Survey of the Actual Situation of HRQoL among Patients with Chronic Diseases at Community Pharmacies in Japan and Decision Tree Analysis of Patient Attributes Affecting HRQoL

Norimitsu Horii[1,2], Akira Yoshida[3], Shinji Oshima[3], Naohito Takahashi[4], Junya Mikata[4], Shigeru Ohshima[*1,2] and Daisuke Kobayashi[2,3]

[1] Laboratory of Pharmacy Management, Faculty of Pharmacy and Pharmaceutical Sciences, Josai University, 1-1 Keyakidai, Sakado 350-0295, Japan
[2] Josai University Pharmacy, 972 Morohongo, Irumagun Moroyamamachi, Saitama 350-0451, Japan
[3] Laboratory of Analytical Pharmaceutics and Informatics, Faculty of Pharmacy and Pharmaceutical Sciences, Josai University, 1-1 Keyakidai, Sakado 350-0295, Japan
[4] Center of Pharmacy Practice and Education, Faculty of Pharmacy and Pharmaceutical Sciences, Josai University, 1-1 Keyakidai, Sakado 350-0295, Japan

Abstract

Objective: We investigated the health-related quality of life (HRQoL) of patients with chronic diseases in community pharmacies in Japan and examined its relationship to patient attributes, an area that has not been previously studied.

Method: We surveyed 1,500 participants with chronic diseases and 1,500 from the general population without chronic diseases (Free-GP) using the EuroQol (5-dimension, 5-level) questionnaire. Patient attributes included the number of drugs used, duration of medication, number of chronic conditions, perceived disease severity, and perceived treatment importance. Logistic regression analyses assessed how these attributes influenced the likelihood of reporting "full health" (no problems on all HRQoL questions) among patients with chronic disease. An exploratory decision tree analysis was performed to identify patient attributes that might decrease HRQoL.

Result: The HRQoL score of patients (0.856) was lower than that of Free-GP (0.942). The HRQoL of patients tended to increase with aging. Among patients, the mean HRQoL score was 0.781 for polypharmacy, which decreased with the addition of disease severity perception (even lower for those in their 20s-40). Even in the absence of polypharmacy, the average HRQoL score decreased when patients were in their 20s with multimorbidity. The HRQoL scores of non-polypharmacy patients in their 30s or older were higher than the mean scores of patients with chronic disease.

Conclusion: To provide extensive care for patients with reduced HRQoL in community pharmacies, it is necessary to focus on polypharmacy. Reduced HRQoL should be considered in younger patients with multimorbidity, even in the absence of polypharmacy.

Key words: health-related quality of life, community pharmacy, chronic disease, polypharmacy, patient attribute

Objective

Community pharmacies in Japan accept approximately 75% of outpatient prescriptions and provide patient care[1]. Community pharmacy patients are individuals whose attending physicians have determined they can be reexamined in an outpatient setting. Therefore, community pharmacists are responsible for medication management. Therefore, to improve medication therapy management, community pharmacists in Japan must understand the characteristics of this patient group and recognize the impact of their care on patient outcomes.

Pharmaceutical care is a fundamental concept for pharmacists involved in patient care. In 1990, Hepler et al. defined pharmaceutical care as "the responsible provision of drug therapy to achieve definite outcomes that improve a patient's QoL[2]". Consequently, a pharmacist's role is to dispense and care for patients to improve their quality of life (QoL). Since then, research has focused on pharmaceutical care and improving

patient QoL.

QoL can be measured as a psychological scale and has been used to determine the health status of specific populations, to measure the effectiveness of medical interventions, and as an indicator of cost-effectiveness[3~5]. Hence, QoL can quantify and assess the outcomes of pharmacists' efforts in community pharmacies.

Comprehensive health-related QoL (HRQoL) scales such as the 36-item Short Form, the 12-item Short Form version 2, and the EuroQol 5-dimensions (EQ-5D) have assessed the effects of pharmacists' interventions. Previous reviews found that some pharmaceutical care interventions improved HRQoL, while others did not improve it or produced inconsistent findings[6-8]. These reviews include studies where community pharmacists analyzed the characteristics of drug-related problems in patients with muscle diseases and examined their relationship to HRQoL using multivariate analysis[6]. Additionally, some papers demonstrate that community pharmacist-provided intervention programs influence different aspects of HRQoL depending on patient attributes. Furthermore, studies have reported the effects of community pharmacist intervention on symptoms, clinical severity, and HRQoL using RCTs for headaches, asthma, and depression[8].

In other countries, research and discussion on the HRQoL of community pharmacy patients are advancing. However, in Japan, few studies have explored the relationship between pharmaceutical care and HRQoL in community pharmacies, and there is limited information on patient attributes associated with reduced HRQoL[9-14].

Most community pharmacy patients in Japan have chronic diseases (Chronic-Pt)[15]. To practice patient care based on the concept of Pharmaceutical Care, it is essential for community pharmacists to first to understand which Chronic-Pt experiences lower HRQoL. Moreover, by identifying the HRQoL levels of Chronic-Pt and the patient attributes associated with HRQoL decline, pharmacists can prioritize patients who require additional support when dispensing prescriptions and providing medication counseling[16-18].

Therefore, this study aims to investigate and compare the HRQoL of Chronic-Pt with that of the general population without chronic diseases (Free-GP), and to examine patient attributes associated with a decline in HRQoL.

Materials and Methods

1．Study Design and Participants
1-1．Online Survey
An online questionnaire was used for the survey, which was commissioned by Rakuten Insight Inc., an online research company with a panel of approximately 2.2 million monitors[19]. The HRQoL of Free-GP and Chronic-Pt was investigated at the same period on the same platform to minimize potential biases associated with different platforms, which can occur when Internet surveys are conducted.

1-2．HRQoL Survey of the Free-GP Group
From April 22 to 28, 2022, a survey was administered to Free-GP to collect approximately 1,500 respondents. Participants who answered "none" to the question "How many chronic diseases do you currently have？" were defined as the Free-GP group. Participants' ages ranged from 20 to 79 years, and the male-to-female ratio was 1：1. Japan was divided into nine blocks (Hokkaido, Tohoku, Kanto, Hokuriku, Tokai, Kinki, Chugoku, Shikoku, and Kyushu [including Okinawa]), and the number of respondents in each region was assigned to reflect population ratios based on population estimates from the Bureau of Statistics[20]. Participants were asked to complete the EQ-5D-5L Health Questionnaire displayed on their browsers.

1-3．HRQoL Survey of Chronic-Pt
During the same period as that of the Free-GP survey, a survey was conducted to collect approximately 1,500 patients who regularly visit community pharmacies. Participants who answered "one or more" to the question "How many chronic diseases do you have？" and "yes" to the question "Do you regularly (four or more times a year) visit a community pharmacy for medication counseling to treat your chronic diseases？" were defined as Chronic-Pt. Participants were asked a variety of questions about patient attributes (see below) in addition to the EQ-5D-5L Health Questionnaire, which was displayed on their browsers.

2．Data Cleaning
To eliminate insincere respondents, matching questions (asking the same questions at the beginning and end of the questionnaire) were used, and respondents whose answers did not match were excluded. After data cleaning, the number of each dataset was 1,500 for both Free-GP and Chronic-Pt.

3．Questionnaires
3-1．HRQoL Scale
The EQ-5D-5L can calculate HRQoL by responding to questions in five domains (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) at one of five levels (no problems, slight problems, moderate problems, severe problems, and extreme problems/unable to).

Responses to the questionnaire can be calculated as utility

scores ranging from -0.025 to 1.00, where 0 means "death" and 1.00 means "full health." The value can be less than 0.00, indicating a state worse than death. The next actual health status score after full health (1.00) is 0.895. Therefore, there are no respondents with scores of 0.895-1.00. This gap is referred to as the truncation point[21,22]. We obtained permission from the development group to use the Japanese version of EQ-5D-5L on the Internet (https://euroqol.org/).

3-2. Patient Attributes

In addition to sex and age, this study also investigated the following five attributes that affect the HRQoL of Chronic-Pt: 1) the number of drugs used, 2) drug use duration, 3) the number of chronic diseases, 4) the perception of chronic disease severity (7-point Likert scale), and 5) the perception of needing-drug treatment (7-point Likert scale).

The above five items were selected by four authors (both community pharmacists and university faculty) and two faculty members who have been pharmacists for at least five years.

Specifically, in the dispensing process, the number of medicines and the period of use can be confirmed from the prescription and the patient's medication history. The patient's perception of the severity of the disease and the need for treatment can be ascertained from the usual medication instructions.

Many studies have investigated income and educational background, which are not information that community pharmacists in Japan ask for to provide care to outpatients[3,23-25]. Therefore, this information was not used in this study.

4．Statistical Analysis

4-1. Survey of HRQoL of Free-GP and Chronic-Pt

HRQoL scores were calculated from the response patterns of the EQ-5D-5L questionnaire (5 items and 5 levels) according to a previous report[16]. HRQoL scores and the percentage of "full health" (score of 1.00) were calculated for Free-GP and Chronic-Pt, respectively, by sex and age group and compared within each group[26-31].

4-2. Attribute Analysis of Patients with Decreased HRQoL

4-2-1. Logistic Regression Analysis

To simplify the interpretation of the results regarding the effect of patient attributes on the HRQoL of Chronic-Pt, we first applied a binomial logistic regression analysis with "full health" (or not) as the objective variable. The explanatory variables were sex, age (Age was defined in 10-year increments), and the five items mentioned above: the number of drugs which was defined as polypharmacy or not (six or more drugs were considered polypharmacy); the number of diseases which was defined as multimorbidity or not (two or more chronic disease were considered multimorbidity); perceived disease severity (levels from 1 to 7); perceived need for treatment (levels from 1 to 7); and drug use duration. The maximum likelihood estimation method was used to estimate the coefficients.

4-2-2. Decision Tree Analysis

A decision tree analysis was performed to determine what combination of patient attributes had more impact on the decrease in the HRQoL of Chronic-Pt. The patient attributes that significantly impacted the logistic regression analysis were used as explanatory variables, and Chronic-Pt HRQoL scores were used as objective variables. Classification and regression trees were used for the decision-tree algorithm.

4-3. Data Analysis Method

Decision tree analysis was performed using JMP Pro Ver. 17 (SAS Institute, Cary, NC, USA). All other statistical analyses were performed using R software (ver. 4.2.2).

4-4. Ethical Considerations

This study was conducted with the approval of the Josai University Ethics Review Committee for Medical Research on Humans (no. Human Medical Ethics-2021-19). All methods employed were conducted following the Ethical Guidelines for Life Sciences and Medical Research Involving Human Subjects of the Ministry of Education, Culture, Sports, Science and Technology. All respondents participated only if they had read and agreed to the consent document on their browsers. The data collected were anonymized according to Rakuten Insight's privacy policy and delivered as data that could not be linked to personal information. This research adhered to the ethical principles of the 1964 Declaration of Helsinki and its amendments.

Results

1．HRQoL of Chronic-Pt

1-1. Comparison of HRQoL Score Distribution with Free-GP

Figure 1 shows the number of Free-GP and Chronic-Pt according to the HRQoL score. When classified in 0.05 increments, the number of "full health" participants was the highest in both groups, and the number of participants in each category decreased as the score decreased.

In all score classes below 1.00, the number of Chronic-Pt was higher than that of Free-GP, showing a decrease in HRQoL among these patients.
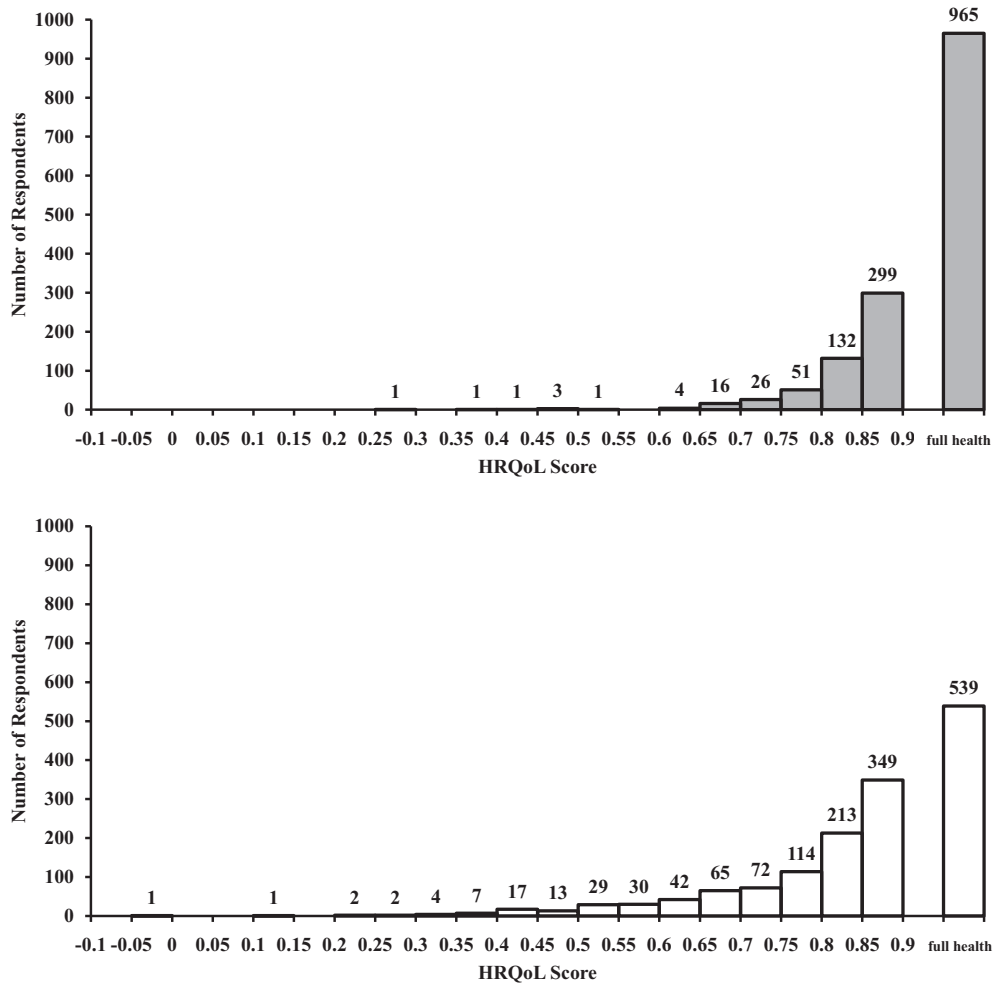
Fig. 1. Distribution of health-related quality of life scores among patients with chronic disease and the general public without chronic diseases. The upper gray histogram illustrates the disease-free group, and the lower white histogram shows patients from community pharmacies.

1-2. Comparison of HRQoL Scores by Sex and Age Group

The number of respondents by sex and age group and descriptive statistics for HRQoL are shown in **Table 1**. Age groups were defined in 10-year increments. Both mean and median in Chronic-Pt were lower than in Free-GP in all age groups. The mean and median values of Chronic-Pt in the 20s were the lowest for both men and women compared to those in other age groups.

1-3. Comparison of the Percentage of "Full Health" by Sex and Age Group

Figure 2 shows the percentage of "full health" by sex and age group. Gray bars indicate Free-GPs, and white bars indicate Chronic-Pt.

Regardless of sex and age group, the percentage of "full health" was lower among Chronic-Pt than among Free-GP. The lowest percentage of "full health" for both men and women

was observed among Chronic-Pt in their 20s.

In men, the percentage of "full health" among chronic patients tended to increase with age, except for those in their 70s, while this tendency was less for free GPs.

Among women, the proportion of "full health" among Free-GP in their 50s was lower compared to other age groups, but excluding this group, the trend is the same as for men.

2. Patient Attributes Associated with Decreased HRQoL

2-1. Logistic Regression Analysis

The results of the logistic regression analysis are shown in **Table 2**. The analysis revealed that the adjusted odds ratio showed a significant effect in all age groups, with those in their 20s as the reference group. Duration of medication use (adjusted odds ratio: 1.020; 95% CI: 1.01-1.03) increased the probability of "full health," while polypharmacy (adjusted odds

Table 1 Number of respondents by sex and age group and descriptive statistics for health-related quality of life

Free-GP							Chronic-Pt						
N	1500						N	1500					
HRQoL Score							HRQoL Score						
Mean	0.942						Mean	0.856					
SD	0.090						SD	0.151					
Median	1.000						Median	0.889					
1st quartile	0.895						1st quartile	0.780					
3rd quartile	1.000						3rd quartile	1.000					
95% confidence interval for the mean							95% confidence interval for the mean						
Lower	0.937						Lower	0.849					
Upper	0.946						Upper	0.864					

HRQoL Score_Free-GP_All							HRQoL Score_Chronic-Pt_ALL						
Age	20s	30s	40s	50s	60s	70s	Age	20s	30s	40s	50s	60s	70s
N	199	227	294	268	252	260	N	250	250	250	250	250	250
Mean	0.925	0.942	0.939	0.938	0.952	0.951	Mean	0.778	0.837	0.846	0.881	0.895	0.901
SD	0.100	0.085	0.103	0.086	0.081	0.080	SD	0.172	0.154	0.155	0.127	0.136	0.122
Median	1.000	1.000	1.000	1.000	1.000	1.000	Median	0.808	0.867	0.867	0.895	0.895	0.895
1st quartile	0.867	0.867	0.867	0.871	0.895	0.895	1st quartile	0.670	0.772	0.772	0.823	0.823	0.831
3rd quartile	1.000	1.000	1.000	1.000	1.000	1.000	3rd quartile	0.885	1.000	1.000	1.000	1.000	1.000
95% confidence interval for the mean							95% confidence interval for the mean						
Lower	0.911	0.931	0.927	0.928	0.942	0.942	Lower	0.757	0.817	0.827	0.866	0.878	0.886
Upper	0.939	0.953	0.951	0.949	0.962	0.961	Upper	0.800	0.856	0.866	0.897	0.912	0.916

HRQoL Score_Free-GP_Men							HRQoL Score_Chronic-Pt_Men						
Age	20s	30s	40s	50s	60s	70s	Age	20s	30s	40s	50s	60s	70s
N	101	116	149	134	123	120	N	125	125	125	125	125	125
Mean	0.920	0.945	0.938	0.946	0.954	0.952	Mean	0.768	0.826	0.847	0.877	0.904	0.909
SD	0.109	0.081	0.105	0.086	0.080	0.084	SD	0.181	0.149	0.155	0.138	0.119	0.119
Median	1.000	1.000	1.000	1.000	1.000	1.000	Median	0.817	0.831	0.867	0.895	1.000	0.895
1st quartile	0.867	0.867	0.895	0.895	0.895	0.895	1st quartile	0.665	0.760	0.771	0.823	0.831	0.867
3rd quartile	1.000	1.000	1.000	1.000	1.000	1.000	3rd quartile	0.871	0.895	1.000	1.000	1.000	1.000
95% confidence interval for the mean							95% confidence interval for the mean						
Lower	0.899	0.930	0.921	0.932	0.940	0.937	Lower	0.737	0.800	0.820	0.852	0.883	0.888
Upper	0.942	0.960	0.955	0.961	0.969	0.967	Upper	0.800	0.853	0.875	0.901	0.926	0.931

HRQoL Score_Free-GP_Women							HRQoL Score_Chronic-Pt_Women						
Age	20s	30s	40s	50s	60s	70s	Age	20s	30s	40s	50s	60s	70s
N	98	111	145	134	129	140	N	125	125	125	125	125	125
Mean	0.930	0.939	0.940	0.930	0.950	0.951	Mean	0.788	0.847	0.845	0.886	0.885	0.893
SD	0.091	0.091	0.102	0.085	0.082	0.078	SD	0.162	0.159	0.157	0.116	0.150	0.124
Median	1.000	1.000	1.000	1.000	1.000	1.000	Median	0.808	0.867	0.867	0.895	0.895	0.895
1st quartile	0.867	0.867	0.867	0.867	0.895	0.895	1st quartile	0.707	0.772	0.778	0.823	0.823	0.831
3rd quartile	1.000	1.000	1.000	1.000	1.000	1.000	3rd quartile	0.895	1.000	1.000	1.000	1.000	1.000
95% confidence interval for the mean							95% confidence interval for the mean						
Lower	0.912	0.922	0.923	0.916	0.936	0.938	Lower	0.759	0.819	0.818	0.865	0.859	0.871
Upper	0.948	0.956	0.956	0.945	0.965	0.964	Upper	0.817	0.875	0.873	0.906	0.912	0.915

Note. Chronic-Pt = Patients with chronic diseases; Free-GP = General population without chronic diseases; HRQoL = Health-related quality of life; SD = Standard deviation.

ratio: 0.33; 95% CI: 0.24–0.47), multimorbidity (adjusted odds ratio: 0.70; 95% CI: 0.55-0.89), and perceived disease severity (adjusted odds ratio: 0.81; 95% CI: 0.75–0.88) decreased the probability of "full health." Patients' sex and perceived importance of treatment were not associated with "full health."

2-2. Decision Tree Analysis

Decision tree analysis was performed using the patient attributes that had a significant impact on the "full health" of Chronic-Pt in the logistic regression analysis as explanatory variables and the HRQoL scores of Chronic-Pt as the objective variables.

For this analysis, age was defined as six levels in 10-year increments (20s, 30s, 40s, 50s, 60s, and 70s), and patient-severity perception was defined as two levels (options 1–4 without severity perception and 5–7 with severity perception). The other conditions were the same as those used in the logistic regression analysis.

The results are shown in **Fig. 3**. HRQoL scores below the mean of 0.856 for Chronic-Pt are underlined. In the bottom left dashed box, the data in the solid box above it (the LEAF node of the decision tree analysis) are shown separately by age group using manual calculations.

First, "polypharmacy" was the patient attribute that had the greatest impact on the decline in HRQoL of Chronic-Pt (first branching factor). The mean score for polypharmacy was 0.781, which was lower than the mean score of 0.856 for Chronic-Pt. Next, when "perception of the severity = yes" was added to polypharmacy, the mean score was 0.747.
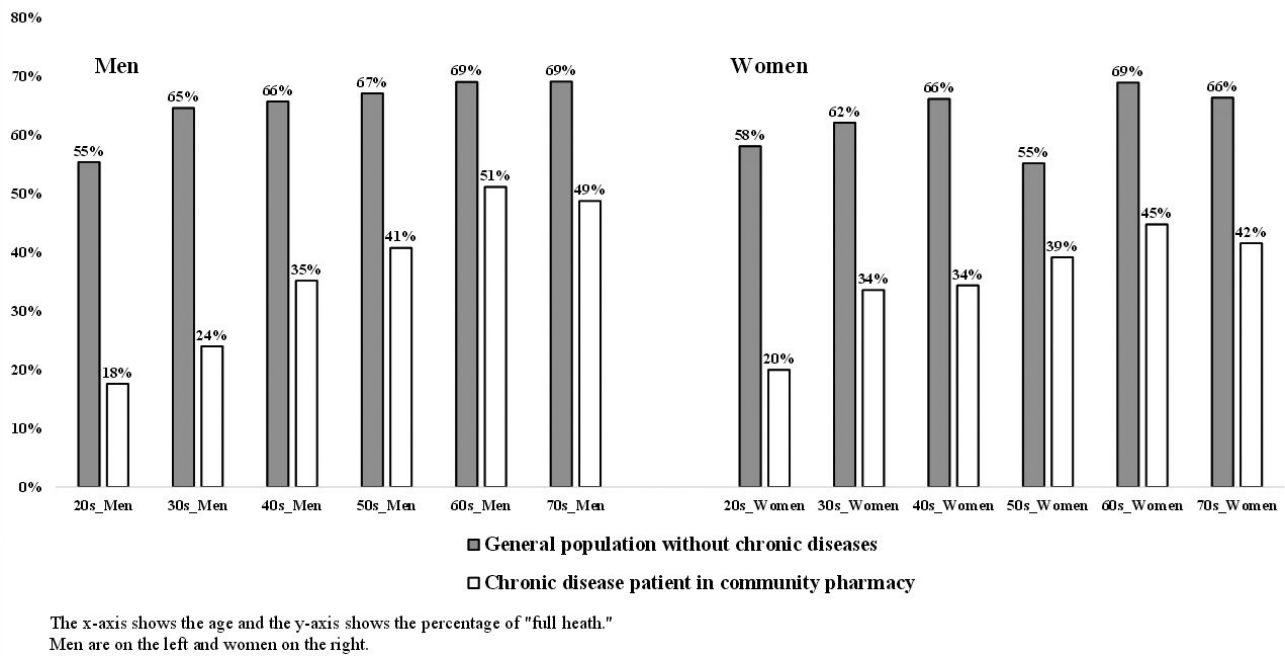
The x-axis shows the age and the y-axis shows the percentage of "full heath."
Men are on the left and women on the right.

Fig. 2 Percentage of full health by sex and age group.

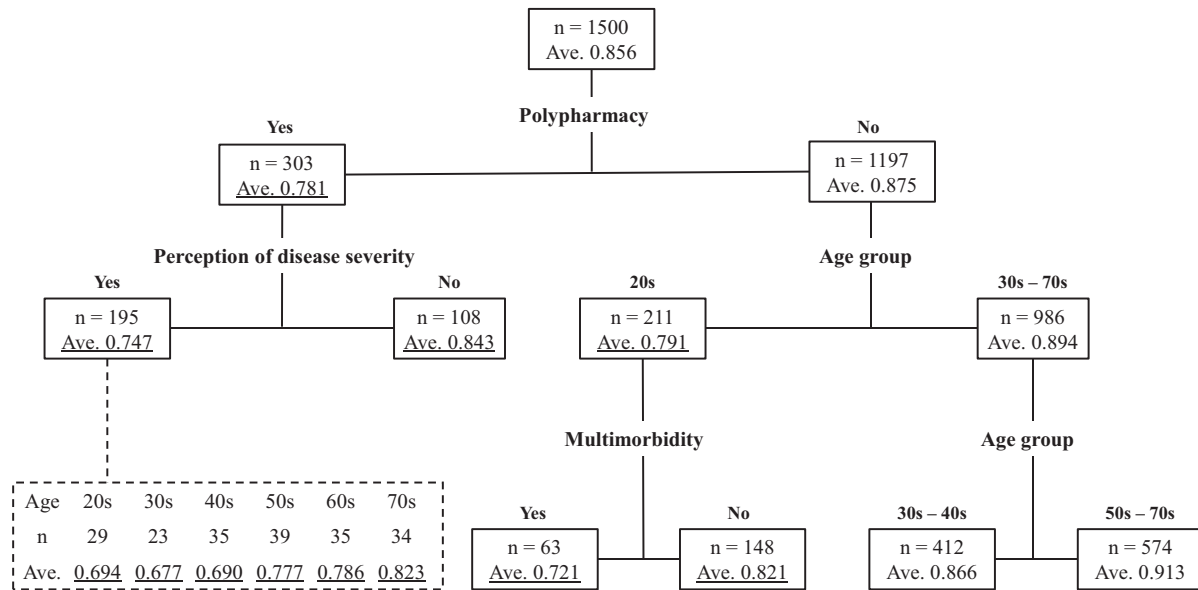Table 2 Influence of patient attributes on the probability of "full health"

| | | adjusted odds ratio | 95% confidence interval | |
			Lower	Upper
Sex	Women	1.000	-	-
	Men	1.170	0.930	1.460
Age	20S	1.000	-	-
	30S	**1.670**	**1.090**	**2.570**
	40S	**2.390**	**1.560**	**3.640**
	50S	**3.040**	**1.990**	**4.630**
	60S	**4.270**	**2.800**	**6.510**
	70S	**3.810**	**2.490**	**5.830**
Multimorbidity	No	1.000	-	-
	Yes	**0.700**	**0.550**	**0.890**
Polypharmacy	No	1.000	-	-
	Yes	**0.330**	**0.240**	**0.470**
Duration of drug use		**1.020**	**1.010**	**1.030**
Perceived importance of treatment		1.080	0.990	1.180
Perceived severity of disease		**0.810**	**0.750**	**0.880**

Note . Multimorbidity: two or more chronic diseases; Polypharmacy: more than six drugs

In the non-polypharmacy condition, simply being in their 20s lowered patients' mean score to 0.791. Furthermore, adding "multimorbidity = yes" reduced the mean to 0.721. The mean score for non-polypharmacy patients in their 30s–70s was 0.894, higher than the mean score of 0.856 for Chronic-Pt.

When the group with "polypharmacy and perception of severity of disease" that showed the lowest HRQoL score in the second branch is further divided by age group (in the dashed box), the mean HRQoL scores for those in their 20s, 30s, and 40s were 0.694, 0.677, and 0.690, respectively, while those in their 50s, 60s, and 70s were 0.777, 0.786, and 0.823, respectively, indicating a divergence in scores for those in their 40s and below

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                           ┌─────────────┐
                           │ n = 1500    │
                           │ Ave. 0.856  │
                           └─────────────┘
                              Polypharmacy
         Yes                                          No
  ┌─────────────┐                            ┌─────────────┐
  │ n = 303     │                            │ n = 1197    │
  │ Ave. 0.781  │                            │ Ave. 0.875  │
  └─────────────┘                            └─────────────┘
 Perception of disease severity                 Age group
   Yes               No                 20s              30s – 70s
┌─────────────┐ ┌─────────────┐  ┌─────────────┐  ┌─────────────┐
│ n = 195     │ │ n = 108     │  │ n = 211     │  │ n = 986     │
│ Ave. 0.747  │ │ Ave. 0.843  │  │ Ave. 0.791  │  │ Ave. 0.894  │
└─────────────┘ └─────────────┘  └─────────────┘  └─────────────┘
                                   Multimorbidity      Age group
                                  Yes        No      30s – 40s   50s – 70s
                               ┌────────┐┌────────┐ ┌────────┐ ┌────────┐
                               │n = 63  ││n = 148 │ │n = 412 │ │n = 574 │
                               │Ave.    ││Ave.    │ │Ave.    │ │Ave.    │
                               │0.721   ││0.821   │ │0.866   │ │0.913   │
                               └────────┘└────────┘ └────────┘ └────────┘
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Age	20s	30s	40s	50s	60s	70s
n	29	23	35	39	35	34
Ave.	0.694	0.677	0.690	0.777	0.786	0.823

- Within the solid box, the number of samples and HRQoL average scores for each group are shown.
- Underlined values indicate HRQoL scores below the average HRQoL score for all patients with chronic diseases.
- Within the dashed boxes, the data within the solid boxes above them (LEAF node of the decision tree analysis) are shown separated by age group using manual calculations.

Fig. 3 Decision tree analysis by patient attributes.

and those in their 50s or above. In the logistic regression analysis, "duration of medication" was a factor that significantly affected HRQoL. Still, in the decision tree analysis, it was not obtained as a factor in the analysis up to the third branch.

Discussion

1．Characteristics of HRQoL of Chronic-Pt
1-1．Comparison with the General Public

In Japan, the HRQoL survey of the general public using the EQ-5D-5L reported that the percentage of "full health" was about 55%[31]. In this study, the "full health" percentage in Chronic-Pt was 36%, lower than that of the general public. Contrastingly, the percentage of "full health" among Free-GP was 64%, which was higher than that of the general public. Previous studies have reported that among community pharmacy patients taking high-risk medications, those using antiepileptic, antidepressant, digitalis, and antiarrhythmic drugs had HRQoL scores of 0.700, 0.763, 0.785, and 0.817, respectively, lower than the overall community pharmacy population[9]. Additionally, a study examining the impact of generic drug administration on HRQoL among community pharmacy patients with Alzheimer's disease found HRQoL scores ranging from 0.477 to 0.720[14]. In comparison, the HRQoL scores observed in this survey were higher than those reported in previous studies. This is considered to be influenced by the fact that this survey focused on patient attributes that can be obtained through routine pharmacist practice to identify patients with reduced HRQoL, and that patients with different disease severities across various disease groups were comprehensively assessed.

1-2．Impact of Aging, Sex, and Chronic Disease on HRQoL

In this study, the "full health" percentage was low among Free-GP women in their 50s. Menopause is known to negatively affect HRQoL scores[32,33]. The present results may be due to this effect.

In Chronic-Pt, the percentage of "full health" increased with age, and the percentage of "full health" was lower in individuals in younger age groups (**Fig. 2**). Prior studies reported that HRQoL in older patients may be maintained as compared to younger patients[34,35].

A prior study showed that older patients were more psychologically resilient than younger patients[36], which may be related to the lower HRQoL of younger patients than that of older patients in the current study.

Depression is more prevalent among younger patients than older patients[15]. The lower HRQoL observed in younger patients may reflect the impact of depression and other conditions that significantly affect HRQoL. Additionally, greater social support for older adults, which has been shown to improve HRQoL[37] along with the extensive care provided by Japanese pharmacists to older patients[38,39] may have influenced the study.

２．Relative Evaluation of HRQoL Scores of Chronic-Pt in Japanese Community Pharmacies

Comprehensive HRQoL scales such as EQ-5D-5L and SF-36 are scales that can be compared regardless of disease[40,41]. The HRQoL score for the general Japanese population is 0.891[31].

The average value for the Chronic-Pt group in this survey was 0.856, and the average value for the 20–30 age group was slightly lower than that for the general population (men: 20s–0.768, 30s–0.826; women: 20s–0.788, 30s–0.847). However, there was no significant decrease in the 60–70 age group (men: 60s–0.904, 70s–0.909; women: 60s–0.913, 70s–0.917). This suggests that older patients with chronic diseases who visit community pharmacies in Japan may have a higher HRQoL than the general Japanese population.

It is difficult to explain this difference based on the available data alone; however, we believe these results suggest that even among patients with chronic diseases who regularly visit community pharmacies, older patients are less adversely affected.

３．Segmentation of Patients with Decreased HRQoL Based on Attributes of Chronic-Pt

The patient attributes that reduce HRQoL, as obtained from logistic regression analysis and decision tree analysis, were (1) polypharmacy and (2) perception of disease severity. Next, in the group of patients who met both (1) and (2), (3) HRQoL scores decreased significantly in their 20s to 40s. In addition, even if they were not polypharmacy, (4) HRQoL was also lower among patients in their 20s with multimorbidity, even if they were not polypharmacy patients.

Logistic regression analysis revealed that longer medication duration was associated with a greater likelihood of reporting full health. This finding may reflect that prolonged treatment fosters greater patient acceptance of chronic conditions.

Polypharmacy and multimorbidity reduce HRQoL[42,43], and our results were consistent with these previous reports. If community pharmacists aim to enhance HRQoL as an outcome of pharmaceutical care, the first step is to identify polypharmacy through prescription information. Reducing unnecessary prescriptions may improve HRQoL in affected patients. Moreover, when polypharmacy patients perceive their chronic diseases as severe, additional care should be considered, as they may be at an even greater risk of HRQoL decline.

Conversely, in patients without polypharmacy, attention should shift to age, particularly to younger patients in their 20s with multiple chronic conditions, whose HRQoL may be more severely impaired than polypharmacy patients. Although improving multiple chronic conditions in community pharmacy settings is challenging, optimizing medication management for primary diseases could lead to overall improvements in HRQoL.

４．Limitations

This study has some limitations. An Internet survey methodology was used in this survey. Although as much data cleaning as possible was performed, untruthful responses cannot be ruled out. In addition, respondents were patients who could respond via the Internet, and the participation of patients with severe diseases was likely to be low. Furthermore, this result may have been influenced by the fact that many respondents were well-informed patients who actively researched their diseases and treatments online. Therefore, this study should be interpreted as a monitored Internet survey.

Additionally, in this survey, perceptions of disease severity and the need for treatment were each using a single question. As a result, there is a possibility that respondents' answers varied depending on their mood, physical condition on the day of the survey, or recent interactions with their physicians.

５．Conclusion

The HRQoL of community pharmacy patients with chronic diseases, measured using the EQ-5D-5L was 0.856. Analysis of HRQoL distribution revealed that younger patients tended to report lower HRQoL, while older patients showed relatively higher HRQoL. Among patient attributes associated with reduced HRQoL, polypharmacy emerged as the most significant factor. Furthermore, considering age, multimorbidity, and perceived disease severity together may offer valuable insights into how community pharmacists can contribute to improving HRQoL.

the corresponding author upon reasonable request.

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