

## ORIGINAL ARTICLE

# Changes in the Characteristics of Rehabilitation Physicians over Two Decades: Analysis of National Physician Census Surveys in Japan

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**Objective:** The aim of the study was to analyze the demographics of rehabilitation physicians and their retention trends, identify factors related to physician retention, and consider the policy implications. **Methods:** The individual data from 1996 to 2016 from a national census survey administered every two years by the national government of Japan were analyzed. The physician retention trends were then evaluated. Finally, a multivariable logistic regression analysis was performed to identify the factors related to the retention of rehabilitation physicians. **Results:** The total numbers of rehabilitation physicians in 1996 and 2016 were 902 (0.4% of all physicians) and 2484 (0.8% of all physicians), respectively, an increase of 175%. It should be noted that between 1996 and 2016 the number of physicians aged  $\leq 39$  years decreased, whereas the number of physicians aged  $\geq 40$  years greatly increased to 2118, accounting for 85.3% of all rehabilitation physicians in 2016. The overall annual retention rate of full-time rehabilitation physicians from 1996 to 2016 increased by 6.6%. The odds of continuing to practice as a rehabilitation physician were significantly higher for academic hospital physicians than for clinic physicians. **Conclusion:** The dramatic increase in the number of rehabilitation physicians in Japan has been prompted by policy measures and rapidly increasing demands for rehabilitation due to the aging of society. Ensuring the entry of younger physicians into this career path through efforts such as establishing rehabilitation medicine classes in every school of medicine is necessary to promote the development of specialist rehabilitation physicians in Japan.

**Key Words:** Japan; longitudinal study; rehabilitation physician; retention rate

## INTRODUCTION

Against a background of worldwide aging trends, the role of rehabilitation is becoming increasingly important. The majority of developed countries have policies in place to promote the retention of board-certified rehabilitation physicians and provide training programs for them.<sup>1)</sup> Rehabilitation physicians are doctors who medically evaluate disabilities arising from disease or injury, establish treatment goals for therapists, and ensure environments conducive to carrying out suitable rehabilitation aimed at functional and

social recovery.<sup>2)</sup> Numerous articles indicate that patients whose treatment plans involve rehabilitation physicians receive an improved quality of medical care compared with patients treated without the involvement of rehabilitation physicians.<sup>3,4)</sup>

In Japan, it is possible to claim to be a rehabilitation department regardless of the presence or absence of a rehabilitation physician. Furthermore, the recognition of rehabilitation physicians in Japan has not involved the national government; rather, it has been carried out by the academic societies of specialist disciplines.<sup>5)</sup> The worsening of physi-

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cian maldistribution because of specialist physician training being carried out primarily at urban university hospitals has been raised as a concern by the Japan Medical Association and the All Japan Hospital Association.<sup>6)</sup>

The geographical maldistribution of physicians is an important issue in Japanese health policy. With the revision of the Medical Law in 2018, effective measures for securing physicians will be promoted in the future by local prefectural governments in response to the degree of uneven distribution of physicians and clinical departments by region.<sup>7)</sup> However, the career transitions and actual conditions of rehabilitation physicians are currently unclear.

It is possible to empirically investigate the demographics of physicians who decide to work as rehabilitation physicians. Such research may be helpful for generating basic data to examine measures intended to ameliorate the uneven distribution of rehabilitation physicians. However, in Japan, no reports have analyzed the characteristics and changes in the numbers of rehabilitation physicians. Moreover, although it is important to analyze rehabilitation physician retention trends and the factors associated with retention, little is currently known about this subject.

The objectives of the present study were to evaluate recent trends in the geographical distribution of rehabilitation physicians in Japan, to identify the factors associated with their retention, and to propose effective policy measures.

## MATERIALS AND METHODS

### Data Sources

Data on individual physicians covering two decades (1996–2016) from the Survey of Physicians, Dentists, and Pharmacists, which is a national census survey conducted every 2 years by the Japanese Ministry of Health, Labor and Welfare (MHLW), were accessed. In Japan, the Medical Practitioners' Act requires all physicians to report their status every 2 years. The response rate is approximately 90%.<sup>8)</sup> The survey data include a physician's ID (registration number), age, sex, years of experience, whether qualification was achieved at >30 years of age (i.e., indicating roughly whether they entered medical college directly from high school), workplace type (municipality type and medical institution type), and specialty. In this study, physicians who chose "working as rehabilitation physicians" as their specialty or the main area of practice from a predetermined list in the survey questionnaire were considered to be full-time rehabilitation physicians. In Japan, 344 Secondary Medical Areas (SMAs) have been classified into the following three

categories based on the population size and population density in 2016: the first group (urban), second group (intermediate), and third group (rural).<sup>9)</sup>

### Data Analysis

First, the distribution of rehabilitation physicians and the ratio of rehabilitation physicians per 100,000 residents by geographic area for 1996, 2006, and 2016 was verified. Next, the demographics and professional characteristics of rehabilitation physicians in 1996, 2006, and 2016 were described in terms of sex, age, years of experience, whether qualification was achieved at >30 years of age, workplace type, and institution type. Data from 2006 were analyzed to compare the data before and after the introduction of the postgraduate mandatory training system. Physicians who graduated in 2004 advanced to new mandatory two-year postgraduate training courses and decided to enter specialist training in 2006. Therefore, because 2004 was a transition period, 2006 was set as a breakpoint.

A cohort dataset was then established using the physician registration numbers. The "retention rate" was defined as the number of physicians still working as rehabilitation physicians at the time of the subsequent survey (e.g., in 1998) divided by the number of rehabilitation physicians in the original survey (e.g., in 1996) among physicians who responded to both surveys (i.e., in 1996 and 1998). For the data from 1996 to 2016 the retention rate was calculated every 2 years and the trend was analyzed. From this, the annual retention rates were obtained by calculating the square root of the biannual rates. Additionally, the temporal trend in the rate of those continuing to work as rehabilitation physicians (among physicians currently working as rehabilitation physicians) and their characteristics were investigated. This was done because keeping the current rehabilitation physicians motivated is also important to increase the number of rehabilitation physicians in the whole country.

Next, a cohort study was conducted to identify physician factors associated with continuing to work as a rehabilitation physician 10 years later for the periods from 1996 to 2006 and from 2006 to 2016. The outcome of interest was working as a rehabilitation physician 10 years later in 2006, whereas the exposures of interest were the following physician characteristics in 1996: age category (<40, 40–54, 55–69, or ≥70 years), sex, whether qualification was achieved at >30 years of age (yes or no), working area (urban, intermediate, or rural), and type of institution (clinic, academic hospital, non-academic hospital, or others). Data on the years of experience were not included because they were strongly

correlated with age.

In addition, the types of institutions and specialties of the rehabilitation physicians who changed their career between 1996 and 2006 and between 2006 and 2016 were analyzed. Finally, the types of specialty certificates held by rehabilitation physicians as of 2016 were verified. For the statistical analyses, P values <0.05 were considered to be significant. STATA 15.1 was used for all statistical analyses.

### Ethical Considerations

This study was approved by the institutional review board of the Harvard T.H. Chan School of Public Health (No. 18–1422). The need for informed consent was waived by the ethics committee.

## RESULTS

The numbers of rehabilitation physicians in 1996, 2006, and 2016 were 902 (0.4% of all physicians), 1855 (0.7%), and 2484 (0.8%), respectively (**Table 1**). The number of rehabilitation physicians increased by 175% between 1996 and 2016. On the basis of the rurality criterion, the number of urban rehabilitation physicians increased by 179%, whereas the number of rural rehabilitation physicians increased by 167% over the same period; the urban versus rural differential thus slightly increased. In terms of the rehabilitation physician-to-population ratio, the increase in urban areas was 155%, whereas it was 220% in rural areas.

It should be noted that the number of physicians aged ≤39 years decreased, whereas the number of physicians aged ≥40 years greatly increased to 2118, accounting for 85.3% in 2016 (**Table 2**). Evidently, the average age of rehabilitation physicians has increased. The number of female physicians increased 3.9-fold between 1996 and 2016, and the proportion of female physicians increased, from 16.1% to 22.6%. Moreover, the percentage of doctors working in clinics in 2016 was low at 6.4%, whereas those employed at “other hospitals” was high at 78.8%.

Annual retention rates were calculated and are presented in **Table 3**. Among rehabilitation physicians in 2014, the proportion who were still rehabilitation physicians 2 years later (2016) was 81.9%. The percentages showed little change between 1996 and 2016, from 75.3% to 81.9%. Among younger physicians with <15 years of experience, the retention rates were relatively low, and were unchanged from 73.3% in 1996 to 73.1% in 2014. The ratios of those who did not report 2 years later (no-report ratio) ranged between 5.7% (2016) and 7.7% (2002), showing no significant differences between the

**Table 1.** Distribution of rehabilitation physicians and the number of rehabilitation physicians per 100,000 residents by geographic area in 1996, 2006, and 2016

	1996		2006		2016		2006:1996		2016:2006		2016:1996	
	Physicians	Physicians/ population <sup>a</sup>	Physicians	Physicians/ population <sup>a</sup>	Physicians	Physicians/ population <sup>a</sup>	Physicians	Physicians/ population	Physicians	Physicians/ population	Physicians	Physicians/ population
Total	902	0.7	1855	1.5	2484	2.0	2.06	2.02	1.34	1.35	2.75	2.72
Urban	439	0.8	827	1.5	1224	2.2	1.88	1.79	1.48	1.42	2.79	2.55
Intermediate	412	0.7	896	1.5	1124	1.9	2.17	2.16	1.25	1.29	2.73	2.77
Rural	51	0.4	132	1.0	136	1.2	2.59	2.76	1.03	1.16	2.67	3.20

<sup>a</sup>Number of rehabilitation physicians per 100,000 residents.

**Table 2.** Demographics and professional characteristics of rehabilitation physicians in 1996, 2006 and 2016

	1996 Survey		2006 Survey		2016 Survey	
Total of subjects, n	902	—	1855	—	2484	—
% of all physicians	0.4%	—	0.7%	—	0.8%	—
Sex, n,%						
Male	757	83.9%	1538	82.9%	1922	77.4%
Female	145	16.1%	317	17.1%	562	22.6%
Age, n,%						
≤39	415	46.0%	533	28.7%	366	14.7%
40–54	297	32.9%	761	41.0%	1017	40.9%
55–69	118	13.1%	346	18.7%	820	33.0%
≥70	72	8.0%	215	11.6%	281	11.3%
Years of experience, n,%						
0–14	447	49.6%	570	30.7%	408	16.4%
15–29	273	30.3%	764	41.2%	1028	41.4%
30–44	116	12.9%	329	17.7%	759	30.6%
≥45	66	7.3%	192	10.4%	289	11.6%
Qualified as a physician while younger or older than 30 years, n,%						
<30	657	72.8%	1348	72.7%	1788	72.0%
≥30	245	27.2%	507	27.3%	696	28.0%
Workplace, n,%						
Urban	439	48.7%	827	44.6%	1224	49.3%
Intermediate	412	45.7%	896	48.3%	124	45.2%
Rural	51	5.7%	132	7.1%	136	5.5%
Institution, n,%						
Clinic	77	8.5%	122	6.6%	158	6.4%
Academic hospital	212	23.5%	316	17.0%	369	14.9%
Other hospital	613	68.0%	1417	76.4%	1957	78.8%

surveys.

**Figure 1** shows the number of physicians becoming rehabilitation physicians, the number of years experience they had, and the retention rate among rehabilitation physicians based on the data in **Table 3**. The number reported to enter the area of practice increased from 544 in 1996–1998 to 707 in 2014–2016. By years of experience, those with 0–14 years of experience made up the highest proportion in 1996–1998, whereas those with 30–44 years of experience constituted the highest proportion in 2014–2016.

The results of the logistic regression analysis shown in **Table 4** indicate that the odds ratios of continuing to practice as a rehabilitation physician were higher among women and among those who had worked for academic hospitals. The strongest predictors were working for academic hospitals in the cohorts between 1996 and 2006 and between 2006 and 2016. For the workplace and qualifying aged 30 years or

more there was no significant association.

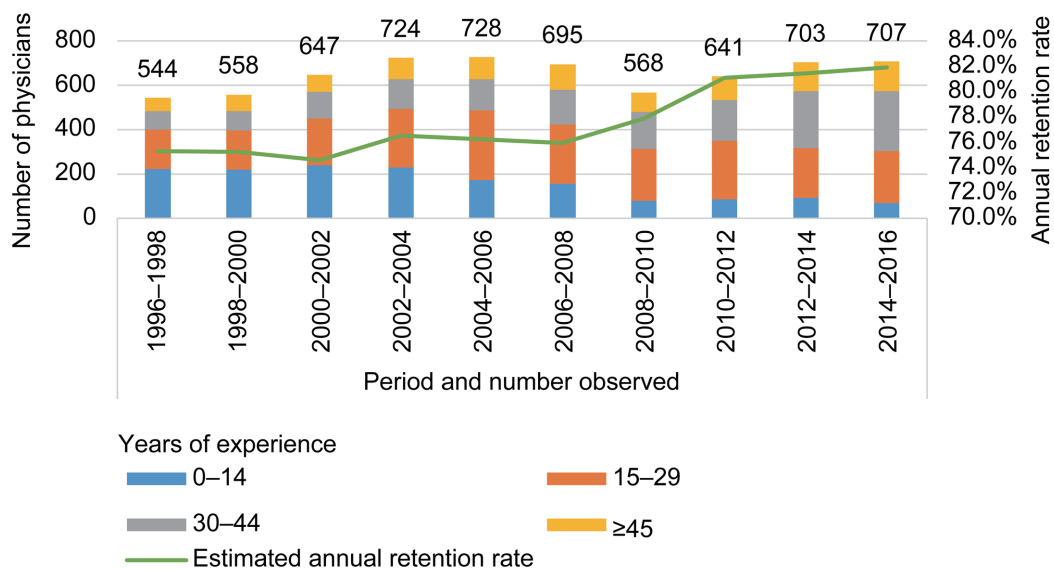
**Table 5** shows the types of institutions from which physicians left the specialty between 1996 and 2006 and between 2006 and 2016. It was found that most physicians who left the rehabilitation specialty worked for non-academic hospitals (49% in 2006 and 59% in 2016).

**Table 6** shows to what specialty physicians who stopped being rehabilitation physicians between 1996 and 2006 and between 2006 and 2016 moved. The highest proportion of rehabilitation physicians leaving the rehabilitation field moved to specialize as orthopedic surgeons (39% in 2006 and 30% in 2016) and the next highest specialty was internal medicine (25% in 2006 and 28% in 2016).

**Table 7** shows data for board-certified physicians working as rehabilitation physicians in 2016. A total of 776 physicians, accounting for 31% of the 2484 physicians working as rehabilitation physicians, did not hold a specialist qualification.

**Table 3** . Retention rate among rehabilitation physicians

	1996-1998	1998-2000	2000-2002	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012	2012-2014	2014-2016
Number at baseline, n	902	1125	1281	1449	1696	1855	1916	1909	2090	2301
Still working as physician scientists, n	581	723	802	972	1127	1221	1341	1449	1598	1777
Changed area of practice, n	257	317	381	386	447	504	432	333	359	392
Entered area of practice, n	544	558	647	724	728	695	568	641	703	707
Years of experience of those entering area of practice, n										
0–14	222	218	240	230	174	156	79	86	94	68
15–29	178	178	209	263	313	268	235	263	221	236
30–44	83	87	121	134	140	157	166	183	260	270
≥45	61	75	77	97	101	114	88	109	128	133
No report, n	64	85	98	91	122	130	143	127	133	132
Estimated annual retention rate, %	75.3%	75.3%	74.6%	76.5%	76.2%	75.9%	77.9%	81.1%	81.4%	81.9%
Retention rate by years since registration as a physician, %										
0–14	74.3%	76.5%	74.5%	75.1%	75.8%	76.0%	77.8%	81.7%	81.4%	83.8%
15–29	79.2%	77.0%	76.7%	79.9%	78.5%	77.9%	80.3%	83.5%	84.8%	84.2%
30–44	72.8%	73.8%	74.1%	75.9%	76.2%	74.5%	78.4%	81.4%	79.8%	82.0%
≥45	73.3%	69.4%	70.2%	73.0%	71.2%	71.9%	71.3%	72.5%	74.2%	73.1%



**Fig. 1.** The annual number of physicians joining the rehabilitation specialty, their years of experience as a physician, and the annual retention rate.

**Table 4** . Factors affecting the likelihood of a rehabilitation physician remaining in the rehabilitation field over a 10-year period

1996–2006 cohort			
	OR	95% CI	P-value
Sex			
Male	Reference		
Female	1.48	0.97–2.27	0.07
Years of experience			
0–14	Reference		
15–29	0.93	0.67–1.29	0.66
30–44	0.53	0.31–0.94	0.03*
≥45	0.47	0.17–1.27	0.14
Qualified over 30 years old			
No	Reference		
Yes	0.72	0.33–1.34	0.05
Workplace			
Urban	Reference		
Intermediate	0.94	0.68–1.30	0.72
Rural	0.77	0.38–1.56	0.47
Institution			
Clinic	Reference		
Academic hospital	4.20	2.11–8.34	<0.01*
Other hospital	1.59	0.86–2.93	0.14
2006–2016 cohort			
	OR	95% CI	P-value
Sex			
Male	Reference		
Female	1.82	1.35–2.45	<0.01*
Years of experience			
0–14	Reference		
15–29	1.11	0.88–1.42	0.38
30–44	0.75	0.54–1.04	0.09
≥45	1.00	0.57–1.76	0.99
Qualified over 30 years old			
No	Reference		
Yes	0.97	0.77–1.23	0.82
Workplace			
Urban	Reference		
Intermediate	1.04	0.84–1.30	0.72
Rural	0.84	0.72–1.32	0.47
Institution			
Clinic	Reference		
Academic hospital	2.06	1.24–3.43	<0.01*
Other hospital	0.94	0.61–1.45	0.79

\*P&lt;0.05. OR, odds ratio; CI, confidence interval.

**Table 5.** Type of institutions from which rehabilitation physicians left the specialty in 2006 and 2016

In 2006 for 1996–2006 cohort		
Total	350	100.0%
Clinic	109	31.1%
Academic hospital	21	6.0%
Other hospital	170	48.6%
Others	50	14.3%
In 2016 for 2006–2016 cohort		
Total	629	100.0%
Clinic	157	25.0%
Academic hospital	26	4.1%
Other hospital	370	58.8%
Others	76	12.1%

**Table 6.** Type of specialty moved to by those who left the rehabilitation specialty in 2006 and 2016

In 2006 for 1996–2006 cohort		
Total	350	100.0%
Orthopedics	135	38.6%
Internal medicine	88	25.1%
Psychiatry	16	4.6%
Neurology	12	3.4%
Others	99	28.3%
In 2016 for 2006–2016 cohort		
Total	629	100.0%
Orthopedics	189	30.0%
Internal medicine	178	28.3%
Neurology	47	7.5%
Neurosurgery	34	5.4%
Others	181	28.8%

The most commonly held specialty certificate among rehabilitation physicians was rehabilitation (41%), followed by orthopedics (17%), neurosurgery (8%), and neurology (6%). In addition, there were no data relating to board-certified physicians in 1996 and 2006 because such data collection was initiated only in 2010.

## DISCUSSION

The number of rehabilitation physicians increased dramatically between 1996 and 2016. The demand for rehabilitation has increased consistently along with the increase in the elderly population. MHLW measures have sought to improve rehabilitation nationwide with such initiatives as the establishment of restorative and rehabilitation units in 2000.<sup>10</sup> It

is likely that the numbers of rehabilitation physicians have increased as a result of the alignment of treatment demands and national policy.

This study showed that while the number of rehabilitation physicians increased markedly between 1996 and 2016, the increase in the physician-to-population ratio in rural areas increased more than it did in urban areas, which means that the geographical maldistribution of physicians has improved. However, as indicated in **Table 1**, in 2016, the number of physicians per 100,000 residents was 1.2 for rural areas compared to 2.2 for urban areas, thereby illustrating that geographical maldistribution is still a major problem.

The number of young rehabilitation physicians decreased between 2006 and 2016, indicating that the average age of rehabilitation physicians is increasing. There are two issues in

**Table 7.** Types of specialty certificates held by rehabilitation physicians and rehabilitation specialists in 2016<sup>a</sup>

Total	2484	100.0%
No certificate	776	31.2%
Rehabilitation	1026	41.3%
Orthopedics	415	16.7%
Neurosurgery	206	8.3%
Neurology	152	6.1%
Internal medicine	99	4.0%
Others	468	18.8%

<sup>a</sup>Data for board-certified physicians working as rehabilitation physicians in 2016. A total of 776 physicians, accounting for 31% of the 2484 physicians working as rehabilitation physicians, did not hold a specialist qualification. Doctors who held two licenses were included.

relation to the decrease in the number of young rehabilitation physicians: first, few young physicians become rehabilitation physicians, and, second, the retention rate of young rehabilitation physicians is low.

Rehabilitation medicine was named as one of the 19 basic discipline areas in the specialist physician system that began in 2018.<sup>5)</sup> According to the Japanese Medical Specialty Board, the number of new rehabilitation physicians in 2019 was 69, which represented 0.8% of the total number of 8615 new specialist physicians.<sup>11)</sup> Although specialist training is usually conducted at university hospitals,<sup>6)</sup> as outlined in **Table 2**, in 2016, the number of physicians, including specialists, working at academic hospitals had reached 369 (14.9%). However, the supervisory system is currently inadequate to accommodate increasing numbers of new specialist physicians. In addition, according to a hearing of the Japanese Association of Rehabilitation Medicine (JARM), at some universities, teams are formed between related fields such as orthopedic and neurosurgery departments, resulting in situations where there are no board-certified rehabilitation physicians. Circumstances such as these are thought to be a factor in the limited number of new specialist physicians.

The present study showed a low annual retention rate among rehabilitation physicians in Japan. In particular, retention rates were relatively low among younger physicians with <15 years of experience. Reasons for the low retention rate are outlined in **Table 2**. For example, in 2016, 44.3% of rehabilitation physicians were  $\geq 55$  years of age. Therefore, it could be considered that a relatively large number of rehabilitation physicians are elderly and are close to retirement. As illustrated in “Entered Area of Practice” in **Table 3**, a decline in the number of young rehabilitation physicians is not the only factor contributing to the overall number of rehabilitation physicians; the number of older physicians who choose

to become rehabilitation specialists is also having an effect. In other words, the number of physicians who have enjoyed a career specializing in another area and are now changing career to enter rehabilitation medicine is increasing. The reason that older people are more likely to work as rehabilitation physicians may be that the work burden is less than that in hospitals and that the work–life balance is favorable.

As detailed in **Table 6**, when rehabilitation physicians changed their specialty, the proportion of physicians transferring to orthopedics was high, at 38.6% in 2006 and 30.0% in 2016. According to the MHLW, although the specialization rate of physicians in Japan was  $>61\%$ ,<sup>12)</sup> as indicated in **Table 7**, the percentage of board-certified rehabilitation physician was only 41%. Interestingly, a large combined proportion (31%) of rehabilitation physicians were board-certified in orthopedics, neurology, or neurosurgery. Taken together, these findings suggest that physicians who specialized in discipline areas that are closely related to rehabilitation medicine are, for unknown reasons, returning to their original specialization. Meanwhile, according to a JARM hearing, there are limited numbers of clinics in Japan that primarily practice rehabilitation medicine. Furthermore, given that rehabilitation medicine is a fairly new discipline, few universities offer specific classes in the field, and lecturing positions remain limited.

As illustrated in **Table 4**, there is a strong likelihood of continuing practicing in rehabilitation departments among doctors working in university hospitals. Ensuring the entry of younger physicians into this career path through the establishment of rehabilitation medicine classes and university lecturer positions in every school of medicine will be necessary to safeguard the development of rehabilitation physicians in Japan.

This study has several limitations. First, the area of



practice was self-reported; consequently, misclassification may have occurred. Additionally, we knew only the self-reported specialties, but not the physicians' work status in departments of rehabilitation medicine. Second, data to investigate the role of part-time rehabilitation physicians was not obtained. Third, owing to the secondary use of existing data, it was not possible to consider potential explanatory variables that might be associated with physicians' area-of-practice choices. Such explanatory factors might include a physician's place of origin, university of graduation, salary, and family structure.<sup>13,14</sup> Fourth, this study was concerned only with associations and could not ascertain causality. The use of interviews and questionnaires could facilitate more comprehensive research. Fifth, in this study, SMAs were classified into three categories based on population and population density. Consequently, the results might change if the classification method were to be changed.

The strength of this study was its large-sample cohort. Because little is known about retention trends among rehabilitation physicians and the factors associated with their retention, this study provides useful information for future discussions about the maldistribution of rehabilitation physicians. Further research is needed on the reasons behind career choices, and further action is required to keep physicians from leaving the field of rehabilitation.

In conclusion, this study showed that the number of rehabilitation physicians practicing in Japan increased dramatically between 1996 and 2016. Increases in the numbers of rehabilitation physicians have been prompted by policy measures and rapidly increasing demand for rehabilitation due to the aging of society. However, detailed inspection of the available data indicates a declining trend in the numbers of younger physicians joining the specialty, resulting in an increasing average age of rehabilitation physicians. Ensuring the entry of younger physicians into this career path through efforts such as establishing rehabilitation medicine classes in every school of medicine is necessary to promote the development of specialist rehabilitation physicians in Japan.

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#### CONFLICT OF INTERESTS

The author declares no competing interests.

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