

# Acute care mattresses: Understanding the potential impact of a new lying surface for emergency care?

Ambreen Chohan<sup>1</sup>, Deborah Harrison<sup>2</sup>, Yik Nok Bryan Lee<sup>1</sup>, Jo-Anne Webb<sup>3</sup>

<sup>1</sup>Allied Health Research Unit, University of Central Lancashire, Preston, UK

<sup>2</sup>A1 Risk Solutions, Stalybridge, Greater Manchester, UK

<sup>3</sup>Adapt and Live, Disabled Living, Manchester, UK

Email: [AChohan@uclan.ac.uk](mailto:AChohan@uclan.ac.uk)

## Summary

Pressure injuries are a preventable, yet rising problem in emergency care settings, as the dependence on ambulance trolleys and short-term beds has risen alongside waiting times. This within-subject comparative study is the first to explore the effect of an alternative acute care shallow depth mattress on interface pressure and subjective comfort. Results showed the new low-tech mattress solution offers significantly improved pressure redistribution and immersion whilst also improving comfort. Consideration of alternative mattress solutions for acute care/ emergency settings has the potential to improve patient care and reduce pressure injury risk.

## Introduction

A pressure injury (PI) is defined as localised damage to skin and or underlying tissue, due to pressure itself or in combination with shear over bony prominences and can often be associated with a medical device or object [1]. In the United Kingdom, the wait from decision to admit at an Emergency department, to admission has significantly increased over the last 10 years. Whilst 19,001 to 158,721 people wait over 4 hours, approximately 54,308 individuals wait more than 12 hours [2,3]. Recent studies have identified that PI's can develop within a few hours of entering an emergency department [4]. The hard narrow surface of the ambulance trollies predisposes a risk of the development of PI. This project aimed to assess the pressure redistribution and comfort properties of a new low-tech clinical acute care mattress compared to an existing standard foam solution.

## Methods

Healthy participants (n=20, aged 30.2±10.8 years, BMI: 25.5±2.54kg/m<sup>2</sup>) volunteered for this study. A single session lab-based experimental study explored patient-surface interface pressures and subjective comfort. Quantitative measures for surface area, peak and mean interface pressure and peak pressure index (PPI) at the head, shoulders, sacrum and heels using an advanced Xsensor pressure mapping system (Sumed, UK). Interventions lasted 21 minutes to allow a 6-minute settling time. There were two acute care mattress conditions: (1)Standard 75mm foam; (2) a new formulation polyurethane (PU) foam 75mm foam.

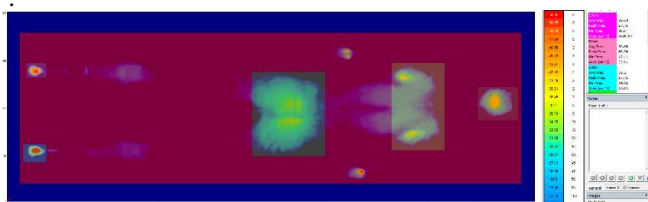


Figure 2. Example pressure map profile of a mattress.

## Results and Discussion

Average contact surface area significantly increased by 33.4% with the New PU foam compared to the standard foam mattress (Table 1) improving patient immersion. The new PU mattress demonstrated better pressure redistribution by significantly (p<.001) lowered average (12.5%) and peak pressure (47.3%) compared to the standard foam mattress. PPI significantly reduced (p<0.001) at all areas (head, shoulders, sacrum, heels) compared to the standard foam mattress, whilst significantly improving comfort (p<0.001).

Table 1: Mean (σ) data for all body interface outcomes.

|   | CONDITIONS                       |                     | % DIFFERENCE<br>NEW PU VS<br>STANDARD<br>FOAM |
|---|----------------------------------|---------------------|---|
|   | New PU Foam                      | Standard Foam       |   |
| Full Body Peak Pressure (mmHg)                  | 80.37 (40.46) <sup>A</sup>       | 152.40 (59.95)      | 47.26%↓                                       |
| Head PPI (mmHg)                                 | 33.89 (2.85) <sup>A</sup>        | 40.81 (4.33)        | 16.9%↓  |
| Sacrum PPI (mmHg)                               | 33.83 (4.09) <sup>A</sup>        | 38.10 (2.65)        | 11.2%↓  |
| Shoulders PPI (mmHg)                            | 28.93 (4.25) <sup>A</sup>        | 36.23 (3.49)        | 20.15%↓                                       |
| Right heel PPI (mmHg)                           | 41.22 (17.95) <sup>A</sup>       | 58.96 (23.12)       | 30.1%↓  |
| Left heel PPI (mmHg)                            | 51.25 (25.53) <sup>A</sup>       | 87.84 (52.57)       | 46.7%↓  |
| Full Body Average Pressure (mmHg)               | 19.92 (1.33) <sup>A</sup>        | 22.77 (3.32)        | 12.5%↓  |
| Total Full Body Contact Area (cm <sup>2</sup> ) | 2802.74<br>(525.38) <sup>A</sup> | 2100.65<br>(475.60) | 33.4%↑  |
| Comfort score<br>(0-10)                         | 7.8 (1.15) <sup>A</sup>          | 6.65 (1.63)         | 17.3%↑  |
| Overall Participant Preference                  | 17 (85%) <sup>B</sup>            | 3 (15%)             | 82.4% MORE                                    |

## Conclusions

The implementation of new low tech PU foam mattresses has the potential to significantly reduce pressure injuries in acute care settings. Whilst not a replacement solution for patient centred care or reducing waiting times, the clinical impact of lying surfaces in emergency care settings warrants further research.

## Acknowledgments

All mattresses were provided by WSR Medical Solutions for this study. The authors thank C. Danes-Daetz and P. Stainton for assistance with data collection.

## References

- [1] EPUAP & NPUAP.(2009) *Quick ref. guide*. Wash. DC.
- [2] NHS Digital (2024) [A&E Attendances and Emergency Admissions](#)
- [3] NHS Digital Statistics (2024) [england.nhs.uk](https://www.england.nhs.uk)
- [4] NICE. (2014). CG179
- [5] London.M. et al. (2011) *Ann Emerg Med*, 58(5): 479-481