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The effect of management of older patients with heart failure by general physicians on mortality and hospitalization rates: a retrospective cohort study

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Abstract

Background The prevalence of heart failure is increasing owing to the aging of the population, resulting in growing medical costs and an increasing number of patients with multimorbidity. The optimal management of heart failure by general physicians in addition to internal medicine physicians, such as cardiologists, is essential, although the specifics are unclear. In this study, we aimed to determine the differences in heart failure management outcomes among older patients between those managed by general physicians and those managed by internal medicine physicians, especially in terms of hospitalization and mortality rates.

Methods This was a retrospective cohort study of patients with heart failure who visited a community hospital in Japan. Patients with heart failure were selected based on International Classification of Diseases codes from electronic medical record data over 9 years, from September 2015 to August 2023. The independent variables were whether a general physician treated the patient; the primary outcome was death; the secondary outcome was hospitalization; and the covariates were patient background, including comorbidities. Multiple logistic regression analysis was used to evaluate the association between being managed by a general physician and death and hospitalization, after adjusting for confounding factors.

Results A total of 1032 patients with heart failure were identified, with a mean age of 82.4 years, and 48.9% were men. Patients treated by general physicians were older, were more likely to have dementia and were more likely to need care than those treated by internal medicine physicians. Being treated by a general physician was significantly negatively associated with death (odds ratio [OR], 0.62) and hospitalization (OR, 0.73).

Conclusions In Japan, where medical specialties are increasingly differentiated, the comprehensive management of older patients with heart failure and multiple comorbidities by general physicians may reduce hospitalization and mortality rates. Appropriate education of general physicians and an increase in their numbers may prove essential for the successful management of patients with heart failure in aging communities.

Keywords Primary healthcare, General practice, Heart failure, Cardiology, Management, Japan

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Background

The incidence of heart failure is increasing as the global population ages, and its management is progressing as many studies are being conducted [1–3]. Heart failure imposes a considerable economic burden worldwide, with healthcare costs related to cardiovascular diseases accounting for the largest share (19.5%) in Japan. [1, 4] In addition, patients with heart failure, especially diastolic heart failure, commonly have many comorbidities, such as hypertension, diabetes mellitus, chronic obstructive pulmonary disease, and renal failure [2, 4]. Thus, not only internists, such as cardiologists, but also general physicians need to manage such patients during primary care.

General physicians are adept at the management of older patients with multiple comorbidities and who need comprehensive care; hence, the management of heart failure by general physicians may reduce mortality and rehospitalization. In Japan, although many physicians have been differentiated into organ-specific departments, the Japanese Medical Specialty Board newly launched the department of general medicine in 2018 owing to the aging of society [5]. The department of general medicine has various names and working styles different countries, and practitioners in this department are called "general physicians" or "general medicine physicians" in Japan. They work in a variety of settings, such as clinics and hospitals, and provide primary care and manage internal medicine in hospitals [6]. According to a systematic review, management of heart failure by primary care physicians after discharge reduces readmissions [7]. In contrast, certain studies indicated that management of such patients by general physicians increases mortality compared to that of patients managed by cardiologists [8], and others revealed no significant differences in readmission and mortality rates between those managed by general physicians and those managed by cardiologists [9]. In addition, to the best of our knowledge, the differences in the management of heart failure between general physicians and internal physicians after 2019 in Japan remain unclear. In contrast to the general physician system in Europe and the U.S., patients in Japan can freely choose the specialty of their physician, and the same general physician often provides management during hospitalization and after discharge. Thus, a current study in Japan may yield different results to those of previous studies, warranting clarification of the association between the management of heart failure by general physicians in Japan and the hospitalization and mortality rates of their patients.

Although various departments manage patients with heart failure owing to its increasing prevalence in Japan, the difference in patient management between general physicians and internal medicine physicians, including cardiologists, is uncertain. Patients managed by general physicians are reportedly older and have more comorbidities, such as dementia and chronic obstructive pulmonary disease, than those managed by cardiologists [8, 10]. Many patients receiving primary care have multiple comorbidities, and comorbidity rates increase with age [11, 12]; thus, patients with heart failure treated by general physicians in Japan may have more comorbidities than those treated by cardiologists. In addition, patients treated by cardiologists are reportedly more likely to have a history of acute myocardial infarction or coronary artery bypass grafting/percutaneous coronary intervention, to receive common heart failure medications, and to be examined for left ventricular ejection fraction via echocardiography [8, 10, 13]. However, to the best of our knowledge, whether the outcomes of general physicians' management of heart failure differs from those of internal physicians, including cardiologists, in Japan is unclear. Therefore, the purpose of this study was to determine whether the outcomes of management of heart failure by general physicians differs from that by internal medicine physicians, including cardiologists. This study highlighted the role and value of general physicians during the heart failure pandemic.

Methods

Aim

To determine whether the management of heart failure by general physicians differs in outcomes from that by internal medicine physicians.

Study design

A retrospective cohort study was conducted to investigate the hospitalization and mortality rates of patients with heart failure attending a community hospital. We obtained patient information from their medical records.

Setting

This study was conducted on patients attending Unnan City Hospital, a regional hospital in Shimane Prefecture, Japan. Shimane Prefecture is one of the most aged prefectures in Japan, with a total population of 657,842 and an aging rate of 34.7% (as of October 1, 2022) [14]. This hospital has 281 beds and 15 departments. General physicians are constantly present in the hospital, and each physician handles outpatients on weekdays. Other regular doctors include specialists in internal medicine, gastroenterology, and endocrinology. Non-regular doctors include cardiologists, hematologists, pulmonologists, and neurologists who are dispatched from a university hospital in the same prefecture to treat outpatients. In this study, 9 years of data were collected (September 2015 to August 2023).

Data collection

We used International Classification of Diseases (ICD) codes to extract the data of patients with heart failure from their medical records. Japan currently follows the ICD-10 (2013 edition) [15], in which two codes are associated with heart failure: I50.0, for congestive heart failure (including congestive heart disease and right ventricular failure), and I50.1, for left ventricular failure (including left heart failure and pulmonary edema). We selected outpatients assigned these codes in the general medicine and internal medicine departments, including the cardiology department. Hospitalized patients were excluded from the study.

Variables

In this study, the primary outcome was death, and the time from diagnosis to death was measured. The secondary outcome was hospitalization. For the secondary outcome, each patient was counted only once, even if that patient was hospitalized multiple times in the study period. The independent variable was the department (general medicine or other internal medicine). The covariates were age, sex (male or female), body mass index, use of healthcare insurance, and the presence of chronic kidney failure, diabetes, chronic obstructive pulmonary disease, asthma, stroke, malignancy, or dementia.

Analysis

For categorical variables, Fisher's exact test was used to compare general physicians and internal medicine physicians. For continuous variables, parametric data were analyzed using Welch" t-test, and nonparametric data were analyzed using the Mann–Whitney U-test to compare the two groups. Multiple logistic regression analysis was used to determine the variables associated with hospitalization and death. All variables, except death, were included for analysis of hospitalization, and all variables were included for analysis of death. Statistical significance was defined as a p-value <0.05. Items with missing data were excluded from analysis. All statistical analyses were performed using Easy R software [16].

Ethical considerations

The anonymity of the participants and confidentiality of their information were ensured throughout the study. All participants were informed of the purpose of this research. We routinely obtain informed consent from patients at the time of admission or their initial outpatient visit in our hospital. Therefore, we had informed consent from all participants or their family members for publication of their results in this study. All procedures in this study were performed in compliance with the Declaration of Helsinki and its subsequent amendments. The Unnan City Hospital Clinical Ethics Committee approved the study protocol (approval ID: 20230035).

Results

Characteristics of the participants

Electronic medical records of 1032 patients with heart failure were evaluated. Only one of these had missing data regarding the time to death. The mean age of all patients was 82.4 years (standard deviation, 11.09), and 48.9% were men. A total of 447 patients were treated by general physicians and 585 by internal medicine physicians; in 336 cases (57.4%), the internal medicine physicians were cardiologists. The proportion of admitted patients was slightly higher in the general medicine group, but the difference was not statistically significant. The proportion of patients who died was slightly lower in the general medicine group, but that difference was also not statistically significant. The time from diagnosis to death was longer in the internal medicine group ($p<0.001$). Patients treated by general physicians were older ($p<0.001$); those treated by internal medicine physicians were more likely to be men ($p=0.038$) and have diabetes ($p<0.001$); and patients treated by general physicians were more likely to be covered by healthcare insurance ($p<0.001$) and to have asthma ($p=0.011$) or dementia ($p<0.001$) (Table 1).

Factors associated with death

Being managed by a general physician (odds ratio [OR], 0.62) was negatively associated with death. Age (OR, 1.04), chronic kidney disease (OR, 2.50), malignancy (OR, 2.36), and hospitalization (OR, 1.71) were significantly positively associated with mortality (Table 2).

Factors associated with hospitalization

Treatment by general physicians (OR, 0.73) and having diabetes mellitus (OR, 0.56) were significantly negatively associated with hospitalization. Age (OR, 1.04), use of healthcare insurance (OR, 1.85), asthma (OR, 2.82), stroke (OR, 1.59), malignancy (OR, 1.69), and dementia (OR, 1.67) were significantly positively associated with hospitalization (Table 3).

Discussion

In this study, patients with heart failure managed by general physicians were older, were more likely to have comorbidities, such as dementia, and were more likely to require nursing care than patients managed by internal medicine physicians, including cardiologists. Despite this background, the study showed that heart failure management by general physicians was associated with lower rates of hospitalization and mortality than management by internal medicine physicians, including cardiologists, after adjusting for confounding factors, such as comorbidities.

Table 1 Characteristics of patients with heart failure treated by general physicians and internal medicine physicians in outpatient settings

		General physician		
Factor	**All patients**	**Yes**	**No**	***P* value**
n	1032	447	585	
Admission (%)	331 (32.1)	152 (34.0)	179 (30.6)	0.25
Death (%)	222 (21.5)	87 (19.5)	135 (23.1)	0.17
Duration until death, median (25-75%)	288 (62–815)	**192 (52.50–530.0)**	**405 (74.25-1259.5)**	**< 0.001**
Age (SD)	82.4 (11.09)	**85.0 (9.73)**	**80.4 (11.64)**	**< 0.001**
Sex, male (%)	505 (48.9)	**202 (45.2)**	**303 (51.8)**	**0.038**
BMI (SD)	21.1 (5.20)	20.6 (3.93)	21.4 (5.97)	0.012
Dependent (%)	420 (40.7)	**231 (51.7)**	**189 (32.3)**	**< 0.001**
CKD (%)	69 (6.7)	34 (7.6)	35 (6.0)	0.32
Diabetes (%)	319 (30.9)	**83 (18.6)**	**236 (40.3)**	**< 0.001**
COPD (%)	45 (4.4)	25 (5.6)	20 (3.4)	0.09
Asthma (%)	99 (9.6)	**55 (12.3)**	**44 (7.5)**	**0.011**
Stroke (%)	112 (10.9)	58 (13.0)	54 (9.2)	0.069
Cancer (%)	92 (8.9)	45 (10.1)	47 (8.0)	0.27
Dementia (%)	84 (8.1)	**52 (11.6)**	**32 (5.5)**	**< 0.001**

BMI, body mass index; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; SD, standard deviation

Table 2 Factors associated with death

	Odds ratio	**95% CI**	***P* value**
General physician	**0.62**	**0.44, 0.86**	**0.004**
Age	**1.04**	**1.02, 1.06**	**< 0.001**
Sex	1.21	0.87, 1.69	0.25
BMI	0.96	0.92, 1.00	0.08
Dependent	1.25	0.89, 1.77	0.20
CKD	**2.50**	**1.44, 4.32**	**0.001**
Diabetes	1.00	0.69, 1.45	> 0.99
COPD	0.58	0.25, 1.35	0.21
Asthma	0.94	0.55, 1.61	0.82
Stroke	1.09	0.68, 1.74	0.73
Cancer	**2.36**	**1.45, 3.84**	$p < 0.001$
Dementia	1.47	0.87, 2.50	0.15
Admission	**1.71**	**1.23, 2.40**	**0.002**

BMI, body mass index; CI, confidence interval; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease.

Table 3 Factors associated with hospitalization

	Odds ratio	**95% CI**	***P* Value**
General physician	**0.73**	**0.54, 0.98**	**0.03**
Age	**1.04**	**1.02, 1.05**	**< 0.001**
Sex	1.12	0.84, 1.51	0.44
BMI	0.99	0.96, 1.02	0.37
Dependent	**1.85**	**1.36, 2.51**	**< 0.001**
CKD	0.99	0.57, 1.72	0.97
Diabetes	**0.56**	**0.40, 0.79**	**< 0.001**
COPD	1.04	0.52, 2.08	0.90
Asthma	**2.82**	**1.79, 4.47**	**< 0.001**
Stroke	**1.59**	**1.04, 2.43**	**0.03**
Cancer	**1.69**	**1.06, 2.71**	**0.03**
Dementia	**1.67**	**1.03, 2.71**	**0.04**

BMI, body mass index; CI, confidence interval; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease.

Comprehensive and continuous care by general physicians in managing heart failure may reduce hospitalization and mortality rates in community hospitals. Previous studies also indicated that general physicians can successfully manage heart failure in older patients and those with comorbidities, such as dementia [8, 10]. Comprehensive heart failure management by general physicians might have led to lower mortality and hospitalization rates in our study because those participants depended heavily on nursing care. Previous studies have revealed that general physicians focus on managing comorbidities rather than on treating a single disease such as heart failure. Furthermore, general physicians value continuity of care and believe in comprehensive patient-centered care that accounts for patients' backgrounds and aims to improve their quality of life, with a good relationship established over time, which may explain the results of the present study [17–19].

For effective collaboration between general physicians and specialists, they must share the role of continuity of care for multimorbidity in community hospitals. Our study revealed that continuous patient-centered care for multimorbidity, a specialty of general physicians, may reduce outpatient hospitalizations and mortality. In contrast, according to previous studies, cardiologists play an important role in intensive care for heart failure, and general physicians need to refer patients to cardiologists and establish a cooperative relationship with such internal medicine physicians [20, 21]. Further studies are needed to demonstrate the differences in the backgrounds and management of patients with heart failure to determine the optimal mode of collaboration in the management of patients with heart failure in a community hospital.

This is, to our knowledge, the first study in which the differences in outcomes between general physicians and internists in the management of heart failure was compared since the establishment of the department of general medicine in Japan. Thus, this study is valuable in demonstrating the importance of general medicine in the management of patients with heart failure with multimorbidity in the broader context of specialization in Japan. In previous studies, areas with adequate primary care physicians had lower all-cause mortality rates and a better general health status [22, 23]. Thus, an adequate supply and distribution of general physicians in each region of Japan may provide health benefits to those communities. In addition, increasing the supply of primary care physicians reportedly results in decreased medical costs and improved quality of care [22]. Thus, increasing the number of appropriately educated general physicians may reduce medical expenses related to the increasing rate of heart failure. This study demonstrated the role of general physicians in Japan. With the aging of society and increasing specialization of physicians in different organ systems, general departments may become more critical in the future.

This study had several limitations. First, it was performed at a rural community hospital. Thus, its external validity may not extend to university hospitals and other settings. However, as the Japanese population is aging nationally, these results may become more applicable to many settings in the future. Second, we only used data from medical records, and detailed information was unavailable. The prevalence of diabetes among patients receiving internal medicine treatment may be related to the registry of diseases for the use of sodium-glucose transport protein 2 (SGLT2) inhibitors for patients with heart failure. In addition, many studies have revealed that diabetes increases mortality and hospitalization rates in patients with heart failure [24, 25]; however, neither mortality nor hospitalization rates were high in this study. One explanation is that we used ICD codes from electronic medical records to extract data from patients with heart failure, and comorbidities were extracted only by disease name. Thus, SGLT2 inhibitors might have been prescribed even if the patients did not really have diabetes, which might have caused the low mortality and hospitalization rates in this study [26]. However, this potential cause was not confirmed as we did not review individual cases. In addition, this study's definition of heart failure was based on ICD codes, and we might have included patients other than those with heart failure because we did not examine each patient's medical records. This might have affected the outcomes of the study. Further research is needed to obtain detailed information on individual patients to determine the factors that lead to lower mortality and hospitalization rates among patients with heart failure managed by general physicians. Third, the difference in the average age of patients treated by internists and general physicians might have influenced the results of this study. Patients with heart failure treated by internists were younger than those treated by general physicians, which may explain the longer time between diagnosis and death of the former. Lastly, this was a retrospective cohort study; thus, causal relationships still need to be clarified. We plan to perform a prospective study in the future.

Conclusions

This study suggests that the management of heart failure in older patients with multimorbidity by a general physician may reduce hospitalization and mortality rates. In Japan, where specialization is progressing, general physicians can provide comprehensive care to patients with heart failure who are older, require nursing care, and have comorbidities such as dementia, thereby potentially reducing hospitalizations and mortality. We believe that appropriate education of general physicians and an increase in their numbers are essential for the successful management of heart failure among the oldest individuals of the aging society.

Abbreviations

ICD	International Classification of Diseases
OR	Odds ratio
SGLT-2	Sodium-glucose transport protein 2

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Author contributions

Conceptualization, K.N.; methodology, K.N. and R.O.; software, K.N. and R.O.; validation, K.N. and R.O.; formal analysis, K.N. and C.S.; investigation, K.N. and R.O.; resources, K.N.; data curation, K.N.; writing—original draft preparation, K.N. and R.O.; writing—review and editing, K.N. and R.O.; visualization, K.N.; supervision, C.S.; project administration, R.O. All authors have read and agreed to the published version of the manuscript.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The anonymity and confidentiality of the participants' information were ensured throughout the study. All participants were informed of the purpose of this research, and informed consent was obtained from all participants or their families. All the procedures were performed in compliance with the Declaration of Helsinki and its amendments. The Unnan City Hospital Clinical Ethics Committee approved the study protocol (Approval ID: 20230035).

Consent for publication

Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. Savarese G, Becher PM, Lund LH, Seferovic P, Rosano GMC, Coats AJS. Global burden of heart failure: a comprehensive and updated review of epidemiology [published correction appears in Cardiovasc Res. 2023;119:1453]. Cardiovasc Res. 2023;118:3272–87.
2. Jessup M, Brozena S. Heart failure. N Engl J Med. 2003;348:2007–18.
3. Sidney S, Go AS, Jaffe MG, Solomon MD, Ambrosy AP, Rana JS. Association between aging of the US population and heart disease mortality from 2011 to 2017. JAMA Cardiol. 2019;4:1280–6.
4. Ministry of Health, Labour and Welfare. Overview of national healthcare expenditures in 2020. https://www.mhlw.go.jp/toukei/saikin/hw/k-iryohi/20/dl/kekka.pdf. Accessed 22 Feb 2024.
5. Japanese Medical Specialty Board. https://jmsb.or.jp/. Accessed 28 Feb 2024). (In Japanese).
6. Yokota Y, Watari T. Various perspectives of General Medicine in Japan-Respect for and cooperation with each other as the same General Medicine Physicians. J Gen Fam Med. 2021;22:314–5.
7. Raat W, Smeets M, Janssens S, Vaes B. The impact of primary care involvement and setting on multidisciplinary heart failure management is a systematic review and meta-analysis. ESC Heart Fail. 2021;8:802–18.
8. Boom NK, Lee DS, Tu JV. Comparison of processes of care and clinical outcomes for patients newly hospitalized for heart failure attended by different physician specialists. Am Heart J. 2012;163:252–9.
9. Philbin EF, Jenkins PL. Differences between patients with heart failure treated by cardiologists, internists, family physicians, and other physicians: analysis of a large, statewide database. Am Heart J. 2000;139:491–6.
10. Rutten FH, Grobbee DE, Hoes AW. Differences between general practitioners and cardiologists in diagnosing and managing heart failure: a survey in everyday practice. Eur J Heart Fail. 2003;5:337–44.
11. Salisbury C, Johnson L, Purdy S, Valderas JM, Montgomery AA. Epidemiology and impact of multimorbidity in primary care: a retrospective cohort study. Br J Gen Pract. 2011;61:e12–21.
12. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet. 2012;380:37–43.
13. Rao A, Walsh J. Impact of specialist care in newly diagnosed heart failure patients: a randomized controlled study. Int J Cardiol. 2007;115:196–202.
14. Shimane Prefecture Goverment. Aging Rate in Shimane Prefecture. https://www.pref.shimane.lg.jp/medical/fukushi/kourei/kourei_sien/toukei/agerate.html. Accessed 22 Feb 2024.
15. Ministry of Health. Labour and Welfare. Statistical classification of diseases, injuries, and causes of death. https://www.mhlw.go.jp/toukei/sippei/. Accessed Jun 16 2024.
16. Kanda Y. Investigation of the freely available easy-to-use software 'EZR' for medical statistics. Bone Marrow Transpl. 2013;48:452–8.
17. Damarell RA, Morgan DD, Tieman JJ. General practitioner strategies for managing patients with multimorbidity: a systematic review and thematic synthesis of qualitative research. BMC Fam Pract. 2020;21:131.
18. Pereira Gray DJ, Sidaway-Lee K, White E, Thorne A, Evans PH. Continuity of care with doctors- a matter of life and death? A systematic review of continuity of care and mortality. BMJ Open. 2018;8:e021161.
19. Baker R, Freeman GK, Haggerty JL, Bankart MJ, Nockels KH. Primary medical care continuity and patient mortality: a systematic review. Br J Gen Pract. 2020;70:e600–11.
20. Janssen M, Fluit CRMG, Sagasser MH, Kusters LHJ, Scherpbier-de Haan ND, de Graaf J. Competencies for collaboration between general practitioners and medical specialists: a qualitative study of the patient perspective. BMJ Open. 2020;10:e037043.
21. Janssen M, Sagasser MH, Fluit CRMG, Assendelft WJJ, de Graaf J, Scherpbier ND. Competencies to promote collaboration between primary and secondary care doctors: an integrative review. BMC Fam Pract. 2020;21:179.
22. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. Milbank Q. 2005;83:457–502.
23. Basu S, Berkowitz SA, Phillips RL, Bitton A, Landon BE, Phillips RS. Association of primary care physician supply with population mortality in the United States, 2005–2015. JAMA Intern Med. 2019;179:506–14.
24. Dunlay SM, Givertz MM, Aguilar D, Allen LA, Chan M, Desai AS, et al. Type 2 diabetes mellitus and heart failure: a scientific statement from the American Heart Association and the Heart Failure Society of America: this statement does not represent an update of the 2017 ACC/AHA/HFSA heart failure guideline update. Circulation. 2019;140:e294–324.
25. Cavender MA, Steg PG, Smith SC Jr, Eagle K, Ohman EM, Goto S, et al. Impact of diabetes mellitus on hospitalization for heart failure, cardiovascular events, and death: outcomes at 4 years from the Reduction of Atherothrombosis for Continued Health (REACH) registry. Circulation. 2015;132:923–31.
26. Kosiborod M, Cavender MA, Fu AZ, Wilding JP, Khunti K, Holl RW, et al. Lower risk of heart failure and death in patients initiated on sodium-glucose cotransporter-2 inhibitors versus other glucose-lowering drugs: the CVD-REAL study (comparative effectiveness of Cardiovascular outcomes in new users of sodium-glucose Cotransporter-2 inhibitors). Circulation. 2017;136:249–59.

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