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# Usability and Feasibility of the Smart Aged-Care Helper Application for Caregivers of Dependent Elderly Individuals in Suphan Buri, Thailand

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## ABSTRACT

**Background:** It is widely acknowledged that the engagement of family caregivers and older adults with dependence is important for primary health care centres. **Objective:** This study will examine the feasibility and usability of the "Ageing Screening Health" application for caregivers of dependent older adults. **Methods:** The "Aging Screening Health" application was evaluated in two dimensions. Seven experts evaluated the technical quality in the first dimension, while 25 end users evaluated the level of satisfaction in the second dimension. The sample was selected by purposive sampling and consisted of caregivers of older adults in Song Phi Nong District, Suphan Buri Province, Thailand. The research instruments were the "Screening Ageing Health" application, the Applications Capabilities Questionnaire, and the questionnaire on satisfaction of end users. Data analysis was conducted using means and standard deviations. **Results:** The quality of the "Screening Ageing Health" application for caregivers of older adults with dependence was very good, with a mean score of 96.57 (SD= 3.31), and the users' satisfaction levels were also good, with a mean score of 90.24 (SD= 4.73). **Conclusion:** The ASH application demonstrated good overall usability and satisfaction, effectively managing health promotion plans to meet the health needs of the elderly in the community. However, village health volunteers with limited health literacy due to cognitive impairment require active planning for future brain training and stimulation.

*Keywords: Caregiver; Mobile Applications; Village Health Volunteer; Older Adult with Dependence*

## INTRODUCTION

Thailand is a rapidly aging society with an increasing population. As a result, the prevalence of chronic diseases and the long-term care required for dependent older adults are also increasing. In southeast Asia, all the families of the caregivers have a responsibility to take care of older adults who are dependent. Dependent older adults are those aged 60 years and over who have limitations in activities of daily living and include those with cognitive impairment. The elderly will experience health deterioration as they age. As most of the family members are now working, the number of caretakers has decreased. In addition, the elderly often have chronic conditions such as diabetes, high blood pressure, or dementia. Residential homes pose a risk of falls, with studies revealing that stumbling during walking, health conditions, bathing, and daily activities account for 26.0% of the incidence rate of falls.

A caregiver is a person who provides care in terms of daily activities, including informal caregivers such as a family caregiver and formal caregivers such as a village health volunteer. A formal caregiver, as a Village Health Volunteer (VHV), plays an important role as a leader in health behavior change throughout health promotion, local disease surveillance, and caring for the elderly with chronic conditions in the community (Doungphummes *et al*., 2022). Members of their community choose Village Health Volunteers (VHAs) for

their public-mindedness, generosity, and willingness to assist those in need. VHAs work well in short-term tasks including health surveys, collecting periodic data, or conducting disease prevention campaigns, such as during the coronavirus pandemic. However, their experience in providing care for chronic conditions is insufficient.

During the COVID-19 pandemic, health care professionals and workers, including VHAs, faced work overload and numerous responsibilities related to managing infected individuals, including enforcing social distancing and home quarantine to curb the virus's spread. Thailand is evolving into a global hub for the health care industry (Bangkok Post, 2020), developing health care services for individuals across all levels, including the creation of applications to enhance access to public health services. At the same time, 8.7 million older adults have a mobile phone, and more than 5.89 million of them use smart phones to access various technologies. Up to 13.58% of older adults receive information for self-care online from social networking sites such as Facebook and Line via mobile phones (Thai Health Promotion Foundation, 2022).

In addition to the National Institute of Development Administration (NIDA Poll), a study consisting of a sample of 1,250 people aged 60 and older from all regions throughout the country found that the majority of the older adults did not use social media, but they used mobile phones for communication. Researchers found that 44.72% of the elderly who used social media used the mobile application, while 30.56% used Facebook, 29.60% used YouTube, 4.80% used Instagram, and 3.44% used Twitter (NIDA Poll, 2022). Most researchers proposed that applications that can maintain the social connections, health, happiness, cognitive performance, and independent activities in life for the elderly, will be the most beneficial for aging population in the future (Sen *et al.*, 2022; World Economic Forum, 2021). With the proliferation of mobile phones and digital technology, they will become increasingly convenient for staying updated on events. Older adults' caregivers could have easier access to resources and support for community caregiving.

Applications for mobile devices and tablets can display important information that caregivers need; they can receive suggestions directly from healthcare professionals with speed, accuracy, and completeness, and they can keep up with changes in health problems. It is an appropriate choice and meets the needs of caregivers in a changing society. Village health volunteers, as role models and consultants for primary health care, have the responsibility to promote health activities in close contact with the people in the community (Sornmai *et al.*, 2023). Mobile applications for Village Health Volunteers as caregivers should have a well-thought-out assessment process that demonstrates quality, must be clear with truthful content, as well as clear and with easy usability. Key features of an application's usability include its ease of use and user-friendliness, particularly for end-users and specialists who utilize mobile applications with capabilities (Nielsen & Loranger, 2006).

Researchers hope that an application can meet the needs of its users through several features, including private chat groups, basic health screening for older adults, emergency calls, and shared locations. The purpose of this study was to assess the feasibility and usability of the Ageing Screening Health application for caregivers of dependent older adults. Researchers have provided clear details about the development of the application and a clear understanding of its implementation, along with a usability study to gather the opinions of end users.

## METHODOLOGY

The study population consisted of experts in computer or information technology, nursing experts, nurse specialists caring for older adults in the community, and older adults' caregivers.

### Participants

For the SAH Application development phase, technical quality was completed by seven experts to obtain more accurate results. Several studies claim that 3–5 users suffice to uncover 80% of problems in a software interface. In contrast, Cazañas and colleagues (2017) indicated that there is not sufficient sample size to detect the level of the problem. Seven experts including 3 experts in computer or information technology, 2 experts in geriatric health nursing and community health nursing, and 2 nurses specialising in the care of the elderly in the community. This application was in the prototype phase; feasibility analysis was done by end-users.

Twenty-five caregivers of older adults were recruited. The purposive randomization method was used. They met the established criteria: age ≥ 18 years; formal caregiver or VHVs at a location > 6 months; smart phone user.

**Measure**

The prototype of the "Screening Ageing Health" application was developed in four steps, as follows:

1. In the first step, a field study was conducted to assess the needs of caregivers and the gaps in what is currently available in community networks. In the first step, a survey was distributed to both formal and informal caregivers through Google Forms and through face-to-face interviews. Participants were eligible if they were over 18 years of age and were able to use applications on a smart phone. Family caregivers who were over 60 years old and had achieved a score of 26 or higher on the Mini-Mental State Examination (MMSE) (n = 50) were recruited for the quantitative survey. Among all the participants 15 agreed to take part in face-to-face interviews to identify issues related to caregiving, the support currently provided, and what caregivers would require from a caregiving mobile application. The interview results can be summarized as needs and possibilities of application development in six aspects, consisting of 1) enhancing the ability to disseminate thorough information; 2) building confidence in the households in caring for the older adults; 3) developing the capacity of caregivers to take care of the older adults; 4) creating a health screening system a team that covers the older adults; 5) supporting resources for taking care of the older adults; and 6) developing and using technology to improve the care of the older adults. For instance, in aspect 4, setting up a health screening system, forming a team to care for older adults, and developing applications will alleviate the burden on staff and those involved in screening the health conditions of older adults. The following quotes are from the face-to-face interviews with participants.

"Health screening requires quite a lot of manpower. We work together, but we have only 2–3 staff on the team. The Village Health Volunteer assists with blood pressure and body weight measurements. 100 of the older adults have already had health screenings. However, there is an outbreak of COVID-19 now, so I haven't done it." (Staff 1)

"During the time that the doctor (SHPH staff) screens an older adult's condition, we went to enlist the older adults. We must set up a place in front of the hospital for this activity. Now they can't sit together because of COVID-19. Moreover, there is a screening for COVID-19." (VHV3).

In the second step, the mobile application was developed based on the analysis of the field study. Scoping reviews and a survey of applications in the main operating systems were conducted, and it was found that digital technologies created by healthcare professionals were available for older adults during the pandemic (Whitelaw *et al.*, 2020). After this step, themes and media were developed based on the Geriatric Screening for Sub-District Health Promoting Hospitals (Ministry of Public Health, 2022) to compose the content of the application. The prototype was built for the Android and iOS operating systems. The application project was entitled "Ageing Screening Health", which was developed using the programming languages of JavaScript, React Native, Node JS, Vue JS, and Golang. Development cycles and weekly meetings were undertaken. A team was composed of researchers, a programmer, and a director of a sub-district health-promoting hospital.

In the third step, after the development of the application prototype, the prototype was sent to all the experts, who were comprised of experts in nursing and information technology, for usability analysis. The nursing experts' criteria include: 1) nurses with hands-on experience in caring for older adults in the community; 2) specialists holding a master's or doctoral degree; and 3) a minimum of five years of professional experience in older adult health nursing or community health nursing. The criteria for IT experts consisted of 1) at least 3 years of experience in IT, computing, programming, or web site creation; 2) a specialist with a masters or doctoral degree; and 3) experience in constructing or validating instruments. The material was sent via e-mail. After this stage was finished, the application was developed for the new version. In the fourth step, usability testing was performed by two groups of experts. The first group was the same as the experts in usability analysis, and the second group was the target population with the same inclusion and exclusion criteria as the field study. A descriptive analysis of the results was performed.

2.   Nooyod *et al.* (2022) developed the Applications Capabilities Questionnaire, which consists of 20 questions covering 5 aspects: functional requirement test, functional test, usability test, performance test, and security test. Responses are ranked on a 5-point Likert scale, where "1" represents "no comfort" and "5" represents "extreme comfort". At the end of the evaluation, a space is allocated for suggestions, criticisms, and general opinions about the application. Cronbach's α was .79 in this study.

3.   The satisfaction and usefulness questionnaire for end-users consists of 20 items covering five aspects specific to the developed application, as well as closed and open questions. End-users are asked to respond to statements using a 5-point Likert scale where "1" represents "no comfort" and "5" represents "extreme comfort". Scores are calculated for each of the five aspect scales. Higher values for the functional requirement test scale indicate the effectiveness of the test for the system's services, with possible total scores ranging from 5 to 15.

Higher values for the functional test scale mean the systems are working according to the user's needs (possible range = 6–30). For the usability test scale, possible scores range from 5 to 25, and higher values mean satisfaction with the suitability of the software for its users. Higher values on the performance test scale indicate that an application is highly responsive, with possible scores ranging from 3 to 15. For the security test scale, higher values indicate participants' greater safety in personal information, with possible scores ranging from 3 to 15. Cronbach's α was 0.9.

## Data Collection

Data collection was conducted between October 2021 and November 2022. The research team collected data from the field study about the problems and needs and the possibility of developing applications. The results were analysed to develop the application and then evaluated by experts as follows: 1) Sending the "Screening Ageing Health" application to 7 experts to evaluate performance; 2) performing the "Screening Ageing Health" application improvements as recommended by the experts; 3) assessing the quality of the application and analysing the data using the mean and standard deviation; 4) estimating the satisfaction of the end users of the application. The target population (n = 25) were caregivers of older adults in the community at Song Phi Nong District, Suphan Buri Province. Enrolled caregivers were instructed to use the "Screening Ageing Health (SAH)" application as a basic health screening tool for older adults, and all caregivers were trained in the project of enhancing the potential of caregivers in managing health care for the older dependent adult (Thummakul *et al.*, 2022).

All participants received and understood an oral and written explanation of the entire study and provided written informed consent to participate. For downloading and setting up the application, the research coordinators assisted the participants on the chosen mobile device(s). Upon downloading the app, users were asked to register with their contact details, who they are caring for, and the age and health condition of the care recipient. However, user contact details and family information were kept hidden due to privacy. The features of the app included: 1) a feature for recording the information of an older adult, such as name, BMI, blood group, eye vision, chronic conditions, mapping, and emergency calling; 2) vital signs (blood pressure, pulse, body temperature); 3) barthel activities of daily living; 4) time-up and go test (TUGT); 5) eating and excretion habits; 6) sleep and rest. 7) The questionnaire consists of two questions (2Q) designed to assess depressive symptoms; 8) It includes an abbreviated mental test (AMT) score; and 9) It includes home visit features designed for caregivers seeking advice on caregiving for their care recipient, as well as to discuss any issues or questions they believe others and health care professionals in the community could help with. All of the features were developed based on basic geriatric screening (Ministry of Public Health, 2022). The use and features of the application were reviewed until the caregivers of the older adults indicated competency. Training in the use of the application was performed verbally by the research team. If participants had difficulties with the use of the application following this training session, the team would attempt to clarify any difficulties for the caregivers until this was acceptable, and then the caregivers would have access to the application on their personal devices. Figures 1–5 provide an example of an application screenshot.

## Ethical Consideration

The study received ethical approval from the Review Board of the Suan Dusit University, Thailand with

Reference No. SDU-RDI-HS-2022-005 on 10th March, 2022 to 9th March, 2023.

**Data Analysis**

Data analysis was done using mean and standard deviation.

**RESULTS**

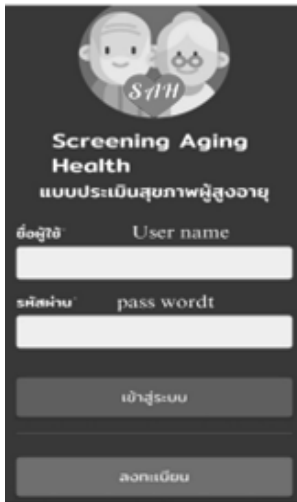1. The development of the "Screening Aging Health" application



Figure 1: ASH



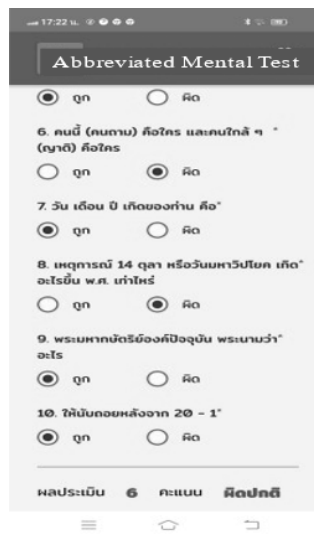Figure 2: Screening List



Figure 3: Mapping



Figure 4: Abbreviated Mental Test



Figure 5: Home Visit

Figure 1-5: Screening List. This figure illustrates the screening tools for older adults. Adapted from Sanprakhon *et al.*, 2023.

2. Usability testing from 7 experts

In regard to the general characteristics of the participants who are the experts in this study, 80% (4/7) were female, and the ages of the experts were between 33 and 47 years with a mean of 41.3 years (SD = 6.6 years).

For educational attainment, they had received at least a master's degree (57.1%) in comparison to a doctoral degree (42.9%).

*Table 1: The Quality of The Application by 7 Experts (N=7)*

|  | Variables | Mean | SD |
|---|---|---|---|
| 1 | Functional requirement test | 14.29 | 0.76 |
| 1.1 | The data recording is contemporary and of benefit to users | 4.86 | 0.38 |
| 1.2 | Basic health assessment meets the needs of users | 4.86 | 0.38 |
| 1.3 | For home visit section: the capability of the app on question input satisfies your demand | 4.57 | 0.53 |
| 2 | Functional test | 29.43 | 0.53 |
| 2.1 | The vital signs measured provide accurate data. | 5.00 | 0.00 |
| 2.2 | The assessment of activities in daily living are accurate | 5.00 | 0.00 |
| 2.3 | The assessment of osteoarthritis and falls are accurate | 5.00 | 0.00 |
| 2.4 | The assessment of personal hygiene is accurate | 5.00 | 0.00 |
| 2.5 | The assessment of depressive symptoms are accurate | 4.71 | 0.49 |
| 2.6 | The assessment of cognitive impairment is accurate | 4.71 | 0.49 |
| 3 | Usability test | 24.00 | 1.53 |
| 3.1 | Size, color, and font style are appropriate | 4.86 | 0.38 |
| 3.2 | Graphic design is appropriate | 4.86 | 0.38 |
| 3.3 | The arrangement of the system components is appropriate | 4.57 | 0.53 |
| 3.4 | The relationship among health assessment items is appropriate | 4.86 | 0.38 |
| 3.5 | The interaction with user is appropriate. | 4.86 | 0.38 |
| 4 | Performance test | 14.43 | 0.79 |
| 4.1 | The finding information is fast | 4.86 | 0.38 |
| 4.2 | The system is stable to use | 4.71 | 0.49 |
| 4.3 | The system processing is accurate | 4.86 | 0.38 |
| 5 | Security test | 14.43 | 0.79 |
| 5.1 | User ID and password are verified by administrator | 4.86 | 0.38 |
| 5.2 | Administrator was authenticated before use. | 5.00 | 0.00 |
| 5.3 | The system preventing data failures are appropriate | 4.57 | 0.53 |
|  | Total | 96.57 | 3.31 |

The assessment by 7 experts found that the overall "Screening Ageing Health" application was at a very good level (mean = 96.57, SD = 3.31). When considering each aspect, it was found that: 1) functional test (mean = 29.43, SD = 0.53); 2) usability test (mean = 24, SD = 0.53); and 3) functional requirement test (mean = 14.29, SD = 0.76) were at the highest level. A single expert noted that the user's responsiveness lacked persuasive expression, resulting in a "3" rating on the Likert scale.

*Table 2: Results of End-User Satisfaction of the "Screening Aging Health" Application (N=25)*

|  | Mean | SD | Possible Range | | Actual Range | |
|---|---|---|---|---|---|---|
|  |  |  | min | max | min | max |
| 1. Functional requirement test | 13.84 | 1.87 | 3 | 15 | 9 | 15 |
| 2. Functional test | 29.72 | 1.04 | 6 | 30 | 25 | 30 |
| 3. Usability | 19.88 | 2.12 | 5 | 25 | 17 | 25 |
| 4. Performance test | 12.64 | 0.97 | 3 | 15 | 11 | 15 |
| 5. Security test | 14.16 | 1.38 | 3 | 15 | 11 | 15 |
| Total | 90.24 | 4.73 | 20 | 100 | 81 | 96 |

Over half of the caregivers (68%) were female. For educational attainment, one-third had received an undergraduate degree (36%) in comparison to a high school qualification. The results of end-user (n = 25) satisfaction with the "Screening Ageing Health" application overall were at a good level (mean = 90.24, SD = 4.73). When considering each aspect, it was found that: 1) the functional test (mean = 29.72, SD = 1.04), 2) the security test (mean = 14.16, SD = 1.38), and 3) the performance test (mean = 12.64, SD = 0.97) were at a high level, respectively.

# DISCUSSION

The findings from the quality assessment showed that the applications were very good. All experts gave a score of "4-5" on the items in the evaluation using the Likert scale, as did the end-users. At the end of the evaluation form, a geriatric health nursing expert recommended that the vital signs be interpreted with suggestions, including in the depression assessment and cognitive impairment test. For example, "Please contact nurses if the depression assessment and cognitive impairment test indicate warning signs".

A community health nursing expert suggested that an application would be beneficial if it included a complete record of the address in the personal information feature. This feature would make it easier to visit older adults at home, show their location and share their localities, and coordinate with other agencies to provide continuous care or refer them to secondary care. However, caregivers have differences in age and educational level. It will be more practical if there is a user manual. As all expert recommendations, application manuals, and warning signs were added, they were made for caregivers.

In terms of usability, this study evaluated satisfaction and usefulness in comprehensive app services. VHV end-users can contact health care professionals in their local area for more advice about elderly health problems. Moreover, the end-user gave some suggestions for improvement in the future, saying that they needed more information on health promotion for cognitive impairment and at-risk groups. However, the Ageing Screening Health App can be used to assess the basic health of older adults and for preventive screening for the elderly with chronic conditions, as well as at-risk groups and those with cognitive impairment in the community. All of this involves not only importing technology for use by older adults but also considering other elements for the end-user (Kaew-nate, 2020).

The aging process can cause physical, biological, mental, and socioeconomic problems, leading to decreased physical ability and disruptions in daily activities, necessitating strong family support as a form of interpersonal relationship to help the elderly face these challenges, demonstrating that family is their closest support system (Mayasari *et al.*, 2022). So, caregivers were also using electronic health records (EHR), wearable devices, social media, online communities, telehealth, and voice-enabled technologies to manage their health (Mendez *et al.*,2023). Therefore, the information obtained will be used as a guideline for further health promotion projects. Similar to Korean research results, family members of clients with breast cancer have high expectations for using mHealth care for self-management and various range of exercises as needed as their health condition (Lim *et al.*, 2023). In accordance with Boza-Chua & Andrade-Arenas (2022), the results of the efficiency of a mobile application for hearing impairment were tested by 10 expert users, and 40 users found a good efficiency level as this system was able to meet the needs of users. For User-Dependent Usability and Feasibility of a Swallowing Training mHealth App for Older Adults, this study was assessed by 11 participants (10 women, 91%; mean age 75.7 years, SD 3.93), which revealed that the high-potential group, who had a higher number of years of education and smart device usage, were more inclined to adopt and learn new technology than the low-potential group (Kim *et al.*, 2020).

Mobile applications are useful for easy-to-use caloric balance monitoring and weight management strategies (Ghelani *et al.*, 2020). This is similar to the mobile-based program that improves healthy eating in ulcerative colitis patients (134 UC patients, whose average age was 37.90 ars). The results were a useful dietary management tool and helped them make healthier food choices (Tu *et al.*, 2023). For cognitive tests in people at increased risk of dementia by using smartphone-based technology, the result showed the performance tests of 151 participants (mean age in years = 57.3, SD = 5.3) improved over time. A good learning effect with feasibility and reasonable adherence was demonstrated by participants compared to conventional neuropsychological tests (Jongstra *et al.*, 2017). The study focused on innovative devices with excellent quality for older adults with dementia, such as smartphones, tablets, and laptops (Zgonec, 2021). Cargivers are relieved to be notified about critical health data thresholds, progress, and the condition of their patients through mobile applications (Ceyhan *et al.*, 2024). Similarly, the usability testing found that overall users (n = 32) were positive about the application and confident that it could help them live a better quality of life (Lwin *et al.*, 2021). For people with heart failure, they were highly satisfied with the audiovisual communication tool to enhance the reduction of salt consumption (Sousa *et al.*, 2021). In addition, on being discharged from the hospital, the feasibility of using an mHealth app for self-care maintenance, management,

and confidence among 12 African American participants showed its feasibility to assist with the self-management of heart failure in patients with low literacy, low health literacy, and limited smartphone experience (Heiney *et al*., 2020).

As more and more older adults in many countries are aging in place (AIP), caregivers in various roles—including service providers, family members, and relatives—are adapting to provide home-based care instead of using hospitals or nursing homes (Lee, Seohyun, & Park, 2023). In the present study, the assessment urged the team to identify how the population needed applications and their reactions. The results were used to improve iterations of an application's potential prevention interventions for the users' characteristics, especially family caregivers. For the last phase of the development of a health care management prototype programme for dependent older adults in the community, the application was used to reduce the burden among family caregivers. Family caregivers of older adults with dependents obviously felt less burden if they can assess the basic health condition of the care recipients through the Smart Visit Home app, discuss care problems, and send evidence such as images to nurses at the primary care centre through a conversation dashboard to refer their care recipient to proper management (Sanprakhon *et al.*, 2023). However, current research findings indicate that the most crucial role of village health volunteers is community health promotion, with basic health screening for the elderly and disease prevention campaigns also being key priorities.

## CONCLUSION

This study revealed that the new application was accepted by participants who were family caregivers. The inclusion of home visits in our application was particularly important to the participants. The SAH app is responsive to the specific needs and preferences of its users. The features and users' preferences indicate its potential efficacy and relevance in the context of remote caregiving, including social distancing in COVID-19. The applications' implementation had limitations in some areas, such as no internet access. In order to improve future studies, it is crucial to accumulate additional research.

The study aims to provide knowledge and health promotion guidelines for older adults living in communities, covering topics such as dementia, MCI, and fall prevention, based on a basic screening feature. Furthermore, the findings of the present study could lay the groundwork for developing and administering nursing interventions aimed at improving caring skills in caregivers of older adults with dependence.

### Conflict of Interest

The authors declare that they have no competing interests.

### ACKNOWLEDGEMENT

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