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Sensor technology: a smart way to manage continence

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Abstract
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Urinary incontinence is one of the most emotionally challenging issues facing people with dementia, and supporting continence is a major concern of both professional and family carers. Paul Fish and Victoria Traynor show how technology is able to assist with continence management.

The implementation of innovative wireless telemonitoring systems has the potential to significantly change urinary continence (UC) management for individuals living with dementia in residential accommodation. Effective UC plans lead to better quality of life for older people and care staff and improvements in the economic costs of delivering effective care.

The aim of this article is to demonstrate how the use of sensor technology can promote effective urinary continence care for individuals living with dementia in residential accommodation.

We know that individuals living with dementia in residential aged care facilities (RACFs) are at risk of experiencing continence problems and very often require support to maintain their UC. Care staff working in residential accommodation spend much of their time on UC care (O’Connell, Ostaszkiwicz & Hawkins 2011).

It follows that organisations providing aged care are continually seeking more efficient and effective ways to undertake UC assessments which save time, are more accurate, increase dignity for the people involved, and which inform person-centred UC care plans.

A small group of studies have demonstrated the benefits of using technology to undertake UC care (Ostaszkiwicz, Chestney & Roe 2010; Lancerini et al 2011; Koutsoyanonis, Lithari & Hatzilygeroudis 2012; Yu et al 2012a, b) and as the technology continues to develop we can assume its use will increase over time.

This article provides a contemporary review of effective UC care for individuals living in residential accommodation using innovative sensor technology which will soon become commonplace in aged care organisations.

The facts

The financial costs of urinary incontinence (UI) for aged care services is considerable (Deloitte Access Economics 2011). It is estimated that UI care accounts for 60 per cent of all residential accommodation nursing care time (Bremner 2004) and the cost of caring for individuals who experience UI in residential accommodation in Australia is about $1.3 billion per annum (Australian Institute of Health and Welfare (AIHW) 2006). Over two-thirds of older people living in residential accommodation need assistance to use the toilet and half of them experience UI (Pearson 2003).

Continence problems become more common in later life because the co-morbidities that some older people experience increase their risk of experiencing continence problems. Nervous system disorders, such as dementia or Parkinson’s disease, affect the muscles which control urine flow and increases the risk of an individual experiencing urge incontinence (Thompson 2006).

The presence of dementia and continence problems are predictors of older people re-locating into residential accommodation and are the first and second most common reasons identified why individuals leave a community home (Pearson 2003; AIHW 2006). A review of 169,900 client records from Aged Care Assessment Teams (ACATs) and RACFs in Australia found that 87 per cent of registered nurses recorded UI as a ‘significant’ or ‘very significant’ reason for relocation into a RACF.

We also know that continence problems cause a range of associated physical health problems, for example, physical pain, propensity to fall, agitation, skin breakdowns and infections. Ineffective continence care has a negative impact on the quality of life of residents (Wagner et al 1996; International Consultation on Incontinence Questionnaire Project 2012) and can lead to poor emotional and mental health. UI can lead to a loss of independence, isolation and embarrassment, resulting in low self-esteem, loneliness and feelings of depression.

Effective management of UI is therefore important to promote the health and well-being of individuals and reduce the costs associated with continence care by aged care services.

Current practices in assessment and management

In Australia, one of the aged care statutory standards includes the requirement that all older people who relocate into residential accommodation are provided with a 72-hour UC assessment to inform their UC care plan (Aged Care Accreditation Standards 1997).

Similar to all population groups, a range of problems can cause UI for individuals living with dementia and one of the most common causes is known as functional UI. Functional UI is caused by the inability of an individual to move sufficiently quickly to void into a toilet, adequately remove clothing to prevent an episode of UI, recognise a toilet or remember the location of a toilet (O’Connell, Ostaszkiwicz & Hawkins 2011).

Currently, the majority of UI assessments in residential accommodation are completed manually by care staff. The care staff record specific information (times of episodes of UI, toileting times, successful or unsuccessful voids into a toilet,
continence aid changes and checks for voiding into a continence aid, fluid intake and presentation of the individual during the day) that requires the care staff member to manually check for voiding into the continence aid. The more frequently the care staff check, the more accurate the information collected will be.

The information generated from the assessment identifies the care needs of individuals and the assessment information is used to develop a person-centred UC care plan.

The current practice of manual UI assessments is intrusive, unreliable, labour-intensive and generally unpleasant for the individuals and the care staff. Failure to detect accurate voiding patterns results in an impersonal and undignified practice of simultaneously taking groups of older people to the toilet at the same predetermined times each day (Yu et al 2012c; Martin et al 2006).

**The way forward: technological innovation**

Innovative technology is a way forward to generate valid data to accurately assess the natural bladder voiding pattern of individuals, inform care plans and deliver individualised UC care. The UC care plans developed from digital assessments might include a toileting assistance program that optimises care staff workflow and achieves effective toileting and appropriate continence aid selection for individuals. A small range of studies have shown the benefits of technology in providing more effective UC assessment and management (Ostaszkiewicz, Chestney & Roe 2010; Lancia et al 2011; Koutsojannis, Lithari & Hatzilygeroudis 2012; Yu et al 2012a, b). Nikoletti, Young and King (2004) evaluated voiding patterns in 41 older people living in residential accommodation using an electronic monitoring device. The monitoring device consisted of a small, moisture sensitive plate (sensor) placed inside an absorbent disposable pad. The sensor communicated to a portable monitoring device carried by the care staff that sent alerts advising them when the older person is incontinent. Monitoring the time of voiding over a period of days allowed care staff to identify individual voiding patterns with precision.

Care staff were taught to use the knowledge generated from UC assessments to identify the optimum times to optimum times to help the older person to use the toilet. During a three-month intervention, the participants experienced improved UC care. The frequency of episodes of UI was significantly decreased for 86 per cent of participants and one-third of the participants’ urinary voids in the pads were reduced by more than 25 per cent.

There were two broad categories of patients identified who would benefit from the study: older people who cannot communicate their toileting needs or are substantially dependent on assistance; and older people with impaired cognitive function who are reasonably compliant with toileting.

The toileting schedules generated from the systems assisted care staff in effectively managing the residents’ incontinence and providing a better quality of life.

**Wireless system**

In Singapore, Wai et al (2008) developed a smart wireless continence management system for residential accommodation and hospitals. The aim of the study was to alert care staff to perform pad changes within a timely automated manner to reduce pad dermatitis/rash that can lead to potential skin issues.

The system used ‘smart’ continence aids to discreetly monitor and alert care staff that an episode of UI had occurred by transmitting information via wireless technology to an intelligent central management system. This information assisted care staff to know when to change the pad or assist a person to the toilet irrespective of their ability to communicate the need.

Ang et al (2008) trialled a wireless intelligent UC management system for the University Malaya Medical Centre (UMMC). It used ‘smart’ continence aids to discreetly monitor and estimate the number of voiding events, detect other relevant clinical conditions and alert care staff that an episode of UI had occurred by transmitting information via wireless technology to an intelligent central management system.

The Wireless Intelligent Incontinence Management System consists of three components: an incontinence detection system and smart diaper, mesh wireless sensor network and intelligent central management software.

The aim of this system was to provide accurate bladder diaries to improve habit training as a toileting assistance program. Habit training matches the toileting times with the person’s voiding pattern. This improves successful toileting by providing care staff with an accurate toileting schedule to assist them to know when to help people with dementia to use the toilet.

Yu et al (2012a, b) evaluated a new wireless telemonitoring system called SIM (Smart Incontinence Management) to inform care planning for UC for older
people living in residential accommodation. The telemonitoring system comprised an electronic sensor, which is inserted into a specially designed disposable continence aid worn by the resident, and a computer software package which manages information and signals alerts (see diagram opposite). The telemonitoring system provides care staff with an alert when an older person wearing the device passes urine and transmits and electronically records urinary output.

**Individualised care plan**

The Yu* et al* study looked at 32 older people living with dementia in a residential facility in Melbourne. Baseline data of the current continence practice was recorded using the electronic telemonitoring system: voiding patterns over 72 hours and urinary output of the participants. This data was then used to develop an individualised UC care plan. Re-assessment was undertaken after two weeks and five weeks and new UC care plans implemented at these times. Evaluation data consisted of urinary output, content of care plans and adherence to care plans.

The results showed significant increases in the number of times the participants were provided with assistance to use the toilet by care staff (p = 0.001), successful toilet use (p = 0.016) and the volume of urine voided into continence pads was reduced (p = 0.013).

This study suggests that the implementation of a wireless telemonitoring system for UC management for individuals living with dementia in residential accommodation is associated with more successful assistance in toileting and fewer episodes of incontinence.

The SIM system has received positive anecdotal feedback. One family carer noted: “We’re happier, because Dad doesn’t feel like he needs to arrive so early each morning to [the nursing home to] make sure Mum is helped to go to the toilet. He trusts the electronic system.” Another anecdotal benefit has been that care staff in the participating RACFs demonstrated an increased awareness about the UC needs of the elderly residents together with increases in appropriate contact time.

**References**


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