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PROGRAMME IN
AGEING URBANISM

Safe Return Technology for People Living with Dementia in Taiwan

Age Friendly and
Dementia Friendly Cities¹

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Wandering is one of the most challenging behavioural symptoms of dementia. It is potentially dangerous, causing people living with dementia to become lost or injured. To support people living with dementia to age in place, and to reduce caregiver anxiety, technology-based solutions have been used in Taiwan and elsewhere to manage or reduce wandering behaviour.

What is Dementia-related Wandering?

Wandering is one of the most common behavioural symptoms exhibited by people living with dementia. Some estimates suggested that up to 63% of older adults living with dementia wander at some point of time². Dementia-related wandering is a locomotion behavioural syndrome. People living with dementia may present repetitive, temporary disoriented, or spatially oriented ambulating behaviour.

¹ This is an evolving database. We will be adding more examples and cases over time.

² Kwak, Y. T., Yang, Y., & Koo, M. S. (2015). Wandering in Dementia. *Dementia and*

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There are multiple traveling patterns for wandering behaviour, including direct, pacing, random, or lapping (see Figure 1). People living with dementia may start wandering straightforward to a destination without brief hesitation (i.e. direct); travel back and forth repetitively between two destinations (i.e. pacing); move along an unorganized path and change directions (i.e. lapping); or shift in a circular loop with possible significant hesitations when direction changes (i.e. random).

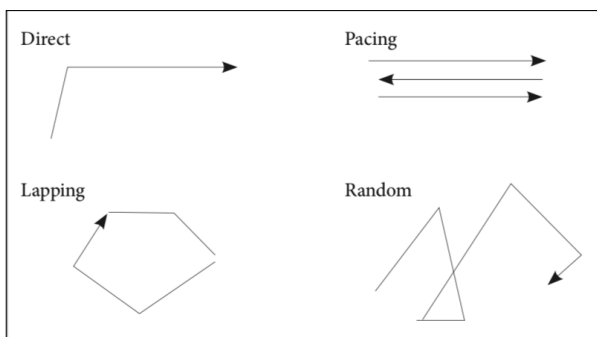


Figure 1. Traveling patterns of dementia-related wandering (Source: Kwak et al., 2015).

Etiology of wandering

The etiology of dementia-related wandering is complex, and the underlying mechanisms are still being explored. Studies suggest that wandering behaviour results from decrements in different cognitive abilities, and from poor person-environment interactions.

Deficits in visuospatial ability is known to increase the risk of wandering. Wandering behaviour may result from navigation difficulty caused by misperceptions and interpretations by people living with dementia about what they see and the size and location of their surroundings. Deficits in executive function impair decision-making, planning and

monitoring abilities, and exacerbate repetitive locomotion behaviours. Time perception distortion can also explain wandering. For example, people living with dementia may confuse night- with day-time, and decide to go out for a walk.

Psycho-social and environmental factors can interact to cause wandering. For example, people living with dementia may exhibit wandering behaviour as a form of release from boredom, anxiety, discomfort and pain due to a change of environment. Also, they may express emotions through physical activities that may induce wandering. Prior habits of an individual may also induce their wandering, because they want to keep with their current or past habitual walking behaviour. Thus, it is very likely for people living with dementia to become lost and wandering even in familiar environments, as they cannot recognize the way back home, or locate an intended destination such as the store in their neighbourhood.

Moreover, the frequency of wandering behaviour is dependent on severity of cognitive impairment.

Impact of wandering

Wandering behaviour can pose risks to the safety of persons living with dementia. Dementia-related wandering can result in 'absconding' or getting lost when unaccompanied. It has been associated with high fall rates, hospital admissions, and even fatalities. A newspaper in Japan recently reported on the fatality of a 91-year-old Japanese man with dementia who wandered into the path of a moving

train, which also led to the delay or cancellation of 54 trains³.

In addition to impacting people with dementia, injuries related to wandering behaviour impacts on families and the wider public. For caregivers, wandering is considered one of the most difficult to manage behaviours of persons with dementia and a considerable source of worry.

Management of Dementia-related Wandering

Caregivers rely on several coping strategies to manage dementia-related wandering. They modify the care environment by imposing physical barriers and restraints on persons with dementia. For example, extra locks on house doors to prevent people leaving the house and wandering at night. However, this action ultimately restricts the mobility of people living with dementia, and limits their opportunities for exercise, stress relief, and social interaction.

In order to facilitate a balance between independence for people living with dementia and peace of mind for caregivers, studies have suggested four strategies to manage wandering behaviour: environmental, technological, physical and psychosocial, and caregiver support and education.

In Taiwan, technology-related strategies in the form of wearable devices that facilitate the safe return of people who become lost, are being used.

Safety Return Technology for Dementia-related Wandering in Taiwan

Loves Bracelet has been used over many decades in Taiwan, to warn carers and others of older adults who become lost due to wandering behaviour. Recently, rapid technological progress has enabled improvements to the 'safe-return' solution. The new safe return technology uses electronic tagging and mobile locator, and it is updated from the *Loves Bracelet*. The new device has been trialled with some success in Taiwan.

Loves Bracelet

Loves Bracelet was introduced in 1998 as a way to aid the safe return of people exhibiting dementia-related wandering. People at high risk of getting lost are eligible to register for the service and apply for a *Loves Bracelet*⁴.

Loves Bracelet uses a verbal alert system to assist people who are suspected to be lost. The system comprises an identification number (ID no.) and an emergency hotline. A passer-by, who notices a person wandering, is able to call the hotline

³ Young, Y., Papenkov, M., & Nakashima, T. (2018). Who Is Responsible? A Man With Dementia Wanders From Home, Is Hit by a Train, and Dies. *Journal of American Medical Directors Association*, 19(7), 563-567. doi:10.1016/j.jamda.2018.02.006

⁴ Federation for the Welfare of the Elderly (FEW). (n. d.). 愛的手鍊 . Retrieved from http://www.oldpeople.org.tw/ugC_Love.asp

number stamped on the bracelet and report the ID no. and location of the person who is lost. The call centre that receives the call extracts the user information according to the ID no. and gives instructions to the reporting person on what action to take next. At the same time, the police and the family members of the person who is lost, are informed.



Figure 2. Design of *Loves Bracelet* (Modified from: FEW, n.d.)

Design is considered critical to the uptake of the *Loves bracelet* by potential users. *Loves bracelet* is designed with a robust buckle to prevent it from being misplaced or lost by the wearer (See Figure 2).

At May 2016, 21,273 people have registered for the *Loves Bracelet*. Approximately 5,504 lost people have been identified and safely returned to their homes, accounting for a 99.9% safe return rate. In comparison, only 58% of those who are not registered for the service have been returned home safely.

The wearable safe return technology has been successful on two levels. It has helped a large number of people return home after becoming lost. Also, it has given peace of mind to family members, which in turn has allayed the restrictions carers have placed on people living with

dementia. This obviously has benefits for the person with dementia in terms of autonomy, independence, and ultimately, their quality of life.

NFC-tag Wristband

In 2015, *Loves Bracelet* was upgraded to *NFC-tag wristband* with an improved technology to enhance the efficiency of the alert system.

NFC stands for a wireless communication technology 'Near Field Communication', which allows data transitions in a short range through compatible devices. This technology is widely and increasingly used in mobile phones for online payment.

In addition to the information connected with the *Loves Bracelet* (i.e. hotline number and ID no.), *NFC-tag wristband* uses a systematic rapid alert system with electronic NFC tag embedded in the wristband and a mobile locator (i.e. GPS) installed in a mobile phone (See Figure 3). After eligible users apply for the *NFC-tag wristband*, verified user information is encrypted into a NFC chip in the wristband. Then, people living with dementia can put on this *NFC-tag wristband*.



Figure 3. Design of *NFC-tag wristband* (Modified from: Huang et al., 2015)

When a member of the public notices and recognizes a person who appears to be confused or disoriented, they are able to use the NFC reader function in their mobile phone to detect the NFC tag on the

wristband. An associated app is not required for the technology, which makes the system more accessible (See Figure 4).

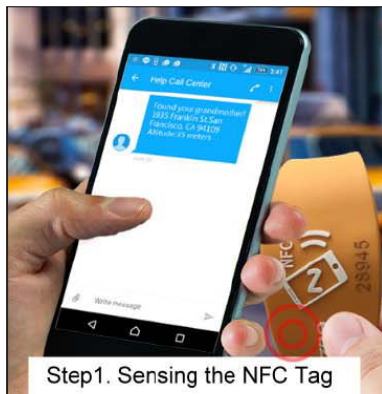


Figure 4. Sensing process using *NFC-tag wristband* (Source: Huang et al., 2015)

Through sensing action, the user information and current Global Positioning System (GPS) location of the mobile phone will be transmitted to central system. In addition, to protect the identity of the passer-by, they were given the option to opt out of providing their contact details (see Figure 5).



Figure 5. Transmission process using *NFC-tag wristband* (Source: Huang et al., 2015)

Further guidance and management is demonstrated on the mobile screen of the passer-by after a series of automatically executed data analysis procedure from cloud services (See Figure 6). In the meantime, police and family members

receive a message notification. Only high-risk cases are reported to a call centre directly to initiate a safety procedure, and navigation and audio systems will pop up and appear for further recommended actions (See Figure 6).

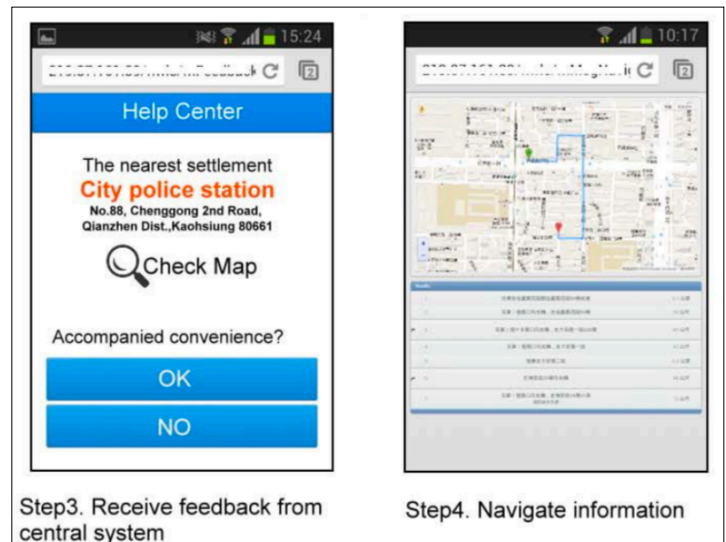


Figure 6. Notification process using *NFC-tag wristband* (Source: Huang et al., 2015)

NFC-tag wristband provides a more cost-effective and efficient systematic alert system to ensure safe return of people living with dementia. This new technology has significantly helped to reduce the amount of time and expenditure on manpower needed to locate and assist a potentially lost dementia older adult to return home safely.

Even though electronic tag embedded on wristband has great performance on addressing dementia-related wandering, traditional *Loves Bracelet* has not been replaced by *NFC-tag wristband*. There are no concrete suggestions as to why *Loves Bracelet* remains popular on the market. It might be because of unfamiliarity with, or understandability of the new technology by caregivers. This may have acted as a

barrier to its application in the safe return service.

Can we depend on technology alone?

This discussion leads to a question: Can we depend on safe-return technology alone to help people living with dementia who exhibit wandering behaviour?

In order for safe-return technologies to work efficiently and effectively, their design should be person-centric. Public education on how to use safe-return technologies. However, the public must be able to recognise the symptoms of dementia and be willing to approach and help a person with dementia.

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