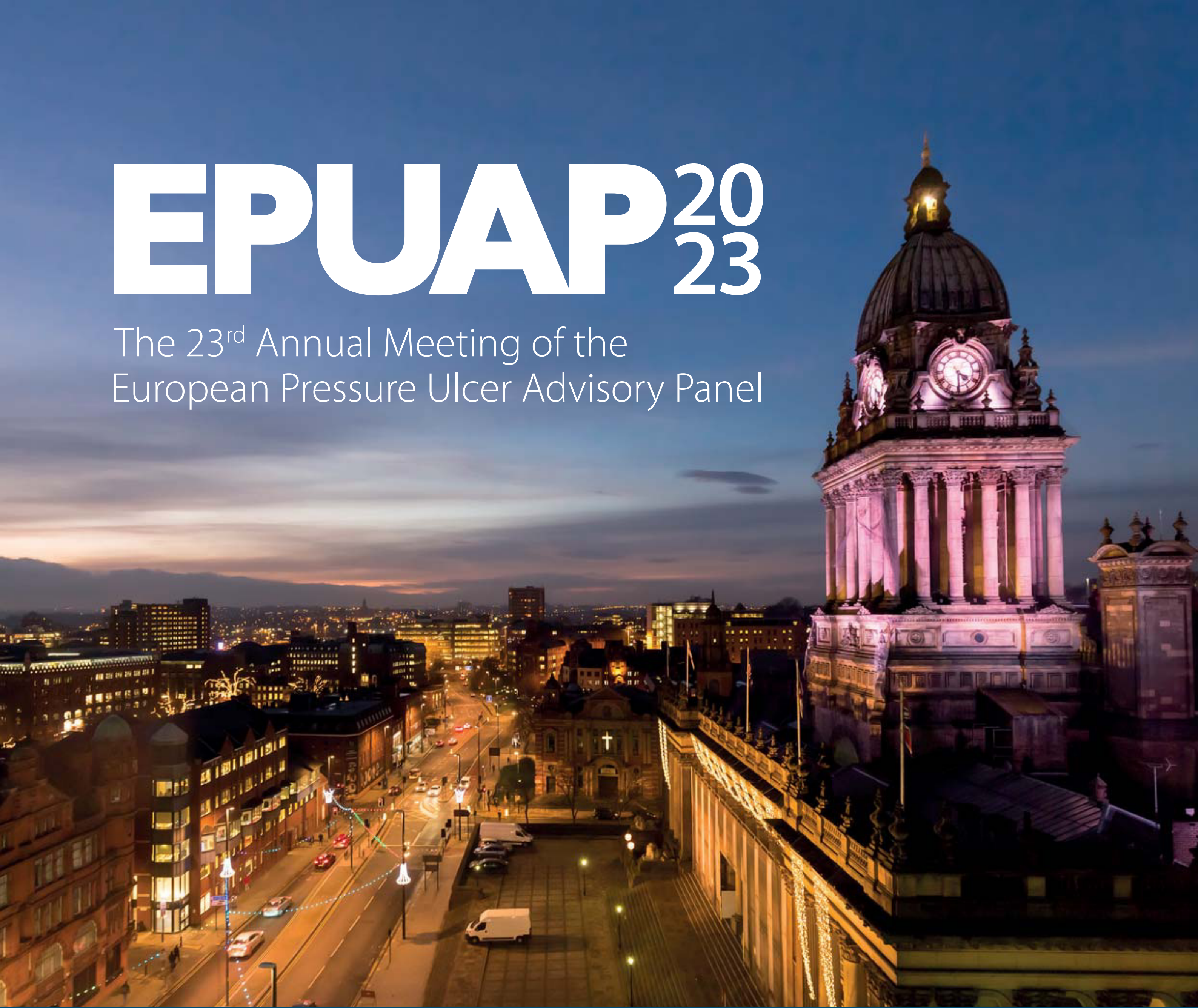

EPUAP 2023

The 23rd Annual Meeting of the European Pressure Ulcer Advisory Panel

ABSTRACT BOOK

INNOVATIONS IN PRESSURE ULCER PREVENTION AND TREATMENT

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INFLUENCE OF THERMAL PROPERTIES OF DRESSINGS USED FOR PREVENTING MEDICAL DEVICE-RELATED PRESSURE ULCERS: THE CASE OF A CONTINUOUS POSITIVE AIRWAY PRESSURE MASK

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Introduction: Prolonged use of continuous positive airway pressure (CPAP) masks imposes a risk to the health and integrity of facial soft tissues as these tissues are simultaneously subjected to sustained mechanical and thermal loads caused by the CPAP materials facilitating the air-tight seal necessary for oxygen delivery [1]. The risk of developing CPAP-related pressure ulcers/injuries (CPAPrPUs) can be reduced through suitable cushioning/dressing materials placed at the skin-mask interface. The specific effects of the properties of such commonly used materials on the skin temperature at the interfaces between a CPAP device and the facial skin is currently unknown, however, thermal conductivity matching, resulting in a healthy release of heat from the skin, is a design target or a selection criterion for cushioning/dressing materials to prevent CPAPrPUs [2].

Methods: We developed a new computational model to determine thermal matching of cushioning/dressing materials applied for preventing CPAPrPUs. The model considers the contact of the CPAP mask with the skin tissue in a simplified geometry and is used to calculated steady-state facial skin temperatures, accounting for metabolic heat generation, natural air convection and forced convection within the CPAP mask space due to breathing. The steepness of the temperature gradient under the applied cushioning/dressing material is used to compare the thermal matching of material alternatives and normalize data with respect to the no-dressing case.

Results: The modeling successfully demonstrates the temperature distribution of facial skin under a selected applied cushioning/dressing material and the gradient of skin temperatures between the skin contained in the inner CPAP space and skin outside that region, including the influence of the thermal conductivity of the applied cushioning/dressing material on the above transition (Figure 1).

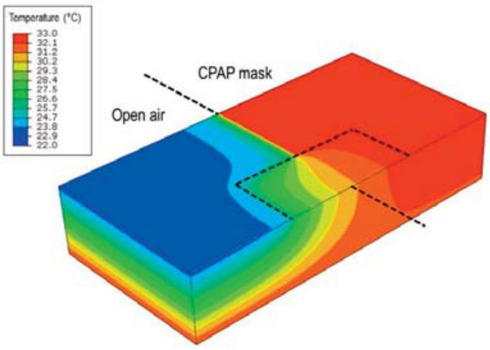

Figure 1: Simplified geometry for the study of the skin temperature (⁰C) at the interface areas under the CPAP mask space and outside the mask space, under an applied cushioning/dressing material (outline shown in dashed lines).

Conclusions: We report in this study a first-of-its kind computational model for investigating thermal matching of cushioning/dressing materials with facial skin, which can be used for quantitative evaluations and comparisons (ratings) of thermal maatching performance in a CPAPrPUs context.

References:

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