

The association between physician's affiliation and patients' adherence to their antihypertensive medication and pharmaceutical knowledge

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Funding information

Ministry of Health, Labor and Welfare of Japan, Grant/Award Number: 1101001001018

Abstract

Background: The aim of this study was to examine whether or not the type of physician is associated with the knowledge of and adherence to hypertensive medication among patients.

Methods: The study was a self-administered questionnaire survey among patients who submitted their prescriptions for antihypertensive drugs to 13 pharmacies in Japan in 2006. We compared patients' knowledge of their medications and the self-reported adherence according to the type of physician.

Results: A total of 736 patients were surveyed, and 687 (362 from clinics and 325 from hospitals) were analyzed. In total, 51.8% of the patients correctly named their antihypertensive medicine, with no significant differences observed between clinics and hospitals (51.4% in clinics vs 52.3% in hospitals; $P = 0.81$, adjusted odds ratio (OR) to the hospital: 0.736, 95% confidence interval [CI]: 0.50-1.08). Significant differences were not observed in the knowledge of the frequency with which hypertensive medication was supposed to be taken (47.2% in clinics vs 46.5% in hospitals; $P = 0.84$, adjusted OR: 0.80, 95% CI: 0.55-1.16), nor observed in the knowledge of the side effects of the medication (53.2% in clinics vs 51.0% in hospitals; $P = 0.57$, adjusted OR: 1.14, 95% CI: 0.78-1.68). No significant difference was observed in self-reported adherence (75.1% in clinics vs 77.7% in hospitals; $P = 0.42$, adjusted OR: 0.73, 95% CI: 0.46-1.16).

Conclusions: About 75% answered that they were taking their medication as instructed. No significant differences were observed in responses based on the physician's affiliation. Further studies are needed to achieve better patient's adherence and pharmaceutical knowledge.

KEYWORDS

adherence, chronic condition, hypertension, patient-physician relationships

1 | INTRODUCTION

Adherence to a medication is defined as the extent to which patients take medications as prescribed by their healthcare providers.¹ Despite the accumulation of evidence and knowledge about chronic disease management, medication adherence is still far from ideal. About half of patients do not take their medication as instructed, especially for asymptomatic conditions.^{2,3} Poor adherence to medication leads to increased morbidity and death and is estimated to incur approximately \$100 billion a year in the United States.¹ To date, numerous strategies for improving adherence have been tested, but no intervention has been proven superior to others.^{4,5}

Hypertension is a major chronic disease that must be managed in order to prevent further complications, such as atherosclerosis, cardiovascular disease, stroke, and chronic renal failure.⁶ Overall, it is estimated that 40% of adults ≥ 25 years of age have been diagnosed with hypertension worldwide, and this disease contributes to 9.4 million deaths per year and was associated with 162 million years of life lost in 2010.⁷ The treatment of hypertension is the most common reason for office visits of nonpregnant adults to their primary care physicians and for the use of prescription drugs.⁸ However, adequate blood pressure control is reportedly achieved in only approximately 30% of patients in high-income countries.^{9,10} A major factor contributing to uncontrolled blood pressure is low adherence to the relevant medication.¹¹ Evidence from previous studies using self-administered questionnaire suggests that 50% to 80% of patients prescribed antihypertensive medication therapy have low adherence to their treatment regimen.¹¹⁻¹³ Low adherence is associated with drug-related factors (size, taste, package, frequency), system-related factors (out-of-pocket cost), and patient-related factors (age, gender, ethnicity).^{14,15}

Studies have shown that a better patient-physician relationship is a key component for better adherence. Primary care physicians have better knowledge of a patient's social background with good access and long-term relationships.¹⁶⁻¹⁹ In addition, primary care physicians in the community are a good resource for patient education, making them potentially a good source for managing asymptomatic hypertension.^{20,21}

However, little is known that what types of physician can better ensure adherence to medication and improve patients' drug knowledge, such as the drug's name, timing for taking the medicine, and side effects. We therefore designed the present study to clarify the association between a physician's affiliation, specifically whether a physician is at clinics or hospitals, and a patients' adherence to their medication and pharmaceutical knowledge.

2 | METHODS

This was a cross-sectional study using a self-administered questionnaire at 13 pharmacies in seven prefectures (Tokyo, Chiba, Saitama, Kanagawa, Nagoya, Osaka, and Shiga) across Japan. The study population comprised patients who submitted their prescriptions for

antihypertensive drugs from October to November 2006. After patients provided their informed consent to participate, we handed out self-administered questionnaires asking about the patients' knowledge of the drugs they were taking, their level of adherence, their understanding of hypertension, the type of the physician who wrote their prescription, and their personal background. Patients who were considered to have physical conditions or cognitive symptoms rendering them unable to fill out the questionnaire and patients who could not read or write Japanese were excluded.

Questions concerning patients' knowledge about hypertensive drugs included inquiries into the number of drugs they were regularly taking, the number of drugs they were taking for hypertension specifically (1, 2, and ≥ 3 drugs), the name of the drug(s), and how often they took the medication (once daily, twice a day, three times a day, or when the blood pressure was elevated). We also asked about patients' familiarity with the adverse effects of the drug(s) using a 4-point Likert scale as follows: 1, know all; 2, know some; 3, hardly know; and 4, do not know at all. Adherence was determined using a 5-point Likert scale as follows: 1, take completely as instructed; 2, take almost completely as instructed; 3, neither; 4, hardly take as instructed; and 5, do not take at all as instructed. We also inquired about the patients' background knowledge of hypertension using five questions.

The questionnaire also inquired about the characteristics of the physicians, patient-doctor relationships, and the demographics of the study participants. Any complications of hypertension, such as retinal disease, ischemic heart disease, cerebrovascular disease, and impaired kidney function, were included.

The recruitment of study participants continued until the number of patients from clinics and hospitals both reached 400, based on the sample size calculation using Stata 9.0 software (StataCorp., College Station, TX, USA). The completed questionnaires were sealed and submitted along with the prescription, with each patient's personal information removed. Researchers evaluated the responses to the returned questionnaires and prescription. We concluded that the knowledge of the drug was correct when the name of the drug was understandable to the pharmacist. Responses with minor errors, such as errors in the spelling or dosage, were still considered correct, as the pharmacist or physician receiving the prescription could still easily understand what kind of drug the patient was taking.

A chi-squared test was used for the evaluation of the differences in the proportions of answers between patients who received their prescription from a clinic and those who received their prescription from a hospital. Statistical significance was determined at $P < 0.05$.

We also conducted a logistic regression analysis to determine the influence of the following factors on the knowledge of the medication: the patient's age, gender, education, numbers of hypertensive complications, knowledge of hypertension, frequency of visits, length of the relationship with the physician, number of regular medications, and number of hypertensive medications. We also compared the knowledge of side effects, frequency of the medication, and adherence to the medication between patients who received their prescription from a clinic and those who received their prescription from a hospital.

TABLE 1 Characteristics of participants

	Type of affiliated institution		P-value
	Clinics n = 362	Hospitals n = 325	
Age, years (mean [SD])	65.0 (10.2)	65.0 (11.3)	0.95*
Range	30-91	28-95	
Gender (%)			
Male	164 (46.7)	178 (56.7)	0.01**
Female	187 (53.3)	136 (43.3)	
Education (%)			
<12 years	55 (15.9)	60 (19.4)	0.17**
12 years	166 (48.1)	123 (39.7)	
≥13 years	114 (33.0)	119 (38.4)	
Did not answer	10 (2.9)	8 (2.6)	
Complication of hypertension (%)			
Retinal hemorrhaging/detachment	20 (6.4)	33 (12.3)	0.01**
Ischemic heart disease	32 (10.4)	58 (21.2)	<0.01**
Cerebrovascular diseases	16 (5.1)	29 (10.8)	0.01**
Impaired renal function	23 (7.7)	46 (17.6)	<0.01**
Average number of complications of hypertension (SD)	0.21 (0.50)	0.43 (0.65)	<0.01***
Average score for knowledge of hypertension (SD)	3.18 (1.47)	3.38 (1.39)	0.08***

SD, standard deviation.

*Student's *t* test.

**Chi-squared test.

***Mann-Whitney *U* test.

The study protocol was reviewed and approved by the Research Ethics Committee of the Institute for Health Outcomes and Process Evaluation Research, a specified nonprofit organization in Japan.

3 | RESULTS

A total of 736 patients were surveyed, and 687 (362 from clinics and 325 from hospitals) mentioned the type of institution at which they had been prescribed medication. Table 1 shows the characteristics of the study participants. The mean age of the participants was similar between the clinic-prescribed and hospital-prescribed groups, but the percentage of male patients at clinics was lower than that among hospital outpatients. The years of education were not markedly different between the two prescription groups, but patients from hospitals tended to have more complications associated with hypertension. No significant difference in the knowledge about hypertension management was noted between the two prescription groups.

The characteristics of the patients prescribed medication for hypertension differed significantly between the two prescription groups (Table 2). More than half of the patients from both clinics and hospitals visited their physician once a month, but patients at clinics visited their physician more often than those at hospitals. In addition,

patient at clinics tended to have longer relationships with their physicians. Indeed, about 40% of patient at clinics had seen the doctor for longer than 6 years, while only 27% of patients at hospitals had such a lengthy relationship. About 70% of physicians in hospitals are internists, and 46% of physicians in clinics are family physicians or general physicians. The age distribution of physicians is younger in hospitals than in clinics. Patients at hospitals were prescribed more medications in total as well as hypertensive medications specifically than those at clinics (Table 3).

More than half of the patients correctly named their hypertensive medicine, with no significant differences observed between clinics and hospitals (51.4% in clinics vs 52.3% in hospitals; $P = 0.81$). Using logistic regression, the adjusted odds ratio (OR) to the hospital was 0.74 (95% confidence interval [CI]: 0.50-1.08), so no differences were observed between affiliated institutions. Significant differences were not observed in the knowledge of the frequency with which hypertensive medication was supposed to be taken (47.2% in clinics vs 46.5% in hospitals; $P = 0.84$, adjusted OR: 0.80, 95% CI: 0.55-1.16), nor observed in the knowledge of the side effects of the medication (53.2% in clinics vs 51.0% in hospitals; $P = 0.57$, adjusted OR: 1.14, 95% CI: 0.78-1.68). Adherence, which was determined as a response of "Take completely as instructed" to the question "Do you take the medication

TABLE 2 Type of physicians and patient-physician relationships

	Clinics n = 362	Hospitals n = 325	P-value*
Age of the physician			
21-40 years	26 (7.6)	77 (24.8)	<0.01
41-50 years	126 (36.6)	108 (34.8)	
51-60 years	100 (29.1)	81 (26.1)	
≥61 years	66 (19.2)	14 (4.5)	
Do not know	26 (7.6)	30 (9.7)	
Specialty of physician			
Family/general physicians	157 (45.9)	60 (19.2)	<0.01
Internal medicine	143 (41.8)	223 (71.2)	
Other	31 (9.1)	22 (7.0)	
Do not know	11 (3.2)	8 (2.6)	
Frequency of the visits			
>Once a month	59 (17.3)	22 (7.1)	<0.01
Once a month	215 (63.0)	160 (51.6)	
Once in two months	27 (7.9)	89 (28.7)	
Once in three months or more	40 (11.7)	29 (12.6)	
Length of the relationship			
Less than a year	39 (11.3)	62 (19.7)	<0.01
1-2 years	69 (19.9)	72 (22.9)	
3-5 years	99 (28.6)	96 (30.5)	
≥6 years	139 (40.2)	85 (27.0)	

*Chi-squared test.

as instructed?", was noted in 75.1% of patients from a clinic and 77.7% of those from a hospital ($P = 0.42$). No significant difference

TABLE 3 Characteristics of the medication

	Clinic n = 362	Hospital n = 325	P-value*
Number of drugs in total			
1-3	215 (61.6)	116 (37.7)	<0.01
4-6	99 (28.4)	121 (39.3)	
7-9	28 (8.0)	51 (16.6)	
≥10	7 (2.0)	20 (6.5)	
Number of doctors who wrote a prescription			
1	269 (76.0)	238 (73.9)	0.73
2	75 (21.1)	70 (21.7)	
3	9 (2.5)	12 (3.7)	
≥4	1 (0.3)	2 (0.6)	
Number of hypertensive medications			
1	183 (52.3)	126 (41.4)	<0.01
2	123 (35.1)	105 (34.5)	
≥3	44 (12.6)	73 (24.0)	

*Chi-squared test.

was observed between the two groups (adjusted OR: 0.73, 95% CI 0.46-1.16) (Table 4).

4 | DISCUSSION

The aim of this study was to examine whether or not the type of physician is associated with the knowledge of and adherence to hypertensive medication among patients. Hypertensive medication, which is commonly prescribed both by specialists and by primary care physicians, is thought to be a good example for determining which types of physician achieve better patient education, resulting in better medication knowledge and better adherence. We used prescriptions as an information source and compared patients' answers to a survey administered at several community pharmacies in Japan.

To our knowledge, our study is the first to assess patients' knowledge of their medication and adherence and to compare the types of institutions issuing prescriptions in Japan. We found no marked difference in the knowledge of the drug name, timing of administration, side effects, or adherence between patients who were treated at hospitals and those who were treated at clinics.

Patients' knowledge of their medications, especially their recall of medication names, has varied in previous studies. One study conducted in a general practice clinic in the UK reported that 22.3% of the patients reported a different dose, and 20.8% reported a different dosing frequency from health professionals such as doctors or nurses.²² Another study involving patient interview at primary health-care centers showed that only 10.9% of respondents knew the name of their medication.²³ However, another study at the emergency department demonstrated that 48% of patients were able to recall all of their current medications,²⁴ and another study found that 85% of general practice patients were able to name their drugs correctly.²⁵ Such variation may be observed because of the methods employed by each study to assess patients' knowledge. Given that our study, in which about 50% of patients were able to correctly name their drugs, timing, and side effects, was based on real prescription and patient survey data obtained at pharmacies, we believe that our results more closely reflect patients' knowledge of medication than previous studies.

In our study, about 75% of participants answered that they were taking their medication as instructed completely. Previous studies conducted in the teaching hospital in Japan using self-report show similar results.^{26,27} Although self-reported adherence is likely to be high, these results were still higher than previous studies conducted outside of Japan.¹¹⁻¹³ Further studies using other measures of adherence, such as standardized questionnaire, pill counts, or direct observation, are needed.

Recently, primary care intensive clinics in the United States have successfully achieved better adherence to treatments for several chronic conditions, including diabetes, hypertension, and hyperlipidemia, than hospitals.²⁸ Theoretically, primary care physicians, who are the main providers of accessible care in the community, should be more familiar with their patients' social backgrounds than specialists and more likely to achieve long-term relationships with

TABLE 4 Knowledge of the name of medication, the timing, side effects, and adherence

	Clinic n = 362	Hospital n = 325	Adjusted OR ^a	95% CI
Knowledge of the name of medication all correct answers	186 (51.4%)	170 (52.3%)	0.74	0.50-1.08
Knowledge of the timing of medication all correct answers	171 (47.2%)	151 (46.5%)	0.80	0.55-1.16
Knowledge of the side effects of medication knows completely	185 (53.2%)	159 (51.0%)	1.14	0.78-1.68
Adherence take medication as instructed completely	265 (75.1%)	248 (77.7%)	0.73	0.46-1.16

OR, odds ratio; 95% CI, 95% confidence interval.

^aOdds ratios were adjusted by respondent's gender, age, the numbers of hypertensive complications, scores for medical knowledge about hypertension (0-4), years of relationships (≤ 3 years vs > 3 years), and the number of medications in total.

their patients by spending much time on single visits than specialists in hospitals, especially subspecialists.²⁹ However, in our study, physicians at clinics failed to achieve better adherence than physicians at hospitals in Japan. One possible explanation for our observation of no marked differences in knowledge and adherence is that, regardless of their worksite, both types of physician in Japan are too busy with the high number of consultations to nurture good relationships with patients. In Japan, on average, each patient visits a physician 14 times a year, much more frequently than in other countries; this makes both clinics and hospitals extremely busy.³⁰ In addition, physicians at clinics in Japan are not necessarily trained as primary care physicians, so they have virtually no training in motivating patients in the primary care setting. Medical education in Japan has traditionally placed little emphasis on primary care, although the recent rapid aging of Japanese society has begun to require a greater focus on primary care-oriented training and community-based care.³¹⁻³⁴ Physicians in community clinics in Japan should become more primary care-oriented and gain better knowledge to treat chronic conditions.³⁵

Physicians need to find ways to provide more direct and effective patient education. Given their understandably limited time for consultation, more effective and strategic tools are necessary.³⁶ Promoting the effective delivery of information about medication, assessing the barriers to medical care, and actively equipping patient with effective tools, including mobile health technology, such as smartphone apps with medication reminder, are promising.^{37,38} Online educational tools to distribute knowledge on medications may also help provide such medical information more effectively.³⁹

Because our study showed that physicians at both clinics and hospitals failed to educate patients properly, collaboration with community pharmacists is considered important. Community pharmacists are important resources for drug information and are expected to play more important roles in the management of chronic conditions, such as hypertension, in the future. Patients previously reported a high degree of satisfaction with the provision of drug information by their community pharmacist,⁴⁰ so more collaboration between community pharmacists and physicians with a team approach will be necessary to achieve better patient knowledge and better adherence.^{41,42}

Several limitations associated with the present study warrant mention. First, our study is cross-sectional in design. Although we use pharmacies from separate areas across Japan, generalizability is not guaranteed. Second, we did not assess the refusal rate between patients treated at a hospital and those treated at a clinic, so there may be some bias in our results. Third, we used a self-administered survey, which may not accurately reflect patients' knowledge of their medication or adherence.

However, despite these limitations, our study demonstrated important findings regarding the association between the physician type and patients' medication knowledge and adherence. A more sophisticated approach may deliver a better understanding of the medication, better adherence, and better patient outcomes.⁴³

In conclusion, only about half of the patients evaluated knew the name of their medication, and about 75% answered that they were taking their medication as instructed. No significant differences were observed in responses based on the physician's affiliation. Further studies are needed to achieve better patient's adherence and medication knowledge.

ACKNOWLEDGEMENTS

The authors appreciate the cooperation of the community-based pharmacies and pharmacists (Katsuo Amioka, Hisashi Iijima, Hisako Takeuchi, Masaki Maeda, Kenichi Miyata, Tadashi Urabe, Eijo Kasahara, Junko Kasahara, Takeshi Kamei, Masakuni Kishimoto, Koji Sato, Koei Sato, Manabu Takahashi, Takako Nakano, Masao Hashizume, Yoshio Hayamizu, Takako Hirata, Sigeyuki Fuzii, Sadamasa Mase, and Noriaki Murasugi) that participated in this study.

CONFLICT OF INTEREST

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

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How to cite this article: Matsumura S, Watanabe K, Fukuhara S. The association between physician's affiliation and patients' adherence to their antihypertensive medication and pharmaceutical knowledge. *J Gen Fam Med*. 2019;20:19-24. <https://doi.org/10.1002/jgf2.219>