

Toward Active Reduction of Pressure Injury Risk, Thermoregulation Mitigation and Rapid Re-triage During Prolonged CASEVAC/MEDEVAC

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Background

Future large-scale combat operations will rely heavily on both casualty evacuation (CASEVAC) and medical evacuation (MEDEVAC) under contested conditions, with high casualty volumes, prolonged evacuation timelines.

- Casualties immobilized 10+ hours across ground, air, and maritime platforms
- Repositioning often infeasible: staff saturation, vibration, altitude, temperature, space/power constraints
- Stressors drive preventable secondary injury: pressure injuries, hypothermia, low perfusion
- Current litter/mattress systems not optimized for prolonged multi-platform movement

Methods

Multi-disciplinary team applied Design Thinking to develop a TRL-3 casualty-support prototype for prolonged CASEVAC/MEDEVAC.

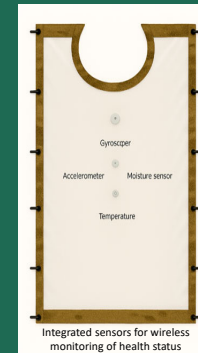
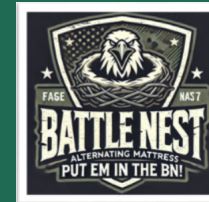
- Phase I evaluated pressure offloading, thermoregulation, condensation control, footprint/power, and provider task performance
- Phase II adds embedded sensors for passive physiological monitoring, exposure tracking, and automated data capture to support re-triage and documentation continuity

Recommendations

Battle Nest sensory equipped technology allows reporting of temperature, movement, and moisture.

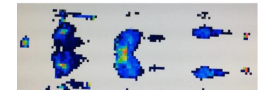
Battle Nest facilitates rapid re-triage while ensuring accurate patient documentation across platforms.

Battle Nest integrated sensors will include temperature sensors to measure within physiologically appropriate range.

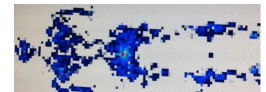


Results

- Battle Nest: reusable alternating-pressure mattress with dual pump (<2.5 kg) + single-use thermoregulating draw sheet + semi-vapor-permeable enclosure with rapid-access ports
- Testing showed improved pressure redistribution, reduced condensate, stable thermal regulation (torso +10F, lateral +9F above baseline)



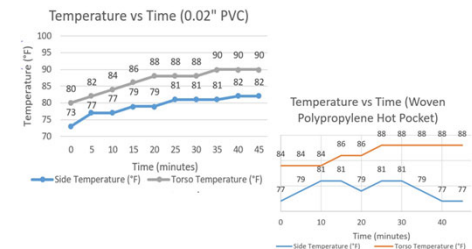
Litter



Litter and insulate mattress pad

- Embedded thermal, accelerometer, and gyroscopic sensors under development for passive characterization of heat exposure, vibration, and movement

Thermoregulation improved with stable temperatures at the torso (10F above baseline) and side (9F above baseline).



Conclusion/Impact

As rapid evacuation becomes less reliable, survivability depends on mitigating secondary injury during prolonged CASEVAC/MEDEVAC across platforms and roles of care. Battle Nest reduces pressure injury risk, improves thermoregulation, decreases task burden, and strengthens documentation continuity without additional staffing or complex power.