Background: The majority of persons living with dementia (PLWD) remain in the community, placing a significant care burden on their family members[1]. In more advanced stages, these PLWD often experience night-time wandering that can lead to unintentional home exits. The worry of this happening can lead to decreased caregiver sleep, increased fatigue, burnout and early institutionalization.[2] Available home monitoring technology can be repurposed to help "cue" the PLWD to the bathroom and back to bed using "light" and/or "sound," all the while improving caregiver sleep.[3]

Methods: This study of 20 PLWD-caregiver dyads in Ottawa, Canada had a duration of 12 weeks. The off-the-shelf technology used included Samsung Smartthings (hub, motion and door sensors, smart outlets), a pressure sensitive mat (Ideal Security SK630), and a Sonos: Play 1 speaker. The system was custom programmed with a simple cloud-based interface (Samsung Smartthings) on a tablet. We present data from 8 out of the first 11 participants with usable pressure mat data and minimal false motion sensor firings, comparing weeks 1 and 6.

Results: 8 homes were located between 3 and 53 km from the hospital research centre: six 2-story homes (1 to 4 bedroom), and two apartments. Typically, 3 home visits were needed to adjust sensor placement or replace batteries. The participants included 6 male and 2 female PLWD: average age 75 years (59 to 98); and 2 male and 6 female Caregivers: average age 66 years (47 to 78). During the 1st week, there were 119 bed exits (2.1 times per person per night-PPPN). For these bed exits, 80 trips were directly to the bathroom (1.4 PPPN), suggesting a cue lighting effectiveness of 67%. However, during the 6th week, nightly rises had decreased to 102 (1.8 PPPN), with first destination bathroom occurring in 98 (1.75 PPPN) of these trips. This suggests an increase of cue effectiveness to 96%. Similarly, during the 1st week, the audio cues were played 28 times (0.50 PPPN), with successful return to bed rates within 3 minutes of 57%. During the 6th week, the number of audio cues was reduced to 20 times (0.0.35 PPPN) with a 50% return rate. Figure 1 shows a radial plot of the summary of activities of the sensors in one home over a period of 84 days. No participant approached the front door during the study. Caregivers reported that they slept better with the system, and most would have wanted to keep the system after the end of the trial.

Discussion: The nocturnal wandering diversion system functioned well in 8 homes. PLWD increasingly responded to lighting and sound cues, helping the caregiver sleep better. In addition, the system provided researchers with objective information about nocturnal wandering. There is room to improve the selection of sensors and development of algorithms for data analysis. This system could easily be commercialized and could provide clinicians and caregivers with objective data about the impact of interventions to reduce nocturnal risk to PLWD.

References

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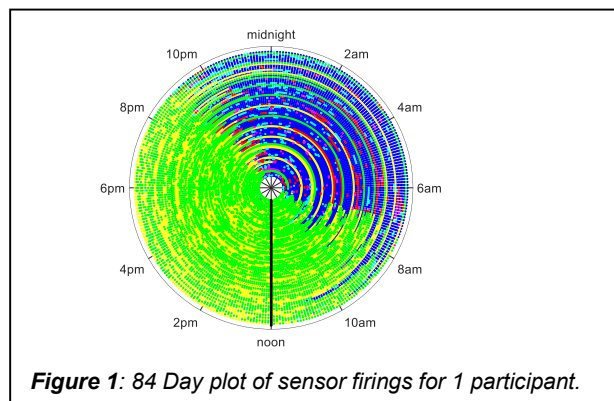
Figure 1: *84 Day plot of sensor firings for 1 participant.*