

# A Pilot Study in Using a Smart Voice Messaging System to Create a Reflection-in-Caregiving Workshop

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**Abstract.** This paper describes a pilot study in terms of reflection-in-caregiving with an assistive technology employing smart messaging by Bluetooth for location identification and annotation for tweets. We conducted 3 sorts of investigations (i.e. questionnaire of role stress, semi-structured interview and reflection workshop) to explore potential for inducing caregiver's behavior change by the assistive technology. Thereafter, we concluded that the assistive technology shows the potential of reflection and behavior change.

**Keywords:** People with dementia, caregiving, reflection workshop, case study, massaging system with voice tweeting.

## 1 Introduction

In Japan, an increasing number of people are over sixty-five years of age. Consequently, the demand for qualified caregivers is increasing; however, most care centers for the elderly are short-staffed and caregiver workloads are increasing. This has resulted in numerous caregivers reaching a burnout state. Japan is not the only country facing this challenge; many other developed countries, such as Germany, Italy, and the Republic of Korea face similar problems. According to a United Nations report [1], many countries are expected to become “super-aged” societies by the year 2050, by then, there is a prediction that more than twenty percent of the population will be sixty-five years or older.

Technology can play an important role in helping caregivers of aging population. For example, several devices (such as sensors) and services have been developed to help locate a person with dementia who may be wandering aimlessly outdoors. Health and safety monitoring technologies aim to keep the elderly healthy and look after them in case their safety is at risk. These technologies are most effective for monitoring people who tend to go about unnoticed.

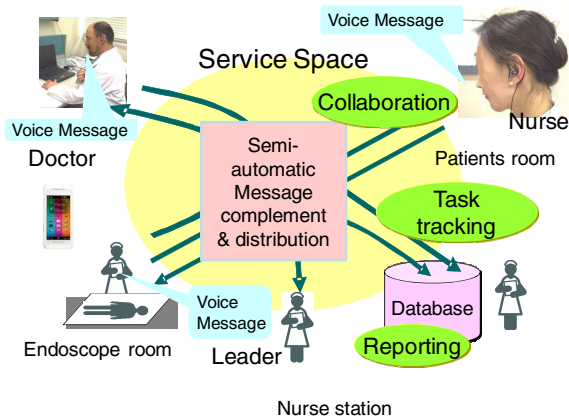
The devices include various sensors such as GPS-enabled mobile phones. Several monitoring systems have been developed to ensure the safety of people with dementia. Such systems focus on preventing residents from taking risky actions such as

wandering [2–5]. A smart home with a sensor network enables caregivers to monitor the whereabouts of residents. When a smart home is inhabited by people with dementia, the home can help caregivers identify the risks involved in any unusual behavior, such as wandering and agitation [6–9]. Although technology may be useful for assisting such people and their caregivers, these technologies have not been embedded into the job processes and workflows of caregivers.

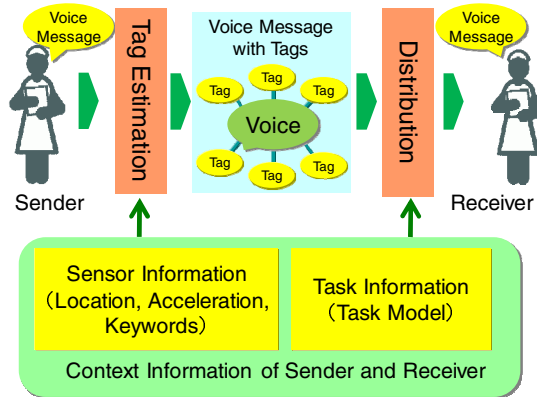
We have therefore developed a workshop for reflection-in-caregiving with an assistive technology employing smart messaging and location identification via Bluetooth; and have developed the Bluetooth component in advance of this current study [10]. We conducted a series of investigations, which consisted of questionnaires regarding role stress, semi-structured interviews, and field trials of our proposed system at a care house, all in an effort to explore and identify the requirements of the workshop. With respect to care tasks, the investigations targeted meal assistance; further, 25 caregiver-days participated in this study.

## 2 Smart Voice Messaging System

Figures 1 and 2 show a smart voice messaging system that provides a hands-free communication method for temporal–spatial collaboration among caregivers and nurses. In our proposed smart voice messaging system, voice messages can be automatically distributed to the right person at the right time and place and in the right way without cumbersome input operations. To do so, as shown in Figure 2, the automatic voice message distribution engine uses tags appended to the voice messages. These voice message tags annotate the message and indicate contextual information about the message. These tags are generated from keywords (obtained via voice recognition) as well as location and acceleration (from sensor data) [11].



**Fig. 1.** An overview of our smart voice messaging system [10]



**Fig. 2.** Message distribution engine that tags and transmits messages from sender to receiver [10]

Nurses and caregivers record voice messages with information observed about patients and care recipients. A better awareness of care recipient conditions is recorded vocally with ease. Further, nurses and caregivers record voice messages of tasks to be performed. Next, a reminder about the task is given. The messages are then used at the shift-change meeting as triggers for reminding staff of incidents or pending tasks to be performed.

A caregiver's voice messages are transmitted to his or her colleague whenever he or she desires. Nurses and caregivers report and share their progress status, and appropriate actions and support can be adaptively implemented collaboratively. During his or her rounds, a nurse speaks with residents and records messages about each patient. These messages are then, for example, distributed to a bath caregiver at bath time. Similarly, other messages are distributed to other nurses during a shift meeting at the nursing station or other specified times. These messages are automatically classified and distributed without any smart phone operations. In traditional communication, information is shared with a sender's intentions and efforts (operations); therefore, only critical information is shared and most noncritical information is lost. While instructions and requests are often critical, other information regarding each client and process are often noncritical. The smart voice messaging system can handle the non-critical information without requiring a sender's strong intentions and efforts.

### 3 Study Design

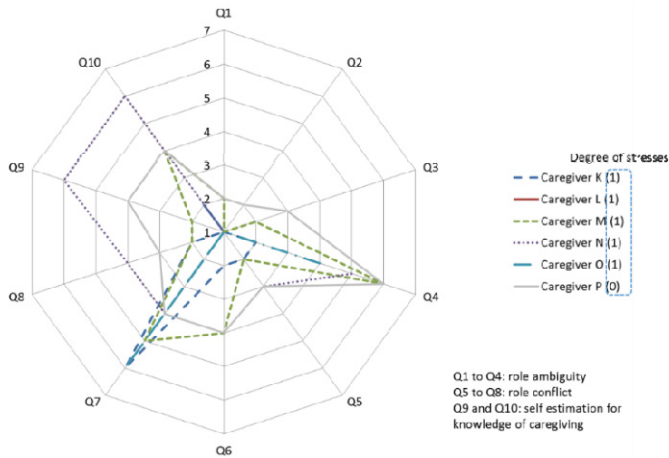
In our study, we first obtained informed consent from the manager and caregivers of a care house, who were the participants in our study. Next, we explained to them how to use the system, what equipment each participant would need, and how to record messages in the system. We then operated our system throughout meal assistance for approximately one hour, fully transcribing all tweets regarding caregiving; we annotated the tweets with tags determined by another of our preliminary studies [12] as a Wizard of Oz experiment.

We also conducted a questionnaire survey and semi-structured interviews with the caregivers to identify highly demanding tasks of the meal assistance process; we also showed a summary of caregivers' traffic lines during meal assistance generated by our system. Note that our system provides a function for repeating all tweets with traffic lines.

We conducted these investigations using our system that consists of a traffic line viewer for meal assistance and tweets during that time period. Further, the questions of our questionnaire focused on the standpoint of role stress [13-15]. With results shown in Figures 3 and 4, the questionnaire consisted of one question regarding overall stress in meal assistance, eight questions of role stress, especially role ambiguity (i.e., questions Q1-Q4) and role conflicts (i.e., questions Q5-Q8), and two questions regarding knowledge levels matched to tasks (i.e., questions Q9 and Q10). The question regarding fatigue used a three-point scale from zero, which indicated no stress, to two, which indicated heavy stress; the other questions used a seven-point scale. Caregivers received a higher fatigue score for certain messages if he or she was faced with a burden during meal assistance or graded it without identification to a certain message (if the caregiver could not identify a specific occasion at the time). Next, the caregivers answered questions regarding role stress and their (self-assessed) knowledge levels.

Inherent to caregiving, the decision-making process of caregivers often becomes vague under the stress of multiple and simultaneous tasks. In the semi-structured interviews, we primarily focused on asking caregivers about the reasons they felt they received the aforementioned questionnaire scores; each interview took approximately 15 minutes.

Workshop requirements were determined based on the results of the questionnaires and interviews. As a result, a workshop for reflecting on the role of the caregiver was held in the same care house.



**Fig. 3.** Results of role stress during the daytime meal assistance process

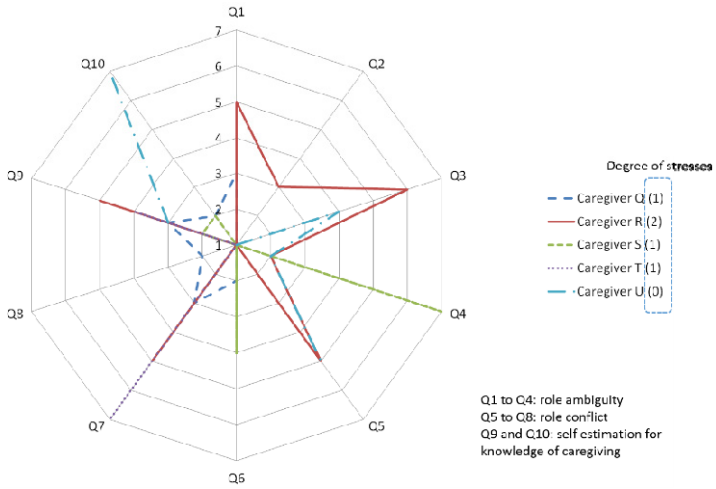


Fig. 4. Other results of role stress during the daytime meal assistance process

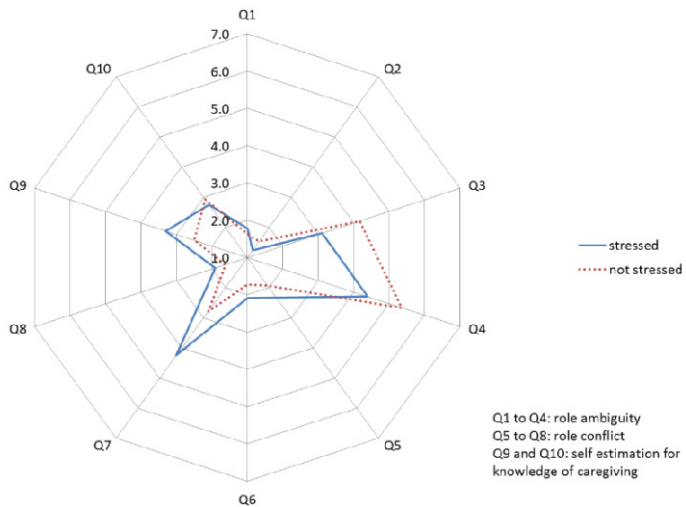


Fig. 5. Averages of role stress

## 4 Results

Figure 3 shows an example of results of the questionnaire given in regards to day meal assistance. Caregivers who felt high levels of stress scored higher on questions of role stress—especially question Q8—than others who did not feel such stress. For instance, Caregiver K, a competent caregiver, reported during her interview that a resident with dementia often becomes unquiet during lunch. This resident sometime yells at the other residents if she feels ignored by her caregivers. In response, the

caregiver and his colleague mandatorily pay more frequent attention to her than that on ordinary days. Consequently, the caregiver feels stressed out and does not concentrate fully on the task at hand.

Figure 4 shows the other results of the questionnaire at daytime meal assistance. Caregivers Q, R, S, and T were rated role conflict higher than Caregiver U, who did not report having any stress during meal assistance. The reason why these four caregivers were stressed out was that they had to cope with simultaneous events in their day, including exercise, haircuts, a visiting medical checkup, meal preparation, and meal assistance.

Caregivers are often placed in dilemmas and experience claims and unexpected actions by residents, as described above. As shown in Figure 5, this caused mental anguish and role stress, in particular role conflict. The figure shows that caregivers who felt stressed rated role conflict higher than the others.

From the results of the questionnaire and interviews, we selected two cases as discussion topics in the reflection workshop: “preventing curse-and-swear,” in which caregivers must take care of their residents and maintain a sociable atmosphere while providing quality care for everyone, in addition to ordinary meals; “preventing a domino effect,” in which if there were many events in the day, caregivers were imposed to cope with multiple tasks simultaneously in addition to their normal daily tasks. In such cases, they also suffered from role conflict.

## 5 Reflective Workshop

We developed a workshop to ensure that the role of the caregiver was clear; and approached this by discussing the two aforementioned topics. We held our workshop three times for the following three distinct audiences: veterans, apprentices, and competent caregivers. The workshop’s goal was to establish an explicit rule for mitigating role conflict and role ambiguity. In the workshop, caregivers discussed their individual ways of coping.

We provided handouts that described the two cases. These descriptions consisted of the role of staff, an overview of the care house (e.g., the number of caregivers and care recipients, times for each meal, etc.), specific points that had to be paid attention to during meal assistance (e.g., symptoms of dementia, preparing medication after the meal, etc.), typical characteristics of the case, and instructions and themes for discussion. Workshop members were selected based on their levels of expertise and position in the care house; we played the role of facilitator. Through multiple sessions, three or four caregivers participated in the workshop; more specifically, there was a veteran caregiver, one or two intermediate caregivers, and one or two novices. Workshop discussions were fully recorded and transcribed for detailed analysis.

We observed that caregivers actively conversed with each other throughout the workshop. They tried to confirm their colleagues’ ways of detecting signs of curse-and-swear behavior and how to cope with it, including when to contact the chief. Likewise, they discussed how they handled dealing with simultaneous events. Veteran caregivers recognized the workshop as an opportunity to share their experiences and

knowledge with younger caregivers. In each workshop, participants produced a set of instructions on how to cope with the domino effect. More specifically, they were able to externalize their implicit knowledge as an explicit explanation. We therefore conclude that our workshop has the potential to change a caregiver behavior and mindset in regards to our smart voice messaging system.

## 6 Conclusion

We conducted a pilot study in a care house with our smart voice messaging system with the goal of designing a workshop to discuss key issues in the role of caregiving. Caregiver tweets during meal assistance that are collected by our system and are stored to serve as triggers of the incidents along with their responses and actions to these triggers. They reported their degrees of fatigue and the role of stress in terms of meal assistance via a questionnaire on our system. We also carried out semi-structured interviews to reveal the relationship between fatigue and stress as well as the cause of them. Workshop requirements for reflection-in-caregiving were then determined after the investigation and the workshop was held thrice. From our results, we concluded that our workshop development in conjunction with our system has great potential to trigger behavioral change. In our future work, we plan to carry out follow-up studies to validate and extend the findings of this study.

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