

Bone Injuries: What research is being done to improve patient care

North America and International Efforts

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What kinds of problems do we treat?

- **High energy trauma**
- Low energy trauma
- Cold trauma



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What kinds of problems do we treat?

- High energy trauma
- Low energy trauma
- **Cold trauma**




Why bother with orthopaedic trauma research?

- Road traffic accidents among top three causes of global disability by 2020
- Fractures cost \$100 billion/yr in lifetime medical cost and productivity loss in the US
- Development of technologies for fracture repair have outpaced rigorous studies to test efficacy



WHO Global Burden of Disease 2000

Finkelstein The incidence and economic burden of injuries in the United States 2006



Fundamentally, we evaluate new technologies/techniques with a singular purpose . . .

A glowing blue signal waveform, resembling a complex audio or data signal, is centered on a black background. The waveform has a bright, glowing blue core with a lighter blue outer glow. The word "SIGNAL" is written in a clean, white, sans-serif font, centered horizontally and vertically over the waveform.

SIGNAL

Evidence-based Practice

- The ***conscientious*** use of ***current best evidence*** from clinical care research in making health care ***decisions***

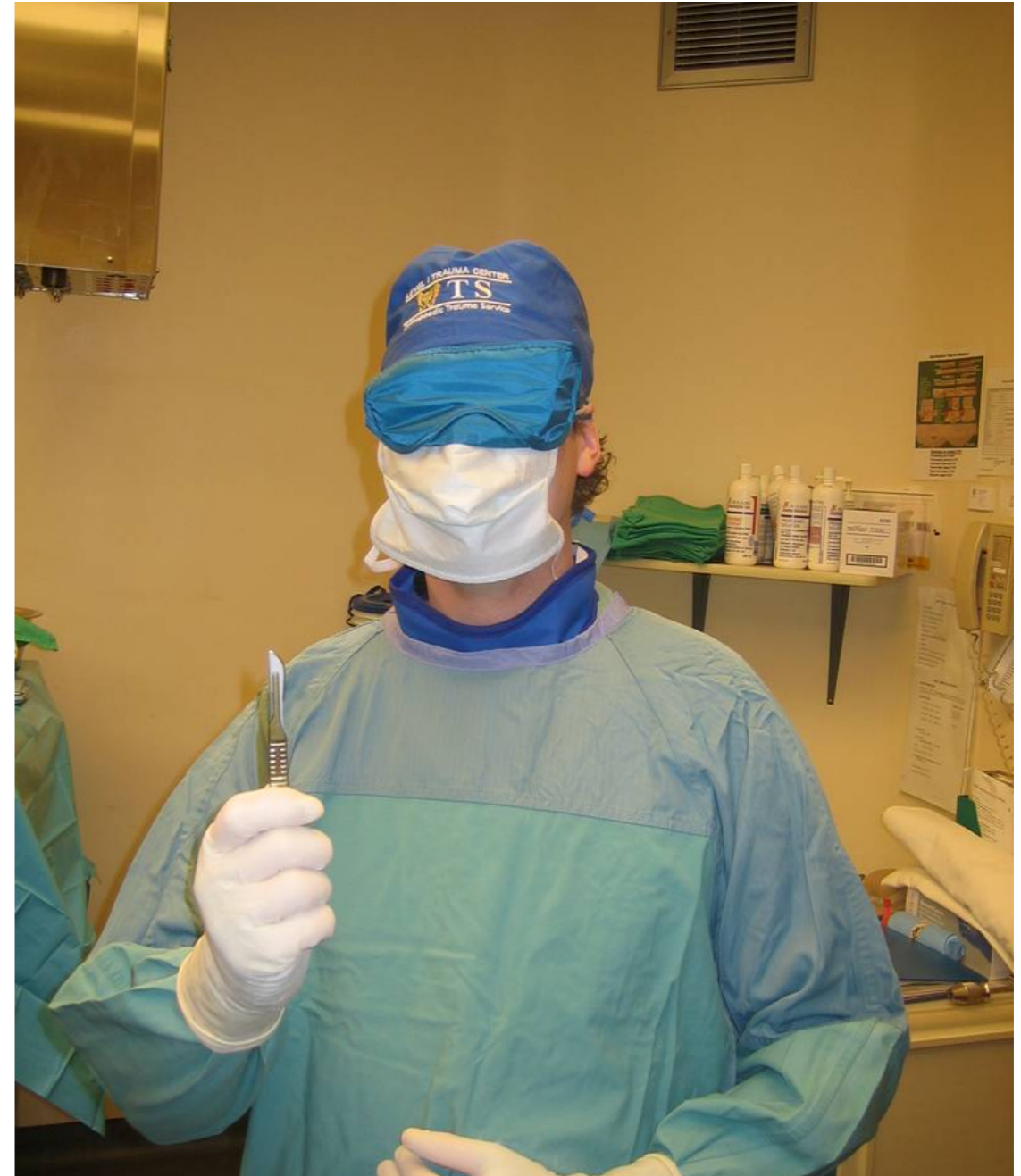
Hierarchy of Evidence

Meta-analysis



What are the obstacles?

- Hard to **blind** surgeons!
- Lack of valid **patient-important outcomes**
- Large prospective studies are **time-consuming** and very **expensive**
- Surgery is a **complex** intervention
- **Expertise** varies widely
- *Equipoise*



Trauma in North America (and other middle to high income countries)

What are we studying?

Overview

- *Common versus Uncommon Problems*
- Types of Studies
 - One surgery versus another surgery
 - Surgery versus non-operative treatment
 - Surgery + Medication
 - Prognosis

Common Problems

- Large numbers
- Low complexity
- Surgeon/Patient willingness to participate

Randomized controlled trials !!!



Common Problems

- Geriatric fractures
 - Hip fracture (>300,000/yr)
 - Wrist fracture (>600,000/yr)
 - Shoulder fracture (>180,000/yr)
- Isolated extremity fractures in young
 - Ankle fractures
 - Collar bone fractures



One surgery versus another

- **INSITE Trial**

- Patients - 880 adults with inter-trochanteric hip fracture
- Comparison- SHS vs. CMN
- Outcome - Health-related quality of life at 2 years



Surgery versus no surgery

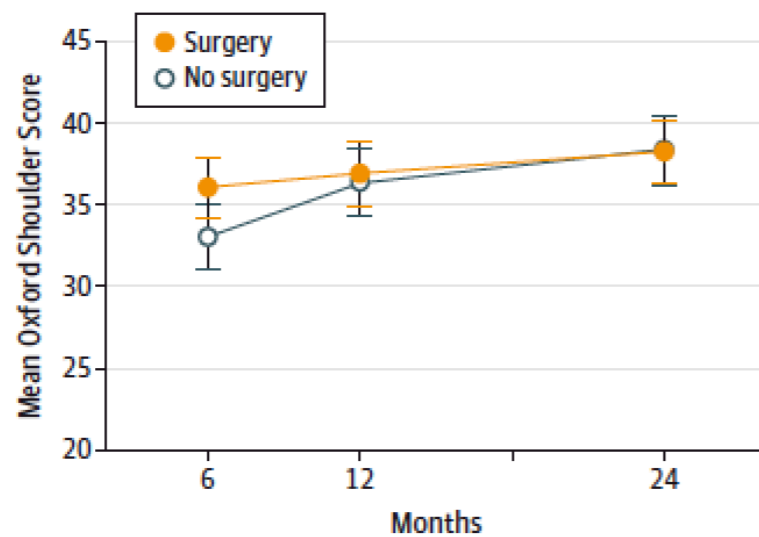
- **PROFHER Trial**

- Adults with proximal humeral fracture (mean age 66)
- Comparison - Surgery vs non-operative treatment
- Outcomes - Function (Oxford Shoulder Score) at 2 years



Rangan *JAMA* 2015

The PROFHER Trial



No. of participants			
Surgery	113	111	106
No surgery	119	114	109

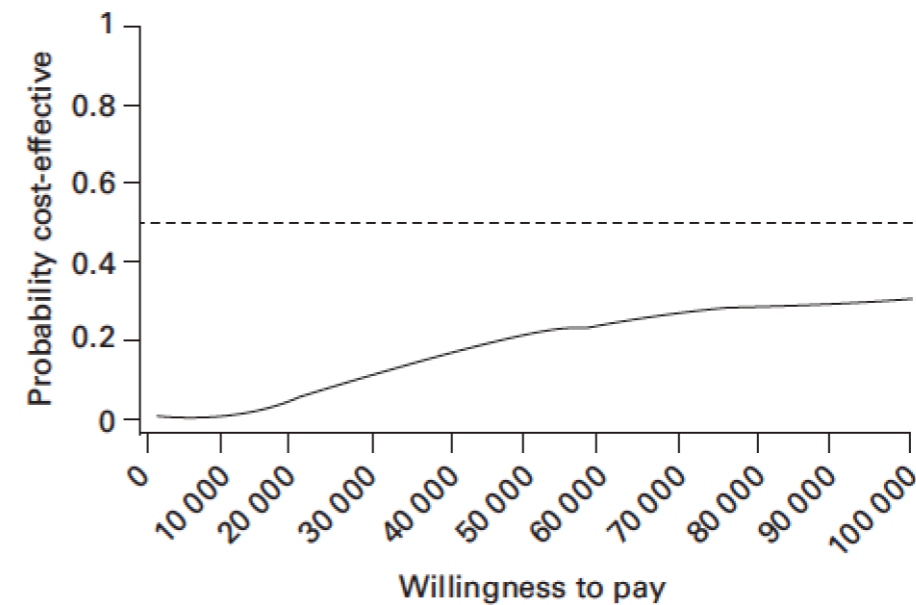


Fig. 2

Cost effectiveness acceptability curve controlling for covariates.

No difference in function

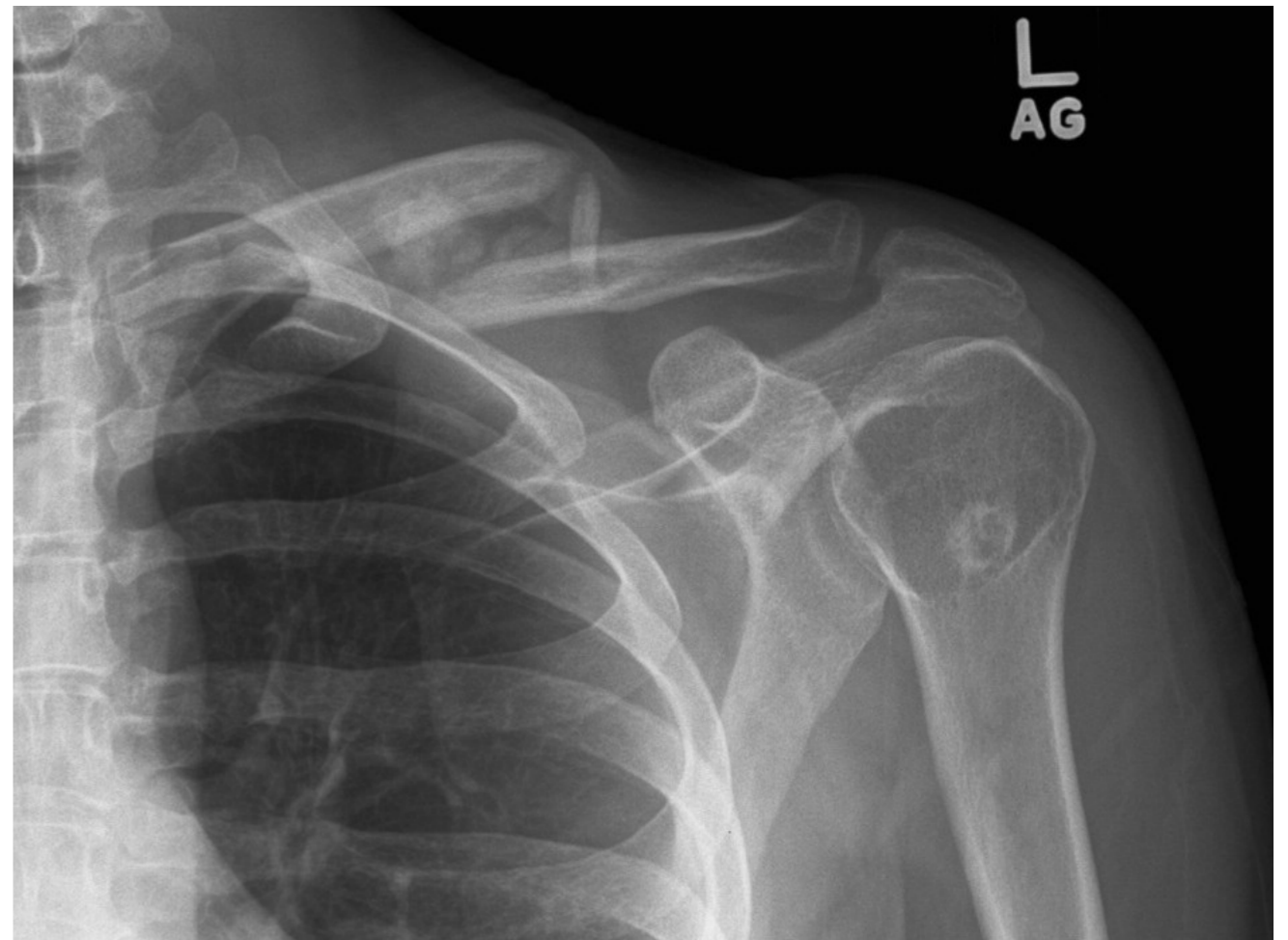
More expensive

Rangan *JAMA* 2015

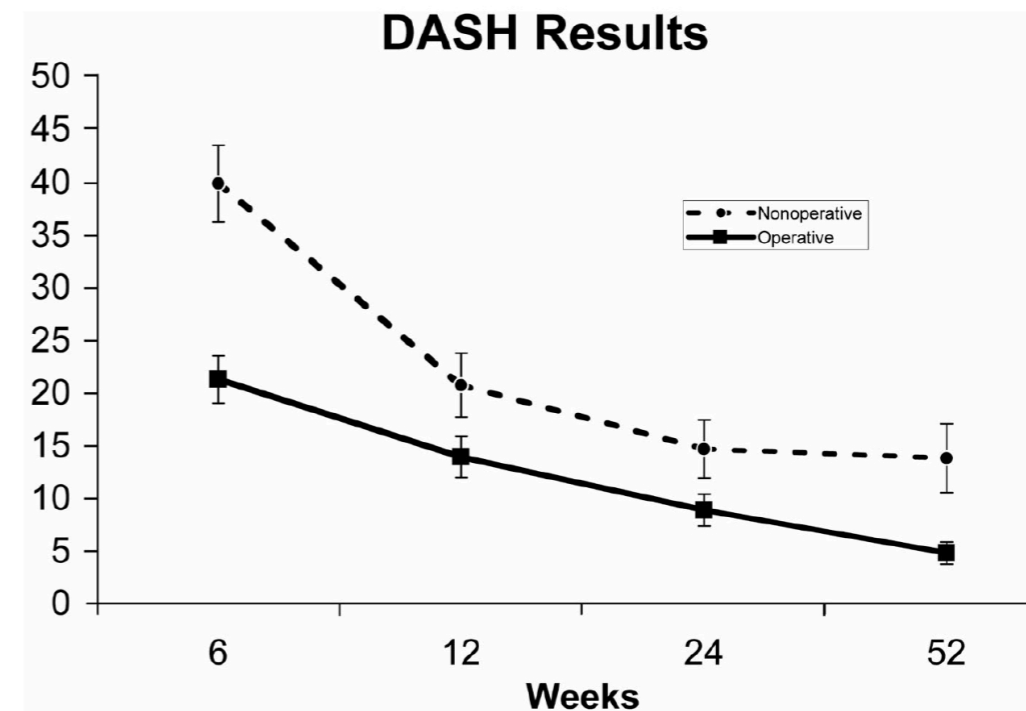
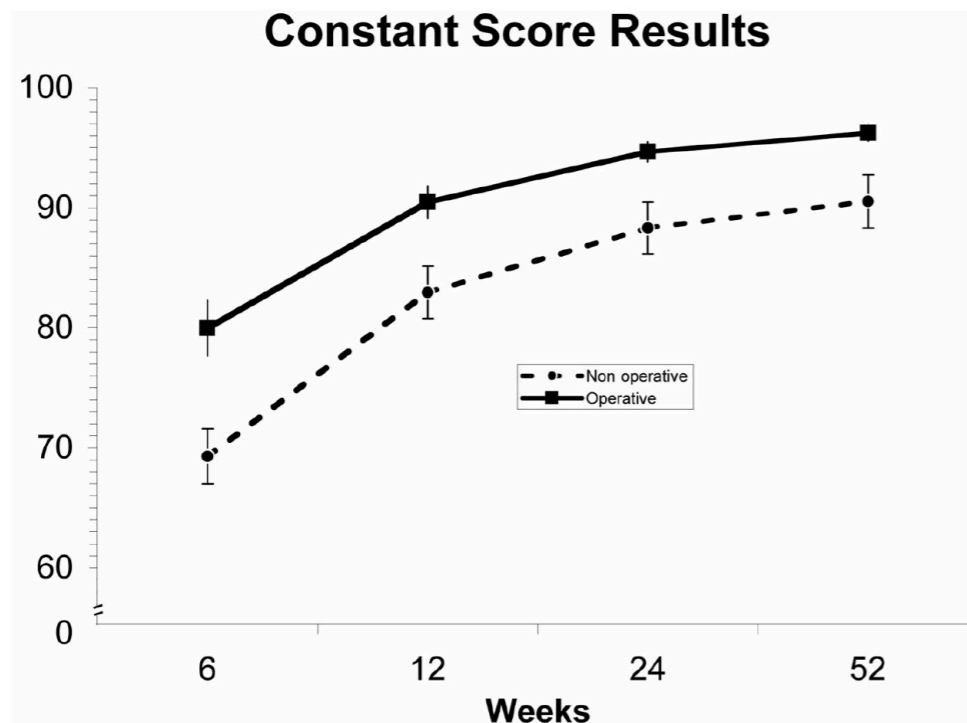
Surgery versus no surgery

- **COTS Clavicle Trial**

- 132 adults with clavicle shaft fractures
- Comparison - Surgery vs non-operative treatment
- Outcomes - Shoulder function (Constant Score and DASH) at 1 year



COTS Clavicle Trial



Surgery leads to better function and fewer complications

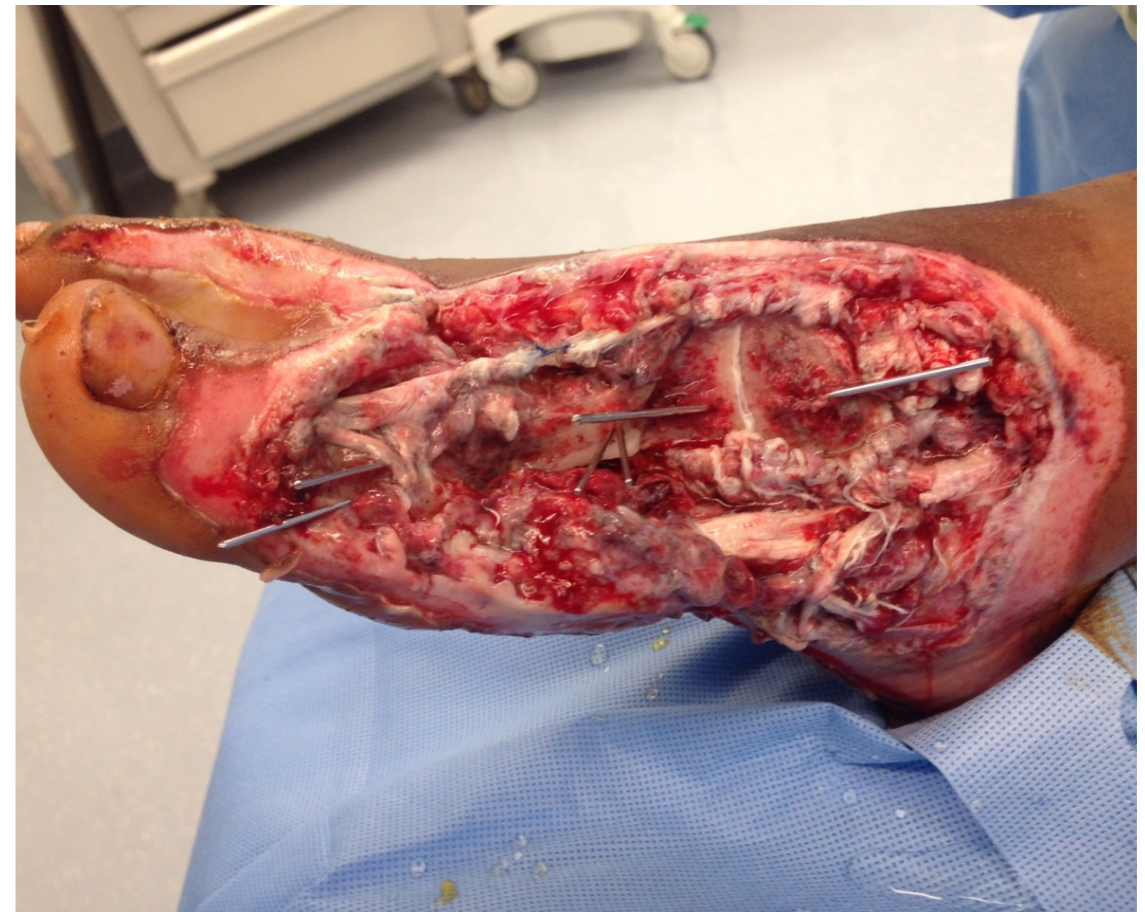
Uncommon Problems

- Rare conditions outside of trauma centers
- Technically demanding
- Limited understanding of drivers of treatment choice and/or outcomes
- Randomization is questionable or unethical



Uncommon Problems

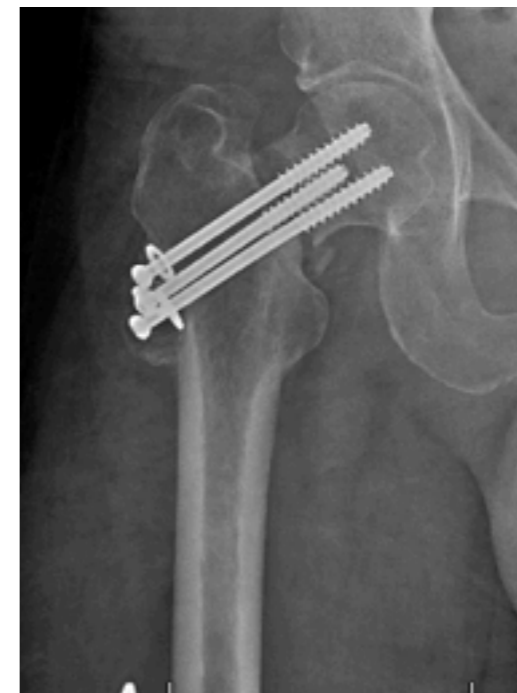
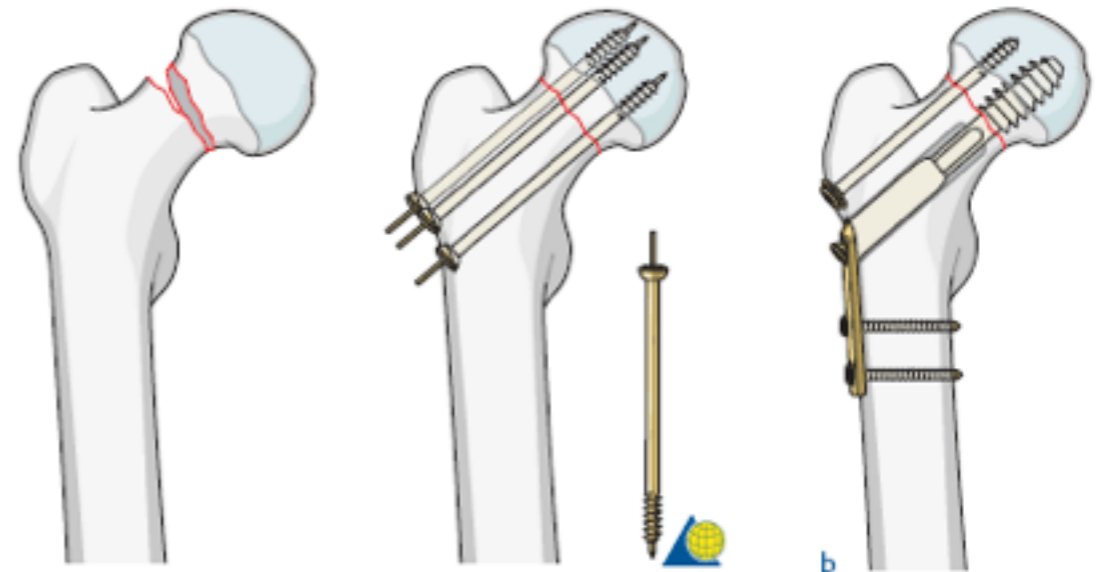
- Hip and pelvis fractures in the young adult
- Limb threatening injuries
- Infections complicating fracture repair
- Bones that don't heal



Testing surgical and medical interventions

- **FAITH - 2 Trial**

- Young adults with fracture of neck of femur
- Comparison - Cannulated screws vs SHS **AND** Vitamin D supplementation vs Placebo
- Outcome - Revision surgery within 2 years



Limb Salvage vs Amputation

- LEAP Study
 - 601 patients with mangled leg and foot injuries
 - Comparison - Salvage vs Amputations
 - Outcomes - Sickness Impact Profile (health-related quality of life)



Bosse *NEJM* 2002

Limb Salvage vs Amputation

What we learned . . .

- >50% persistent severe disability and only 58% working again by 7 years
- Disproved older injury scoring systems and clinical parameters for decision making
- Conceptual framework for understanding recovery process – economic, social, and personal resources more important than treatment received
- Opportunities for future interventions



No difference

Burden of extremity trauma in overseas conflicts

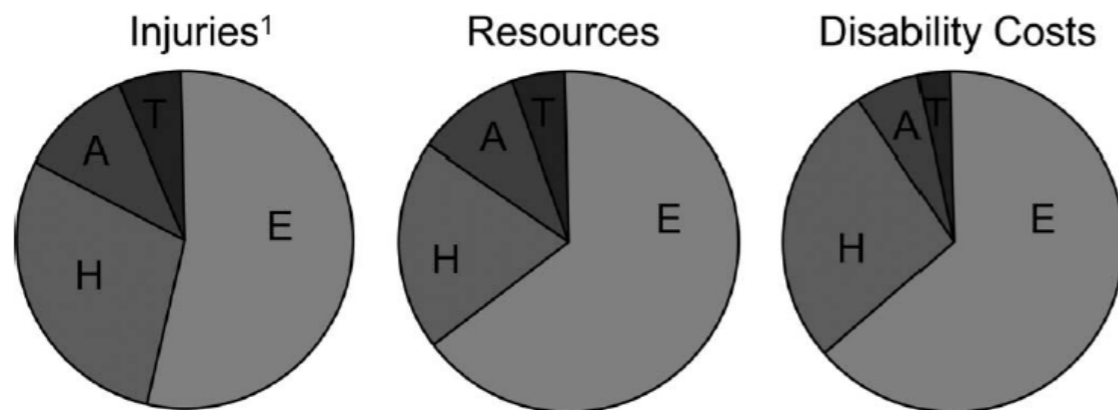


FIGURE 1. Distribution of injuries, resources, and disability costs by body region. A, abdomen; E, extremity; H, head/neck; T, thorax.

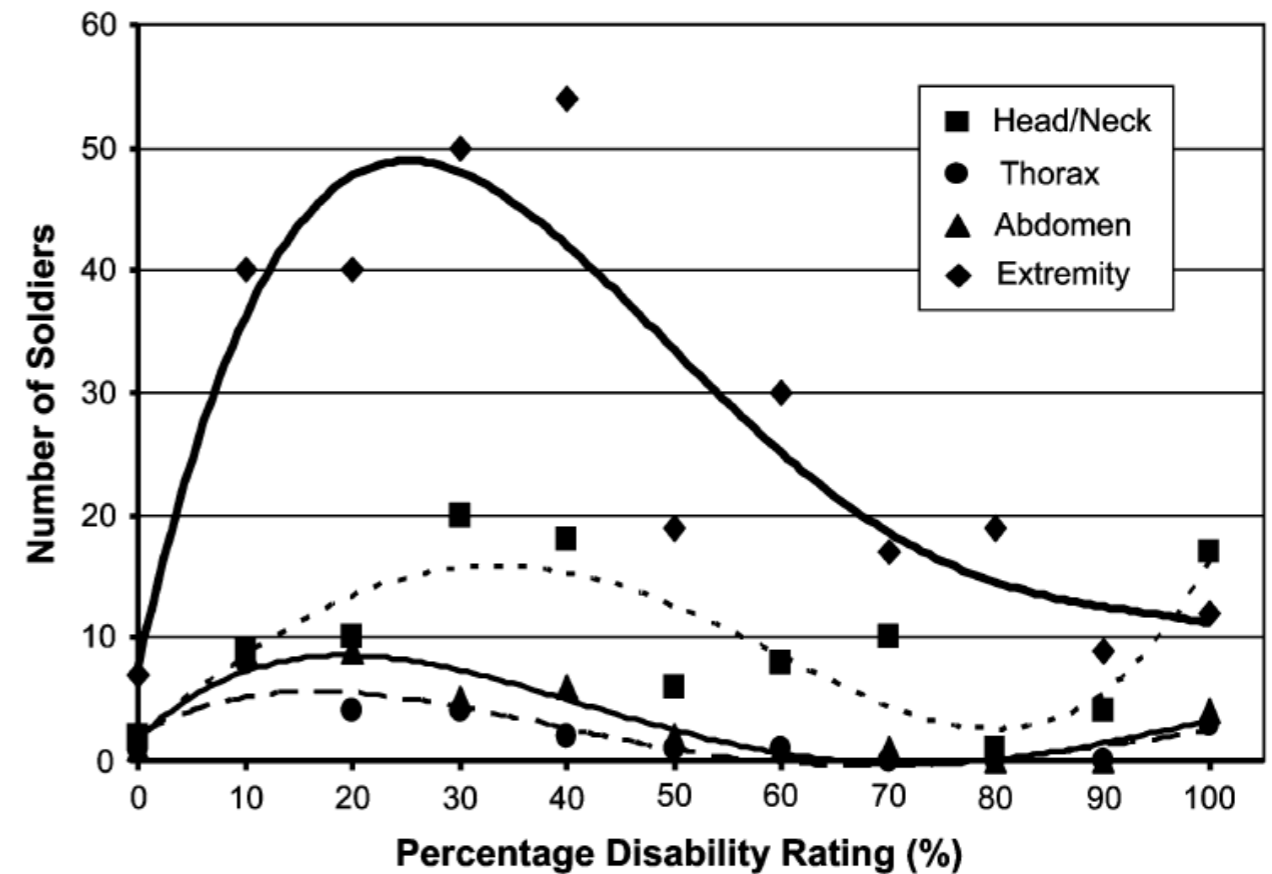
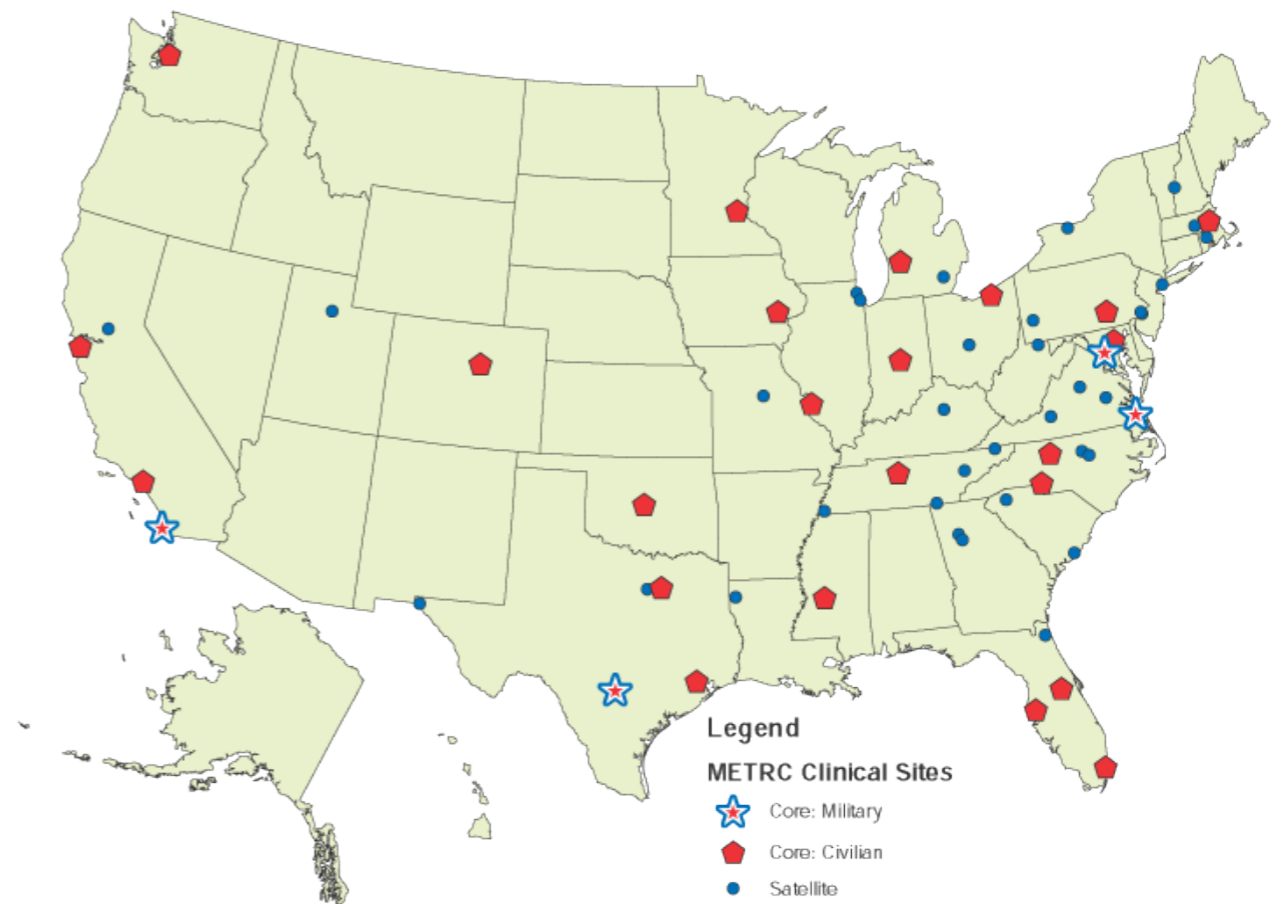


FIGURE 2. Distribution of PEB disability ratings by body region injured with trendlines.

An opportunity for research...

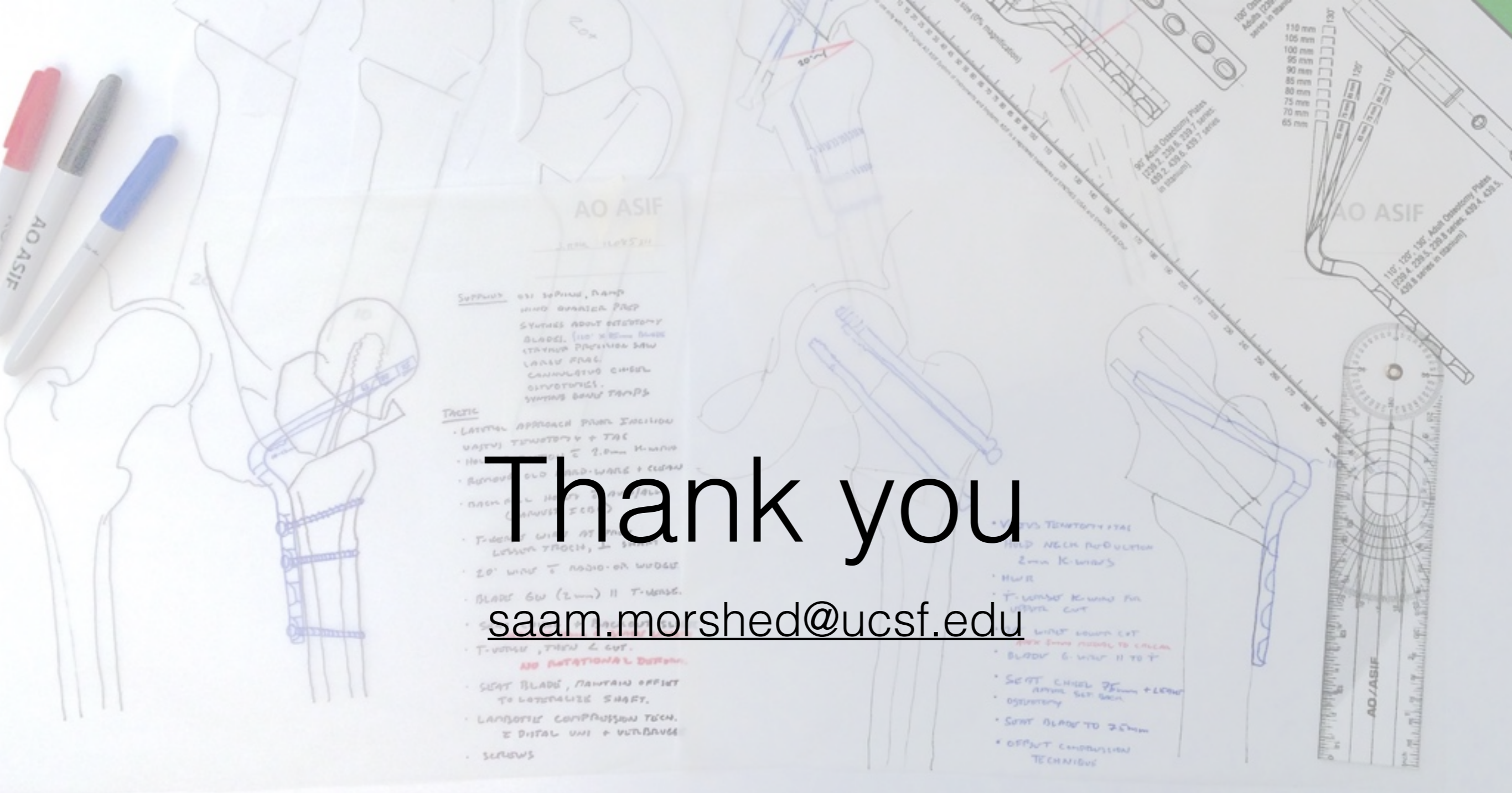


Questions from LEAP

1. What is the burden of injury beyond which patients would be better off with an amputation? (**OUTLET Study**)
2. What type of amputation technique results in improved function and performance? (**TAOS Study**)
3. How do we best measure the quality of prosthetic fit and alignment? (**ProFit Study**)
4. How can we optimize resiliency factors like self efficacy after major extremity injuries? (**TCC Study**)

Orthopaedic Trauma Research in North America

- Focused on outcomes most important to **patients**
- Strives to determine the **optimal treatment** of skeletal injuries
- Leverages communities of investigators to better understand management of both **common and uncommon problems**



AO ASIF
Distal Radius/ULNA

SUPPLIES AO ASIF blade, Ramp
and various plate
SYNTHES ADJUST EXTENSIVE
BLADE (110° x 85mm BLADE
STAYING PROXIMAL SAW
LARGE PLATE
CANNULATED CHISEL
OLYMPUS
SYNTHES BONY TENDS

TECH

- LATERAL APPROACH FROM EXTENSION
WASPS TENDON + TAC
- HULL 2mm K-WIRE
- REMOVE OLD HARDWARE + CLEAN
- DRILL ALL HULL 2mm K-WIRE
(LAVAGE 5-6)
- T-WIRE WITH AT THE
LOWER TROCH, IN SHIRT
- 20° WIRE T RADIO-OR WOODS
- BLADE 6W (2mm) II T-WIRE
- S...
• T-WIRE, THEN 2 CUT.
NO ROTATIONAL DEFOR.
- SEAT BLADE, MAINTAIN OFFSET
TO LATERALIZE SHIRT.
- LANGRISSE COMPRESSION TECH.
2 DIGITAL UNI + VERBASSE
- SCREWS

Thank you

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