



Advanced Technology Applications for Combat Casualty Care 2009



Feasibility of negative pressure wound therapy during transcontinental aeromedical evacuation of combat casualties

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Overview



■ Background

- Landstuhl Regional Medical Center
- Soft tissue wound care
- Negative pressure wound therapy

■ Research protocol

■ Results

■ Conclusions and recommendations



Landstuhl Regional Medical Center

History



- US Army hospital opens in 1953
- Medical and surgical referral center for EUCOM
- Long history of casualty care
 - 1983 Beirut US Marine barracks bombing
 - 1988 Ramstein AB air show disaster
 - 1990-91 Operations DESERT SHIELD/STORM
 - 1993 Battle of Mogadishu
 - 2000 USS Cole terrorist bombing





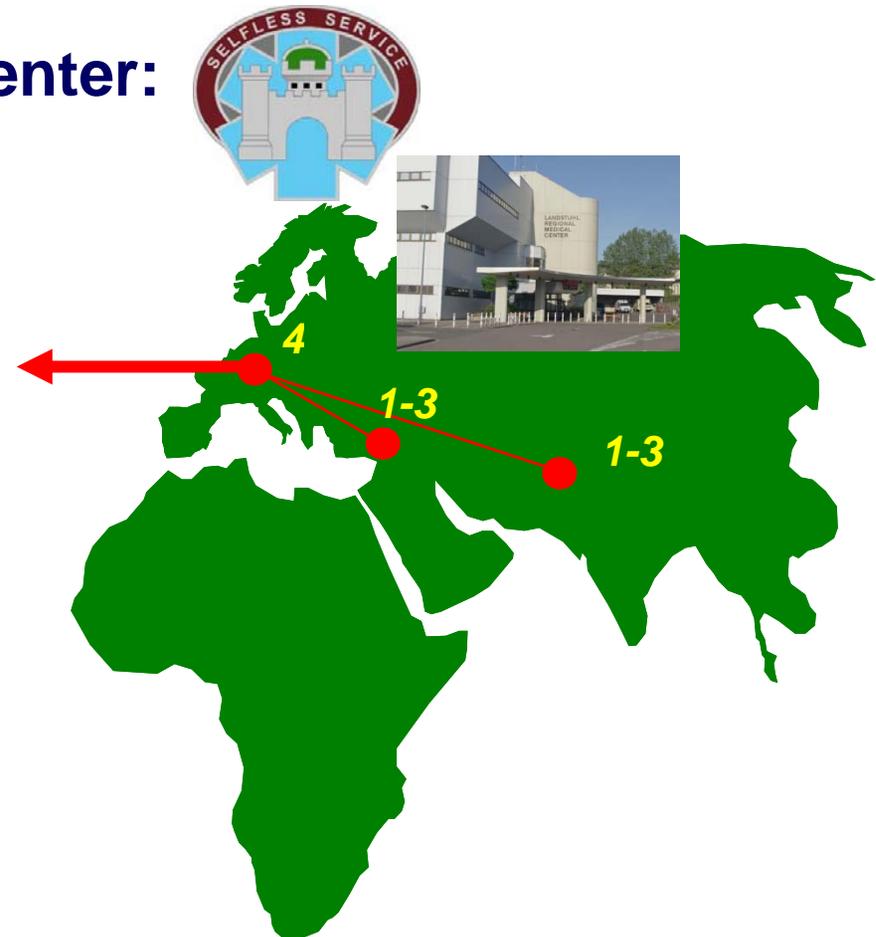
Landstuhl Regional Medical Center

Today



Landstuhl Regional Medical Center:

- US Army hospital staffed by US Army, Air Force and Navy personnel
- Echelon 4 MTF supporting US Central Command
- Referral center for US European and African Commands
- Verified Level II trauma center by the American College of Surgeons





Global Trauma Care System



Right Patient
Right Care
Right Place
Right Time



Balad



Baghdad

Tampa VA Hospital



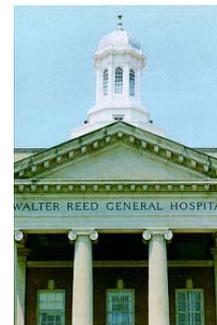
Mosul



BAMC



WRAMC



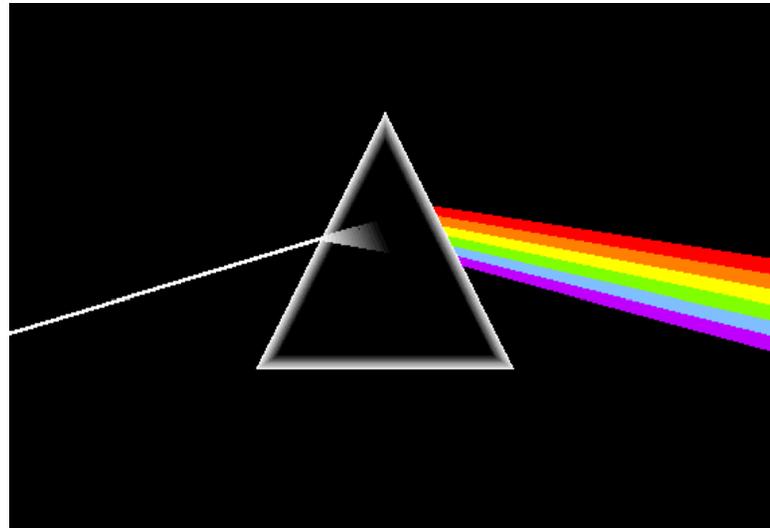
Bethesda Naval



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The Landstuhl “Prism”



Input: Chaotic, complex compilation of nationalities, diagnoses, medical records and damage control care processes from combat theaters.

Output: Stable patients following a consistent CPG-guided evaluation and with an complete and organized medical record who are evacuated to facilities throughout the world.



Traditional Wound Care

Wet-to-Dry Dressings



- Time-honored technique
- Allows wounds to dessicate
- Non-selective debridement
- Better practice -> “wet-to-moist”
- “Standard of care” during aeromedical evacuation
 - In reality, no dressing changes in flight





Traditional Wound Care

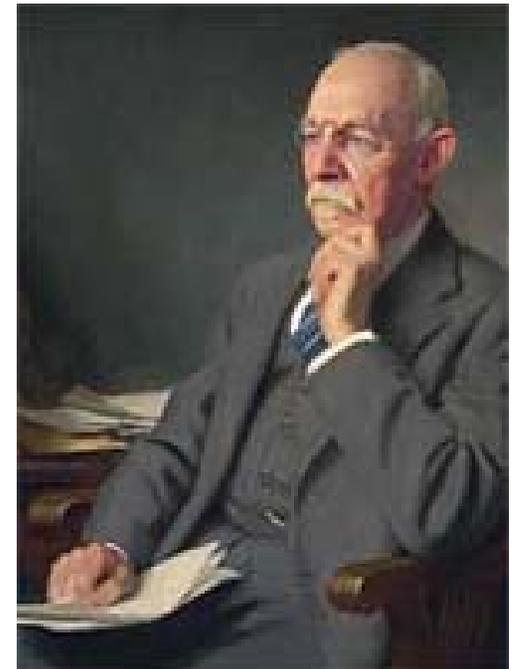
Wet-to-Dry Dressings



“Wounds of the soft parts would also be packed with gauze, which from its adhesion to the skin would cause pain, sometimes very distressing, and the first removal of the gauze was an event anticipated with apprehension by the patients, who were quite sure to be advised by their ward neighbors of its terrors.”

JAMA 1913; LX:1119-1126.

William Stewart Halsted (1852-1922)





Negative Pressure Wound Therapy

Ascribed Benefits



- Maintains moisture
- Protects wound from environment
- Augments wound granulation
- Stimulates wound contraction
- Improves control of exudates
- Decreases wound edema
- Reduces skin maceration
- Improves pain management
- Decreases nursing care requirements





Negative Pressure Wound Therapy

Contaminated War Wounds



Leinenger BE, Rasmussen TE, Smith DL, *et al.* Experience with Wound VAC and delayed primary closure of contaminated soft tissue injuries in Iraq. **J Trauma** 2006;61:1207-1211.



- Experience reported from the 332nd AFTH (echelon III facility at Balad AB, Iraq)
- Initial rapid aggressive debridement w/ pulsatile lavage followed by NPWT dressing
- Serial debridements and irrigation until wound grossly clean for delayed closure
- **RESULTS:** 77 patient w/ 88 separate wounds. No wound infections or complications



KCI V.A.C.® Freedom® System



- December 2006 awarded Joint Airworthiness Certification
- Portable weighing 3.2 pounds
- 100-240 V, 50-60 Hz AC, 1 amp power consumption
- 12 hour internal battery life



KCI V.A.C.® Freedom® System



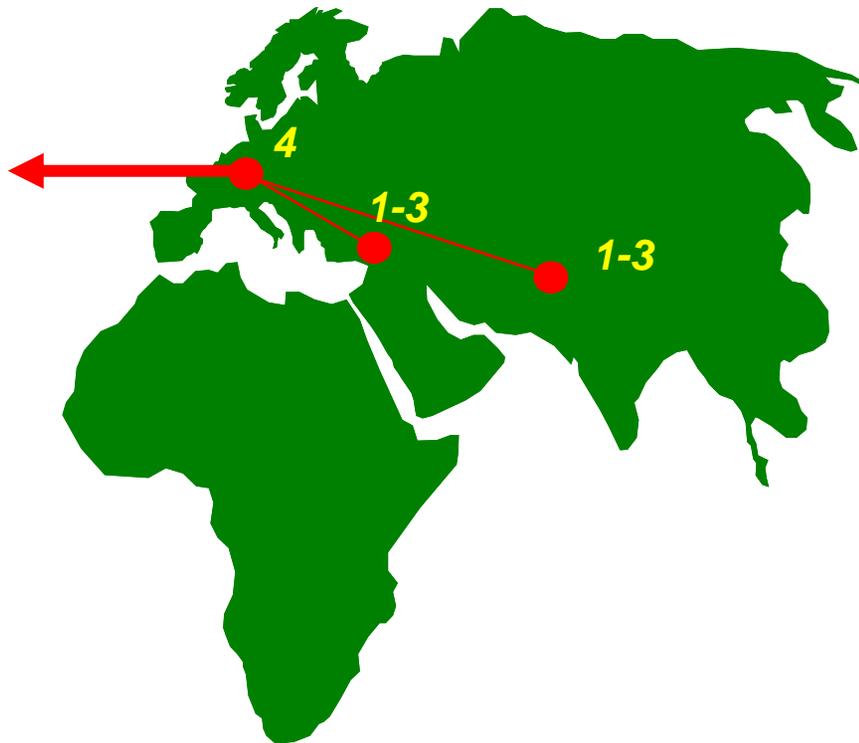
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Soft Tissue Wound Management



Due to anecdotal events and safety concerns, moratorium in effect regarding NPWT dressing use during AE from Germany to CONUS.



- NPWT available for use in theater for local national casualties.
- NPWT available for use for AE between Bagram AB and Joint Base Balad to LRMC.
- NPWT available for use during LRMC hospitalization.
- NPWT available for use for some coalition military members and contractors.
- NPWT **NOT AVAILABLE** for US military evacuating to CONUS.



Study Protocol



Feasibility of negative pressure wound therapy during transcontinental aeromedical evacuation of combat casualties

- Prospective patients identified from trauma census
- Informed consent mandatory
- Specific exclusion criteria:
 - Inappropriate wound by judgment of operating surgeon
 - Exposed arterial vessel or bone
 - Joint involvement
 - Proximity to orthopedic hardware
- Evacuated to CONUS with NPWT dressing in place
- Investigator assigned as medical attendant for flight
- Primary end-point -> arrival to destination with functional system



Study Results



- 35 patients consented, 30 patients flown
 - 2 patients with changes to destination facility
 - 3 patients with exclusion criteria discovered at surgery
- 41 separate wounds treated with NPWT
 - 29 lower extremity
 - 7 upper extremity
 - 5 torso (3 buttocks/perineum)
- 70% continuation of NPWT initiated downrange



Combat Wounds





Combat Wounds





Combat Wounds





Study Results



- All arrived to CONUS with functional systems
- Negligible impact to AE crew workload
- Subjective feedback from AE crews and patients uniformly positive
- 29/30 NPWT dressings replaced in CONUS



Conclusions



- Negative pressure wound therapy is feasible during intercontinental aeromedical evacuation without increasing wound complications or crew workload
- Recommend that NPWT be available during AE as a therapeutic option
- Patient and wound selection criteria are necessary due to logistical limitations.
- Efficacy studies are indicated to compare NPWT to other available wound care techniques.





Vielen Danke (Thank you) for your attention!



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