

SYMPOSIUM PRESENTATION 3: PHYSICAL AND MENTAL HEALTH

Delivery of health and social care for lower-income older adults in communities: Does technology help?

H. Kim (Convener)

Participants H. Kim (Korea), T. Lee (Korea), E. Kim (Korea), and Y. Kim (Korea). **ISSUE** South Korea faces rapid population aging and an increased burden of healthcare costs and institutionalization. Policy initiatives that promote community-based integrated care have been launched since 2018, and various research and demonstration programs have been launched and executed. Technology is a known key to the success of such large system change, and it has been widely adopted in many demonstration programs and related research projects. Limited evidence and strategies have been reported, however, on how technology can contribute to reducing inequalities in health and care. **CONTENT** Our symposium is based on two government-funded projects aiming to advance health- and social-care delivery for low-income older populations. One is a machine learning (ML) prediction modeling project using nationwide integrated care management databases for social services, and the other is an ongoing health equity intervention project, a health and wellness program (HWePS) for community-dwelling seniors that has used a mobile app and other technologies since 2019 and continuing throughout the COVID-19 pandemic. We will highlight 1) the policy and social contexts of these technology-enhanced senior health and care projects in communities in Korea, 2) the development and validations of the technology (the mobile app and ML algorithms) in meeting specific project goals, and 3) the implementation process and (early) findings as well as policy and practical lessons from three case studies on the use of these innovative tools for design and delivery of integrated health and social care. **STRUCTURE** H. Kim first will present an overview of the two technology-enhanced, integrated health- and social-care management projects for older community-dwelling people including the goals, theoretical background, study design, settings, and data. Next, Y. Kim and colleagues will present a care-needs resource-use pattern analysis using machine learning methods to develop and analyze multi-year, nationwide, integrated case-management databases targeting the low-income older population receiving social welfare services. Lee and colleagues will then present the development and validation results of a self-checkup module in the HWePS project app, which is the foundation for making evidence-based, individualized (self)-care management plans for older people. E. Kim and colleagues will present the development and use of a care-management module in the HWePS app and the early health and service outcomes. **CONCLUSION** Through real-world case studies, this symposium will inform the audience of the large potential of ICT use in improving service quality and the health and wellbeing of socially disadvantaged older adults in resource-limited policy environments. It will also explore multi-dimensional challenges and also potential strategies to overcome these challenges and scale-up the projects in the next stages.

Keywords: community care, health and well-being, health equity, m-Health, AI

Address: Graduate School of Public Health and AI Institute, Seoul National University, Seoul, Republic of Korea

Email: hk65@snu.ac.kr

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ICT use promoting integrated health and social services through multi-disciplinary research efforts: Cases from Korea

H. Kim

Purpose Significant investment in improving the health and wellbeing of aging populations continues, but health and care inequality is an ongoing challenge in Korea, as in other aging countries. Gerontech is often considered a potential solution, but the still-mixed evidence in real-world settings often hampers the widespread adoption of gerontech in the current health and care systems in Korea. This presentation will provide as case studies an overview of two recent government-funded R&D projects in Korea targeting socially disadvantaged older adults and aiming to build evidence on how ICT can improve the design and delivery of integrated health- and care-management services (Min et al., 2021) and public preventive healthcare (Kim et al., 2021). **Method** The session will begin with the unique health- and social-care challenges caused by rapid population aging in Korea. In particular, a lack of human resources, including social workers and nurses, compared to increasing care demands is one of the most pressing policy issues in community-based integrated care delivery. Min et al.'s (2021) study is presented as a case study that addresses this and other policy issues by developing and validating prediction models of linkages between care needs and resource allocation, which can assist care workers' case management work. This study is the first machine learning/artificial intelligence (ML/AI) modeling study using the nationwide integrated (health-social welfare) case-management big database (HangBok e-Um), which has over 340,000 old welfare beneficiary cases (2018-2020), combined with other databases in Korea. The session will also address collaborative, multi-disciplinary team efforts along with a study overview and lessons learned. Next, the second case study (Kim et al., 2021) presented is a health equity study conducted in a low-income small neighborhood in Seoul during COVID-19. The session will provide the policy and theoretical rationale for developing a community-based integrated health and wellness program and elaborate on how ICT was incorporated and implemented in order to maximize the effectiveness and efficiency of multidisciplinary care coordination and delivery to about 700 older residents in a lower-income urban district with limited financial and human resources. **Results and Discussion** This presentation will provide the audience with the broader research context, theoretical rationales, and research design underpinning other case studies in the Korean context.

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Keywords: ICT, integrated care management, big data, Asia

Address: Institute of Health and Environment, Seoul National University, Seoul, Republic of Korea

Email: hk65@snu.ac.kr

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SYMPOSIUM PRESENTATION 3: PHYSICAL AND MENTAL HEALTH

Development of needs-resources prediction model using integrated case management big data

Y. Kim, H. Kim, T. Lee, S. Min, S. Park, W. Lee

Purpose In Korea, social care services are becoming important according to changes in the demographic structure due to aging. Case management using big data is used to effectively respond to this. The use of big data provides new insights into social service planning, goal setting, and delivery (Gillingham et al. 2017), and serves as an alternative methodology when qualitative methods for accessing dangerous or vulnerable classes are not sufficient or reasonable (Zetino et al. 2019). Recently, machine learning-based prediction models were employed to understand the complex needs in case management and to accurately support the resources that matched them. The purpose of our research is also to develop a machine learning-based prediction model for three big data surveyed by the Social Security Information Service and local governments. **Method** From the three big data collected from 2019-2020, a categorical variable consisting of four needs (maintaining daily life, economy, health, and living environment) and a categorical variable consisting of five resources (physical health, health management, mental health, psychological sentiment, and housing) were defined as two outcome variables. For independent variables, depending on how we combine the big data, three datasets including multiple variables related to physical and mental health and house structure related variables were constructed. After preprocessing by combining the three sets of independent variables with the two outcome variables, six datasets were created with different sample size(n) and number of variables(p): (1) the three datasets related to the needs – dataset 1(n=15,434, p=176), dataset 2(n=4,075, p=334) and dataset 3(n=600, p=412), (2) the three datasets related to the resources – dataset 4(n=15,434, p=208), dataset 5(n=4,075, p=365) and dataset 6(n=600, p=419). In building the prediction model for the resources as outcome variable, needs-related variables were added to the independent variables. We considered two methods for multi-label classification (Zhang et al. 2013). One method called “Binary relevance” was considered to build machine learning models for each binary category from the four needs and the five resources. The other method called “Chain ensemble classifier” was considered to build machine learning models using the four needs and the five resources as outcome variables. The prediction models included logistic regression, lasso, svm, randomforest, xgboost (Hastie et al. 2009), and they were tuned by 10-folds cross-validation in the train set, and best prediction models were evaluated using F1-score in the test set. The ratio of train set and test set was divided into 3:1. **Results and Discussion** First, we identified the predictive performance results of each best model for the four needs: Daily life (F1=0.866), economy (F1=0.720), health (F1=0.870), and living environment (F1=0.768). For the resources, the results were physical health (F1=0.893), health management (F1=0.949), mental health (F1=0.553), psychological sentiment (F1=0.772), and housing (F1=0.916), respectively. The high predictive performance of the models was confirmed, and in particular, noticeably high in two types, health management and housing(>0.9). This result shows an opportunity to confirm the possibility of machine learning-based models, which is still rarely applied to national policies and practices, as a decision support tool for case managers.

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Keywords: case management, social care services, big data, machine learning, multi-label classification

Address: Graduate School of Public Health, Seoul National University, Seoul, Republic of Korea

Email: yeonjin217@snu.ac.kr

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Development and validation of a mobile app-based interRAI CUSR for older adults in urban, low-income communities

T. H. Lee, S. Chun, E. Kim, H. Kim

Purpose The number of aging populations is continuously growing and the increasing need for systematic health care for the elderly living alone and urban poor in small-areas calls for community-wise action for health disparity reduction. In Korea, despite the efforts to facilitate community-based health care, there is limited number of valid and reliable self-checkup tools for assessing health and function of community older adults. Hence, it is necessary to apply comprehensive information system to promote collecting and processing assessment data to facilitate self-care and elevate the quality of care. The interRAI Check-Up Self-Report Korean version (interRAI CUSR-K) is a self-check-up tool for about comprehensive geriatric assessment (CGA), which involves a holistic, multidisciplinary evaluation of health and function of the Korean older adults in community setting. We designed and developed the HWePS project app, which is a non-profit, prototype, self-check app to provide contactless, self-report based CGA under social distancing due to COVID-19 pandemic. In this context, our study introduces a process of development, application, and validation of the interRAI CUSR-K using the HWePS project app in the community setting. **Method** We reviewed existing literatures, gathered advices from experts, and conducted multidisciplinary research team meeting to carry out design and development of the app. To verify the reliability and validity of the instrument, we recruited eight lay health leaders (volunteers) from an urban small-area and provided education and training to help the community older adults in self-assessment of health and function using mobile app via interview method. A total of 168 seniors did the self-checkup with volunteers' assistance and the psychometrics properties of the results are examined. SAS 9.4 was used for statistical analysis. **Results and Discussion** Based on the information collected, the software was programmed in the Hybrid Web development using Java languages. The average age of the participants (n=168) was 74.4 years-old and the overall self-assessment took about 25 minutes. The participants responded that the assessment results were fairly accurate and presented their health in general, and the questionnaire were easy to comprehend. Overall mean score of weighted kappa (test-retest, inter-rater evaluation) were ranged between 0.7-0.9, confirming the reliability of the instrument of about 90 items. The study demonstrates application and psychometric properties of a evidence-based, self-reported, internationally reliable geriatric assessment tool using mobile app under community setting. The results of the study would propose implications for future technology-supported community health interventions and m-health applications as a decision support tool to improve quality of care.

Keywords: mobile app, comprehensive geriatric assessment, community, lower-income, older adults

Address: Graduate School of Public Health, Seoul National University, Seoul, Republic of Korea

Email: maclover@snu.ac.kr

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A smartphone application-based communications tool for the care management of community-dwelling older adults: Findings from the HWePS

E. Kim, T. H. Lee, S. Chun, H. Kim

Purpose Older adults living in communities have very diverse needs and preferences. Communication and cooperation between care managers, multidisciplinary teams, and health leaders are important to provide individualized health services that reflect the needs and preferences of the aged. In this study, we seek to introduce a case of a smartphone-based application used as a communication tool to provide tailored interventions for older adults living in the community. **Methods** The 'Health and Wellness Program for Seniors(HWePS) project' is currently being carried out in an urban small-area designated based on socioeconomic indicators. The HWePS utilizes a smartphone application (the HWePS project app) to encourage seniors' ability for self-care through individualized care management using a peer-support via community health leaders. As care managers, assigned nurses set individualized intervention plans reflecting individual seniors' needs and preferences. According to the intervention plan, tailored nutrition, exercise, emotional, and social interventions programs are provided to the seniors for 12 weeks by an interdisciplinary team of professionals. The contents of the tailored programs are built into the smartphone application. Its end users include seniors and community health leaders. The leaders help seniors maintain their self-care using the app using a to-do checklist for health behaviors such as "walking more than 30 minutes", "drinking 6 cups of water", and "participating in group social settings". Utilization of the application makes it possible to provide a tailored intervention based on peer-support, rather than a uniform intervention that disregards the different needs and preferences of older adults. To enhance utilization of the application, we provided education to senior participants, community health leaders, and the professional team of nurses, dietitian, physical trainer and social worker. 216 senior participants received the care management intervention, and education on the smartphone application was provided to 42 community health leaders and 7 professional health workers. We analyze the effectiveness of a 12-week intensive intervention program for two clusters of seniors (n=216) that received the intervention between fall 2021 to summer 2022, using paired t-tests. **Results and discussion** Of 216 participants, the following analysis reports data for 197 individuals who responded to the pre-post survey. 62% of participants were women and 61% of participants were aged between 65-74. Proportion of those who participated in regular walking improved from 63% to 78% ($p=0.001$), proportion of those aware of their own blood sugar levels increased from 50% to 63% ($p=0.006$), and proportion of those experiencing stress decreased from 13% to 7% ($p=0.028$). While there were positive improvements in mental health and self-rated health, they were not statistically significant. The ICT-integrated HWePS project provides integrated and tailored services. In particular, the use of ICT for health information and communication tool to encourage healthy behaviors enhanced older adults' self-management in times of COVID-19. Furthermore, various health and behavior outcomes improved, providing evidence for effectiveness of an ICT-based community health service model.

Keywords: mobile app, communication, older adults, tailored intervention

Address: Graduate School of Public Health, Seoul National University, Seoul, Republic of Korea

Email: kimeunji7@snu.ac.kr

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