 18 years of age
- Contractile response to electrical stimulation of gluteus maximus

Outcomes measured

- Interface pressures
- Transcutaneous blood flow
- Muscle bulk (gluteal muscle thickness)

Interface pressure measurement

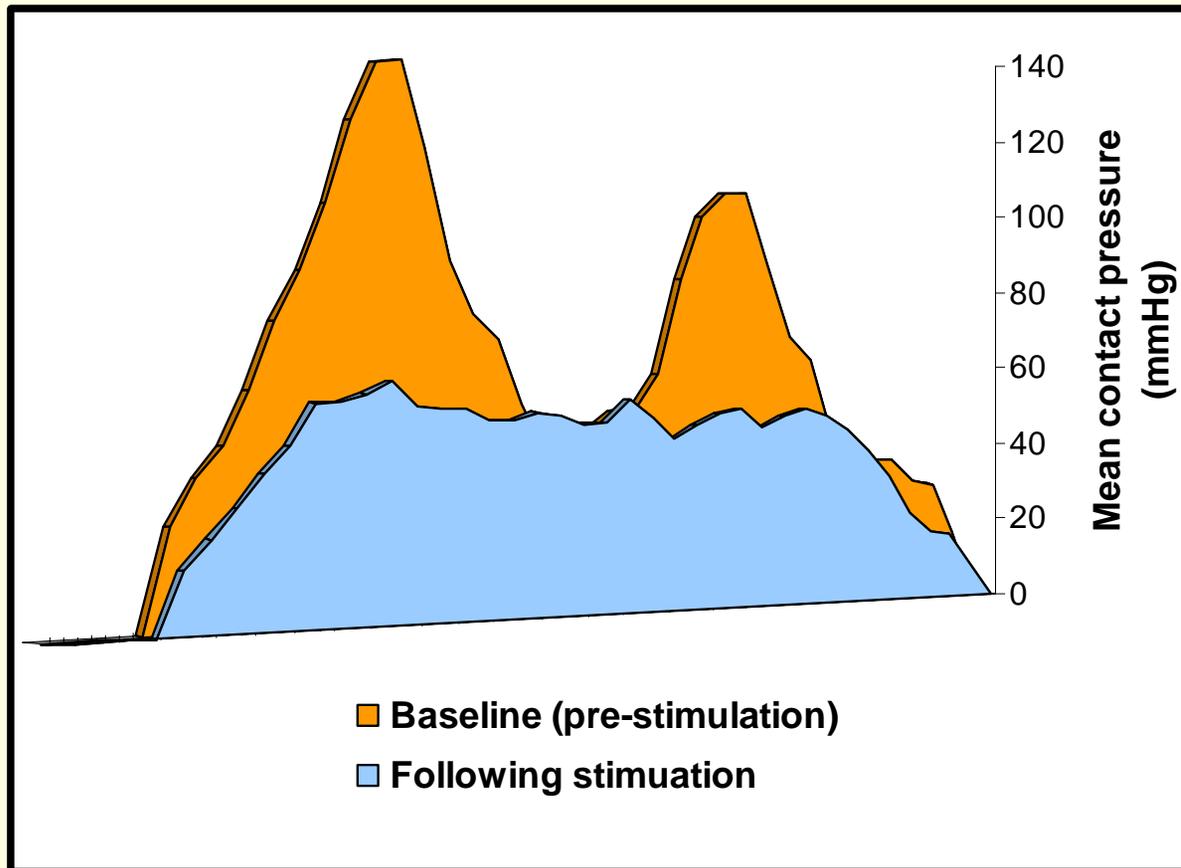
**Repeated
assessments over
several months and
years**



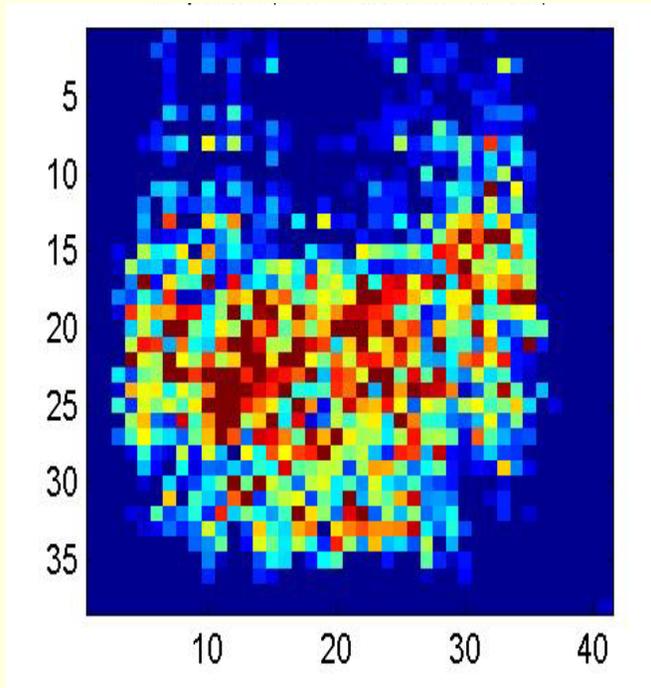
**Tekscan Advanced Clinseat
System**

Interface pressure measurement

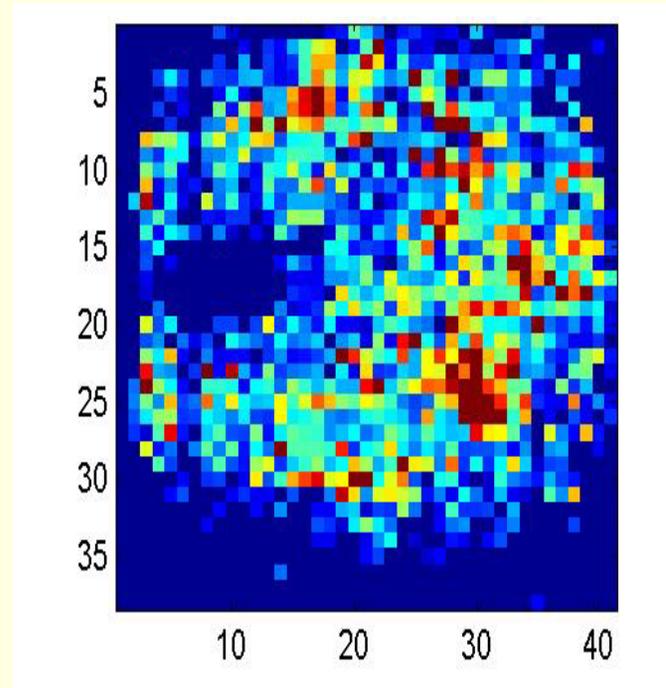
Desired outcomes: static pressure distributions



Long term effects on interface pressures: static pressure maps



Baseline



Following treatment

Motivation for development of novel analytical method

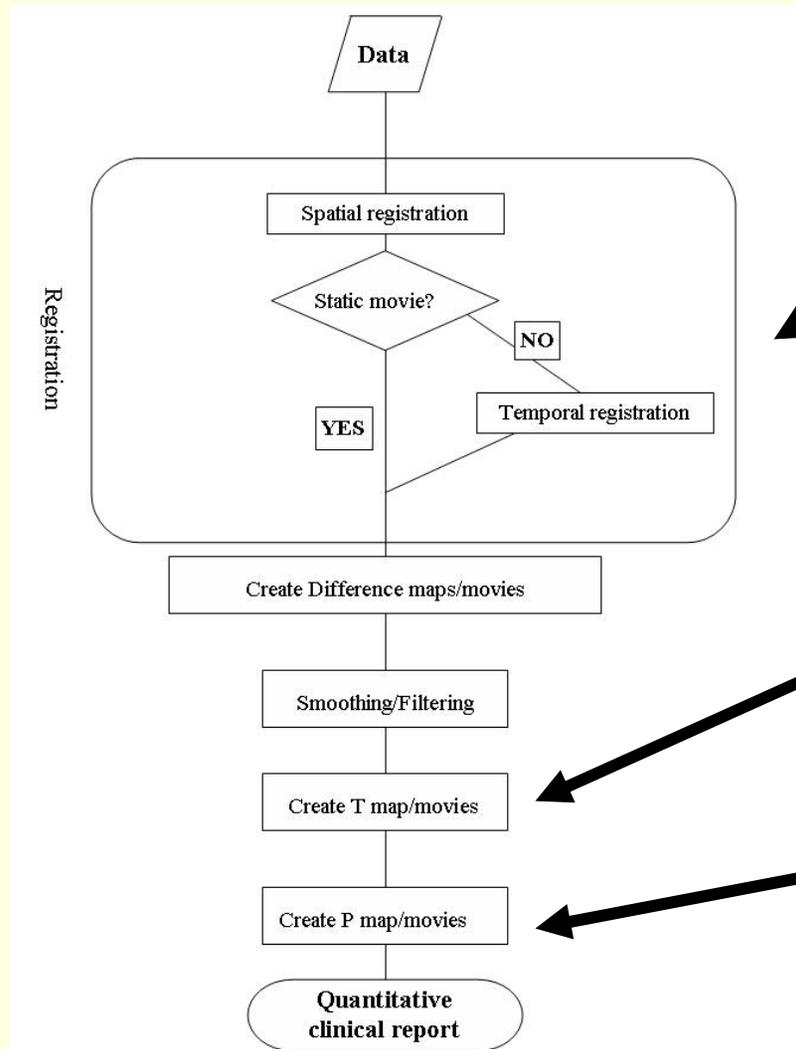
Spatial alignment

Temporal alignment

Simultaneous evaluation of multiple data points

Determination of truly significant differences within huge data sets

Longitudinal Analysis with Self-Registration LASR

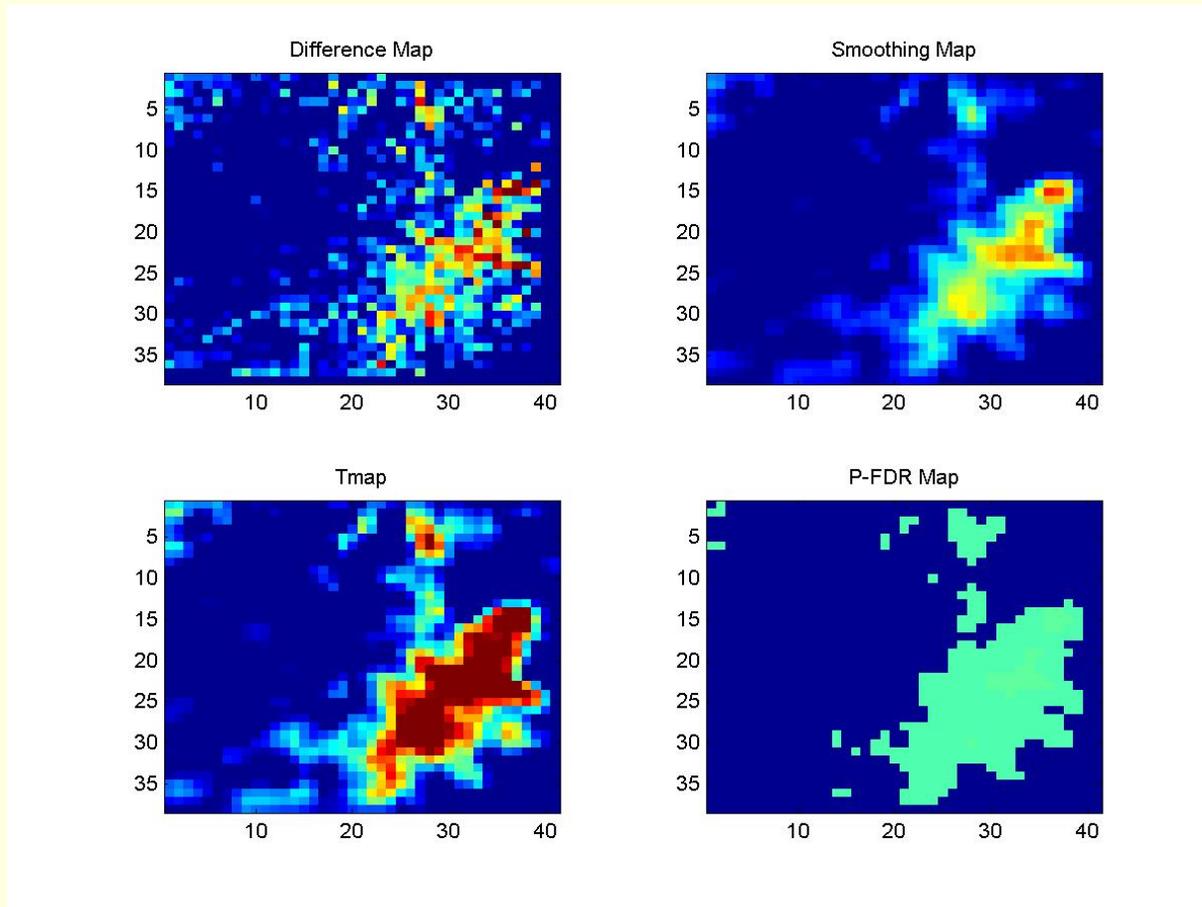


Spatial alignment
Temporal alignment

Simultaneous evaluation
of multiple data points

Determination of truly
significant differences
within huge data sets

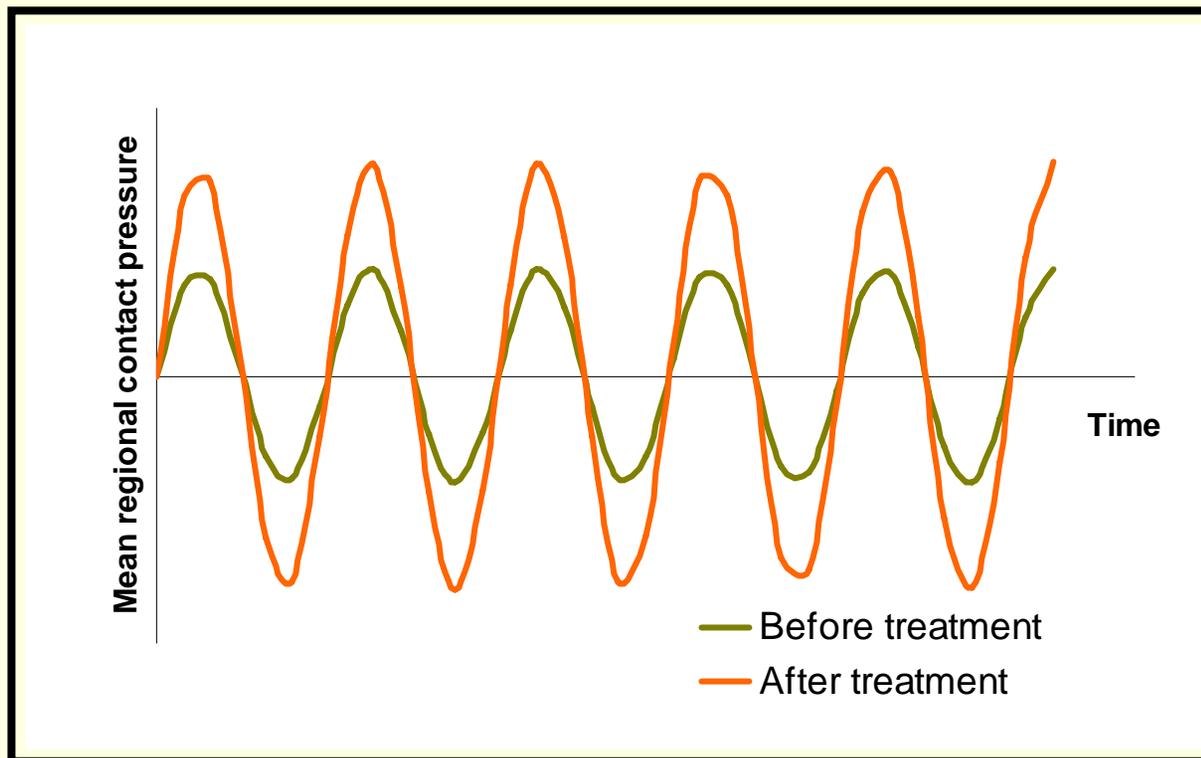
Long term effects on interface pressures: LASR analysis static mode



Baseline vs post-treatment

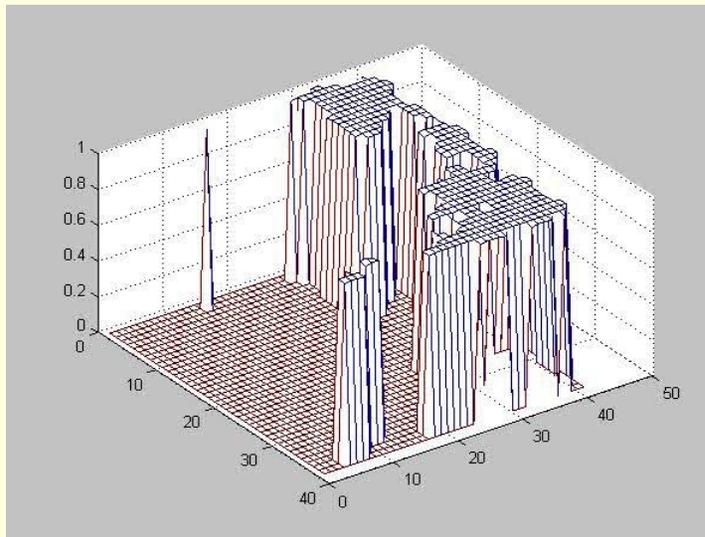
Interface pressure measurement

Desired outcomes: dynamic pressure distributions

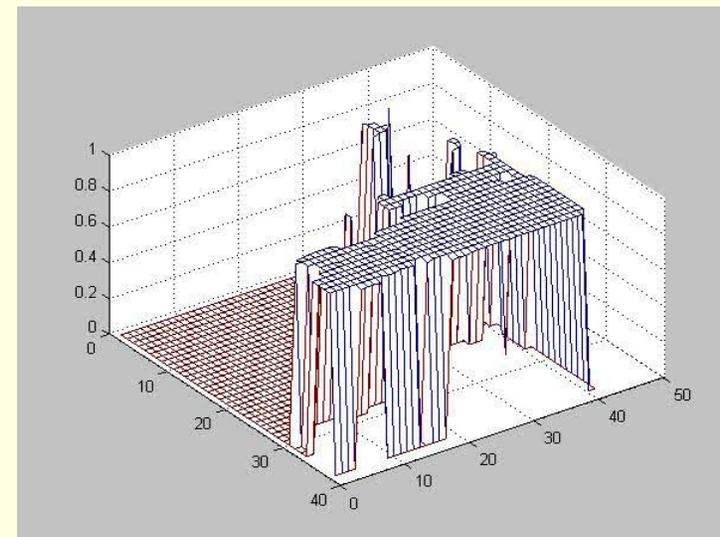


Long term effects on interface pressures: LASR analysis dynamic mode

No stimulation: $T=0$



Left side on: $T=5.5$



**Baseline vs
post-treatment**

Pressure ulcer prevention using NMES

Conclusion

Clinical implications

Regular use of an implanted gluteal stimulation system can:

- **Decrease sitting pressures**
- **Provide an extra means of weight-shifting**
- **Improve local blood flow**
- **Increase muscle size**

Continued usage of stimulation is necessary to sustain improvements in tissue health.

Multidisciplinary teams in wound care and research

Multidisciplinary Clinical Research is one of the major NIH Roadmap initiatives*

....move beyond the confines of their own discipline and explore new organizational models for *clinical care and research*

* <http://nihroadmap.nih.gov/overview.asp>

Multidisciplinary teams in wound care and research

- *Wound care is a multi-factorial problem with no single 'right' answer'*
- *Different approaches should complement not compete*

Cleveland VAMC Pressure Ulcer Research Program

- Overall focus: clinical research on pressure ulcer management in spinal cord injury (SCI), in order to:
 - Validate current treatment methods
 - Explore novel prevention and treatment methods
- Clinical studies crossing the boundary between research and clinical care

Cleveland VAMC Pressure Ulcer Research Program

Bridging the gap between research and clinical practice

- Establishment of Skin Care Team consisting of research and clinical personnel
- Closer partnership between the SCI Unit and FES Center
- Introduction of rigorous methodological standards and measurements into clinical care, e.g. standardization of the measurement of wounds

Ultimate Goal

To improve the care and quality of life of individuals with spinal cord injury



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