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EXPLORING PRESSURE AND BODY POSITIONING: A PILOT EVALUATION AMONG CRITICALLY ILL PATIENTS

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Aims

• To investigate the effect of body mass index (BMI), severity of illness, positioning, age and risk of PI development on pressure displacement and interface pressure (IP)

Participants aged >18 years sub-divided by BMI category (normal, overweight and obese)

Participants further sub-divided by health status based on sequential organ failure assessment (SOFA) score →

Patients with burn injuries (>40% total burn surface area) excluded from study
Measures

• Primary outcome measures

1. Interface pressure (IP)
   • Xsensor X3 pressure mapping system - full body sensor mat (81cm x 203cm); 1,664 capacitive pressure sensors
   • IP measured as peak pressure index (PPI) and defined as highest recorded value with a 9-10 cm² area
     • approximate contact area of a bony prominence.
Variables

All participants
• Age
• Gender
• Comorbidities
• Body mass index

Critically ill patients only
• Diagnosis
• ICU length of stay
• Acuity
  • Sequential organ failure assessment (SOFA) score
• Braden scale score
  • Risk assessment for pressure injury development
Results - Participant characteristics

- Mean participant age 50 years (SD 18.3) years
- 58% male
- Healthy adults all non-smokers; no comorbidities
  - Healthy adults about 20 years younger than ICU patients
  - Age confounded with patient type
  - Need to control for age in models assessing effect of acuity
- Median Braden scale score 13 (IQR: 11-23) for ICU patients
- Median length of ICU stay 14.5 (IQR: 8.0-20.5) days
Results: Variation in PPI with SOFA and BMI

- PPI values vary between patient types.
  - Lower values in healthy adults and low acuity patients.
  - Higher values recorded at greater trochanter than at sacrum.

- PPI values vary between patients with different BMI levels.
  - Higher values recorded at greater trochanter than at sacrum.
Summary of analysis of PPI data

- Participant type substantively related to PPI at sacrum and greater trochanter assessed jointly ($p=0.093$)
- PPI values for high acuity patients 13.1 mmHg higher (95% CI -17.1 to 43.1 mmHg) at sacrum and 32.5 mmHg higher (95% CI -5.03 to 70.0 mmHg) at greater trochanter than for healthy adults
- PPI values for low acuity patients 2.67 mmHg higher (95% CI -17.5 to 22.9 mmHg) at sacrum and 2.90 mmHg higher (95% CI -22.3 to 28.1 mmHg) at greater trochanter than for healthy adults
- Model controlled for age; statistically significant ($p=0.008$)
  - Moderate to large effect (partial-$\eta^2=0.351$)
- No evidence of association between PPI and either BMI or patient type; or either Braden or SOFA scores (ICU patients only)
Conclusion and recommendations

• Peak pressure index is an under-reported phenomenon in the critically ill patient population and literature

• This pilot analysis has determined several associations of importance
  • Substantive differences in outcomes observed between low- and high-acuity ICU patients; and between ICU patients and healthy volunteers.
  • Variation in IPs for sacral and greater trochanter areas depend on BMI categories and level of participants’ health status

• Further work is recommended on a larger scale in the critically ill patient population using ‘real time’ periods of load to provide indication of optimum repositioning time for these vulnerable patients
References


- Bergstrand S. Preventing pressure ulcers by assessment of the microcirculation in tissue exposed to pressure. 2014. *Linkoping University Medical Dissertations No. 1407.*


thank you!