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RESEARCH ARTICLE

Association of cognitive impairment severity with potentially avoidable readmissions: A retrospective cohort study of 8897 older patients

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Abstract

Introduction: Understanding the association between cognitive impairment severity and potentially avoidable readmissions (PARs) in older patients may facilitate the identification of at-risk individuals who would benefit from readmission prevention measures.

Methods: This retrospective cohort study was conducted using claims data linked with routinely collected cognitive impairment assessment results from a general acute care hospital in Tokyo, Japan. Patients were 65 years or age or older who were discharged from the subject hospital to home or a facility between July 2016 and September 2018.

Results: A multivariable logistic regression analysis adjusted for covariates showed that the odds of PARs within 90 days to the subject hospital for patients with moderate and severe cognitive impairment were 1.418 times (95% confidence interval: 1.005-2.002) and 2.212 times (95% confidence interval: 1.206-4.058) higher, respectively, that for patients with normal cognition.

Discussion: Older inpatients with later-stage cognitive impairment may represent a suitable target population for transitional care programs aimed at reducing readmissions.

KEYWORDS
big data, cognition, cohort studies, geriatrics, health services, patient readmission, regression analysis

1 | BACKGROUND

Hospital readmissions after discharge are not uncommon, and can impose heavy clinical and economic burdens on older patients, providers, and payers. In the United States, almost 34% of Medicare beneficiaries were readmitted within 90 days after hospital discharge, and unplanned readmissions are estimated to cost 17 billion dollars annually.[1] With the increasing recognition that at least some of these readmissions are preventable, the readmission-related healthcare reforms are shifting from all-cause readmissions to potentially avoidable readmissions (PARs).[2–11]

Abbreviations: CCI, Charlson Comorbidity Index; CI, confidence interval; ICD-10, International Classification of Diseases, 10th Revision; ICU, intensive care unit; PARs, potentially avoidable readmissions

Cognitive impairment is fairly prevalent among older inpatients, with reported prevalences ranging from 27% to 40% in older patients admitted to general hospitals.[12–14] Older patients with cognitive impairment or dementia have a higher risk of in-hospital adverse events, such as death and delirium.[13,15–19] Although two systematic reviews did not find any association between dementia and early readmission,[17,18] a recent US study indicated that dementia severity in the later stages was associated with PAR among home care patients.[5] This suggests that the risk of readmission is only elevated for patients above a certain level of dementia. A UK study reported that almost 40% of older inpatients with cognitive impairment did not have a dementia diagnosis, and that these patients had generally poorer clinical outcomes.[13] Although that study identified an association between the presence of cognitive impairment and higher all-cause readmission rates among hospitalized older patients,[13] we are not aware of any studies to date that have investigated the association between cognitive impairment severity and PARs.

Because the risk of PAR may only be affected above a certain level of cognitive impairment, it is important to characterize the association between cognitive impairment severity and PAR to identify subpopulations that would benefit from readmission prevention measures, such as transitional care programs.[20–22] Similar to a previous study that examined the association between dementia severity and PAR,[5] we hypothesized that more severe cognitive impairment would be associated with a higher risk for PAR. Our study aimed to examine the association between cognitive impairment severity and PAR within 90 days after discharge (90-day PAR) using claims data linked with cognitive impairment assessment data from older patients admitted to a general acute care hospital in Japan.

RESEARCH IN CONTEXT

1. **Systematic review**: The authors reviewed the existing literature using traditional (eg, PubMed) sources. Although previous studies have reported higher readmission rates for patients with cognitive impairment, little is known about the relationship between the severity of cognitive impairment and readmissions. The literature shows that the foci of academic interest and readmission-related healthcare reforms are shifting from all-cause readmissions to potentially avoidable readmissions (PARs).
2. **Interpretation**: Our study showed that moderate and severe cognitive impairment were positively associated with PARs within 90 days in older patients admitted to a general acute care hospital in Japan. This indicates that the risk of PAR is elevated for patients with only a certain minimum level of cognitive impairment.
3. **Future directions**: Establishing a standardized assessment system for cognitive impairment severity before hospitalization may help to develop more accurate PAR prediction models and optimize inpatient care for older adults with cognitive impairment.

2 | METHODS

2.1 | Study design and participants

This retrospective cohort study was conducted using a large-scale, anonymized medical claims database linked with routinely collected cognitive impairment assessment results from a large general acute care hospital in Tokyo, Japan. The study period spanned July 2016 to December 2018. The data included patient-level demographic characteristics, treatments, prescribed drugs, and diagnoses during clinical encounters with insurance claims. Diagnoses were recorded using International Classification of Diseases, 10th Revision (ICD-10) codes.

Our analysis focused on patients who had been admitted to the subject hospital and were discharged to home or a facility (nursing home or residential care facility) between July 1, 2016, and September 30, 2018. If patients were admitted to this hospital twice or more during the study period, the first hospitalization episode was designated the index hospitalization. Patients without an identified primary diagnosis in the index admission were excluded from the analysis. We also excluded patients with missing data for cognitive impairment severity and patients younger than 65 years of age.

The study protocol was approved by the ethics committee of the Tokyo Metropolitan Geriatric Hospital and Institute of Gerontology (Approval No. R18-20). This study used opt-out consent because all data were anonymized before being received by the authors. All analyses were performed in accordance with the Ethical Guidelines for Medical and Health Research Involving Human Subjects established by the Japanese government.

2.2 | Exposure

At the subject hospital, patients were routinely screened for cognitive impairment before admission using the Dementia Assessment Sheet for Community-based Integrated Care System 21-items (DASC-21, Appendix A).[23] A previous study reported that the DASC-21 has adequate reliability and validity to evaluate cognitive and daily functioning impairments, detect dementia, and assess dementia severity in community-dwelling older adults in Japan.[24] In that study, Cronbach alpha for DASC-21 as evaluated by trained nurses was estimated to be 0.934, and DASC-21 scores were significantly correlated with the Clinical Dementia Rating total and box scores, the Mini-Mental State Examination, and the Frontal Assessment Battery.[24] The 21 items of DASC-21 are answered using a scale ranging from 1 to 4 (total score range: 21-84), and a total score of 31 or more indicates a risk of dementia.[23]

In this study, cognitive impairment severity was derived from the DASC-21 data and classified into four categories in accordance with

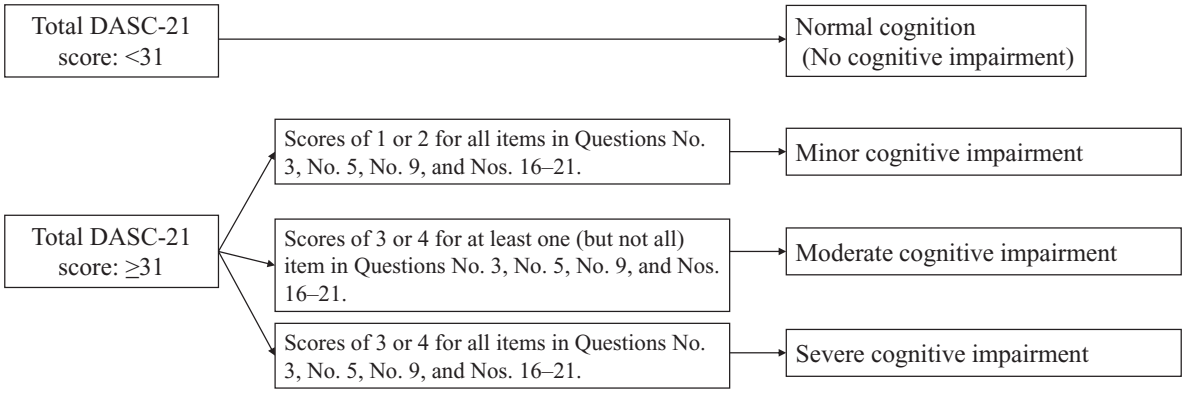

FIGURE 1 Categorization of cognitive impairment severity. Questions: No. 3 (remote memory): "Does he/she forget his/her own birth date?"; No. 5 (spatial orientation): "Does he/she forget where he/she is?"; No. 9 (social common sense): "Can he/she select his/her own clothes appropriately according to the season or situation?"; Nos. 16-21 (physical activities of daily living): "Can he/she take a bath by himself/herself?", "Can he/she change clothes by himself/herself?", "Can he/she use the toilet by himself/herself?", "Can he/she take care of his/her own appearance?", "Can he/she eat on his/her own?", and "Can he/she move around the house by himself/herself?". DASC-21, Dementia Assessment Sheet for Community-based Integrated Care System-21 items

the DASC-21 assessment manual: (1) normal cognition (ie, no cognitive impairment), (2) minor cognitive impairment, (3) moderate cognitive impairment, and (4) severe cognitive impairment (Figure 1).[23] This category of cognitive impairment severity was based on the clinical status of impairment in cognitive function and functioning in daily life using the total DASC-21 score and responses to the items about remote memory (Question 3), space orientation (Question 5), social common sense (Question 9), and physical ADL (Question 16-21).[23] A total score of 30 or less on the DASC-21 indicated "normal cognition." A total score of 31 and above and a score of 1 or 2 for Questions 3, 5, 9, and 16-21 indicated "minor cognitive impairment." A total score of 31 and above and a score of 3 or 4 for at least one item (but not all) for Questions 3, 5, 9, and 16-21 indicated "moderate cognitive impairment." A total score of 31 and above and a score of 3 or 4 for all of these questions indicated "severe cognitive impairment." The DASC-21 is administered to each patient's family members or caregivers to assess the patient's cognitive function during the month before admission. If a patient did not have any family member or caregiver available to answer, they completed the DASC-21 themselves or through a proxy such as a care manager or care worker.

2.3 | Study outcome

The outcome measure was the occurrence of 90-day PAR to the subject hospital following discharge. The causes of readmissions were identified using recorded diagnoses through ICD-10 codes.[6,25] As presented in Appendix B,[26] we defined 90-day PAR as the first unplanned readmission within 90 days of discharge owing to one of the 17 admitting diagnoses for PAR identified by a previous Japanese study. This prior study was recoded from ICD-9 to ICD-10 codes based on admitting diagnoses for potentially avoidable hospitalizations identified by the US Centers for Medicare & Medicaid Services.[27,28]

2.4 | Covariates

We included variables available in the medical claims data that were included as covariates in the regression model used by prior studies that examined the factor of readmission (sex, age, annual income, diagnosis at admission, Charlson Comorbidity Index, emergency admission, intensive care unit (ICU) utilization, surgical treatment, length of hospital stay, and discharge location).[5–7,13,29] Information on patient sex, age (65-74, 75-84, and ≥85 years), and insurance copayment rate was collected. Because the patient's economic status was associated with readmission,[29] we used an annual income that was determined by using the copayment rate: 10% and 20% for patients aged ≥75 years and 70-74 years, respectively, with an annual income of <$34,007 USD; and 30% for both patients aged ≥70 years with an annual income of ≥$34,007 USD, as well as patients aged ≤69 years (1 USD = 108.8 JPY in 2016).[30] In addition, as we were unable to determine an annual income category (< $34,007 USD or ≥$34,007 USD) by using the copayment rate for patients aged ≤69 years or patients who received public welfare, we categorized these patients as "unknown." We identified the main disease in the index admission by using the corresponding ICD-10 codes of the primary diagnosis in the index admission, and included the main disease in the index admission as a covariate in the analysis. According to previous reports based on ICD-10 coding,[6,25] we first categorized nine diseases (musculoskeletal disease, neurological disease, gastrointestinal disease, malignancy, metabolic disease, renal disease, cardiac disease, respiratory disease, and others) of the main condition in the index admission. We separated the cardiac diseases of the main condition such as congestive heart failure, coronary heart disease, and cerebrovascular disease to clear the clinical condition of patients. In addition, respiratory diseases focused on pneumonia and acute bronchitis because of clearing the clinical condition of patients. Moreover, diagnoses of cataracts and glaucoma were also included as these were common causes of hospitalization among our

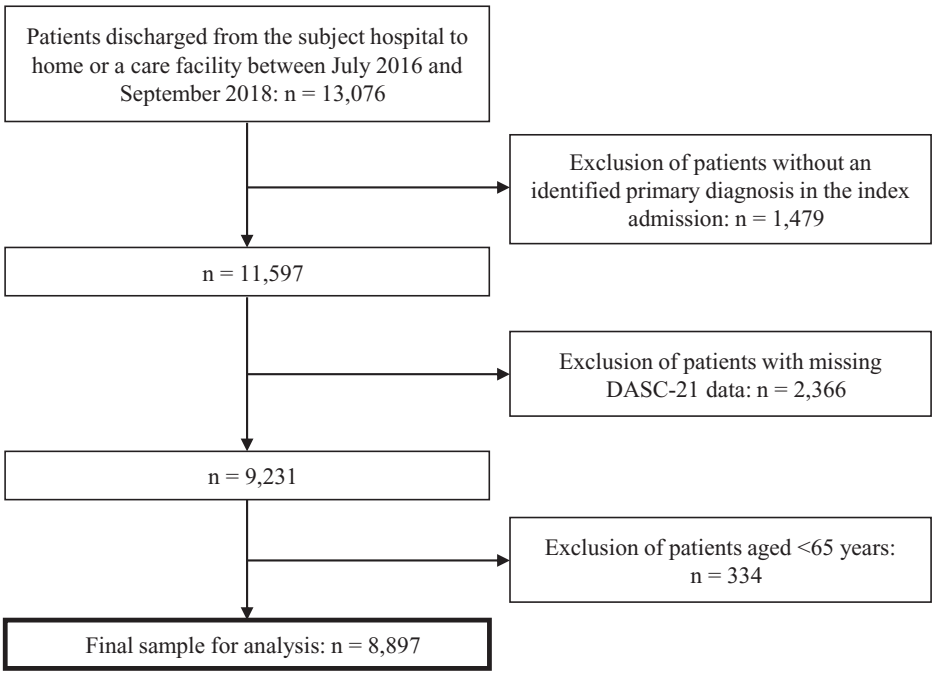

FIGURE 2 Flow chart of patient selection. DASC-21, Dementia Assessment Sheet for Community-based Integrated Care System 21-items

study subjects. Using a previously described method,[31] we calculated the Charlson Comorbidity Index (CCI), which is a weighted index of specific comorbidities identified using ICD-10 codes and included CCI as a covariate in the analyses. Dementia was excluded from the total CCI score to avoid collinearity with cognitive impairment, and the CCI score was divided into three categories (0, 1-2, ≥3) for analysis.[32,33] Furthermore, we included emergency admission, ICU utilization, surgical treatment, length of hospital stay, and discharge location as covariates of health processes in the analysis. Emergency or non-emergency admissions, use or nonuse of surgical treatment, and use or nonuse of ICU services at the index admission were identified through the corresponding records in the claims data. We also calculated the hospital length of stay for each patient during the index admission. We included the discharge place (home or facilities) as a covariate in the analyses.

2.5 | Statistical analysis

First, the chi-square test and Mann-Whitney *U* test were used to compare the rates of 90-day PAR among the various patient characteristics. We also calculated the effect size using Cramer V-test, φ or r in these univariate analyses. We then examined the association between cognitive impairment severity and 90-day PAR using the logistic regression model and a multivariable logistic regression model that adjusted for the aforementioned covariates. Adjusted odds ratios and their 95% confidence intervals (CIs) were calculated, and *P*-values (two-tailed) below 0.05 were considered statistically significant. All analyses were conducted using SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

3 | RESULTS

Figure 2 shows the flow chart of patient selection. We first identified 13,076 candidate subjects who were admitted to the subject hospital and discharged to home or a care facility during the study period. We excluded 1479 patients without an identified primary diagnosis in the index admission, 2366 patients with missing DASC-21 data, and 334 patients younger than 65 years of age. The final sample for analysis comprised 8897 patients.

The characteristics of the patients are summarized in Table 1. The overall mean age was 79.8 years (SD: 7.4 years); 850 patients (9.6%) had minor cognitive impairment, 1815 patients (20.4%) had moderate cognitive impairment, and 215 patients (2.4%) had severe cognitive impairment.

A total of 238 patients (2.7%) experienced 90-day PAR according to our identification criteria. Table 1 also shows the 90-day PAR rates according to the patients' characteristics. Patients with severe cognitive impairment had the highest 90-day PAR rate (9.3%), followed by patients with moderate cognitive impairment (5.5%), and patients with minor cognitive impairment (2.2%). The 90-day PAR rates were highest in patients 85 years of age or older, patients with congestive heart diseases, and patients with CCI scores of ≥3. Moreover, the 90-day PAR rates were significantly higher among patients with emergency admissions, patients without surgical treatment, patients who used ICU services, and patients discharged to care facilities. Hospital length of stay during the index hospitalization was significantly longer in patients with 90-day PAR than patients without 90-day PAR.

Table 2 presents the breakdown of causes of 90-day PAR among the 238 applicable patients. The most common causes were respiratory infection (33.2%) and congestive heart failure (20.2%).

TABLE 1 Patient characteristics and 90-day potentially avoidable readmission rates*

Characteristics		Total, n (%)	90-day PAR, n (%)	*P* *	Effect size[a]
Total	8897 (100)	238 (2.7)			
Cognitive impairment severity	None	6017 (67.6)	100 (1.7)	<0.001	0.113
	Minor	850 (9.6)	19 (2.2)		
	Moderate	1815 (20.4)	99 (5.5)		
	Severe	215 (2.4)	20 (9.3)		
Sex	Men	3892 (43.7)	103 (2.6)	0.883	0.002
	Women	5005 (56.3)	135 (2.7)		
Age, years	65-74	2674 (30.1)	38 (1.4)	<0.001	0.009
	75-84	4137 (46.5)	91 (2.2)		
	≥85	2085 (23.4)	109 (5.2)		
Annual income	<$34,007 USD	6462 (74.6)	197 (3.0)	0.016	0.030
	≥$34,007 USD	918 (10.6)	18 (1.9)		
	Unknown	1279 (14.8)	23 (1.8)		
Diagnosis at index admission	Musculoskeletal disease	521 (5.9)	4 (0.8)	<0.001	0.189
	Neurological disease	313 (3.5)	6 (1.9)		
	Gastrointestinal disease	1203 (13.5)	16 (1.3)		
	Malignancy	964 (10.8)	28 (2.9)		
	Metabolic disease	317 (3.6)	7 (2.2)		
	Renal disease	405 (4.6)	16 (4.0)		
	Congestive heart failure	282 (3.2)	43 (15.2)		
	Coronary heart disease	438 (4.9)	5 (1.1)		
	Cerebrovascular disease	217 (2.4)	6 (2.8)		
	Pneumonia/acute bronchitis	440 (4.9)	44 (10.0)		
	Cataract/glaucoma	1767 (19.9)	9 (0.5)		
	Other	2030 (22.8)	54 (2.7)		
CCI score	0	5453 (61.3)	90 (1.7)	<0.001	0.081
	1-2	1919 (21.6)	77 (4.0)		
	≥3	1525 (17.1)	71 (4.7)		
Emergency admission	No	6277 (70.6)	75 (1.2)	<0.001	0.142
	Yes	2620 (29.4)	163 (6.2)		
Surgical treatment	No	4328 (48.6)	184 (4.3)	<0.001	-0.095
	Yes	4569 (51.4)	54 (1.2)		
ICU utilization	No	8399 (94.4)	207 (2.5)	<0.001	0.054
	Yes	498 (5.6)	31 (6.2)		
Discharge location	Home	8363 (94.0)	190 (2.3)	<0.001	0.099
	Facility	534 (6.0)	48 (9.0)		
		Without 90-day PAR, n = 8659	With 90-day PAR, n = 238		
Hospital length of stay, mean days (SD)		10.5 (12.7)	18.8 (14.1)	<0.001	-0.126

CCI, Charlson Comorbidity Index; ICU, intensive care unit; PAR, potentially avoidable readmission; SD, standard deviation.
[a]Cramer V, φ or r.
*Chi-square test or Mann-Whitney *U* test.

TABLE 2 Breakdown of causes for 90-day potentially avoidable readmissions (n = 238)

Medical condition groups	n (%)
Respiratory infection	79 (33.2)
Congestive heart failure	48 (20.2)
Urinary tract infection	31 (13.0)
Electrolyte imbalance	15 (6.3)
Skin ulcers and cellulitis	14 (5.9)
Constipation/fecal impaction/obstipation	13 (5.5)
Diarrhea/gastroenteritis/*Clostridium difficile* infection	7 (2.9)
Chronic obstructive pulmonary disease and asthma	6 (2.5)
Sepsis	6 (2.5)
Fall and fracture	5 (2.1)
Seizures	4 (1.7)
Acute renal failure	4 (1.7)
Altered mental status/acute confusion/delirium/ psychosis/agitation/organic brain syndrome	2 (0.8)
Diabetes	2 (0.8)
Hypertension	1 (0.4)
Anemia	1 (0.4)
Weight loss and malnutrition	0 (0)

Table 3 shows the association between cognitive impairment severity and 90-day PAR after adjusting for all covariates. The odds of 90-day PAR for patients with moderate and severe cognitive impairment were 1.418 times (95% CI: 1.005-2.002) and 2.212 times (95% CI: 1.206-4.058), respectively, higher than the odds for patients with normal cognition. Minor cognitive impairment was not significantly associated with 90-day PAR.

4 | DISCUSSION

This retrospective cohort study examined the association between cognitive impairment severity and 90-day PAR among 8897 older patients discharged from a large general acute care hospital using a claims database linked with cognitive impairment assessment data. Approximately 20.4% of the patients had moderate cognitive impairment and 2.4% of the patients had severe cognitive impairment. The 90-day PAR rate was 2.7%, and the odds of 90-day PAR were significantly higher in patients with moderate or severe cognitive impairment than in those with normal cognition. These findings indicate that patients with later-stage cognitive impairment may benefit from readmission prevention strategies.

In a large cohort study conducted in the UK, patients with cognitive impairment without a dementia diagnosis were found to have poorer outcomes, such as death or readmission, due to inadequate hospital care.[13] Similarly, our study showed a consistent linear dose-response association between cognitive impairment severity and 90-day PAR. Because the observation of a straightforward monotonic relationship can be regarded as evidence of cause and effect,[34] these findings provide stronger evidence of the influence of cognitive impairment severity on PAR than previously available.[13] Therefore, our results indicate that ascertaining the severity of cognitive impairment before hospitalization would be important for the early identification of patients at risk of readmission, thereby supporting the efficient and effective deployment of preventive measures.

When compared with older patients with normal cognition, the odds of 90-day PAR in those with moderate and severe cognitive impairment were 1.4 times and 2.2 times higher, respectively. To inform and improve the development of preventive strategies, it is important to consider the possible mechanisms through which later-stage cognitive impairment increases the risk of PAR. Our finding that congestive heart failure is one of the most common reasons for PAR was consistent with previous studies conducted in the United States and Japan.[6,8,11] Moreover, heart failure is a target condition for the Centers for Medicare & Medicaid Services Hospital Readmissions Reduction Program.[35] A systematic review and meta-analysis of heart failure patients found that transitional care involving nurse-led post-discharge home visits and structured telephone support (such as telephone-based monitoring, education, and self-care management) reduced readmissions caused by heart failure.[36] In contrast, a recent large randomized clinical trial found that telephone calls and telemonitoring did not reduce 180-day readmissions in patients with heart failure.[37] That trial had excluded patients with dementia, but included those with

TABLE 3 Association of cognitive impairment severity with 90-day potentially avoidable readmissions

The severity of cognitive impairment	ORs	95% CIs	*P**	aORs	95% CIs	*P*†
Normal	1.000			1.000		
Minor	1.353	(0.824-2.221)	0.232	0.790	(0.470-1.327)	0.373
Moderate	3.414	(2.572-4.530)	< 0.001	1.418	(1.005-2.002)	0.047
Sever	6.069	(3.678-10.014)	< 0.001	2.212	(1.206-4.058)	0.010

aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

*Logistic regression analysis.

†Multivariable logistic regression analysis that adjusted for all covariates (sex, age, annual income, diagnosis at admission, Charlson Comorbidity Index, emergency admission, intensive care unit utilization, surgical treatment, length of hospital stay, and discharge location).

cognitive impairment.[37] Cognitive impairment presents barriers against self-care, medication management adherence, and recognizing the changes in symptoms that can result in readmissions[38]; however, telephone-based transitional care may not be sufficient to overcome these barriers for patients with later-stage cognitive impairment. It may therefore be important to provide post-discharge transitional care programs that include home-based follow-up for patients with co-existing heart failure and cognitive impairment.[20–22,36] Because previous studies have shown that exercise-based cardiac rehabilitation in patients with chronic heart failure reduces 90-day readmission and hospitalization due to heart failure,[39,40] post-discharge rehabilitation services may help to decrease heart failure–related readmissions. Nevertheless, older patients with cognitive impairment are often considered to have poor rehabilitation potential, and studies have noted that patients with cognitive impairment and higher frailty were less likely to receive rehabilitation services.[33,41] Further research is needed to determine if this diminished access to rehabilitation services at home or in long-term care facilities increases the risk of readmissions.

Respiratory infection was also found to be a major cause of readmission in our study population, which was consistent with previous findings.[6,7,11] Severe cognitive impairment is a risk factor of dysphagia that can lead to aspiration pneumonia.[42,43] In our experience, breaks in the continuity of care to ensure safe eating, such as maintaining proper posture and appropriate food texture, can lead to aspiration pneumonia among patients with cognitive impairment and dysphagia. Therefore, encouraging participation in transitional care involving multiple specialists (eg, nurses, speech therapists, and nutritionists) and facilitating communication among hospitals, home care facilities, and residential care facilities could help to prevent readmissions in adults with cognitive impairment.

A strength of this study is the use of claims data linked with cognitive impairment assessment data for all patients 65 years of age or older who were admitted to a general acute care hospital. To the best of our knowledge, no previous studies have been conducted using a database that links claims data and cognitive impairment severity data among all applicable inpatients in a hospital. Therefore, this study is the first to identify the association between cognitive impairment severity and PAR using clinical assessments of cognitive impairment. Another strength is that our study provides more robust evidence of a cause-effect relationship between cognitive impairment and PAR due to the observation of a consistent monotonic relationship between these factors.

This study has several limitations. First, our database did not include information on eligible patients who were readmitted to other hospitals or those who had died after discharge, which may have led to an underestimation of 90-day PAR. Second, because we used secondary data that were originally recorded for the medical claims, our database lacked information like the disease burden at the index admission, which may be a covariate between cognitive impairment severity and PAR. As an alternative, we used CCI to adjust for the burden of comorbidities. Because disease severity can directly affect treatment approaches and readmission rates, this information should be included in future studies where possible. Third, our findings may not be generalized directly to other hospitals due to institutional variations in patient case-mix and discharge services. Moreover, the differences in populations and healthcare systems among countries should be taken into consideration when comparing our findings with those of other countries. Future studies are needed to confirm the association of cognitive impairment severity with PAR using study populations from multiple institutions and other countries. Finally, we did not have a reference standard for cognitive impairment severity to examine the validity of cognitive impairment severity based on the DASC-21 manual. Although the prior study reported that the DASC-21 had sufficient discriminatory ability between dementia and non-dementia,[24] future studies to examine the validity of cognitive impairment severity based on the DASC-21 are required. Moreover, ≈43% of our subjects answered the DASC-21 (3851/8897 patients) by themselves (data not shown). Although moderate correlations have been reported between self-completed DASC-21 and other dementia assessment tools (Clinical Dementia Rating total and box scores and the Mini-Mental State Examination), these correlations were stronger when the DASC-21 was completed by family members.[24] It has also been reported that self-completed DASC-21 scores tend to be lower than family completed DASC-21 scores among patients with minor cognitive impairment,[24] which may have led to misclassifications of cognitive impairment levels among our 180 subjects with minor cognitive impairment who answered the DASC-21 themselves. However, this misclassification would occur independently of PAR, and would therefore be a form of non-differential misclassification. Because non-differential misclassifications tend to bias the odds ratios toward a value of 1,[34] the odds ratios in our study may be underestimated. Similarly, the other limitations in our study were also likely to underestimate the association between cognitive impairment severity and PAR. Despite this possible underestimation, our analysis was able to detect a higher risk of 90-day PAR among older patients with later-stage cognitive impairment than among those with normal cognition.

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CONFLICTS OF INTEREST

None.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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