

Innovative textiles in pressure ulcer prevention

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Introduction

Often overlooked aspects of disability are the possible harm and potential benefit of the fabrics that interface with people and their environment. Common types of clothing and support surfaces cannot meet the special needs of those with unique health conditions and body habitus. Bedridden people and wheelchair users are among those suffering from pressure ulcers (PU) – a huge and costly health care problem. Overlapping fabric, thick seams, and accessories in common clothes create high pressure points on body tissues especially over areas of bony protuberances. Pressure reduces tissue oxygenation and perfusion, causing discomfort and PU.

Weadapt projects, *FashionMe* and *Sense4me*, have developed functional clothing and support surfaces adjusted to minimize the pressure concentrators that promote tissue injury and skin ulcers while maintaining comfort and aesthetic appeal.

Methods

The *Weadapt* program works with investigators from the *University of Minho* and more recently with an integrated international team of researchers from *MIT* and *University of Texas*. Studies are based on in-depth anatomic and ergonomic investigations that bring together doctors, nurses, physiotherapists, occupational therapists, patients and their relatives and care providers.

Clothing and devices produced are tested in their intended-use environment in hospitals, rehabilitation centers and disability associations and in the laboratory. Comfort and function are evaluated using first hand feedback and a model system that incorporates a thermal mannequin, a motion capture system, infrared video camera, physical and chemical experiments and use of different types of sensors (pressure, temperature and humidity).

A multidisciplinary research program includes: innovative pattern design that considers users anatomic position (seated or laying down) and anthropometric data; clothing design to incorporate specific special needs like the ease of insertion of a catheter or housing of a fluid collection bag and ease of interaction between doctor/nurse and patient; Materials selection, materials structure and application of special finishing's to address needs of sensitive skin and reduce the impact of critical factor in PU development, like temperature and humidity.

Results



Fig. 1: Patented design of the *Weadapt's* Functional trouser for urine bag users.

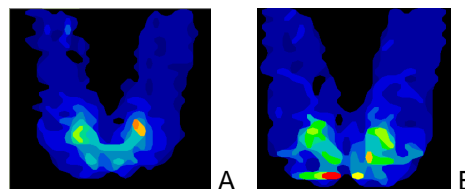


Fig. 2: Comparison between *Weadapt's* jeans (A) pressure points and standard jeans (B) in the same user.

Weadapt's trousers contribute to the prevention of PU with the ergonomic design, use of flat seams in joining panels, removal of pockets on the back (but still topstitched as in standard jeans for able-bodied people), removal of excess of fabric in critical areas like in the back of the knee (reducing temperature in this critical area for PU development), special tracks for tubes along the leg (avoiding obstruction and positioning below the leg).

Clinical relevance

PUs are an enormous and significant source of morbidity and mortality. The costs of treating PU are massive, from direct needs for medical procedures and health staff intervention – and indirectly, as PU prolong hospital stays and prevent patients from carrying on normal lives. *Weadapt* programs offer the potential for novel fabrics and garments that remove the stimuli for PUs, reducing their impact and increasing the ability to treat once formed. Extensions of the *Weadapt* paradigm offer great promise for extending the options for the disabled – no longer sacrificing comfort, aesthetics or dignity for safety.

Acknowledgements

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References

[1] Carvalho, M.A.F. *et al.*, Inclusive Clothing Design - Proposal for Product Development for Mobility Impairment. Proceedings of the 25th International Conference on Disabilities - Pacific Rim 2009.