Posture, mobility and pressure signatures of community dwelling individuals with pressure ulcers: stratifying exposure to support personalised care

Introduction: Individuals living in the community can spend prolonged periods of time in bed or chair, particularly those with mobility impairments.[1] This can result in local tissue damage in the form of pressure ulcers (PUs). It has been demonstrated that pressure monitoring can be used to assess posture and mobility in vulnerable individuals.[2] However, there is a need to combine posture and mobility data with interface pressure parameters to fully explore the exposure to harmful loads. Therefore, the aim of the present study was to evaluate posture, mobility, and pressure profiles in a cohort of community residents who had PUs.

Method: This study represents a secondary analysis of the quality improvement project, 'Pressure Reduction through COntinuous Monitoring In the community SEtting (PROMISE)'.[3] Pressure data were collected with a commercial continuous pressure monitoring system (ForesitePT, Xsensor, Canada) for between five hours and four days. These data were analysed with an intelligent algorithm involving machine learning[2,4] to determine posture and mobility events. Duration and magnitude of pressure signatures, e.g., peak pressure gradient, of each static posture were estimated. Injury thresholds were identified based on a sigmoid relationship between pressure and time exposure,[5] calculated to determine 'low', 'moderate', 'high', and 'very high' categories.

Results: In total, 22 patients were selected from 105 recruited community residents. Patients had a wide range of ages (30–95 years), body mass index (17.5–47kg/m^2) and a series of comorbidities, which may have influenced the susceptibility to skin damage. Posture, mobility and pressure data revealed a high degree of inter-subject variability. Largest duration of static postures ranged between 1.7–19.8 hours, with 18 patients spending at least 60% of their monitoring period in static postures which lasted >2 hours. Data revealed that some patients spent most of their time (>50%) in the 'low' category. On closer inspection, their respective data revealed a high number of postural changes with static postures sustained for short periods (<3 hours). By contrast, there were patients whose combined mobility and pressure signatures fell either in the 'very high' exposure category for 60–80% of their time. Other patients revealed extended periods in the 'moderate' category, whereby prolonged static postures (>10 hours) were associated with mean peak pressure gradient values of approximately 20mmHg/cm.

Conclusion: This represents the first study to combine, through intelligent algorithms, posture, mobility and pressure data from a commercial pressure monitoring technology. The community residents included in this analysis had acquired a PU at the time of monitoring and many exhibited trends which exposed their skin and subdermal tissues to prolonged pressures during static postures. These indicators will undergo further refinement and validation prior to prospective clinical trials.

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