Pressure Ulcer Management—Getting Smarter

The emerging use of technology in pressure ulcer prevention and intervention

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INTRODUCTION — The Pressure Problem

The aetiology and prevention of pressure ulcers are well understood amongst nursing professionals and those that work in the field of seating and posture. Despite this, and a strong evidence base for prevention 1,2, thousands of people develop pressure ulcers every year in the UK; whether in or out of hospital; whether elderly in care home or young and active wheelchair user. Pressure ulcers are commonly referred to as preventable, yet they cost the NHS in excess of £2 billion per year 3,4.

SUMMARY

This poster presents current directions in the field of pressure ulcer prevention and intervention, particularly focusing on the use of technology to increase availability and affordability of tools key in reducing the impact of pressure ulcers; on healthcare systems and the lives of those at risk.

TECHNOLOGIES

A. Smart support surfaces

Sensor-integrated support surfaces - Thin and flexible sensing technology is allowing manufacturers to consider ‘smart cushions’ (or other surfaces) with integrated sensors. Coupled with the cheaper, more accessible ability to send/receive data to auxiliary storage devices, and to power such sensors, the technology is there to empower the patient to feel by proxy; a form of alternative or augmentative sensation.

Clinical Benefits — Provide early warning when pressure and/or time increase beyond set thresholds. Can be used as an active, sensor-led movement reminder to redistribute weight or relieve pressure completely. Integration with smart phones would be powerful to log and view loading/pressure/history.

Air cushion pressure monitoring - 270 air-cell-based cushions are issued per year to highly vulnerable patients by the wheelchair service in South Wales (local audit). These high-end cushions are prone to faults in set-up and in air leakage which can result in them becoming ineffective or unsafe. Current set-up involves a hand check, is subjective and void of measurement 5.

PUPIS - patients on these cushions have seen great benefit but report they feel vulnerable without knowing it is set up optimally.

Clinical Benefits — User confidence; Less incorrectly set-up or faulty equipment in use; Reduce home visits/reliance on professionals.

B. Flexible pressure sensing mats/ covers

Development in flexible sensing materials is allowing for more representative mapping of interface pressure. As cost reduces, systems may become more available for day-to-day use by patients, perhaps integrated with cushion covers or sheets.

C. Movement monitors/Reminders

The time for which tissue is loaded is just as important as the pressure experienced. Monitoring/reminding tools may be powerful in limiting the length of time a person spends in one position by promoting mobility and/or repositioning 6. These tools help people who are reliant on others to reposition, who have a tendency to forget to move, or have limited available, low risk recording.

Clinical Benefits — User confidence; Less incorrectly set-up or faulty equipment in use; Reduce home visits/reliance on professionals.

D. Mobile technology — Education, Engagement, Empowerment

Mobile technology is set to meet the challenge of increasing awareness in at-risk individuals as well as empowering them, their family and support staff through tailored, practical education 7. Streamlined logging and sharing of data might further allow personal risk recording of wound progression and related activity/events. The widespread accessibility of powerful mobile devices limits barriers in reaching a wide range of individuals with smart, interactive education.

E. Wound imaging

Three-dimensional image capture has become popular in many different formats for different applications 8. As this technology becomes more widely available, the consistency and reliability of tracking wound status might be greatly improved 9.

F. Remote consultation through ‘Tele-Rehab’ brings opportunities to increase efficiency and accessibility of specialist services 10. Its use is likely to be particularly key in pressure ulcer prevention as we meet the increasing demand of our growing and aging population.

References:

11) Levy A, Kopplin K, Sagen A. A mobile hand-held cushion for pressure ulcer protection remarkably reduces tissue stresses in the seated buttocks with respect to foam: finite element studies. Journal of tissue viability. 2014

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Pressure Ulcer Prevention and Intervention Service (PUPIS)

PUPIS is an award-winning, collaborative team which sees in excess of 250 complex pressure ulcer patients per year. Consisting of nurse specialists, rehabilitation engineers and clinical scientists it adopts a truly multidisciplinary and holistic approach to ulcer management.

EXAMPLES

ROHO Smart Check (A) — Indicates when cushions internal pressure is within a set range (defined for size of cushion, calculated on generic algorithm considering expected body weight and anatomy). Individual set-up option — Clinician can set patient-specific minimum pressure (which then defines a smaller range)

PUPIS — local reliability and usability evaluation

Similar systems:

EPUAP Woundcare (B) — 1-6 scale of pressure; Advises to set to number corresponding to height and weight

WINNicare Kinetic — Analogue Manometer; Advises best pressure level (30-57 mmHg) based on height and weight

SensiMat (A,C) — www.sensimatiteamsystems.com

Cushion integrated sensors track pressure

Blindtark (F,A, P) — Flexible pressure measurement system.

Bluetooth interface to mobile devices

Alarm for repositioning

Adjustable tolerance

Movement monitor (Compliant Concepts) (C) — Record/replay mobility

ForeSite Patient Turn System (xSensor, B,C) — Interactive education guides

Movement reminders

Wound/ risk monitoring

ForeSite Patient Turn System (Phone/ tablet app) (A,C) — Filp on/ off, smart use of technology to improve access to specialist services for multiple sclerosis patients and/or their carers.

GFC Woundcare app (E,F) — www.gfc.com/wound-care

3D Intel® RealSense™ camera - Simple, accurate, repeatable

Remote support to community staff

GFC Woundcare (E,F) — technical, clinical and usability evaluation; assisting development led by GPC solutions.

Eykona (E) — www.futur-3d.com

Stand-alone device for measurement of wound parameters (wound length, width, depth, area, volume, colour)

PUPIS — evaluation study testing the accuracy of parameters and tested for feasibility of use within the service.