



Original article

Reasons for medical students selecting a rural prefecture in Japan for initial clinical training: a single-center-based cross-sectional study

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Abstract

Objective: Securing a sufficient number of medical residents to work in rural areas is an urgent issue. This study sought to clarify the factors that cause medical students at a rural university in Japan to select a particular place for their initial clinical training.

Materials and Methods: A questionnaire was administered to all medical students at Saga University between February and March 2021. Participants were divided into two groups based on their training location choice: those who chose Saga Prefecture (Saga group) and those who selected other prefectures (non-Saga group). Then, logistic regression analysis was performed.

Results: The questionnaire was answered by 300 students (46.3% response rate), of whom 291 agreed to participate in the study; 122 (41.9%) and 169 (58.1%) students were allocated to the Saga and non-Saga groups. Within the Saga group, the following factors were statistically significant: being admitted to Saga University's medical school through the system of special allotment of admission to applicants pledging to work in Saga Prefecture following graduation (or regional quota programs for admission) (odds ratio [OR], 19.18; 95% confidence interval [CI], 6.99–52.60); and being from Saga Prefecture (OR, 6.05; 95% CI, 2.24–16.35). With the non-Saga group, the desire to work in an urban area (OR, 0.03; 95% CI, 0.00–0.37) was statistically significant.

Conclusion: To encourage medical residents to choose this prefecture for their initial clinical training, the focus should be on medical students who are from Saga Prefecture or admitted through the regional quota program.

Key words: initial clinical training, regional quota programs, common diseases, questionnaire, medical students

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Introduction

In Japan, clinical training for medical residents in the 1st and 2nd year after graduation became mandatory in 2004¹⁾. This change allowed students to apply to any hospital of their choice which met the criteria set by the Ministry of

Health, Labor and Welfare (including university hospitals and any educational hospital in Japan) for their initial clinical training. Accordingly, many residents chose common educational hospitals mainly in urban areas, which were away from the rural university hospitals from where they had graduated²⁾. The residents sought a greater number and variety of cases, which exacerbated the uneven distribution of medical doctors between urban and rural areas^{2–5)}.

To address this problem, regional quota programs for admissions have been introduced. Under this system, after graduation, students have to pledge to work for a certain period within the prefecture of the medical school to which they apply; this period is usually around nine years⁶⁾. Although medical students admitted through regional quota programs usually receive a scholarship from the prefectural government where their university is located, the availability and amount of this scholarship differ among universities and prefectures⁷⁾. Students are exempted from repaying the scholar-

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ship if they fulfill their pledge by working in that prefecture for the predetermined period⁸). However, this system did not necessarily improve the uneven distribution of physicians because many young doctors repaid the scholarship amount and chose different locations for their initial clinical training⁹. Furthermore, a new medical training system for doctors to be certified as specialists after completing their initial 2-year residency was introduced in 2018; reportedly, this has further deteriorated the imbalanced distribution of doctors¹⁰.

An appropriate supply of young physicians, especially residents, is essential to maintain an operational medical system in rural areas. However, to the best of our knowledge, there is scarce research on the factors which influence medical students in rural universities to select the prefecture where their university's location for their residency training^{11, 12}). This study uses a questionnaire survey targeting all current medical students at Saga University (located in Saga, a typical rural prefecture in Japan) to clarify which factors influence their location choice for their initial clinical training.

Materials and Methods

Study design and participants

This single-center cross-sectional study was undertaken for all students enrolled in Saga University's medical school from February to March 2021. Students who did not respond to the questionnaire or did not agree to participate were excluded from analysis. The remaining students were divided into two groups according to their choice of prefecture for their initial clinical training: those who preferred Saga Prefecture (Saga group) and those who chose other prefectures (non-Saga group).

Setting

Located in northwestern Kyushu (the main island in southern Japan), Saga Prefecture, which mostly consists of rural cities and towns, has a population of approximately 830,000. This study was conducted at the medical school of Saga University (the sole national university in Saga Prefecture) and covered all 648 students enrolled at the medical school. Among them, 125 (19%) had been admitted on the recommendation of their high schools and 157 (24%) had been admitted through the regional quota program. The number of students from Saga Prefecture admitted through the regional quota program and on high school recommendations were 145/157 (92%) and 15/125 (12%), respectively. The regional quota program at the medical school of Saga University is divided into two types: with and without a scholarship. Students admitted through the former type must accept the scholarship from Saga Prefecture for six years while in medical school, undertake initial clinical training for two years after their graduation, and then work

for nine years in Saga Prefecture. When they fail to fulfill their obligations, they have to reimburse the scholarship. Meanwhile, students who are not given scholarships have to pledge to undergo initial clinical training for two years in Saga Prefecture, without any penalties for not fulfilling this obligation. Notably, the increase in the number of medical doctors in Saga Prefecture from 2016 to 2018 was only one, which was the second lowest in Japan following Okinawa Prefecture¹³). Further, the matching rate, or the proportion of new residents who were undergoing their initial clinical training in Saga Prefecture to the number of openings for such staff in all the prefecture's educational hospitals, was just 74.9%; in this regard, Saga Prefecture ranked 31st among Japan's 47 prefectures¹⁴).

Data sources

Data were collected using a questionnaire. The questionnaire items were determined following a discussion of the results of a narrative literature review by the four researchers: one medical student and three physicians engaged in teaching students at the medical school of Saga University^{12, 15–18}). Created using Google Forms, the questionnaire was sent via email to all students enrolled in the medical school by the university's Student Affairs Division in February 2021. The questionnaire was also sent via a social networking service (SNS) allocated to students in each grade and set up by the student union. They subsequently received a reminder using the same SNS 2–3 weeks later. The questionnaire items included the following: age; gender; parental occupation; presence of relatives, acquaintances, or friends living in Saga Prefecture since before admission; presence of a partner or spouse; admission on recommendation by their high school; admission through a regional quota program; experience of repeating a school year; current grade at university; home region; desired place for initial clinical training; current probability of working as a medical resident in Saga Prefecture (percentage); preferable hospital type for initial clinical training; future clinical department; reasons for selecting a hospital for the initial clinical training; satisfaction with their own life; satisfaction with classroom lectures or practical training (for 1st to 4th grade students); satisfaction with hospital training (for 5th and 6th grade students); satisfaction with tuition in hospital training (for 5th and 6th grade students); encounters with role model doctors during hospital training; and study morale. The definitions of these items are presented in Supplementary material 1.

Data analysis

Continuous variables were expressed as the median and interquartile range compared using the Mann–Whitney *U* test; categorical variables were expressed as percentages compared using the χ^2 test. Regarding collinearity, we selected candidate variables showing $P < 0.1$ after univariate

analysis and a low correlation coefficient. When a Spearman's r value or a Kendall coefficient's r value between two items was greater than 0.7, we chose one of the items and excluded the other from the analysis. Then, logistic regression analysis was performed for the candidate variables to calculate the factors and their odds ratios for students whose first choice was Saga Prefecture for initial clinical training. Statistical significance was set at $P < 0.05$. SPSS Statistics (version 25; IBM Corp., Armonk, NY, USA) was used for statistical analysis. The sample size for this study was calculated to be 80 cases using a significance level of 95% and a statistical power of 80%. This was based on a study from 1999 that reported the proportion of physicians from rural areas among all physicians from any area who chose a rural location as their first place of work after graduating from medical school¹⁹.

Ethical consideration

This study was approved by the Ethics Committee of the Faculty of Medicine, Saga University (Approval No. R2-37). The content of the study was disclosed on this faculty's website. Participants were asked for their agreement to participate at the beginning of the questionnaire, and only students who agreed were included in the analysis. This study conformed to the 1975 Declaration of Helsinki and the rule on Medical Ethics of the Faculty of Medicine.

Results

Enrollment and assignment of participants

From February to March 2021, 647 students were enrolled in the medical school. Among these, 300 responded to the questionnaire (46.3% response rate); of these, 291 agreed to participate in the study. These were then separate into the Saga and non-Saga groups of 122 (41.9%) and 169 (58.1%) students, respectively (Figure 1).

Univariate analysis

Table 1 presents the participant characteristics. 89 (31%) and 41 (14%) out of 291 participants were admitted through a regional quota program and on recommendation by their high schools, respectively. Among them, 68/89 (76%) and 1/41 (2%) cited Saga Prefecture as their home region, respectively. The Saga group had a higher percentage of participants with the following characteristics: presence of relatives, acquaintances, or friends living in Saga Prefecture since before admission (63% vs. 21%, $P < 0.001$); admission through a regional quota program (68% vs. 4%, $P < 0.001$); experience of repeating a school year (16% vs. 6%, $P = 0.007$); and having Saga Prefecture as the home region (64% vs. 8%, $P < 0.001$). Furthermore, the Saga group had a lower percentage of participants who were admitted on recommendation by their high school (6% vs. 20%, $P = 0.001$). There were no

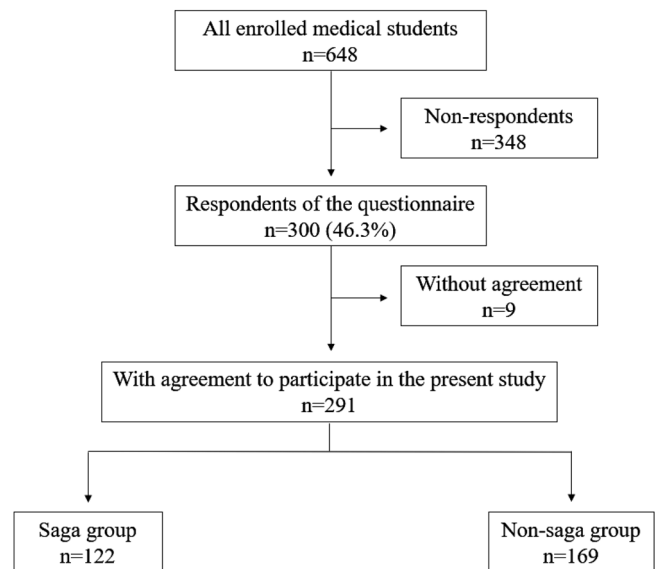


Figure 1 Inclusion criteria.

All 648 students (359 males and 289 females) were enrolled in the medical school during the survey. Among them, 300 responded to the questionnaire (46.3% response rate); of these, 291 were included after agreeing to participate. The Saga and non-Saga groups comprised 122 (41.9%) and 169 (58.1%) students, respectively.

significant differences between the two groups in age, sex, parental occupation, presence of a partner or spouse, or current grade at university.

Table 2 outlines the details related to the preferred hospital type for initial clinical training and the reasons for selecting that type. The preferred hospital type for initial clinical training between the two groups differed significantly ($P < 0.001$). Regarding the reasons for selecting a particular type, the non-Saga group showed a significantly higher desire to work in an urban area (1% vs. 21%, $P < 0.001$). Meanwhile, the following reasons did not differ significantly between the two groups: future clinical development ($P = 0.154$); presence of role models at the preferred hospital (16% vs. 16%, $P = 0.926$); good salary or fringe benefits (31% vs. 33%, $P = 0.801$); satisfactory program content for initial clinical training (44% vs. 49%, $P = 0.472$); extensive experience in the emergency room (16% vs. 23%, $P = 0.162$); extensive experience with common diseases (28% vs. 38%, $P = 0.075$); fulfilling education system (33% vs. 36%, $P = 0.630$); influence of partner (21% vs. 11%, $P = 0.145$); influence of senior students (8% vs. 13%, $P = 0.195$); and willingness to contribute to the local community (33% vs. 27%, $P = 0.230$). The first desired places and preferable hospital types for initial clinical training in each grade are shown in Supplementary material 2.

Table 3 reports the results related to student satisfaction with university life and study morale. There were no sig-

Table 1 Participant characteristics

	Total (n=291)	Saga group (n=122)	Non-Saga group (n=169)	P-value
Age	22 (20–24)	22 (21–24)	22 (20–23)	0.312
Male	148/285 (52)	60/119 (50)	88/166 (53)	0.839
Parental occupation				
One of the parents is a doctor	92 (32)	40 (33)	52 (31)	0.715
One of the parents is a practitioner	35 (12)	17 (14)	18 (11)	0.396
Relatives, acquaintances, or friends in Saga prefecture [†]	112 (38)	77 (63)	35 (21)	<0.001
Existence of a partner or spouse	110 (38)	48 (39)	62 (37)	0.645
Admission through a regional quota system	89 (31)	83 (68)	6 (4)	<0.001
Admission on recommendation by high school	41 (14)	7 (6)	34 (20)	0.001
Experience of repeating a school year	29 (10)	19 (16)	10 (6)	0.007
Current grade at university				
First	49 (17)	21 (17)	28 (17)	
Second	45 (15)	19 (16)	26 (15)	
Third	38 (13)	12 (10)	26 (15)	0.324
Fourth	46 (16)	16 (13)	30 (18)	
Fifth	59 (20)	27 (22)	32 (19)	
Sixth	54 (19)	27 (22)	27 (16)	
Home region				
Saga prefecture	91 (31)	78 (64)	13 (8)	
Kyushu/Okinawa region [§]	152 (52)	32 (26)	120 (71)	
Chugoku region	14 (5)	3 (2)	11 (7)	
Kinki region	10 (3)	3 (2)	7 (4)	<0.001
Chubu region	5 (2)	1 (1)	4 (2)	
Kanto region	19 (7)	5 (4)	14 (8)	
Shikoku/Tohoku region and Hokkaido	NA	NA	NA	

Categorical data are expressed as n (%) and were compared using the χ^2 test. Continuous variables are expressed as the median (interquartile range) and were compared using the Mann–Whitney *U* test. [†] Since before admission. [‡] Recommendation by high school. [§] Other than Saga Prefecture.

nificant differences between the two groups for the following: satisfaction with their own life (8 vs. 8, $P=0.149$); for 1st to 4th grade students, satisfaction with classroom lectures or practical training (7 vs. 7, $P=0.316$); for 5th and 6th grade students, satisfaction with hospital training (7 vs. 7, $P=0.895$), satisfaction with tuition in hospital training (39% vs. 53%, $P=0.146$) and encounters with role model doctors during hospital training (63% vs. 72%, $P=0.246$). There were no significant differences between the two groups regarding the following: questions about study morale, including the desire to have contact with doctors practicing in a medical setting before starting hospital training in the 5th and 6th grades (43% vs. 49%, $P=0.339$); desire to engage in medical research and write medical articles while being a medical student (12% vs. 16%, $P=0.378$); and desire to treat many patients during hospital training (42% vs. 43%, $P=0.813$). The proportion of students who believed that repeating a year would decrease their commitment to Saga Prefecture or Saga University also did not differ significantly between the two groups (14% vs. 18%, $P=0.317$). A similar result was observed after presenting this question to students who had repeated a school year (16% vs. 20%, $P=0.775$).

Multivariate analysis

Table 4 presents the results of the multivariate logistic regression analysis using the forced entry method. Significant factors for the Saga group were as follows: admission through a regional quota program (odds ratio [OR], 19.18; 95% confidence interval [CI], 6.99–52.60); and having Saga Prefecture as the home region (OR, 6.05; 95% CI, 2.24–16.35). Meanwhile, a significant factor in the non-Saga group was the desire to work in an urban area (OR, 0.03; 95% CI, 0.00–0.37).

Discussion

This study sought to clarify the causative factors for medical students selecting a particular prefecture for their initial clinical training. In Japan, the initial clinical training system for residents began in 2004, mandating 2 years of clinical training after graduating from medical school¹⁾. However, this change unintentionally exacerbated the uneven distribution of physicians between urban and rural areas^{2–5)}. To maintain community medical care, young physicians need to be recruited from rural areas. Thus, clarify-

Table 2 Preferable hospital type for initial clinical training and reasons for selecting a hospital

	Total (n=291)	Saga group (n=122)	Non-Saga group (n=169)	P-value
Probability of working as a medical resident in Saga prefecture (%)	50 (10–100)	100 (99–100)	20 (0–40)	<0.001
Preferable hospital type [†]				
University hospital	44 (15)	22 (18)	22 (13)	<0.001
Common educational hospital	85 (29)	18 (15)	67 (40)	
Course including both	69 (24)	40 (33)	29 (17)	
Undecided	93 (32)	42 (34)	51 (30)	
Future clinical department				
Internal medicine	94 (32)	42 (34)	52 (31)	0.154
Surgery	59 (20)	20 (16)	39 (23)	
Minor surgery	21 (7)	7 (6)	14 (8)	
Pediatrics and Obstetrics	34 (12)	12 (10)	22 (13)	
Other	27 (9)	17 (14)	10 (6)	
Undecided	56 (19)	24 (20)	32 (19)	
Reasons for selecting a hospital [†]				
Desire to work in an urban area	36 (12)	1 (1)	35 (21)	<0.001
Presence of role models [¶]	46 (16)	19 (16)	27 (16)	0.926
Good salary or fringe benefits	93 (32)	38 (31)	55 (33)	0.801
Satisfactory program content [†]	136 (47)	54 (44)	82 (49)	0.472
Extensive experience in the emergency room	59 (20)	20 (16)	39 (23)	0.162
Extensive experience with common diseases	98 (34)	34 (28)	64 (38)	0.075
Fulfilling education system	100 (34)	40 (33)	60 (36)	0.63
Influence of partner	17/110 (15)	10/48 (21)	7/62 (11)	0.145
Influence of senior students	32 (11)	10 (8)	22 (13)	0.195
Willingness to contribute to the local community	85 (29)	40 (33)	45 (27)	0.23

Categorical data are expressed as n (%) and were compared using the χ^2 test. Continuous variables are expressed as the median (interquartile range) and were compared using the Mann-Whitney *U* test. † For initial clinical training. ¶ At the preferred hospital.

Table 3 Student satisfaction and study morale

	Total (n=291)	Saga group (n=122)	Non-Saga group (n=169)	P-value
Students' satisfaction				
Students' own life	8 (6–9)	8 (6–8)	8 (7–9)	0.149
Classroom lectures or practical training	7 (6–8)	7 (6–8)	7 (6–8)	0.316
Hospital training	7 (6–8)	7 (6–8)	7 (6–8)	0.895
Tuition in hospital training	52/113 (46)	21/54 (39)	31/59 (53)	0.146
Encounter with role model doctors [†]	82/120 (68)	36/57 (63)	46/64 (72)	0.246
Study morale				
Desire to have contact with doctors [¶]	136 (47)	53 (43)	83 (49)	0.339
Desire to engage in research and write articles [§]	42 (14)	15 (12)	27 (16)	0.378
Desire to treat many patients [†]	124 (43)	51 (42)	73 (43)	0.813
Whether repeating a year would decrease the commitment to Saga Prefecture or Saga University				
The whole students	48 (16)	17 (14)	31 (18)	0.317
Those who repeated a school year	5/29 (17)	3/19 (16)	2/10 (20)	0.775

Categorical data are expressed as n (%) and were compared using the χ^2 test. Continuous variables are expressed as the median (interquartile range) and were compared using the Mann-Whitney *U* test. † During hospital training. ¶ Doctors practicing in medical setting before starting hospital training in the 5th and 6th grade. § While a medical student.

Table 4 Results of multivariate logistic regression analysis

Predictive factors	OR	95% CI	P-value
Admission through a regional quota system	19.18	6.99–52.60	<0.001
Saga prefecture as home region	6.05	2.24–16.35	<0.001
Desire to work in an urban area [†]	0.03	0.00–0.37	0.006
Experience of repeating a school year	2.07	0.68–6.30	0.2
Relatives, acquaintances, or friends in Saga prefecture [‡]	1.71	0.73–4.01	0.215
Preferable hospital type for the initial clinical training	1.24	0.91–1.70	0.178
Admission on recommendation by high school	1.06	0.40–2.82	0.903
Extensive experience with common diseases [§]	0.55	0.25–1.20	0.132

OR: odds ratio; CI: confidence interval. † One of the reasons for choosing a hospital for initial clinical training.

‡ Since before admission.

ing the factors that lead medical school students in rural or suburban prefectures to select places for their initial clinical training can have policy implications for these prefectures. Here, we found that “having Saga Prefecture as the home region” and “admission through a regional quota program” were significant factors for selecting Saga Prefecture. “The desire to work in an urban area” was a significant factor for not choosing Saga Prefecture.

Some of our results are similar to other studies. One Japanese cohort study found that students who were admitted to medical school based on the recommendations of their high school or through a regional quota program of admission were more likely to choose rural areas for their initial clinical training. This tendency increased with time after the students began residency. Importantly, the aforementioned study highlighted the successful effect of regional quota programs in encouraging doctors to engage in community healthcare, especially in rural areas¹⁾. However, the number of applicants admitted under the regional quota system has decreased owing to the excessively long years that residents must work in rural areas; the result has been a lack of such applicants in some prefectures. However, some report that the current regional quota programs have failed to address the uneven distribution of physicians; this is because many students attempt to avoid their commitment by repaying their scholarships, allowing them to freely choose their clinical training location⁹⁾. Furthermore, the usefulness of regional quota programs clearly differs across prefectures; thus, it is necessary to examine this issue for each prefecture. Here, we found that admission through a regional quota program, than on recommendation by high school, was a significant factor in selecting Saga Prefecture. Thus, the system may have been beneficial in encouraging medical residents who have graduated from Saga University to choose Saga Prefecture for their initial clinical training. However, to confirm the usefulness of regional quota programs, we need to investigate the differences between students admitted to such programs and through regular enrollment procedures regarding successful graduation rates,

pass rates for the National Examination for Medical Practitioners, and the proportion of students who choose their university’s prefecture for clinical training.

Medical students from rural areas are reportedly 10 times more likely to select a rural area for work than those from non-rural areas²⁰⁾. Moreover, students with a prior relationship with rural areas (e.g., coming from rural areas, having graduated from a rural high school, or having significant others such as a spouse or family member living in rural areas) exhibited a stronger tendency to undergo initial clinical training in such areas^{19, 21)}. Here, we found that having relatives, acquaintances, or friends living in Saga Prefecture before their admission was not a significant factor for the Saga group; however, having Saga Prefecture as the home region was a significant factor, in line with previous studies^{19–21)}.

Among all enrolled students in Saga University’s medical school, 24% were admitted through a regional quota program. Among these, 92% were from Saga Prefecture. Thus, having Saga Prefecture as the home region, which we found to be a significant factor, was influenced by admission through a regional quota program. However, we observed that the proportion of participants admitted through such programs was almost the same as that of all participants. The proportion of participants admitted through a regional quota program with Saga Prefecture as the home region was lower than that of all participants. Therefore, our results do not indicate a marked influence of admission through such programs.

This study has several limitations. First, this was a single-center cross-sectional study conducted at Saga University’s medical school, which is the only national university with a medical school in the Saga Prefecture. Thus, the results would have been different in different settings, such as a medical school of a private university or college, in a metropolitan prefecture, or in a prefecture with multiple universities or colleges with medical schools. Second, this study was conducted in Japan, which has a unique insurance system and a super-aged society; thus, the results may differ

in other countries. Third, students' current location choices for initial clinical training may differ on graduation; for example, students may change their minds as their course progresses.

Conclusions

We identified two notable factors for medical students choosing Saga Prefecture for their initial clinical training: having Saga Prefecture as the home region and being admitted through a regional quota program. To encourage medical residents to select Saga prefecture for their initial clinical training, we need to focus on medical students who have these two characteristics.

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