Association between advanced care management and progression of care need level in long-term care recipients: a retrospective cohort study

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Abstract

Background: Japanese long-term care insurance system started a special reimbursement for care coordination by qualified care managers (so-called “advanced care managers”). However, relationship between advanced care management and outcomes in long-term care recipients remains unknown.

Objective: We aimed to compare the outcome of long-term care recipients between advanced care management and conventional care management, in terms of progression of care need level.

Methods: We conducted a retrospective cohort study using the Survey of Long-term Care Benefit Expenditures in Japan. We identified those aged ≥65 who were newly certified at care level 3 and received long-term care services between April 2009 and March 2014 in Tokyo. We compared survival without progression of care needs level between the groups with and without advanced care management, using Kaplan-Meier method. Factors affecting the outcomes were determined with a multivariable logistic regression model fitted with a generalized estimating equation.

Results: Of 45,330 eligible persons, 12,903 (28.5%) received long-term care based on advanced care management. The average duration of progression-free survival was 17.4 months. The proportions of five-year cumulative progression-free survival were 41.2% and 32.8% in those with and without advanced care management, respectively. The group with advanced care management had significantly lower care needs levels (odds ratio, 0.77; 95% confidence interval, 0.72 to 0.82; p < 0.001).

Conclusion: Advanced care management was significantly associated with improved care need levels.
Keywords: Community Health Services, Health Services for the Aged, Integrated Care, Long-Term Care, Patient Care Planning
Introduction

In 2000, the Japanese government introduced Long-Term Care Insurance (LTCI), which provides welfare and health care services with comprehensive care management,1-3. Eligible persons can receive a variety of services, such as nurses’ visit, rehabilitation at home, bathing service at home, meal services at home and rental service for welfare equipment,4-6. Long-term care support specialists titled as “care manager” handle these care services provided by nurses, physical therapists, and official caregivers,7-9. The main tasks of care managers were: (1) assessing care needs and health problems of the elderly and their families; (2) coordinating care providers and designing long-term care service plans and care programs; and (3) monitoring and evaluating the long-term care service plans and care programs,10-11.

The government introduced a new qualification named “advanced care manager” in 2006,4,12. Advanced care managers must have at least 5-year experience as a care manager and are expected to design long-term care service plans and care programs with higher quality. The government started an additional reimbursement for long-term care agencies with advanced care managers from April 2009,13.

However, little is known about the effectiveness of this governmental policy on improved benefit of long-term care in Japan. More specifically, it remains unclear whether care coordination by advanced care managers is associated with improved outcomes of elderly persons. In the present study, we compared progression of care
need levels of long-term care recipients between advanced care management and conventional care management, using a national long-term care database in Japan.

**Methods**

**Study design and data source**

The study design was a retrospective cohort study. We used data from the Ministry of Health, Labour and Welfare in Japan as part of the Survey of Long-term Care Benefit Expenditures. This national data set contained baseline characteristics and information on solitary, dementia, care need levels (ranging from 1 to 5), type of long-term care services, type of long-term care agencies and care managers in charge of care plans.

The targeted population was elderly persons who were eligible for the LTCI services in Tokyo between April 2009 and March 2014. The study subjects were selected based on the following criteria: (1) persons who were aged 65 years or older; (2) those who were newly certified as care need level 3; and (3) long-term care service plans and care programs were designed by care managers. Care need level 3 indicates moderate level that needs a part of assistants of their lives, such as standing, excretion and bathing. We excluded individuals with: (1) using in-home services for less than 6 months; and (2) no use of in-home services for more than one month.

**Measurements**

*The outcome*
The outcome of the present study was progression of care need level. Care need levels were measured according to the criteria of “independence degree of daily living for the elderly,” which is designated by the government to assign elderly persons a score from 1 (less dependent) to 5 (more dependent),1,4,6,15. Care need levels were reassessed by 6 to 12 months.

**Advanced care management**

“Advanced care manager” system was introduced to improve quality of care management for long-term care recipients in 2006,4,12,16. Advanced care managers must have more than five years of experience as a care manager,17,18. The government set an additional reimbursement to long-term care agencies with at least one advanced care manager under the LTCI in 2009,13.

**Data analysis**

**Progression-free survival analysis**

We used Kaplan-Meier method and log-rank test to compare survival without progression of care need levels (i.e., transition from care level 3 to 4 or 5) between the groups with and without advanced care management. The progression-free period was counted from the month of newly certified as care need level 3 to the month of deterioration of care levels. Censors were individuals with: (1) no events, (2) hospital admission or nursing home admission, and (3) death during the study period.

**Risk factors**
To examine risk factors of progression of care need level, we used a logistic regression model fitted with a generalized estimating equation to account for the different lengths of the follow-up periods. The dependent variable was the progression of care need levels. The predictor variables included: (1) demographic variables (age, gender, and solitary), (2) dementia (level of independent living ≥ 3), and (3) type of agency with and without advanced care management. These variables were based on the previous studies and existing knowledge of risk factors for the deterioration of care need levels.\textsuperscript{19} The threshold for statistical analyses was set at $p < 0.05$ in a two-tailed test. Statistical analyses were performed using Stata (version 14, Stata Corp., Texas, USA).

**Ethical considerations**

Ethical considerations were examined in accordance with the Japanese epidemiological guidelines for secondary data analysis. This study was approved by the Institutional Review Board at The University of Tokyo, Japan. The requirement for informed consent was waived because of the anonymized nature of the data in the database.

**Results**

We identified 45,330 eligible people during the study period. The baseline information is shown in Table 1. The numbers of elderly people with and without advanced care management were 12,903 (28.5%) and 32,427 (71.5%), respectively. The average (standard deviation) of progression-free period was 17.4 (10.2) months. A total of 10,327 patients had progression of care need levels.
Table 1

<table>
<thead>
<tr>
<th>Elder person characteristics</th>
<th>n (%) or mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>82.7 ± 7.83</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>28217 (62.2)</td>
</tr>
<tr>
<td>Male</td>
<td>17113 (37.8)</td>
</tr>
<tr>
<td>Yes</td>
<td>6465 (14.3)</td>
</tr>
<tr>
<td>No</td>
<td>38865 (85.7)</td>
</tr>
<tr>
<td>Solitary</td>
<td>6465 (14.3)</td>
</tr>
<tr>
<td>No</td>
<td>38865 (85.7)</td>
</tr>
<tr>
<td>Dementia</td>
<td>11262 (24.8)</td>
</tr>
<tr>
<td>Level of independent living ≥ 3</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>34068 (75.2)</td>
</tr>
</tbody>
</table>

| Agency variable              |                   |
| Types of management          |                   |
| Advanced care management     | 12903 (28.5)      |
| Conventional care management | 32427 (71.5)      |

A total of 29,815,241 receipt data were analyzed in 45,330 patients during the analysis for five years. The data are presented as number of the patients (percentage) or mean (standard deviation). SD: interquartile range.

Figure 1 shows the progression-free survival curves in the groups with and without advanced care management. The proportions of five-year cumulative progression-free survival in the groups with and without advanced care management were 41.2% and 32.8%, respectively ($p < 0.001$). The ratios of the hazards of the groups were not constant over the study period. The hazard ratio changed at the regular re-assessment months (e.g.; 6, 12, 24, 36, and 48 months).
Kaplan-Meier method for the deterioration of care levels.
The analysis for the deterioration of care levels in 45,330 patients showed that the 5-year cumulative progression-free survival rate of the special and the general agency were 41.2% and 32.8%, respectively.

Table 2 summarizes the risk factor analysis indicating that those with advanced care management was significantly less likely to have progression of care need level (odds ratio, 0.77; 95% confidence interval, 0.72 to 0.82; $p < 0.001$). Age was significantly associated with progression of care need level (odds ratio, 1.01; 95% confidence interval, 1.01 to 1.02; $p < 0.001$).
Table 2
Risk factor analysis for deterioration of care levels using a generalized estimating equations model.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Forced entry</th>
<th>OR</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td></td>
<td>1.01</td>
<td>[1.01–1.02]</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Gender: female</td>
<td></td>
<td>1.04</td>
<td>[0.99–1.08]</td>
<td>0.12</td>
</tr>
<tr>
<td>Solitary: yes</td>
<td></td>
<td>0.81</td>
<td>[0.76–0.87]</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Dementia: yes</td>
<td></td>
<td>1.40</td>
<td>[1.33–1.47]</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Type of management: advanced care management</td>
<td></td>
<td>0.77</td>
<td>[0.72–0.82]</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Force entry: All variables were entered into the statistical analysis. OR: odds ratio; CI: confidence interval. The generalized estimating equations model showed that age and dementia were risk factors for deterioration of care levels. The advanced care management and solitary reduced the risk for deterioration of care levels.

Discussion

Primary findings

We found that elderly persons with advanced care management was significantly less likely to have progression of care need level than those without advanced care management.

Previous small studies suggested that advanced care managers could appropriately assess and care for elder persons based on their extensive experiences.20,21. They could combine a variety of care services efficiently and design care service plans suitably because they have broad knowledge of provided care services. They were also more likely to coordinate care teams with their personal connections. Therefore, the advanced
care managers could improve care service plans and care programs, which may have a meaningful impact on the outcomes of older persons.

Furthermore, agencies with advanced care managers could provide better educational environments than those without. As one of the basic duties of advanced care managers, they play pivotal roles in training and supporting other care managers,20,22. We believe such an educational environment may have an impact on the outcomes.

In our risk factor analysis, age and dementia were risk factors for deterioration of care need levels. These results were consistent with those in previous studies,23-25. In other countries, they also determined the age and dementia as main risk factors for deterioration of functional levels of the elderly,26-28. Regarding the hazard ratio in the progression-free survival analysis, the hazard ratios of the both groups changed at the regular reassessment months. It is possible that some older adults did not apply for the reassessments when their functional and psychosocial statuses deteriorated seriously. Further research about the reassessments is needed.

**Policy implications**

The additional reimbursement for advanced care management was introduced to enhance the quality of services and improve the outcomes in 2009,13. Without any evidence of this policy, there has been on-going discussion on more additional reimbursement for advanced care management,29. Although our study did not analyse the direct effect of this policy, we believe additional reimbursement for advanced care management may have been useful to improve the outcome.
**Limitations of study**

Our study has several limitations. First, because the present study was based on an observational design, there may have been unmeasured confounding factors that could affect progression of care need levels. However, a previous report showed similar demographic characteristics across agencies,30. Second, our findings may not be generalized to other countries.

**Conclusion**

The present study using a national long-term care database showed that elderly people with advanced care management had a lower probability of progression of care need level. The finding suggests that the Japanese governmental policy for enhancing advanced care management may be effective to improve the outcome of long-term care recipients.

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**Conflicts of Interest and Source of Funding**

The authors declare no conflict of interests.
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