

## ORIGINAL ARTICLE

# Determinants of polydoctoring among multimorbid older adults; a cross-sectional study in an urban area of Japan

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## Abstract

**Background:** Multimorbidity increases with age, leading to various adverse outcomes, including higher mortality, care dependency, hospitalizations, and healthcare costs. Polydoctoring, managing a patient with multimorbidity by multiple healthcare providers, can be a risk of fragmented care and increased healthcare expenditures. This study aims to identify patient-related factors contributing to polydoctoring in older adults with multimorbidity.

**Methods:** This study is a cross-sectional study using baseline data from the Kawasaki Aging and Wellbeing Project. Participants were residents of Kawasaki City aged 85–89 years, without disability in basic activities of daily living, and being able to visit study site. The regularly visited facilities (RVF) index was employed to quantify polydoctoring. Polydoctoring was defined as having two or more RVFs. Poisson regression analysis was conducted to assess the association between polydoctoring and patient demographics, including types of chronic conditions and socioeconomic factors.

**Results:** A total of 968 participants with multimorbidity were analyzed. Increased RVF was significantly associated with eye diseases (rate ratio [RR] 1.27, 95% confidence interval [CI] 1.12–1.44), osteoporosis (RR 1.22, 95% CI 1.08–1.38), prostate diseases (RR 1.22, 95% CI 1.07–1.40), and osteoarthritis (RR 1.16, 95% CI 1.05–1.27). No significant correlation was found with educational status or financial hardship.

**Conclusion:** The study indicated that certain chronic conditions are linked to increased polydoctoring among multimorbid older adults in Japan. However, most of those conditions are considered to be within a scope of family medicine/general practice. Training general practitioners to manage these conditions could reduce healthcare costs and the treatment burden, indicating a direction for future healthcare policy and medical education.

## KEYWORDS

aging society, care fragmentation, multimorbidity, polydoctoring, scope of practice

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## 1 | INTRODUCTION

The prevalence of multimorbidity, defined as the concomitant presence of two or more chronic conditions, increases with advancing age.<sup>1,2</sup> Multimorbidity is associated with adverse outcomes, such as higher mortality, escalated care dependency, increased incidence of hospitalization, and increased healthcare costs.<sup>3-7</sup> Multimorbidity poses a substantial challenge for the healthcare systems in developed nations characterized by aging societies.<sup>8,9</sup>

Patients with multimorbidity often require care from numerous healthcare providers. This phenomenon, referred to as polydoctoring, entails the management of a single patient by different physicians and healthcare facilities.<sup>10</sup> Inadequate care coordination in polydoctoring can lead to fragmented care delivery, resulting in a higher incidence of hospital admissions, polypharmacy, and an overall increase in healthcare expenditure.<sup>10-13</sup> Consequently, polydoctoring is now recognized as a pivotal factor in the management of multimorbidity.

Polydoctoring and fragmented care result from the ways patients seek healthcare. This health-seeking behavior of patients is influenced by a complex interplay of factors including patient characteristics, attributes of the healthcare provider, and the structure of the healthcare system.<sup>14</sup> Japan has a national health insurance system that offers free access to healthcare facilities, allowing patients to choose their healthcare provider.<sup>15</sup> The universal health insurance system coupled with the provision of primary care by specialists, provides a conducive backdrop for the occurrence of polydoctoring. The fragmentation of care for older adults is recognized as a critical issue in healthcare across various nations, and polydoctoring among patients with multimorbidity is expected to provide significant insights for the consideration of healthcare policies internationally.<sup>16,17</sup>

Previous studies suggest that higher levels of education and income may predispose individuals to prefer specialist consultations; however, the specific characteristics of patients who are at an increased risk of engaging in polydoctoring are not well characterized.<sup>14,18-20</sup> Moreover, understanding the specific conditions associated with consulting multiple healthcare facilities is important for policy interventions and capacity building of general practitioners. This study aimed to elucidate the patient-related factors contributing to polydoctoring among older adults with multimorbidity, thereby addressing a gap in the current understanding of healthcare use patterns within this demographic.

## 2 | METHODS

### 2.1 | Setting, study population, and data collection

This is a cross-sectional study that used baseline data from the ongoing Kawasaki Aging and Wellbeing Project (KAWP) in Kawasaki City—a major metropolitan area adjacent to Tokyo, Japan, with a population of approximately 1.5 million.<sup>10,21-24</sup> The inclusion criteria for KAWP participants were as follows: (1) residents of Kawasaki

City aged 85–89 years; (2) absence of disability in basic activities of daily living; and (3) being able to visit the study site, the Kawasaki Municipal Hospitals independently.

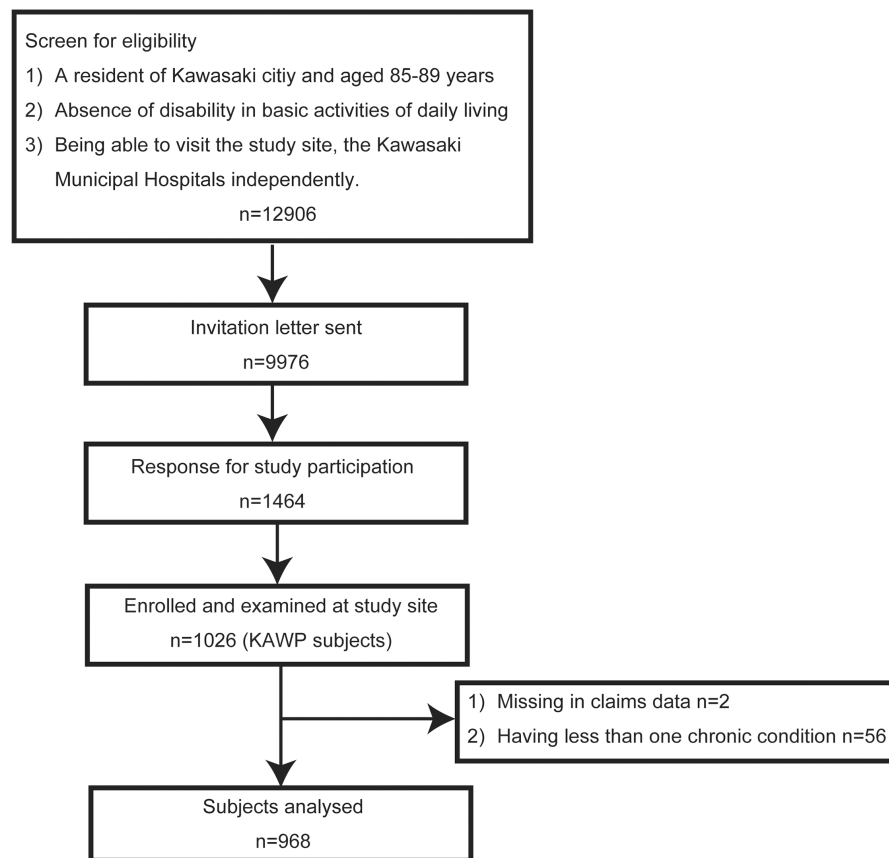
There were two main modes of data collection in the KAWP. First, face-to-face assessments were conducted by a multidisciplinary team comprising physicians, nurses, pharmacists, and psychologists. These assessments included physical measurements, psychological evaluations, and blood tests. Second, medical and long-term care insurance claims data were analyzed to examine the utilization patterns of medical and caregiving services.

In March 2017, we began by identifying 12,906 potential participants using the basic resident registration and long-term care insurance databases in Kawasaki city. We then sent participation invitations to 9976 individuals. Out of these, 1464 eligible residents responded, indicating their interest in joining the study. Over the period from March 2017 to December 2018, we successfully enrolled 1026 independent older adults into the KAWP study. Among the 1026 participants of KAWP, individuals who had consented to the use of their medical and caregiving insurance claims data and had two or more chronic conditions were included in the present study. (Figure 1) Missing data on medical history were treated as absent, and other missing values were not imputed in this study. Instances with unknown data of medical history constituted 175 out of 17,424 condition-person records, representing approximately 1%.

### 2.2 | Measure

The study employed the Regularly Visited Facilities (RVF) index to measure polydoctoring among multimorbid patients.<sup>10</sup> RVF were defined as healthcare facilities meeting the following two criteria within a year's healthcare claims data: (1) presence of claims data for over three times a year and (2) a minimum of a six-month interval between the first and last claims data. An RVF score of 0 indicates no regular healthcare facility visits, whereas a score of 1 indicates attendance at a single healthcare institution. This study measured RVF over 1 year following the initiation of the baseline survey. The definition of polydoctoring and the cutoff for RVF have not yet been established. However, in this study, polydoctoring was defined as an RVF of two or more, as in our previous research.<sup>10</sup>

The covariates selected for this study were as follows: presence or absence of each of the 18 chronic conditions; gender; frailty; educational background; and financial hardship. Previous literature has indicated that educational background and financial status are associated with specialist consultations.<sup>18,19</sup> Frailty is associated with increased healthcare utilization, particularly higher rates of specialist clinic visits.<sup>25,26</sup> Therefore, we included these covariates in the model. Due to the relatively homogeneous age range of the study population (85–89 years), age was not included as a covariate to avoid the potential risk of overfitting. Chronic conditions were categorized into the following 18 chronic conditions as our previous study: cerebrovascular disease, cardiac disease, hypertension, diabetes, dyslipidemia, respiratory disease, gastrointestinal disease, renal



**FIGURE 1** Flow diagram of participant selection. This diagram illustrates the participant selection process for the study. KAWP, Kawasaki Aging and Wellbeing Project.

disease, prostate disease, thyroid disease, Parkinson's disease, connective tissue disease, eye disease, osteoporosis, osteoarthritis, hyperuricemia, malignancy, and dementia.<sup>10,23</sup> The presence of chronic diseases was determined through physician-conducted interviews of the participants. Frailty was assessed through face-to-face surveys based on the revised Japanese version of the cardiovascular health study (J-CHS) criteria.<sup>27</sup> Frailty was treated as a binary variable (frail vs. robust/prefrail) to avoid overfitting risk in our limited sample size. Educational status was measured as completed years of schooling, dividing participants into two groups: those with a high school education or higher ( $\geq 12$  years) and those with less than a high school education ( $< 12$  years), in accordance with previous studies.<sup>19,28</sup> Regarding financial status, this study employed the measurement of self-reported financial hardship. Financial hardship can be conveniently measured using a single question, and its association with health status has been demonstrated.<sup>29,30</sup> Financial hardship was measured by the 5-point Likert scale question, "How does your household manage its monthly finances?" Participants who answered "struggling very much" or "struggling somewhat" were classified as experiencing financial hardship.

### 2.3 | Statistical analysis

Given the exploratory nature of this study, a sample size calculation was not conducted. Poisson regression analysis was conducted with RVF as the dependent variable. Initial univariate regression analyses

for each variable were followed by multivariate regression analysis. Given that the RVF index represents count data, Poisson regression was deemed appropriate for modeling the frequency of events.<sup>31</sup> Gender, educational status, financial hardship, presence of each chronic disease, and frailty were included in the model as binary variables. The variance inflation factors (VIFs) were calculated to ensure the absence of multicollinearity, and the presence of overdispersion was assessed using the Poisson regression model.  $p < 0.05$  was considered indicative of statistical significance for all analyses. Statistical analyses were performed using R version 4.3.1 on RStudio 2023.06.1.

## 3 | RESULTS

Out of 1026 participants, two opted out of using their claims data, and 56 had one or fewer chronic conditions, resulting in a total of 968 participants being included in the analysis. (Figure 1) The characteristics of the study population are summarized in Table 1. Forty-five percent of the participants had more than 12 years of education, and 19% reported experiencing financial hardship. The average number of concurrent chronic conditions among our cohort was 4.7, with a median RVF index of 2. Polydoctoring, defined as two or more RVFs, occurred in 65.3% of participants. The prevalence of each of the 18 diseases studied is presented in Figure 2. Eye diseases were the most common, followed by hypertension, digestive diseases, dyslipidemia, and osteoarthritis.

TABLE 1 Characteristics of the study population.

N	968
Age (median [IQR])	86.00 [85.00, 88.00]
Gender, n (%)	487 (50.3)
Male	481 (49.7)
Female	487 (50.3)
Education $\geq 12$ years, n (%)	436 (45.0)
Financial hardship, n (%)	
No	760 (78.5)
Yes	178 (18.4)
Missing	30 (3.1)
Frailty, n (%)	
Robust	141 (14.9)
Prefrail	574 (60.6)
Frail	232 (24.5)
Missing	21 (2.2)
Number of chronic conditions (median [IQR])	5.00 [3.00, 6.00]
RVF (median [IQR])	2.00 [1.00, 3.00]
0	55 (5.7)
1	281 (29.0)
2	292 (30.2)
3	217 (22.4)
4	71 (7.3)
5	35 (3.6)
6	10 (1.0)
7	6 (0.6)
8	1 (0.1)

Abbreviations: IQR, interquartile range; RVF, regularly visited facility; SD, standard deviation.

Univariate Poisson regression analysis of factors associated with RVF is depicted in a forest plot in Figure 3. RVF was significantly associated with eye diseases (rate ratio [RR] 1.29, 95% confidence interval [CI] 1.15–1.44), osteoporosis (RR 1.21, 95% CI 1.10–1.33), osteoarthritis (RR 1.21, 95% CI 1.11–1.32), prostate diseases (RR 1.17, 95% CI 1.06–1.29), and gastrointestinal diseases (RR 1.15, 95% CI 1.05–1.25).

The results of the multivariate Poisson regression analysis are presented in a forest plot in Figure 4. All VIFs of the multivariate model were below 5, indicating that multicollinearity was not observed in our analysis. In this analysis, RVF showed a significant association with eye diseases (RR 1.27, 95% CI 1.12–1.44), osteoporosis (RR 1.22, 95% CI 1.08–1.38), prostate diseases (RR 1.22, 95% CI 1.07–1.40), and osteoarthritis (RR 1.16, 95% CI 1.05–1.27). RVF showed no significant association with educational status (RR 1.03, 95% CI 0.93–1.14) or financial hardship (RR 0.98, 95% CI 0.87–1.11).

Within the category of eye diseases, the most-prevalent condition was allergic conjunctivitis (28.4%), followed by hyperopic

astigmatism (21.7%), cataract (20%), myopic astigmatism (15.9%), and glaucoma (14.1%). Within the category of prostate diseases, 98.1% of the cases had benign prostatic hyperplasia (BPH).

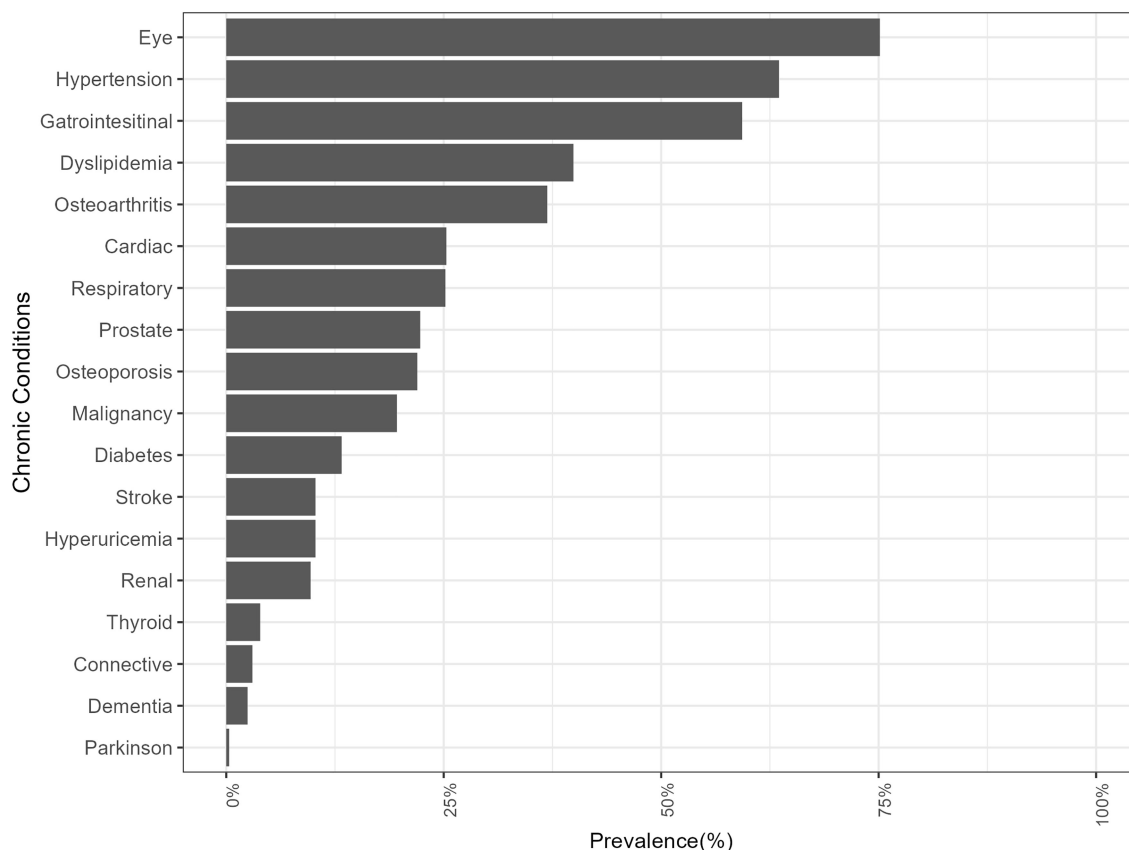
## 4 | DISCUSSION

This study indicated that among very old patients with multimorbidity, the presence of eye diseases, osteoporosis, prostate diseases, and osteoarthritis is associated with an increased tendency to visit multiple healthcare facilities regularly. This trend likely reflects the structure of primary care in Japan, where these conditions are typically managed by the respective specialists.

Eye diseases often require the specialized care of an ophthalmologist; however, the most common condition in this dataset was allergic conjunctivitis. It is conceivable that non-ophthalmologist primary care physicians can manage mild cases of allergic conjunctivitis. Furthermore, with regard to prostate diseases, over 90% of cases were BPH, which is also a common condition that is amenable to management by non-urologists, especially if the treatment is pharmacological. Osteoporosis and osteoarthritis are also prevalent diseases, and their pharmacological treatment is generally considered within the scope of primary care physicians. Indeed, guidelines of the American Academy of Family Physicians and the Royal College of General Practice include allergic conjunctivitis, BPH, osteoporosis, and osteoarthritis within the scope of practice for family physicians and general practitioners.<sup>32,33</sup> The objectives for general medicine training in Japan also include the management of these conditions, and it is anticipated that general practitioners will manage these conditions in the future.<sup>34</sup>

Increased specialist consultations can increase the treatment burden on patients.<sup>20</sup> Furthermore, polydoctoring is a risk factor for polypharmacy and increased healthcare costs.<sup>10</sup> Indeed, comprehensive care provision by primary care physicians is more economically desirable provided that it does not compromise patient outcomes.<sup>10</sup> Enhancing the capacity of primary care physicians to provide safe and effective care for these diseases can reduce the treatment burden of older adults with multimorbidities.

Some reports suggest that patients with certain conditions, such as heart disease and diabetes, may experience better outcomes under the care of specialists than generalists. Conversely, the efficacy of care by specialists and generalists is comparable for some diseases, and the care provided by generalists may even be superior to that provided by specialists in certain contexts.<sup>35</sup> Regarding BPH, several reports have indicated that generalists may be less proactive than urologists in conducting investigations and prescribing medications.<sup>36–38</sup> However, the impact of this difference in approach on patient outcomes remains unclear. For osteoporosis, reports suggest that primary care physicians may opt for treatment choices that are more considerate of costs, patient frailty, and potential medication complications than orthopedic specialists; however, the impact of these preferences on patient outcomes is also unclear.<sup>39</sup> In the case of osteoarthritis,



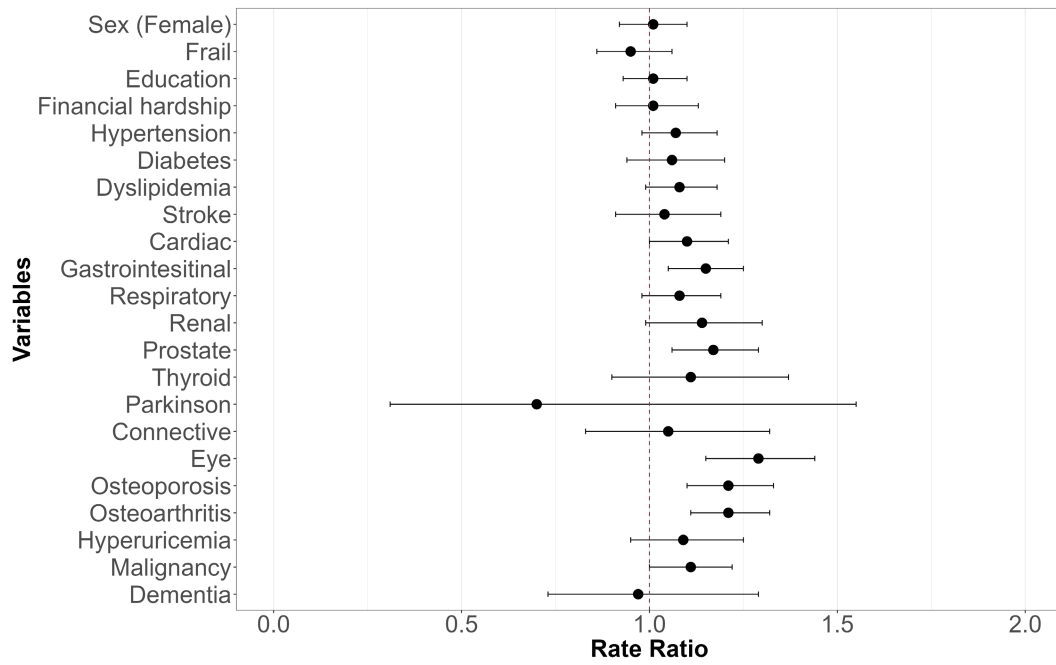
**FIGURE 2** Prevalence of each chronic condition among analyzed participants. This figure illustrates the prevalence of various chronic diseases within the analyzed cohort. Past medical history was obtained not from claims data but through direct interviews by physician. Each chronic disease is represented on the horizontal axis, while the vertical axis displays the prevalence rate (percentage).

while there is a paucity of studies comparing the care provided by generalists to that provided by specialists, one study indicated minimal difference in functional outcomes among them.<sup>40,41</sup> Even for these common diseases, there is still limited knowledge about the impact of care provided by generalists versus specialists on patient outcomes. Further research is warranted to investigate the advantages of comprehensive care provision by generalists supplemented with interventions to bridge gaps versus exclusive specialist care.

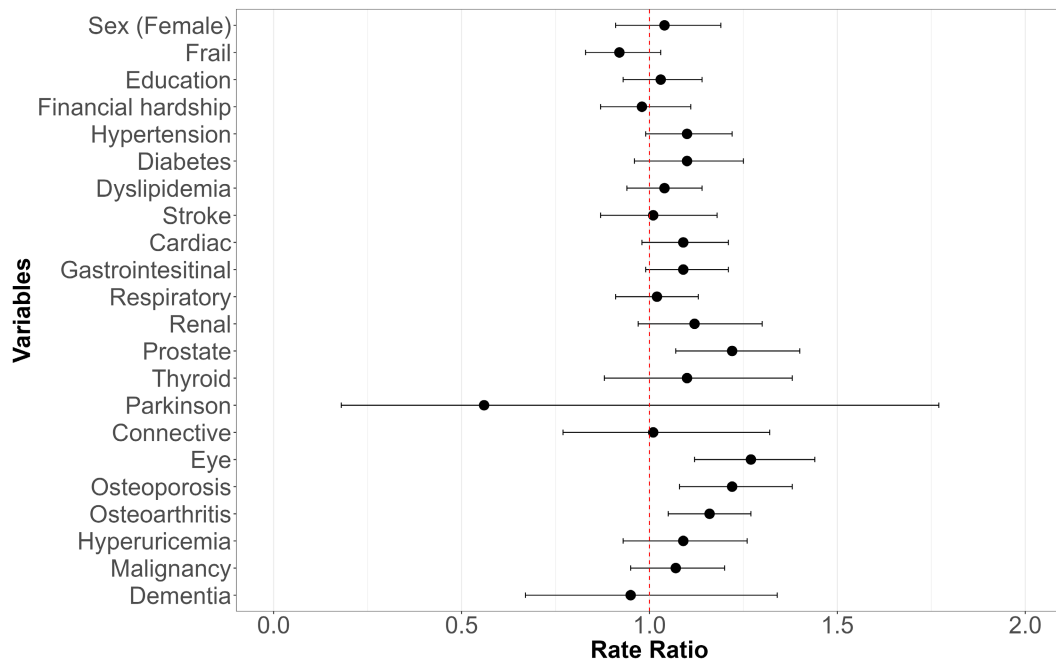
Contrary to prior studies suggesting that higher education and financial status promote specialist consultations, no significant association between polydoctoring and educational status or financial hardship was observed in the present study.<sup>18,19</sup> This may be influenced by Japan's universal health coverage, which allows equal access to healthcare regardless of financial status. This could diminish the impact of financial hardship on the decision to seek care from multiple providers. Previous studies have measured direct income values, whereas this study assesses subjective financial hardship, which may also contribute to the differences in results. Due to the limited sample size, we used a binary categorization of education level ( $\geq 12$  years and  $< 12$  years). This approach may have limited our ability to detect differences based on education levels. Additionally, the homogeneity of the study's age group and urban setting might not reflect broader societal

trends, as healthcare utilization in this demographic could be less affected by socioeconomic factors compared to other age groups or settings.

Some limitations of this study should be considered while interpreting the results. First, there is a potential for information bias, as data on chronic diseases were obtained through physician-conducted interviews. Participants' misunderstanding of their medical conditions may lead to inaccuracies in the reported prevalence and details of chronic conditions. Second, this study focused on an urban area and the findings may not be directly applicable to rural regions with limited access to healthcare facilities. Previous studies have found differences in specialist consultations between urban and rural areas.<sup>14,18,20</sup> Urban areas generally have a higher density of specialists and better access to medical facilities, and urban residents have a greater tendency for seeking specialist care. Future research should encompass both urban and rural regions on a nationwide scale to provide more robust insights. Furthermore, the voluntary nature of participation in this study may have introduced an element of participation bias, limiting its generalizability to the broader population. Additionally, polydoctoring was measured quantitatively using the RVF in this study, without considering qualitative aspects or instances where patients visit multiple departments within the same medical facility.<sup>10</sup> For example, a patient may visit different internal medicine departments within the same institution.



**FIGURE 3** Result of univariate Poisson regression analysis for higher regularly visited facility (RVF). This figure presents the outcome of a univariate Poisson regression analysis, where the RVF is the dependent variable. The horizontal axis depicts the rate ratio for an increment of one unit in the RVF attributed to each factor in unadjusted analysis.



**FIGURE 4** Result of multivariate Poisson regression analysis for higher regularly visited facility (RVF). This figure delineates the results from a multivariate Poisson regression analysis with the RVF as the dependent variable. This adjusted model includes gender, frailty, education, financial hardship, and the presence of each condition. The horizontal axis indicates the rate ratios that represent the expected change in the RVF for each increment of one in the associated factors, while controlling for all other variables in the model.

This limitation might affect the interpretation of our results, as it does not fully capture the complexity of healthcare-seeking behaviors. However, this is one of the first studies to describe the

healthcare-seeking behaviors of older adults with multimorbidity, particularly in relation to polydoctoring, offering vital insights for more efficient care strategies for this population.

## 5 | CONCLUSION

Eye diseases, osteoporosis, prostate diseases, and osteoarthritis increase the likelihood of patients regularly visiting multiple health-care facilities in Japan, where organ-specific specialists predominantly deliver primary care. Although this study is situated within the context of Japan's healthcare system, its findings on the determinants of polydoctoring have broader implications. The interplay between patient behavior and healthcare system structure that encourages multiple consultations can inform healthcare system designs in other countries. Thus, identifying the specific conditions and patient demographics linked to polydoctoring can aid in developing more integrated care approaches, both within Japan and potentially in other healthcare systems facing similar issues. Training of general practitioners to cover these conditions, which are within the scope of general medicine training, can help reduce healthcare costs and the treatment burden on patients. Insights from this study can help inform future healthcare policy and medical education.

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### CONFLICT OF INTEREST STATEMENT

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

### ETHICS STATEMENT

Ethics approval statement: This study was approved by the ethics committee of Keio University School of Medicine (ID: 20160297).

### PATIENT CONSENT STATEMENT

All participants signed an informed consent statement prior to participation in the study.

### CLINICAL TRIAL REGISTRATION

This study is registered in the University Hospital Medical Information Network Clinical Trial Registry as an observational study (ID: UMIN000026053).

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