Research Article

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Career Progression and Role of Videoconferencing Systems for Medical Doctors Graduating with Regional Quotas in Rural Areas in Japan

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Abstract

Background: Jichi Medical University (JMU), established to address Japan's rural doctor shortage, trains students who, in exchange for free education, must work in rural areas for nine years as an obligation period (OP). This system may hinder their specialist training compared to urban physicians. Therefore, this study investigates the impact of this system on the attainment of specialist certifications and career progression among doctors.

Method: The study surveyed 81 JMU graduate doctors (JMUGDs) in Wakayama and 76 in Hyogo Prefecture, using a Google Forms® questionnaire to assess their board certification status, the impact of OP on their careers, and their views on the utility of videoconferencing systems.

Results: In Wakayama Prefecture, 40 out of 81 JMUGDs responded, and in Hyogo Prefecture, 22 out of 76 JMUGDs responded. Over 80% of JMUGDs in Wakayama and over 70% in Hyogo had board-certified specialties, exceeding the national average of 62.5% (Wakayama: 35/40 87.5%, Hyogo: 16/22 72.7%). Despite OP causing delays in specialization, over 70% JMUGDs had a favorable opinion of it. More than 90% of JMUGDs viewed videoconferencing as a valuable tool for career development, especially for tele-consultation and tele-education.

Conclusions: This survey revealed that, despite OP, JMUGDs achieve a higher rate of board-certified specialist qualifications compared to the Japanese average. Additionally, many JMUGDs found OP meaningful for career development and considered videoconferencing system beneficial.

Keywords: Career progression in rural areas, Obligation period, Specialist qualification, Regional quotas, Videoconferencing system

What was Known

- Videoconferencing systems improve poor accessibility in rural areas.
- Graduates from Jichi Medical University or regional quotas must temporarily work in rural areas.
- This obligation to work may lead to a decline in their motivation and professional qualifications.

What's New and Next

- The rate of specialist qualification acquisition by Jichi Medical University graduates is high.
- Jichi Medical University graduates view the obligation to work in rural areas as beneficial.
- They believe that videoconferencing systems will be helpful for career progression in rural areas.

Introduction

In Japan, as in many other countries, significant healthcare disparities exist between rural and urban areas.[1] Rural residents often need to travel to the city for hospital visits due to a shortage of doctors.[2,3] Telemedicine using ICT (information and communications technology)-based videoconferencing systems has been reported to potentially improve limited access[4, 5]. For example, individually customized exercise programs for physical and cognitive training for older adults, using laptop computers with webcams, have been reported[(4)]. These programs can be used to provide rehabilitation to older adults in their homes remotely, playing an active role in resolving the shortage of doctors.

Jichi Medical University (JMU), established in 1972 to solve the shortage of medical doctors in rural areas in Japan, has a distinctive system to train doctors to work in the

community.[6, 7, 8] The university admits approximately 120 students annually, including two or three students from each of Japan's 47 prefectures. These students receive free enrollment and tuition but are required to work in their home prefecture for nine years after graduation, known as the "obligation period" (OP).[9, 10] Of these nine years, five must be spent working in rural hospitals and clinics as generalists. After residency, Japanese physicians usually require about three years of specialized training to become board-certified specialists. Consequently, JMU graduate doctors (JMUGDs) are often at a disadvantage in their specialty careers compared to urban physicians.

In recent years, because JMU alone has not solved the doctor shortage, many medical schools have established regional quotas, known as "Chiiki-waku," that require graduates to work in specific regions.[11, 12] The rules vary among universities, but many follow the JMU system. The regional quota system began in earnest in 2008, has expanded due to government measures, and currently accounts for about 20% of the total medical school quota.[11, 13] Doctors graduating under regional quotas face similar challenges to JMUGDs regarding medical specialties. Moreover, it is unclear whether the use of video conferencing systems is beneficial for the career development of newly graduated doctors working in areas that have adopted a regional quota system, such as the JMU system or "Chiiki-waku" system.

We investigated how the OP, initiated well before the "Chiiki-waku" system, impacts the attainment of specialist certifications and career progression among JMUGDs. Additionally, we examined the potential role of videoconferencing systems in supporting career advancement.

Materials and Methods

1. Study population of JMUGDs and data collection in Wakayama and Hyogo prefectures (Figure 1)

This study included 81 JMUGDs who were serving their OP or had completed it in Wakayama prefecture (population: approximately 900,000 people, 40th among 47 prefectures. area: approx. 4,700 square kilometers, 30th), which is located in the Kansai region of Honshu and bordering Osaka Prefecture to the north, and had subscribed to a graduate mailing list in Wakayama. A Google Forms® survey link was emailed to them in July 2024, containing six closed-ended questions and one open-ended question in Japanese: 1. "Have you completed your OP?"; 2. "Are you a board-certified specialist in any field?" 3. "Were you able to obtain a board-certified specialist qualification during the OP?" (aimed at only those who answered "yes" to question 2); 4. "Did the OP delay your specialist certification?" (aimed at only those who

answered “yes” to question 2); 5. “How did the OP influence your career progression?” (aimed at only those who answered “yes” to question 1); 6. “Do you think that videoconferencing systems are useful in career development?”; and 7. “What do you consider to be the best use of videoconferencing systems in career development?”. Responses were collected securely and anonymously. Furthermore, responses on videoconferencing system utilization were categorized into teleconsultation, telemedicine systems, among others, based on previous literature[14].

Owing to possible data bias in one prefecture, 76 JMUGDs serving the OP in the Hyogo Prefecture (population: approximately 5,400,000 people, 7th among 47 prefectures. Area: approx. 8,400 square kilometers, 12th), also located in the Kansai region of Honshu and bordering Osaka Prefecture to the east, were included in the mailing list and surveyed in July 2024 in the same format.

The study protocols were reviewed by the local ethics committee of Wakayama Medical University (number 4202). The study was conducted in accordance with the World Medical Association Declaration of Helsinki and Good Clinical Practice Guidelines.

2. Data collection on all Japanese doctors

We examined the rate at which doctors in Japan obtain a board-certified specialization in any field. According to the Japanese Ministry of Health, Labor and Welfare’s (MHLW) 2022 report, 37.5% of all doctors (122,707/327,444 persons) had not obtained a medical specialty[15]. From these data, 62.5% of doctors had some type of board-certified specialization, which is considered the Japanese average.

3. Statistical analyses

Statistical analyses were performed using JMP pro™ version 16 for Windows (SAS institute, Cary, NC, USA). Categorical variables are presented as numerical values (percentages), and comparisons were made using Fisher's exact test. Statistical significance was set at $p< 0.05$.

Table 1 Summary of the six closed-ended questions and one open-ended question for JMUGDs in Wakayama and Hyogo prefectures.

No.	Question	Answer choices
1	Have you completed your OP?	Yes/No
2	Are you a board-certified specialist in any field?	Yes/No
3	Were you able to obtain a board-certified specialist qualification during the OP? (aimed at only those who answered "yes" to question 2)	Yes/No
4	Did the OP delay your specialist certification? (aimed at only those who answered "yes" to question 2)	Yes/No
5	How did the OP influence your career progression? (aimed at only those who answered "yes" to question 1)	Positive impact/ No impact/ Negative impact
6	Do you think that videoconferencing systems are useful in career development?	Yes/No
7	What do you consider to be the best use of videoconferencing systems in career development?	Open-Ended Answer

JMUGDs, Jichi Medical University Graduate Doctors; OP, obligation period

Results

1. JMUGDs characteristics in Wakayama and Hyogo (Figure 1)

Using a Google Forms® questionnaire, we received responses from 40 of 81 JMUGDs in Wakayama and 22 of 76 in Hyogo. The average number of years after graduation for respondents were as follows: Wakayama: 20.9 +/- 11.7 years; Hyogo: 18.3 +/- 11.2 years. The percentages of ongoing versus completed were as follows: Wakayama: during the OP = 6/40, 15.0% and after the OP = 34/40, 85.0%; Hyogo: during the OP = 3/22, 13.6% and after the OP = 19/22, 86.4%.

2. Rate of specialization among JMUGDs and comparison with Japanese medical doctors (Figure 2)

First, we asked participants if they had any specialization, finding that more than 80% of JMUGDs in Wakayama and more than 70% in Hyogo had a specialization of some kind (Wakayama: 35/40, 87.5%, Hyogo: 16/22, 72.7%). There was no significant difference in specialization acquisition rate between Wakayama and Hyogo JMUGDs, but both prefectures were significantly higher than the national average (62.5%).

3. The impacts of JMUGD on obtaining a medical specialist and their impressions of working in a hometown prefecture and rural area (Figure 3A: Wakayama, 3B: Hyogo)

JMUGDs with any specialization were asked if they obtained their qualification during the OP. In both prefectures, many had obtained a board-certified specialization during the nine years of OP while working in their home region (Wakayama: 28/35, 80.0%, Hyogo: 11/16, 68.8%). They were also asked whether working in their home region had delayed obtaining any specialist qualification, with more than half reporting a delay (Wakayama: 20/35, 57.1%, Hyogo: 10/16, 62.5%).

JMUGDs who had completed the OP were asked about their current careers. When asked whether the OP had a positive, negative, or neutral impact on their career, most reported a positive impact (Wakayama: positive = 25/34, 73.5%, negative = 2/34, 5.9%, no impact = 7/34, 20.6%; Hyogo: positive = 15/19, 78.9%, negative = 2/19, 10.5%, no impact = 2/19, 10.5%).

4. Efficacy of the videoconferencing system in JMUGDs' career progression and suggestions for its effective use (Figure 4)

All JMUGDs were asked whether the videoconferencing system could benefit their careers, with over 90% of respondents in Hyogo affirming its usefulness (Wakayama: 31/40, 77.5%, Hyogo: 20/22, 90.9%). Additionally, we requested suggestions on how the system could aid in career progression, receiving 21 responses from Wakayama and 11 from Hyogo. However, some responses included "I don't know specifically" (Wakayama: 7 responses, Hyogo: 2) and some emphasized the effectiveness of onsite rather than online (Wakayama: 3, Hyogo: 2).

Among the remaining suggestions, the most common were related to teleconsulting category (Wakayama: 5 suggestions, Hyogo: 3, receiving expert guidance in rural areas on clinical or research), followed by suggestions in the telemedicine systems category (Wakayama: 4, Hyogo: 2, to make available the acquisition of points for obtaining a specialist), and suggestions in the tele-education category (Wakayama: 2, Hyogo: 2, teleteaching from senior doctors to junior doctors, teleconferencing with their colleagues).

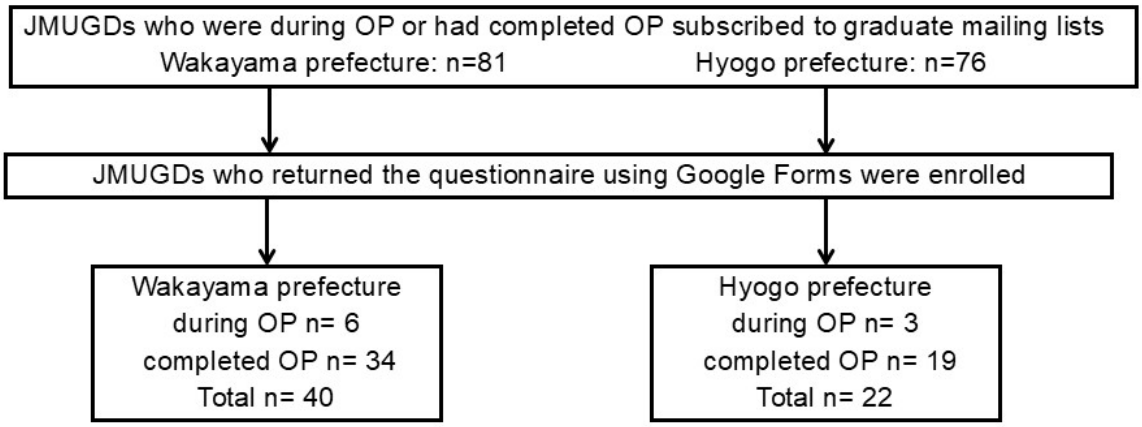
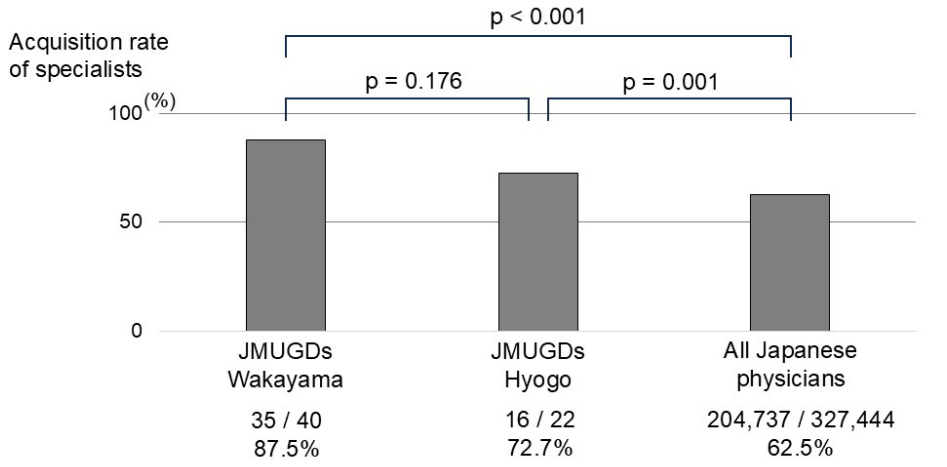


Figure 1 Enrolment flowchart for Wakayama and Hyogo prefectures.

JMUGDs = Jichi Medical University Graduate Doctors, OP = obligation period



Acquisition rate of any specialists in JMUGDs and all Japanese medical doctors

Figure 2 Rate of specialization among JMUGDs and comparison with Japanese medical doctors

JMUGDs = Jichi Medical University Graduate Doctors. Statistical significance was set at $p < 0.05$. Specialization rates from the questionnaire of JMUGDs in Wakayama and Hyogo prefecture were compared with those of all Japanese physicians from the national data. The rates for both prefectures were significantly higher than the national average.

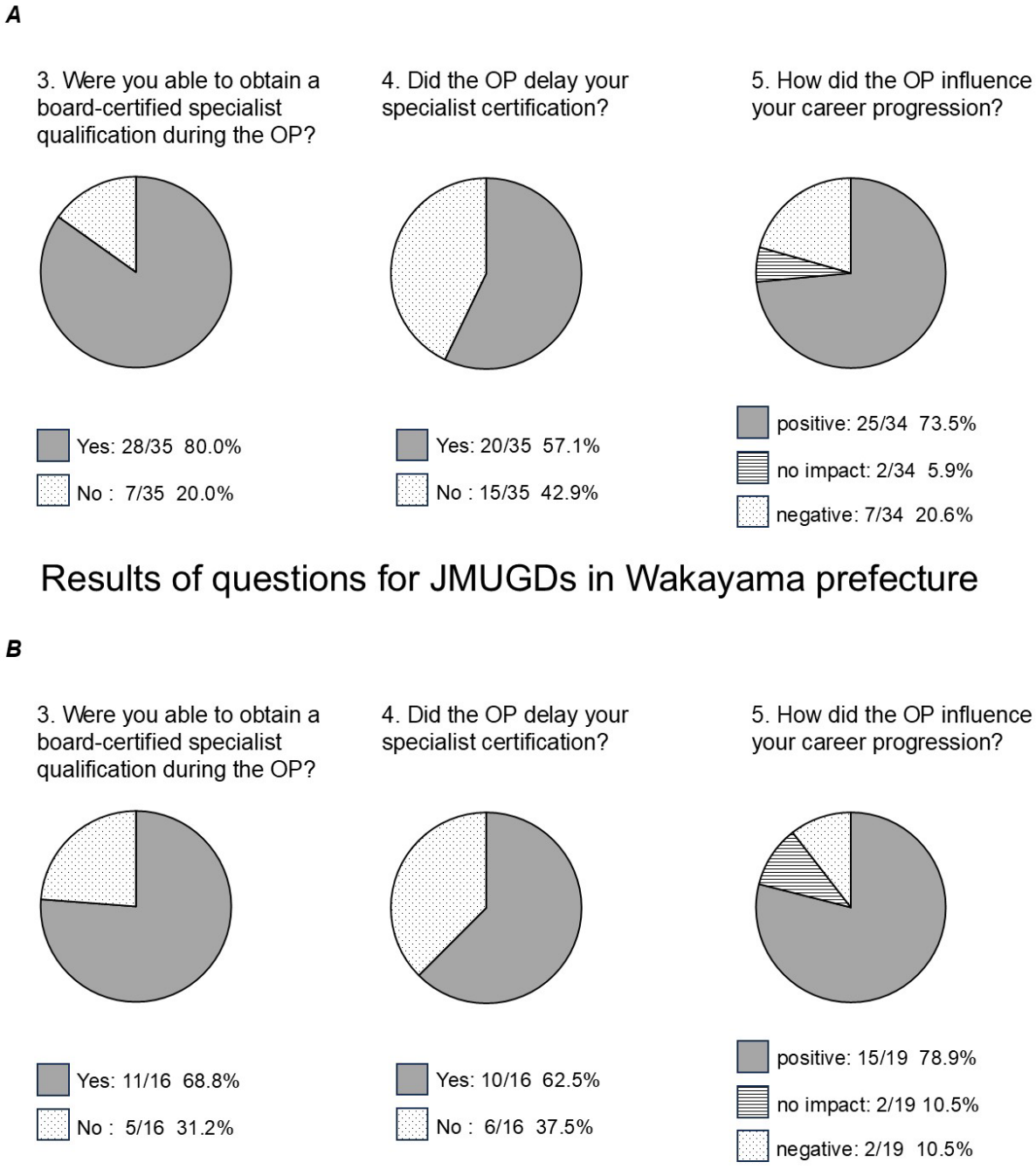
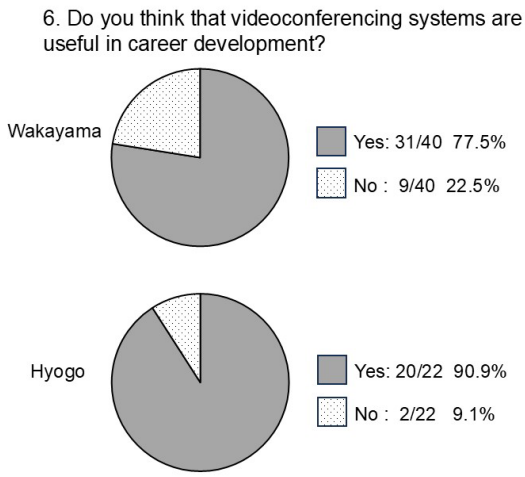


Figure 3 Results of questions for JMUGDs (A: in Wakayama, B: in Hyogo)

JMUGDs = Jichi Medical University Graduate Doctors, OP = obligation period. Qualified medical specialists among JMUGDs were asked questions 1. and 2., and JMUGDs who had completed their OP were asked question 3. In both Wakayama and Hyogo, Although many JMUGDs had delayed qualifying as a specialist due to the OP, they considered the OP to have had a positive impact.



Specific suggestions on how videoconferencing systems can help JMUGDs in their careers

Tele-consulting: (receiving expert guidance in rural areas on clinical or research)	Wakayama : 5 Hyogo : 3
Telemedicine systems: (making available the acquisition of points for obtaining a specialist)	Wakayama : 4 Hyogo : 2
Tele-education: (teleteaching from senior doctors to junior doctors or teleconferencing with their colleague)	Wakayama : 2 Hyogo : 2

Figure 4 The efficacy of videoconferencing in JMUGDs' career progression and suggestions for its effective use

JMUGDs = Jichi Medical University Graduate Doctors. Many JMUGDs reported that videoconferencing systems helped them in their career development. Specific suggestions were made regarding Tele-consulting, Telemedicine systems, and Tele-education in that order.

Discussion

This study suggests that JMUGDs have a higher rate of board-certified specialization than the Japanese average, and more JMUGDs find the OP meaningful for career progression. Moreover, it was evident that participants consider teleconsultation, tele-education, and obtaining specialist points through video conferencing systems beneficial for career development.

1. Reasons for concern about the career development of doctors from JMU or another regional quota

In 2024, MHLW reported annual changes in the proportion of JMU students and regional quota "Chiiki-waku" students in medical school enrolments. In 2023, the total capacity of medical schools was 9384, with 123 (1.3%) JMU students and 1770 (19.1%) "Chiiki-waku" students. In addition, the number of JMUGDs employed in 2023, excluding deaths and other cases, as reported by JMU[16], was 4492, which is 1.4% of the total number of doctors, calculated from the number of doctors currently working as reported by the MHLW.[15]

The OP at JMU is nine years and this system is the same for the JMUGDs from all prefectures. Regional quotas, on the other hand, are the same for those who work in the prefecture where the university is located after graduation, but the rules for these quotas vary among the universities in each prefecture (Table 2). The rules for the most common regional quota follow those of the JMU, and students are required to work at a designated hospital in the hometown prefecture for nine years instead of receiving a scholarship (regional quota with scholarship).[17] Some regional quota rules include a scholarship, with the ability to work anywhere in the prefecture (non-quota with scholarship). There is also a rule that allows students to enroll on the condition that they do not receive a scholarship but work somewhere in the prefecture after graduation (non-quota without scholarship). In other words, Japanese medical schools have five systems: the JMU system, regional quota with scholarship, non-quota with scholarship, non-quota without scholarship, and unrestricted normal student. Other special medical schools include the University of Occupational and Environmental Health, where graduates are required to work as industrial physicians for a fixed period, and the National Defense Medical College, where graduates are obliged to work as self-defense officers for nine years.

Table 2 Classification of the Japanese medical education system based on regional quotas and scholarships

Category	Characters
JMU system	They must work at a designated local hospital or clinic in the hometown prefecture for the first nine years instead of receiving a scholarship.
regional quota with scholarship	They must work at a designated local hospital or clinic in the prefecture where the university is located for a certain period (for most, 9 years), instead of receiving a scholarship.
non-quota with scholarship	They need to work at any hospital or clinic for a certain period of time in the prefecture where the university is located, instead of receiving a scholarship.
non-quota without scholarship	As a condition for entering the university, they need to work at any hospital or clinic for a certain period of time in the prefecture where the university is located.
unrestricted normal students	They have no restrictions on where they can work.
Others	They have special work restrictions (University of Occupational and Environmental Health and National Defense Medical College)

The establishment of JMU and another regional quota in Japanese medical universities is an important policy to address the physician distribution imbalance and support regional healthcare.[18, 19] On the other hand, it creates disadvantages for doctors who graduated from these institutions. In exchange for scholarships, entrance fees, tuition fees, and ease of entry into universities, students are required to work semi-compulsorily in rural areas from a young age. Over the course of a medical student's life, it has been reported that this causes a loss of motivation to work in rural areas.[20] Therefore, some return their scholarships without completing their OPs. Some drop out without informing the university or filing a lawsuit, claiming the invalidity of their contracts. The Japan Board of Public Health and Social Medicine only recently, from 2023, begun to consider this social issue.[21]

2. Career perspectives and realities of doctors who graduated from JMU

A notable finding is that many JMUGDs who completed their OP had a positive impression of it and believed it was useful in terms of career progression. In fact, the rate of obtaining a board-certified specialization was higher than the national average, albeit being delayed. Many JMUGDs who completed their OP had a positive impression for OP and it is thought that maintaining high ability and gaining experience as a doctor after serving the OP will also help with the transition from generalist to specialist.

Dr. Matsumoto examined the performance of JMU and regional quota students during their school years.[22] The pass rate for the national medical practitioners qualifying examination (NME) among quota students followed this order: JMU, regional quota with scholarship, non-quota with scholarship, and quota without scholarship. The lowest passing rates were observed among medical students without regional quotas or scholarships (normal medical students). One reason for the high NME pass rate among JMU students may be their strong academic aptitude. It is difficult to pass the entrance exam for JMU, so the deviation scores for these students are often higher than those of students with regional quotas. Another reason may be that JMU's education in community medicine is excellent.

One of the teaching ideas of JMU is that "Doctors are trained by local residents." Thus, providing local medical care is a shortcut to becoming an excellent physician. During their studies, JMU students receive practical training in their hometown prefecture, which motivates them to work in rural areas. Community-Based Medical Education (CBME) is a practical way to teach primary care and family medicine worldwide.[23, 24]

Revealing the high rate of board-certified specialization among JMUGDs and reviewing the education of students with regional quotas could ultimately help address the issue of regional quota withdrawal.

3. The current state of regional quota system for the shortage of physicians worldwide

There are scholarship programs around the world that address the shortage of doctors in rural areas, similar to the regional quota system in Japan.

In United States, programs that forgive the repayment of government loans are called "Loan Forgiveness Programs," the most famous of which is the National Health Service Corps (NHSC) run by the Department of Health and Human Services.[25] The program is aimed at doctors who want to work in primary care, but the fact that it can be used even after graduation upon finding a job in an approved area makes it different from the regional quota system in Japan, where the career path is decided upon entering university. In addition, many states have their own scholarship programs, for example, in Minnesota, the Rural Physician Partnership Program was established in 1971 with state funding to increase the number of primary care doctors in rural areas.[26]

There is also a project in Thailand to train doctors to work in rural areas, similar to the Japanese JMU system. The Collaborative Project to Increase Production of Rural Doctors (CPIRD) is one such project, and it was launched by the Thai Ministry of Health in 1994.[27, 28] Another program, called One District One Doctor (ODOD), has also been launched, and students selected from the local community are required to provide medical services in their community after graduation.[29] In both systems, students who abandon their duties are required to pay a large fine.

4. The potential of videoconferencing systems for career support in rural areas

Videoconferencing systems have existed for some time; however, the recent COVID-19 pandemic has led to its rapid spread.[30, 31, 32] In clinical practice, telemedicine has only been previously used in a few regions; however, the pandemic has made it common in Japan.[33, 34] Although local doctors have had fewer opportunities to study due to poor accessibility, it is hoped that the distance barrier will be overcome by videoconferencing systems.

Even from our past paper[14], it was stated that in telemedicine it is often used in teleconsultation for specialists, and many of the suggestions from the current survey mentioned the need for such teleconsultation. In the field of clinical practice, these are technically simple

but require specialist doctors' time and effort. Therefore, it is important to establish appropriate systems in each prefecture if they are to be used by local physicians.

Other suggestions include the use of a system to teach junior colleagues or conduct conferences with colleagues. The usefulness of teleteaching has been established in previous studies[35, 38] and is currently used in training courses for teaching residents in Japan.[39] Videoconferencing systems are expected to be increasingly used in education in the future.

One interesting proposal is to allow videoconferencing systems to obtain points for acquiring or maintaining a specialization. These points can be collected by participating in conferences and workshops. During the pandemic, conferences and training courses were held online; however, most have been held onsite. For example, the Japanese Society of Internal Medicine still allows all conferences to be attended online, and case registration to obtain board-certified specialists can also be performed online.[40] We believe that ICT should be actively used by other nations to eliminate the differences between urban and rural doctors during their career development.

Based on the opinions of JMUGDs, who have a wealth of experience as doctors in rural areas, the three main benefits of videoconferencing were thought to be: contact with specialists, obtaining specialist points, and conferences with senior doctors and colleagues. This indicates that doctors working in rural areas hope that videoconferencing systems will overcome poor access. However, a survey conducted in 2020 of local clinics across Japan found that only 19% of them were using ICT.[5] This suggests that the rate of ICT use in local healthcare in Japan is low, highlighting the need for policy reforms that promote its use in local areas.

5. Limitations

This study employed a questionnaire survey distributed via graduate mailing lists, but it did not encompass all JMUGDs in Wakayama and Hyogo prefectures. The response rate was approximately 50% for Wakayama and 30% for Hyogo. Given that past surveys in Japan[41, 42], where respondents receive no incentives, typically achieve response rates of 10-20%, we consider these rates acceptable. Although Japan comprises 47 prefectures, only two in the Kansai region were surveyed, resulting in a limited sample size. Consequently, the findings may not be generalizable to all JMUGDs. Additionally, as the survey was anonymous, the accuracy of the responses cannot be verified.

Despite being a cross-sectional study, systematic sampling was not possible. In addition, although the respondents varied in their years post-graduation from JMU, stratification was not possible, which may have introduced selection bias. Furthermore, this study focuses solely on videoconferencing systems, excluding other ICT modalities and artificial intelligence (AI).

Conclusion

This survey revealed that, despite serving an OP, JMUGDs achieve a higher rate of board-certified specialist qualifications compared to the Japanese average. Many participants found the OP meaningful for career development. Additionally, they believe that videoconferencing systems are important for their career development. The results of this study have clarified that there are benefits to using videoconferencing systems for both doctors and newly graduated doctors working in rural areas.

Ethical Approval Statement

The study protocols were reviewed by the local ethics committee of Wakayama Medical University (number 4202, date of approval 24 July 2024).

Author Contributions

Conceptualization, T.Y. and T.K.; methodology, T.Y.; software, Y.K.; validation, Ak.T., M.T. and T.W.; formal analysis, M.U.; investigation, M.U.; resources, S.O.; data curation, K.S.; writing—original draft preparation, T.Y., T.K and Y.O.; writing—review and editing, M.K. and Y.S.; visualization, A.K. and T.T.; supervision, H.K.; project administration, At.T. All authors have read and agreed to the published version of the manuscript

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Conflicts of Interest

All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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