The perceived efficiency and acceptability of remote real-time health monitoring system in elderly residential setting and community isolation facility

Registration No.: NCT05302440

Document Date: 30 March 2022

STUDY PROTOCOL

1. Project title

The perceived efficiency and acceptability of remote real-time health monitoring system in elderly residential setting and community isolation facility

2. Investigators

Principal Investigator

Dr. Derek Yee Tak CHEUNG, Assistant Professor, School of Nursing, The University of Hong Kong

3. Study sites

Woo Ping Care and Attention Home, Haven of Hope Christian Service

Haven of Hope Nursing Home, Haven of Hope Christian Service

Haven of Hope Sister Annie Skau Holistic Care Centre, Haven of Hope Christian Service

Kai Tak Holding Centre Zone D (operated by Haven of Hope Christian Service)

4. Aims of the project

The study is a single-group 4-week trial of exploring the perceived efficiency and acceptability of remote real-time health monitoring system. The qualitative sub-study aims to explore the experience in setting up the remote health monitoring system, and the perceived benefits and acceptability of the care staff towards the system. The study deliverable will be a local testing protocol for future adaptation of remote health monitoring systems in elderly residential settings.

5. Outcomes

The primary outcomes include the efficiency of the system perceived by the care staff and staff perceptions on the whether the adoption of the system facilitates early detection of abnormal vital signs, facilitates early delivery of medical support, and reduces staff stress.

Ancillary outcomes include number of hospital admissions and any medical assistance due to the adoption of the system, and perceived benefits and acceptability of the care staff towards the system. The barriers and difficulties in the set-up of the system, and the concerns in choosing wireless or cable connection for the system are also explored.

6. Estimated duration and commencement data

Project start date: March 2022
Testing period: March 2022 – April 2022
Proposed study completion date: April 2022
Expected final report date: June 2022

7. Scientific/historical background

The vital signs of physically weak residents need to be continuously monitored so as to facilitate timely medical intervention. The procedures involved are labour intensive and time consuming. Moreover, during pandemic, a proportion of residents are infected with infectious disease, imposing threat to the staff who monitor their vital signs in close contacts. The application of remote monitoring system enables autonomous and continuous monitoring of vital signs without close contact between the residents and the staff. It is expected to reduce the time in monitoring the vital signs, however the efficiency is yet to be investigated. Apart from the potential time saving, the perceived benefits and acceptability of the stakeholders towards the system would also influence the future adoption of the system. Their perceived benefits and acceptability need to be explored.

Gerontechnology is playing a role in assisting the elderly in living independently, supporting their social interactions, improving their quality of life, and preventing emergencies. Conceptually, gerontechnology can be divided into four categories according to its use: first, gathering continuous data (e.g., heart rate and motion) to monitor the performance of older adults or detect falls through wearable sensors; second, assisting older people cognitively and socially using, for instance, interactive robotic pets; third, providing care or monitoring of health from a distance, with the help of telecare or telemedicine; and finally, compensating for possible technology deficits in the home environment, which mainly refers to a smart home. In this study, gerontechnology is used as an umbrella term for all the aforementioned technologies. Gerontechnology helps older adults maintain their

health and wellbeing in their homes, which is considered to be of positive significance to aging in place. Using telecommunications, gerontechnology can now provide health professionals and caregivers with remote access to older patients. In addition, gerontechnology has shown great potential in reducing escalating medical costs by eliminating the need for expensive and limited medical facilities. In the context of the accelerated aging process, gerontechnology already has a broad market prospect, and delivering healthcare services based on gerontechnology has been one of the trends of providing care for older adults in Hong Kong.

Compared to developed countries, the smart health technology of China is still in its infancy. It was only in 2020 that the Social Innovation and Entrepreneurship Development Fund and other NGOs first introduced the Gerontechnology Platform specifically work on projects on improving access and evaluating technology-based applications and innovations for consumer (elderly use at home) and healthcare settings (e.g., elderly home and geriatric hospital ward setting). Thus, although several international studies have explored the perspectives of the care staff in residential homes and healthcare settings on emerging technologies across the world, the data on Hong Kong are still insufficient. Thus, this study aims to determine:

1. The intention of the care staff in residential homes and community isolation facility in Hong Kong to adopt gerontechnology.
2. The factors influencing the adoption intention and use of gerontechnology.

Gerontechnology, based on the elderly users' needs, is playing a role in improving the daily functions of the elderly. Piau et al. (2014) mentioned that gerontechnology can help the elderly in living independently and support their social interactions. They classified gerontechnology applications by the elderly users' needs: social isolation (e.g., mobile phone technologies and social media apps), functional decline (e.g., robotic vacuums and electric wheelchairs), and cognitive disorders and Behavioral and Psychological Symptoms of Dementia (BPSD) (e.g., telemonitoring and location tracking technologies). Carmeli (2009) indicated that gerontechnology such as "smart or future homes" allows the elderly to control their environments, and therefore they improve their overall quality of life, increase independence,

and prevent emergencies. This study refers to the abovementioned gerontechnology application contexts and then explains the products and services of gerontechnology for the participants by giving some examples, such as “mobile phones for the elderly, social media apps, robotic vacuums, electric wheelchairs, wearable healthcare monitoring systems, location tracking technologies, and smart homes”. The study will be conducted in compliance with the protocol, GCP and the applicable regulatory requirement(s).

8. Research Questions

The study has 3 primary research questions and 6 secondary research questions targeting care staff in the setting of residential homes for the elderly and community isolation facilities. The 3 primary research questions are:

(1) Will care staff perceive the remote real-time health monitoring system as efficient?
(2) Will the system facilitate any early detection of abnormal vital signs?
(3) Will the system facilitate early delivery of medical support?

The 6 secondary research questions are:

(4) What are the numbers of hospital admissions and further medical assistance due to the adoption of the system?
(5) Will the system reduce the stress level of the care staff?
(6) What are the perceived benefits and acceptability of the care staff towards the system?
(7) What should be considered when developing the evaluation framework for the adaption of the system in elderly residential setting?
(8) Are there any barriers and difficulties in the set-up of the system?
(9) What are the concerns in choosing wireless or cable connection for the monitoring device?

9. Study design

This is a single-group 4-week trial of using the remote health monitoring system. All care staff who manage the system will complete a very brief survey (1-minute) after each work shift for 2 weeks. Detection of abnormal vital signs will be recorded by the system. Hospital admission and further medical assistance due to the adoption of the system will be counted by the care team. The care staff will be interviewed about the set-up of the system, their perceived benefits and acceptability of the system.

10. Subjects

Care staff in study sites who are responsible to set up and operate real-time remote health monitoring system will be recruited. They also need to be able to read and understand Chinese.

11. Procedures

11.1 Implementation

The remote monitoring system will constantly record the temperature, pulse and SpO2 of the residents wearing the equipment. When the staff find abnormal vital signs, they will provide further medical assistance. After every shift during the trial period for 2 weeks, they will fill in a 1-minute survey.

11.2 Data collection

The remote monitoring system will remotely and real-time record the temperature, pulse and SpO2 of the residents wearing the sensor. When the staff are notified of any abnormal vital signs by the system via screen display and notification sound, they will deliver further medical assistance. Hospital admission and further medical assistance due to the adoption of the system will be counted by the care team under pre-existing practice. After every shift during the trial period for 2 weeks, the staff will fill in a 1-minute survey about their operation and perceived efficiency of the system, such as facilitating more frequent monitoring of particular residents' vital signs, the provision of further medical assistance, perceived time saving in monitoring vital signs, and acceptability of the system. They could record their experience of using the system in written format or in a mobile phone messaging app (such as Whatsapp) in audio format. If they fill in the survey for fewer than 8 times during the 2 weeks, they would be invited to continue to fill in the survey after work shift for an extra week until they fill in it for at least 8 times. Meanwhile, as a staff

may complete more than 1 shift per day, they would not be invited to fill in the survey after having completed it for 12 times. At the end of the trial, HOHCS staff will provide the number of abnormal vital signs recorded by the system, number of hospital admissions and further medical assistance without any personal identifiers to HKU research team. All data collected that is related to residents is not identifiable.

There are two parts of the qualitative sub-study. When the system is set up, the unit IC and care staff responsible to set up the system from each participating unit will be interviewed by HKU research assistant(s). Themes of qualitative questions include: (1) barriers and difficulties in the set-up of the system; and (2) the concerns in choosing wireless or cable connection for the monitoring device. Meanwhile, when the main trial ends, a total of 9-15 care staff from all participating units responsible to operate the system will be interviewed about their perceived benefits and acceptability of the system. Themes of qualitative questions include: (1) Acceptance of using the remote health monitoring system (including ease of operation, care staff's confidence and convenience in using the system); (2) Benefits of using the remote health monitoring system (including usefulness of the innovation, impacts on quality of care); (3) Concerns in using the remote health monitoring system (including if any residents stop using the sensor and the reason behind); and (4) Overall perception of using the remote health monitoring system. For both parts of the qualitative sub-study, an interview guide with open-ended and iterative questions will be used to probe for more experiences from the interviewees. Each interview will be conducted by a trained research assistant and will last about 15 - 30 minutes.

12. Blinding

Blinding is not applicable in this single group study.

13. Sample size determination

The sample size is estimated by the number and availability of the staff in the participating units. It is estimated that a total of 12-20 staff will be recruited.

14. Data analyses

The proportion of all the responses in the staff survey will be calculated. The numbers of abnormal vital signs, hospital admission and further medical assistance due to the adoption of the system will be counted.

The qualitative interview content will be transcribed verbatim in Chinese for further analysis. The qualitative interview transcripts will be analyzed using framework analysis to construct a coherent and logical structure from the classification of many opinions and perceptions of the system. The results will then be discussed and consolidated in the panel meetings with the co-authors.

15. Risk Control & Contingency Planning

Outbreak of infectious disease in the society/service unit that might limit the access of the research staff to carry out qualitative study. As a contingency plan, the qualitative interview can be done via virtual platform (e.g. WhatsApp or Zoom).

For damage and repair of any components during the testing period, the product supplier will provide sufficient number of devices as back-up with a 3-month warranty for the new device and maintenance.

As a voluntary participation, the participants have the right to withdraw from the study and intervention any time without consequences.

In case of inclination of product developers to produce positive test results, the research investigators will maintain research independence by excluding the product developer in data analysis and evaluation report writing.

16. Time-line: (HOLD*3 study)

HKU to prepare research instruments (staff survey etc.)	March 2022
Perform trial and monitoring for the main trial	March 2022 – April 2022
Carry out qualitative study	
Perform data cleaning and analysis	
Prepare datasets for data entry	April 2022 – June 2022
Data entry	
Transcription	
Summarization of transcripts by Nvivo	
Data analysis and tabulation	

17. Describe any unusual or discomforting procedures to be used: Nil.

18. Are there any hazards associated with the investigation? No.

19. Direct access to source data/documents

The raw data will be stored in the CD-ROM and locked in a cupboard with keys kept by the Principal Investigator. Only the Investigators and Research Assistant of the project will be permitted to access to raw data and/or study record. The data will be kept for 10 years or longer after the study completed.

20. Dissemination of study result

Study results will be made available for the funder, Gerontechnology Platform (GTP), and Haven of Hope Christian Service (HOHCS). Upon the agreement of the funder and product supplier, study results shall be made available presented in international conferences such as International Conference on Gerontechnology and published in internationally ranked journals, such as Gerontechnology Journal and International Journal of Nursing Studies.

21. Consent

Care staff responsible for the operation or installation of the remote health monitoring system will be invited to participate in the study by obtaining written consent. The HKU researcher or the investigator not responsible for the home will explain to the relevant details of the study before seeking consent. As a voluntary participation, the participants have the right to withdraw from the study any time without consequences to their rights or their work appraisals.

22. Conflict of interest: None

23. Financing and insurance

This research will be funded by the Social Innovation and Entrepreneurship Development Fund.

24. Reference

Carmeli, E. (2009). Aspects of assistive gerontechnology. International Journal on Disability and Human Development, 8(3), 215-218.

Piau, A., Campo, E., Rumeau, P., Vellas, B., & Nourhashemi, F. (2014). Aging society and gerontechnology: a solution for an independent living? The journal of nutrition, health & aging, 18(1), 97–112. https://doi.org/10.1007/s12603-013-0356-5.