The Journal of Frailty & Aging
Volume 8, Number 2, 2019

BRIEF REPORTS

PREDICTIVE ABILITY OF SEVEN DOMAINS OF THE KIHON CHECKLIST FOR INCIDENT DEPENDENCY AND MORTALITY

S. SATAKE[1,2], H. SHIMOKATA[3,4], K. SENDA[5], I. KONDO[6,7], H. ARAI[8,9], K. TOBA[10]

1. Section of Frailty Prevention, Department of Frailty Research, Center for Gerontology and Social Science, National Center for Geriatrics and Gerontology; 2. Department of Geriatric Medicine, Hospital, National Center for Geriatrics and Gerontology; 3. Section of Longitudinal Study of Aging, National Institute for Longevity Science (NILS-LSA), National Center for Geriatrics and Gerontology; 4. Graduate School of Nutritional Sciences, Nagoya University of Arts and Sciences; 5. Department of Clinical Research Promotion, Innovation Center for Clinical Research, National Center for Geriatrics and Gerontology; 6. Director, Center of Assistive Robotics and Rehabilitation for Longevity and Good Health, National Center for Geriatrics and Gerontology; 7. Department of Rehabilitation Medicine, Hospital, National Center for Geriatrics and Gerontology; 8. Director, Center for Gerontology and Social Science, National Center for Geriatrics and Gerontology; 9. Director, Hospital, National Center for Geriatrics and Gerontology; 10. President, National Center for Geriatrics and Gerontology.
Corresponding author: Shosuke Satake, Section of Frailty Prevention, Department of Frailty Research, Center for Gerontology and Social Science, National Center for Geriatrics and Gerontology, 7-430, Morioka-cho, Obu, Aichi 474-8511, Japan, Phone: +81-562-46-2311, FAX: +81-562-44-8518, e-mail address: satakes@ncgg.go.jp

Abstract: The Kihon Checklist (KCL) is a structured questionnaire consisting of 7 domains to assess seniors' function in daily living. The aim of this study was to examine which domains of the KCL can predict incident dependency and mortality. The municipality sent a KCL questionnaire to independent seniors in Higashi-ura Town and collected the answers of the 5542 seniors who provided complete answers. Their incident dependency and mortality were followed-up for 2.5 years. A Cox proportional hazard model indicated that meeting any of the criteria in instrumental activities of daily living, physical, nutrition, and mood domains significantly predicted the risk of dependency, whereas meeting any of the criteria in physical, nutrition and socialization domains significantly predicted the risk of mortality. Category assessment by the KCL could be useful to predict incident dependency and all-cause mortality.

Key words: Self-reported questionnaire, frailty, category assessment, long-term care, older adults.

J Frailty Aging 2019;8(2)85-87
Published online February 20, 2019, http://dx.doi.org/10.14283/jfa.2019.3

Background

The Kihon Checklist (KCL), which was developed by the Ministry of Health, Labor and Welfare (MHLW) in Japan, is extensively used to assess seniors' physical, mental, and social functions in daily lives and to identify older adults who are at risk of requiring support or care in the near future (1). It is a self-reported questionnaire that consists of 25 yes/no questions regarding 7 domains, instrumental activities of daily living (IADL), physical, nutrition, eating, socialization, memory, and mood (2). Difficulty with any question is counted as a score in the KCL, with a higher score in each domain of the checklist indicating a higher risk of requiring support or care in that domain. The MHLW proposes original criteria to identify vulnerable seniors for disability and supplemental criteria for specialized supports (3).

In previous studies, several investigators reported how well the original and supplemental criteria of the KCL could predict incident dependency in community-dwelling older adults (3-5). However, there have been no reports in which the relationship between each domain of the KCL and all-cause mortality was analyzed, as far as we know.

The aim of this study was to examine which domains of the KCL were related to all-cause mortality in addition to new-onset dependency in the Japanese community-dwelling population.

Methods

Design and subjects

Of all senior residents aged 65 years and older in Higashi-ura Town in April, 2010, the municipal government identified 8091 independent older persons who were not certified as long-term care insurance (LTCI) service need. They sent a KCL questionnaire to the independent seniors and asked them to return it after answering all questions. Among the respondents, the independent older residents who filled in all of the questions of the questionnaire were selected as the subjects eligible for this study. The subjects' baseline characteristics and KCL data were collected. Information about a new LTCI certification and death within 2.5 years was given by the municipal government. The Ethics Committee of the National Center for Geriatrics and Gerontology, Obu, Japan and Higashi-ura municipal assembly approved the study protocol.

Category assessments

Among the original criteria, a score of 3 or more in the physical domain (#6-10), a score of 2 in the nutrition domain (#11 and #12), and a score of 2 or more in the eating domain (#13-15) indicate physical decline, malnutrition, and oral dysfunction, respectively (3). In addition, a score of 1 or more in the memory domain (#18-20) and a score of 2 or more in the mood domain (#21-25) suggest cognitive impairment and depressive mood, respectively, based on the supplemental criteria (3). Homebound status was defined as an answer of

Received August 29, 2018
Accepted for publication December 4, 2018

"no" to question #16 in the socialization domain (#16 and #17). Because there is no published cut-off value for the IADL domain (#1-5), a cut-off value of a score higher than one point was used in this study. Subjects who did not meet each criterion were considered controls.

Definition of dependency

Dependency was defined as having a certification for needing the LTCI service in this study. In the LTCI service system, certification for LTCI service need is separately assessed by entrusted investigators from responsible municipal governments and medical doctors in charge of the senior who applied for certification by the LTCI. Then, based on their reports regarding dependency in activities of daily living and comorbidities, the examining committee composed of municipal staff, medical doctors, and community health nurses rich in experience in the geriatric field decides the need for certification and its grade (6). Information on the LTCI certification and death of all senior residents was collected by the municipal government.

Statistical analysis

The chi-squared test was used to analyze the differences in the baseline characteristics and the incidences of dependency and mortality within 2.5 years between cases meeting any of the criteria and controls. Cox proportional hazards model regression analyses were used to estimate hazard ratios (HRs) and construct 95% confidence intervals (CIs) of cases in each domain compared to controls, adjusting for age, sex, and all-domains except the target domain. All analyses were conducted using the R statistical package version 3.2.2. (R project for Statistical Computing, Vienna, Austria) (7). A p value of less than 0.05 was considered significant.

Results

Among the 9367 residents who were 65 years and older, 1276 seniors who had already been certified as requiring care or support in their daily lives were excluded. The KCL questionnaire was sent to the remaining older residents. Although 5638 seniors replied and filled in the questionnaire, 5542 seniors (68.5%) filled it out completely and were eligible for this study.

The mean age of the study subjects was 72.6 years, and 46.4% were men. The subjects' baseline characteristics and KCL data have been described elsewhere (8). The percentages of the subjects meeting each criterion of the KCL were 25.7%, 15.2%, 1.2%, 13.5%, 7.4%, 33.7%, and 17.4% for IADL, physical, nutrition, eating, socialization, memory, and mood domains, respectively. The percentages of seniors who had new LTCI certifications (Figure 1a) and died (Figure 1b) over the 2.5 years were significantly higher in cases meeting any of the criteria in each domain than in controls. The Cox proportional hazard model adjusted for age, sex, and 6 domains except the target domain indicated that IADL, physical, nutrition, and mood domains were significant predictors for the risk of dependency, compared to control, with HRs of 1.696 (95% CI: 1.371-2.099), 1.938 (95% CI: 1.548-2.426), 1.824 (95% CI: 1.047-3.175), and 1.892 (95% CI: 1.522-2.352), respectively (Figure 2a). On the other hand, the risk of all-cause mortality could be predicted by physical, nutrition, and socialization domains, with HRs of 1.875 (95% CI: 1.196-2.941), 2.645 (1.071-6.530), and 1.843 (1.123-3.024), respectively (Figure 2b).

Figure 1

Percentages of subjects (a) who had new certification for long-term care insurance service need, and (b) who died within 2.5 years in the case and control groups of each domain of the KCL

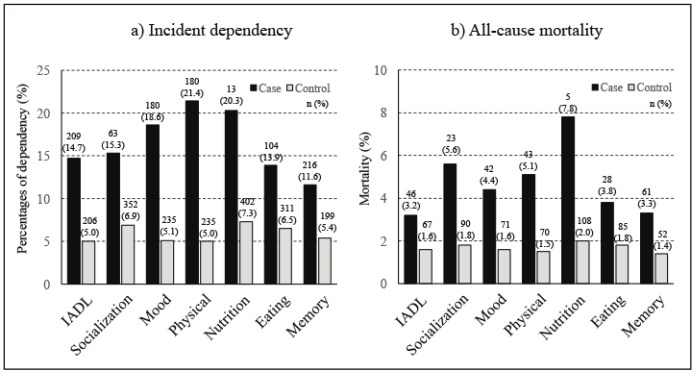
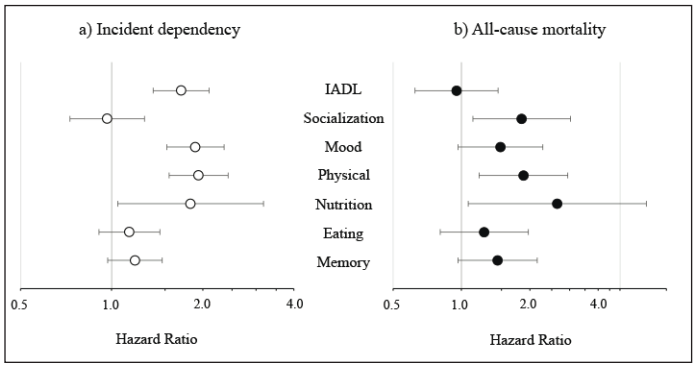


Figure 2

Hazard ratios of incident dependency (a) and all-cause mortality for each domain of the KCL. Lines indicate 95% confidence intervals



Discussion

In this study, both physical and nutrition domains in the KCL could significantly predict incident dependency and all-cause mortality within 2.5 years. In addition, IADL and mood domains were significant predictors of dependency, while the socialization domain significantly predicted mortality. From the view point of aging process, the deficits in the IADL or mood domain may be an early sign for predicting adverse health

outcomes, whereas the deficits in the socialization domain may be a later sign or serious indication.

We previously reported that the total KCL score could be a useful index to assess frailty status and to predict new incidences of dependency and mortality (8, 9). However, it was unclear which domain could affect independent seniors' health in the future. In this sense, our results of this study indicate that category assessment by the KCL could be useful to predict the impact on adverse health outcomes.

Several previous studies using the KCL showed that it could predict new certification for LTCI service need (3-5) or a deterioration in the Tokyo Metropolitan Institute of Gerontology Index of Competence (10). Recently, Kamegaya et al. reported the predictive ability of the 6 domains of the KCL, except the IADL domain in which the MHLW did not show the public cutoff point, for the risk of 3-year incident LTCI certification in 21,325 community-dwellers (5). They reported that physical, nutrition, memory, and mood domains showed significant odds ratios to predict new certification for LTCI service need on logistic regression analysis incorporating age, sex, and six domains into the model as covariates. On the other hand, we proposed a cutoff point of the IADL domain based on this community-based complete survey and analyzed new incident dependency incorporating all 7 domains of the KCL into the Cox proportional hazard model. Unlike the previous analysis, the present analysis did not indicate that the memory domain could significantly predict the new incidence of dependency. This difference is probably due to whether the IADL domain was simultaneously incorporated into the analytical model, because IADL is related to cognitive impairment (11), or due to a lack of analytic power in this study.

Furthermore, it was found that physical, nutrition, and socialization domains of the KCL could significantly predict all-cause mortality. In particular, seniors meeting the socialization domain criterion of the KCL, which means homebound status, had a higher risk of death independent of other domains. Mortality of subjects without LTCI certification within 2.5 years was significantly higher in people with problems in the socialization domain than in those without (data not shown). Recently, the co-existence of social isolation and homebound status was reported to increase the risk of all-cause mortality by Sakurai et al (12). The present result also supported their report, although homebound status was assessed in the present study by asking just one question, 'Do you go out at least once a week?'.

The limitations of this study are 1) the limited number of subjects answering all questions, 2) insufficient medical information at baseline, and 3) indirect assessment of dependency, because new certification for LTCI service need was selected as indicating new incident dependency.

In conclusion, the results of the present study showed that the category assessment of the KCL could predict incident dependency and all-cause mortality in the near future. It is important to identify the problematic domains of seniors' function in daily living.

Funding: This study was supported by the Research Fund for Longevity Science (22-1, 25-11, and 30-6) from the National Center for Geriatrics and Gerontology, Japan. The sponsor had no role in the design and conduct of the study; in the collection, analysis, and interpretation of the manuscript; or in the review or approval of the manuscript.

Acknowledgements: The authors greatly appreciate the municipal staff's help and efforts.

Conflict of interest: None.

References

1. Japanese Ministry of Health, Labor, and Welfare. The Manuals of the Evaluation for Ability to Perform Daily Activities on Preventive Care. 2005. https://www.mhlw.go.jp/topics/2009/05/dl/tp0501-1c_0001.pdf. Accessed 5 October 2012.
2. Sewo Sampaio PY, Sampaio RA, Yamada M, Arai H. Systematic review of the Kihon Checklist: Is it a reliable assessment of frailty? Geriatr Gerontol Int. 2016; 16: 893-902
3. Tomata Y, Hozawa A, Ohmori-Matsuda K, et al. Validation of the Kihon Checklist for predicting the risk of 1-year incident long-term care insurance certification: the Ohsaki Cohort 2006 Study. Nihon Koshu Eisei Zasshi. 2011; 58: 3-13.
4. Fukutomi E, Okumiya K, Wada T, et al. Relationships between each category of 25-item frailty risk assessment (Kihon Checklist) and newly certified older adults under Long-Term Care Insurance: A 24-month follow-up study in a rural community in Japan. Geriatr Gerontol Int. 2015; 15: 864-871.
5. Kamegaya T, Yamaguchi H, Hayashi K. Evaluation by the Basic Checklist and the risk of 3 years incident long-term care insurance certification. J Gen Fam Med. 2017; 18: 230-236.
6. Japanese Ministry of Health, Labor, and Welfare. Long-term Care Insurance System of Japan. https://www.mhlw.go.jp/english/policy/care-welfare/care-welfare-eldely/dl/ltcisj_e.pdf. Accessed 21 April 2017.
7. R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing. 2015 Vienna, Austria. URL: https://www.R-project.org/.
8. Satake S, Shimokata H, Senda K, Kondo I, Toba K. Validity of the Kihon Checklist score for the predicting the incidence of 3-year dependency and mortality in a community-dwelling older population. J Am Med Dir Assoc. 2017; 18: 552.e1-552.e6.
9. Satake S, Senda K, Hong YJ, et al. Validity of the Kihon Checklist for assessing frailty status. Geriatr Gerontol Int. 2016: 16: 709-716.
10. Fukutomi E, Okumiya K, Wada T, et al. Importance of cognitive assessment as part of the "Kihon Checklist" developed by the Japanese Ministry of Health, Labor, and Welfare for prediction of frailty at a 2-year follow-up. Geriatr Gerontol Int. 2013; 13: 654-662.
11. Fieo R, Zahodne L, Tang MX, et al. The historical progression from ADL scrutiny to IADL to advanced ADL: Assessing functional status in the earliest stages of dementia. J Gerontol A Biol Sci Med Sci. 2017; Dec 13: doi: 10. 1093/Gerona/glx235.
12. Sakurai R, Yasunaga M, Nishi M, et al. Co-existence of social isolation and homebound status increase the risk of all-cause mortality. Int Psychogeriatr. 2018; Jul 19: 1-9. doi: 10. 1017/S1041610218001047.