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Physician retention and migration in rural clinics designated for areas without physicians in Japan: descriptive epidemiological study using the national physicians' survey

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Abstract

Background In Japan, local governments have rural clinics designated for areas without physicians (RCDA) to secure physicians for rural medical care. Moreover, a medical policy of dispatching physicians between the RCDA and core hospitals for rural areas (CHRA) exists. This study aimed to assess the actual situation of physician migration from RCDAs and those who migrated, and examine the factors associated with their migration.

Methods This retrospective cohort study used biennial national physicians' survey data from 2012 to 2018. It targeted physicians who worked at RCDAs in 2012 and participated in all four surveys ($n=510$). The physicians were divided into two groups. One group consisted of physicians who worked continuously at the RCDA over the four study periods (retained physicians, $n=278$), and the other included physicians who migrated to other institutions midway through the study period (migrated physicians, $n=232$). We tracked the types of facilities where RCDA physicians worked from 2012 to 2018, also examined the factors associated with their migration.

Results Among physicians from RCDAs who migrated to other institutions ($n=151$) between 2012 and 2014, many migrated to hospitals ($n=87/151$, 57.6%), and some migrated to CHRA ($n=35/87$, 40.2%). Physicians in their 40s (Hazard ratio 0.32 [95% CI 0.19–0.55]), 50s (0.20 [0.11–0.35]), and over 60 years (0.33 [0.20–0.56]) were more likely to remain at RCDAs. Changes in their area of practice (1.82 [1.34–2.45]) and an increase in the number of board certifications held by physicians between 2012 and 2018 (1.50 [1.09–2.06]) were associated with migration.

Conclusions Many migrating physicians choose to work at hospitals after migrating from RCDAs. It was seemed that the physician dispatch system between RCDA and CHRA has been a measure to secure physicians in rural areas. Young age, obtaining board certification, and changes in areas of practice were associated with physician migration from RCDAs.

Keywords Primary care, Remote area, Rural clinics, Rural medicine

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Introduction

Physicians are typically present in large numbers in urban areas. There is an urgent need to reduce the disparity in physician distribution across urban and rural areas and secure physicians in rural areas [1–3]. Many countries are trying to secure physicians in rural areas by providing incentives such as job placements and scholarships [4–6]. Moreover, only a few physicians continue to work in rural areas for a long time. So, strategies that retain physicians in rural areas must be implemented [7, 8].

In Japan, each prefecture has formulated medical plans to ensure rural medical care [9, 10]. These plans have established rural clinics designated for areas without physicians (RCDA, *Hekichi-shinryojo* in Japanese) [9, 11]. RCDAs have been established in areas with a population of 1,000 or more, where residents live within approximately a 4 km radius of the central community and require more than 30 min to reach major medical institutions, even with ordinary transportation [9, 11]. Japan does not have a gatekeeper system with primary care physicians [12], but patients typically visit a clinic first [13]. RCDAs are essential, as residents in these areas often find it difficult to visit other medical institutions. As of April 1, 2020, Japan had 1,113 RCDAs, but only 554 of these had regular physicians [14]. Moreover, 631 regular physicians were working at RCDAs [14]. Based on the medical plan, physicians are dispatched to RCDAs from core hospitals for rural areas (CHRA; *Hekichi-iryo-kyoten-byoin* in Japanese) [9]. CHRAs, designated by each prefecture, are required to send physicians to RCDAs to provide mobile medical care to rural residents [9, 15]. Although a dispatch system for physicians exists, the strategies for recruiting physicians for RCDAs vary by prefecture, and physicians' backgrounds vary widely [16]. For example, Jichi Medical University (JMU) was established by national and local governments to secure physicians for rural medical care, with their graduates receiving tuition exemption after completing a nine-year compulsory service period, including several years of rural service [17]. According to prefectural medical plans, these physicians can work in RCDAs during their mandatory service period. Physicians trained through scholarship programs from medical universities other than JMU can also fulfill their compulsory service in rural areas [6]. Physicians from medical educational institutions, including university hospitals, can be sent to RCDAs [18]. In other cases, the local government recruited physicians to the local RCDA.

Many RCDAs have limited medical resources, are located in rural areas, and are often staffed by solo practitioners [19]. Previous studies have reported that the factors that lead to the retention of physicians in rural areas are age, rural background, family or primary care physicians, multi-specialty rotation for postgraduate training, and administrative position [20–24]. These studies focused on physicians working in rural areas [20–23]. In this study, we focused on physicians in RCDAs, not just those in rural areas. They also played distinct roles in rural medical care. Understanding the retention and migration patterns of these physicians is essential when considering strategies for securing physicians in rural areas. This retrospective cohort study used data from national physician surveys conducted biennially from 2012 to 2018 to identify the actual migration patterns of physicians from RCDAs to other institutions and the differences in attributes between physicians who migrated and those who remained in RCDAs. We also explored factors associated with their retention and migration from RCDAs.

Methods

In Japan, the Ministry of Health, Labour and Welfare (MHLW) conducts a national survey titled "The Survey of Physicians, Dentists, and Pharmacists" (before 2016) or "The Statistics of Physicians, Dentists and Pharmacists" (since 2018), and according to the Medical Practitioners Act, every physician must declare their status every two years [25–28]. In this retrospective cohort study, we used the national survey guide, which was not specifically created for this study [25–28], analyzing data from four surveys conducted between 2012 and 2018. We sought permission from the MHLW to analyze parts of these surveys for research purposes, following procedures set out in the statistics act (approval dates: September 29, 2021, and November 15, 2021). The sample size for this study was determined by the number of respondents to the national survey. While the survey's response rate has not been made public by the MHLW, it is estimated to be approximately 90% [29].

The survey data included registration number, sex, age, place of work, area of practice, and board certification status. All physicians provided their registration numbers, which were then anonymized by our research group by assigning unique identifiers. We established a cohort dataset using these numbers to track physicians during the study period. Exclusion criteria encompassed physicians who did not respond to questions regarding sex, age, place of work, or board certification status. Our study targeted physicians who worked at the RCDAs in 2012 and participated in all four surveys. First, we extracted data on the physicians registered in all four surveys from 2012 to 2018 (n=246,585). We excluded physicians who did not respond to survey questions about their place of work (n=2,479), resulting in a total of 244,106 physicians' responses (80.5% of the 303,268 physicians who participated in the 2012 survey). Of these, none were missing data on sex, age, or board certification status. Next, the physicians were categorized

according to their medical institutions. The institutions were categorized into clinics, medical education institutions (universities with medical schools or their affiliated institutions), hospitals (excluding hospitals affiliated with medical education institutions), healthcare facilities for older people requiring long-term care, other types of institutions, and others, according to the type of institution in the survey data.

Regarding the types of institutions in the survey data, RCDAs were included in the clinical classification, and CHRAs were included in the hospital classification. Classification of RCDAs and CHRAs was performed by creating and using a text reference program that matched the facility names in the physicians' survey data with the RCDA names in the data published by the MHLW (as of April 1, 2020) [14]. Using this procedure, we estimated that 510 physicians worked at RCDAs in 2012, and the number of RCDAs in which these physicians worked was 442. It was considered a solo practice if an RCDA had only one registered physician. We then divided the data of physicians who worked in the RCDAs into two groups. One group consisted of physicians who worked at the RCDA throughout the four study periods (retained physicians, $n=278$), and the other group included physicians who migrated to another type of institution midway through the study period (migrated physicians, $n=232$). We then compared the physicians' attributes. We also explored the factors associated with physician migration from RCDAs. Furthermore, we charted the types of facilities where RCDA physicians worked from 2012 to 2018.

Table 1 Classification of board certifications or area of practice

Internal medicine	Surgery	General areas
Internal Medicine	Surgery	General Internal Medicine
Respiratory Medicine	Pulmonary Surgery	Surgery
Cardiology	Cardiovascular Surgery	Pediatrics
Gastroenterology	Breast Surgery	Obstetrics and Gynecology
Nephrology	Tracheoesophageal Surgery	Orthopedics
Neurology	Gastroenterological Surgery	Neurosurgery
Diabetes Medicine	Anal Surgery	Ophthalmology
Metabolic Medicine	Pediatric Surgery	Otorhinolaryngology
Hematology		Acute Medicine
Allergy		Anesthesiology
Rheumatology		Dermatology
Infectious Diseases		Urology
Psychosomatic Medicine		Plastic Surgery
		Radiology
		Pathology
		Rehabilitation
		Psychiatry
		Laboratory Medicine
		General Practice

The areas of practice and board certification were classified into three categories (internal medicine, surgery, and others), as shown in Table 1, following a previous report [30]. The institutions that did not have an area of practice (e.g., health care facilities for older people requiring long-term care) and cases where the area of practice was unknown or remained unanswered in the survey were included in the "others" category (number of unknown responses or remained unanswered regarding area of practice: none in 2012; $n=22$ in 2018). Since 2018, the MHLW has defined board certifications by general areas (Table 1) [31]. Before 2018, academic societies with boards and multiple board certifications in general fields were recognized [31]. Board certifications for psychiatry were not included in the 2012 survey, and laboratory medicine and general practice were not included in the statistics from 2012 to 2018. General practice was certified by the board of directors after the research period; therefore, there were no certified individuals during the research period. We compared physicians' areas of practice categories in 2012 and 2018. If those categories were different, it was classified as "changes in area of practice." We also compared the number of board certifications held by each physician in the general area in 2012 and 2018. The number of board certifications in general regions held by the physicians in 2012 and 2018 was classified as "increase," "no change," and "decrease."

Additionally, we considered physicians who were not certified in the general area in 2012 but had at least one certification in the general area in 2018 as new board certification holders. The data were anonymized. If the number of physicians aggregated was under 10, the table marked it as "<10" to prevent individual identification.

Statistical analysis

Data were expressed as percentages if they were categorical variables or medians (interquartile range, IQR) if they were continuous variables. Categorical variables were analyzed using the chi-square or Fisher test and continuous variables using the Mann-Whitney test. When chi-square analysis revealed significant differences, residual analysis was performed. A multivariate Cox regression analysis was used to determine the factors associated with migration from RCDAs. The outcome was migration from the first RCDA. Exposures included the area of practice, board certification status, and solo practice. The covariates included in the multivariate Cox regression analysis were sex (male or female), age (categorized as 20s, 30s, 40s, 50s, and over 60), area of practice (categorized as internal medicine, surgery, or others), change in location of practice ("no change" or "change"), difference in the number of board certifications held by physicians

in general areas between 2018 and 2012 (categorized as "no change", "decreased", or "increased"), and practice status ("group" or "solo practice"). This selection of covariates was determined by our research group based on factors that were significant at the $P<0.05$ level in the comparison of the two groups, including sex and age. For the analysis, we used the forced entry method.

Additionally, since this study targeted physicians who participated throughout the study period, no physicians were lost to follow-up. We tracked the physicians for up to six years. Results are reported as adjusted hazard ratios (HR) with 95% confidence intervals (CI). IBM SPSS version 28.0 (IBM, Tokyo, Japan) was used for all the statistical analyses. The significance level was set at 5% for all analyses.

Results

Migration of physicians from RCDAs

The migration of physicians working at the RCDAs in 2012 is shown via a flow chart in Fig. 1. The number of physicians who did not migrate from RCDAs in each survey year was 359/510 (70.4%) in 2014, 300/359 (83.6%) in 2016, and 285/316 (90.2%) in 2018. When physicians from RCDAs migrated to other institutions ($n=151$) between 2012 and 2014, many migrated to hospitals ($n=87$, 57.6%); other hospitals ($n=52$, 34.4%), or CHRAs ($n=35$, 23.2%). Among the physicians who migrated in each survey year, the number of physicians who migrated to CHRAs was 35/151 (23.2%) in 2014 and 12/59 (20.3%) in 2016. The number of physicians in 2018 was not calculated because it <10. Of the retained physicians, 25 (8.9%) were transferred between various RCDAs at least once.

Comparison between retained and migrated physicians

A comparison of the attributes of the retained and migrated physicians is shown in Table 2. In 2012, the median age of RCDA physicians was 51 years (IQR 37–60). The median age in 2012 was significantly higher for retained physicians (54 [IQR 48–63]) than for migrated physicians (38 [IQR 31–56] years) ($P<0.01$; not stated in the table). In age distribution, a significantly higher proportion of retained physicians were in their 40s (retained physicians: 21.9% vs. migrated physicians: 14.2%), 50s (39.2% vs. 12.1%), and over 60 years (30.9% vs. 19.0%) compared to migrated physicians. The retained physicians had a significantly higher proportion of those who practiced internal medicine (88.5%) than the migrated physicians (82.3%). For the change in the number of board certifications held by physicians, the proportion of "no change" status was significantly higher among retained physicians (91.0%) than among the migrated physicians (67.2%). The retained physicians (4.7%) had a significantly lower proportion of "increase" in board certifications than migrated physicians (29.3%). The proportion of "new board certification holders" was significantly lower among retained physicians (4.3%) than among migrated physicians (28.4%). In descending order, the new board certification holders for the migrating physicians were internal medicine, surgery, pediatrics, orthopedics, and acute medicine. The percentage of physicians who changed their practice area was significantly lower among the retained physicians (5.8%) than among

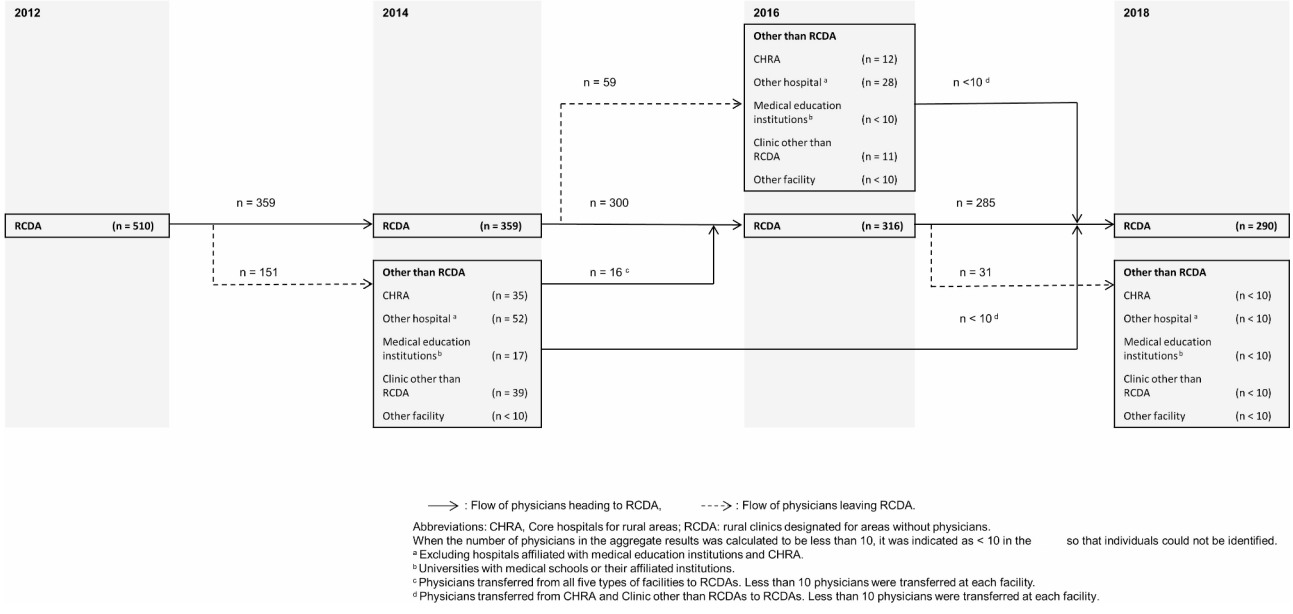

Fig. 1 Flow chart showing RCDA physicians' migration patterns in 2012

Table 2 Comparison of attributes between retained and migrated physicians

	Total physicians *n* = 510	Migration *n* = 232	Retention *n* = 278	*P*-value
Male, n (%)	466 (91.4)	206 (88.8)	260 (93.5)	0.06
Age (years) [a]				
20s	29 (5.7)	28 (12.1)	1 (0.4)	< 0.01
30s	120 (23.5)	99 (42.7)	21 (7.6)	
40s	94 (18.4)	33 (14.2)	61 (21.9)	
50s	137 (26.9)	28 (12.1)	109 (39.2)	
over 60	130 (25.5)	44 (19.0)	86 (30.9)	
Area of practice [a], n (%)				
Internal Medicine	437 (85.7)	191 (82.3)	246 (88.5)	0.03
Surgery	22 (4.3)	< 10 (-)	13 (4.7)	
Others	51 (10.0)	32 (13.8)	19 (6.8)	
Board certificated physician in general areas [a], n (%)	78 (15.3)	36 (15.5)	42 (15.1)	0.90
Top3				
Internal Medicine	24 (30.8 [c])	11 (30.6 [c])	13 (31.0 [c])	0.97
Surgery	21 (26.9 [c])	< 10 (-)	13 (31.0 [c])	0.49
Orthopaedics	< 10 (-)	< 10 (-)	< 10 (-)	0.73
Difference between the number of board certification by each physician in 2018 and the number in 2012, n (%)				
No change	409 (80.2)	156 (67.2)	253 (91.0)	< 0.01
Decrease	20 (3.9)	< 10 (-)	12 (4.3)	
Increase	81 (15.9)	68 (29.3)	13 (4.7)	
New board certification holders, n (%)	78 (15.3)	66 (28.4)	12 (4.3)	< 0.01
Top3 [b]				
Internal Medicine	50 (64.1 [d])	40 (60.6 [d])	10 (83.3 [d])	0.13
Surgery	< 10 (-)	< 10 (-)	0 (0)	0.59
Pediatrics	< 10 (-)	< 10 (-)	0 (0)	1.00
Orthopaedics	< 10 (-)	< 10 (-)	0 (0)	1.00
Acute Medicine	< 10 (-)	< 10 (-)	0 (0)	1.00
Physicians who changed area of practice between 2012 and 2018, n (%)	89 (17.5)	73 (31.5)	16 (5.8)	< 0.01
Solo practice [a], n (%)	393 (77.1)	165 (71.1)	228 (82.0)	< 0.01

[a] As of 2012. [b] Number of physicians with board certification of surgery was larger than that of pediatrics, orthopaedics and acute medicine. The number of physicians with board certifications in pediatrics, orthopaedics, and acute medicine was the same. [c] Percentage of board certified physicians. [d] Percentage of newly board certified physicians

the migrated physicians (31.5%). Among the migrated physicians, the most common pattern of changing practice areas was from internal medicine to areas other than internal medicine and surgery for 50 physicians (68% of the 73 physicians changed their practice areas). The proportion of solo-practicing physicians was significantly higher among retained physicians (82.0%) than among migrated physicians (71.1%).

Factors associated with RCDA physicians' retention and migration

Table 3 shows the factors associated with physician retention and migration at RCDAs. Physicians in their 40s (0.32 [0.19–0.55]), 50s (0.20 [0.11–0.35]), and over 60 years of age (0.33 [0.20–0.56]) showed a higher likelihood of staying in RCDAs. Conversely, increase in the number of board certifications (1.50 [1.09–2.06]) and changes in physicians' areas of practice (1.82 [1.34–2.45]) were associated with a higher likelihood of migration.

Discussion

Our study provides insights into the migration patterns among RCDA physicians and the factors associated with migration from RCDAs. Covering approximately 80% of regular physicians, estimated based on nationally published data on RCDA [14], our research depicts the migration situation within Japanese RCDAs. Furthermore, the results reveal previously undocumented destinations for these migrating physicians, providing deeper insights into the drivers of physician mobility [21, 31].

Our study showed that some of physicians from the RCDAs were transferred to CHRAs. Approximately 20% of the physicians who migrated from RCDAs were transferred to CHRAs. When a CHRA sends physicians to an RCDA, the number of times a physician is dispatched is standardized (at least 12 times per year), although regulations regarding the dispatch period are not specific [15]. Furthermore, it is up to each RCDA to request hospitals to send physicians. Our results suggest that the transfer

Table 3 Factors associated with physicians' migration from RCDAs

	Retention rate, *n* (%)	Adjusted HR (95% CI) [b]	*P*-value
Sex			
Male	260/466 (55.8)	1 [reference]	
Female	18/44 (40.9)	0.99 (0.65–1.51)	0.96
Age (years) [a]			
20s	1/29 (3.4)	1 [reference]	
30s	21/120 (17.5)	0.88 (0.58–1.35)	0.56
40s	61/94 (64.9)	0.32 (0.19–0.55)	< 0.01
50s	109/137 (79.6)	0.20 (0.11–0.35)	< 0.01
Over 60	86/130 (66.2)	0.33 (0.20–0.56)	< 0.01
Area of practice			
Internal Medicine	246/437 (56.3)	1 [reference]	
Surgery	13/22 (59.1)	0.83 (0.41–1.69)	0.62
Others	19/51 (37.3)	1.08 (0.73–1.59)	0.70
Difference in the number of board certifications between 2018 and 2012			
No change	253/409 (61.9)	1 [reference]	
Decreased	12/20 (60.0)	1.24 (0.59–2.61)	0.57
Increased	13/81 (16.0)	1.50 (1.09–2.06)	0.01
Change in the area of practice			
No change	262/421 (62.2)	1 [reference]	
Change	16/89 (18.0)	1.82 (1.34–2.45)	< 0.01
Practice status			
Group	50/117 (42.7)	1 [reference]	
Solo	228/393 (58.0)	0.80 (0.60–1.07)	0.13

Abbreviations: CI, confidence interval; HR, hazard ratio; RCDA, rural clinics designated for areas without physicians. [a] As of 2012. [b] Adjusted for sex, age, area of practice, changes in the number of board certifications held by each physician, changes in physician's area of practice, and practice status

of physicians between CHRAs and clinics was recognized at a specific rate and that there were some physicians whose dispatch period was a few years. The physician dispatch system between the RCDA and the CHRA seemed to be a useful measure to secure physicians in rural areas.

Previous studies have shown that young age is associated with migration from rural areas [20, 21]. These findings are consistent with those of the present study. In addition, our findings suggest that one of the reasons for younger physicians' migration is associated with the timing of acquiring their board certification. In our study, many physicians migrated to hospitals after their tenure at RCDAs, following which they acquired board certifications. Typically, early-career physicians undergo training at designated hospitals to obtain board certification [22, 32–34]; therefore it is common for young physicians to migrate from RCDAs to hospitals for this purpose. Another reason for migration could be that JMU graduates and other scholarship-trained physicians must practice in rural areas for approximately 3–5 years as a compulsory service [17]. These young physicians work in RCDAs to fulfill their mandatory service obligations. Furthermore, factors related to social environments, such as the educational needs of their children may also influence the migration decisions of these physicians [35].

Our results can be beneficial in developing strategies to retain physicians in rural clinics that support rural medical care, not only in Japan but also worldwide [36]. Physicians under 40 years of age working in rural areas are more likely to migrate to urban areas or other areas [37, 38]. Young physicians may find acquiring board certifications more critical than extending their time in RCDAs. In designing the careers of young physicians, it may be essential to determine whether the timing of compulsory service in rural areas before or after acquiring board certification impacts retention. Further research is required to assess the impact of physicians' work experience with RCDAs on their subsequent practice locations and career trajectories. Beyond long-term retention strategies, policymakers should consider implementing a rotation mechanism for physicians to ensure adequate coverage in RCDAs. Recently, a career development program for scholarship-trained physicians in Japan was introduced; this program is anticipated to provide ongoing support and planned placements for these physicians in rural settings, including RCDAs, while also facilitating career advancement opportunities such as their prospect of board certification while serving in rural areas [39]. Establishing a clear career progression for physicians in RCDAs could alleviate young physicians' concerns about potential delays in obtaining board certification owing to RCDA postings, thereby leading to a smoother rotation of physicians within RCDAs.

The proportion of physicians who changed from their area of practice in internal medicine to areas other than internal medicine and surgery was higher among migrated physicians. Physicians in areas of practice other than internal medicine and surgery (e.g., radiology, anesthesiology, and acute medicine) have a tendency to work in urban areas [40]. Our results also showed that physicians not specializing in internal medicine were required to provide internal medicine care at RCDAs. Owing to the shortage of physicians in RCDAs, there may have been cases in which physicians' board certifications and their actual practice areas differed.

Limitations

Our study has several limitations. First, the reasons physicians work in RCDAs and their migration needed clarification. Future research, possibly incorporating interviews or surveys that directly inquire about reasons for migration, such as the pursuit of certifications, is necessary. Second, because the statistical survey was conducted every two years, transfers made in less than two

years were unknown. Therefore, the actual number of physicians who migrated could be higher than reported, as the survey may have included physicians who migrated from RCDAs and subsequently returned within two years. Third, the year of the national survey differed from the year of public data collection for the RCDAs. The RCDAs identified in this study may have included clinics not designated as RCDAs at the time of the national survey and may have excluded clinics that lost their designation post-survey. Fourth, the non-respondents likely included physicians working in RCDAs, potentially leading to an underestimation of the number of RCDA physicians in this study. However, the numbers of RCDAs and regular physicians have not changed substantially in recent years (RCDAs, $n=1{,}126$; regular physicians in RCDAs, $n=653$, as of April 2023) [41]. Despite these limitations, our results are considered to adequately represent the actual situation of RCDAs in Japan.

Conclusions

Many physicians choose to work at hospitals after migrating from RCDAs. The physician dispatch system between RCDAs and CHRAs seemed to be a measure for securing doctors in rural areas. Young age, board certification, and changes in areas of practice were associated with physicians' migration from the RCDA. The results suggest that younger physicians initially worked in RCDAs and subsequently migrated to hospitals with intention of acquiring board certification in their chosen specialties. Further research is required to understand the effects of physicians' work experience with RCDAs on their subsequent practice locations and careers.

Abbreviations

CI	confidence interval
CHRA	Core hospitals for rural areas
IQR	Interquartile range
HR	Hazard ratio
JMU	Jichi Medical University
MHLW	Ministry of Health, Labour and Welfare
RCDA	rural clinics designated for areas without physicians

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Author contributions

HT conceived the study, performed the analysis, and drafted the manuscript. KK and SK interpreted the data and revised the manuscript. KK and SK supervised the study. All the authors have read and approved the final version.

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Data availability

The data that support the findings of this study are available from the Ministry of Health, Labour and Welfare with restrictions to apply the others under license for the current study and are not publicly available. The data are not shared.

Declarations

Ethics approval and consent to participate

The Jichi Medical University Bioethics Committee for Medical Research approved this study (21–067). This study was conducted following the "Ethical Guidelines for Medical and Biological Research Involving Human Subjects" (Ministry of Education, Culture, Sports, Science and Technology, Ministry of Health, Labour and Welfare, and Ministry of Economy, Trade and Industry. 2021), and study participants' consent requirement was waived because it was a secondary data analysis of a government survey. The MHLW approved access to the survey data.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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