self-designated rheumatologists (760 as of the end of 2006) is far less than the number of board-certified specialists registered with the Japan College of Rheumatology (3,701 as of March 2008).

The data for 270,353 physicians from the 2004 survey and 277,927 from the 2006 survey were used to carry out the future estimation of physicians. The data from 1996 to 2006 were used to analyze trends in physicians' specialty choices. The researchers were not able to identify individual physicians from the data provided. To carry out the estimation of the future number of physicians by specialty, a multistate life table was used. A conventional life table only indicates "dead" or "alive," while a multistate life table deals with broader status categories [7,8]. First, we identified seven medical specialty status categories (six different specialties groups plus a "not reported" status). Then, the physician distribution among the specialties according to years of work experience was determined using the survey data from 2004 and 2006. By assuming that the probability of status category changes in a given year of experience is constant, the distribution of physicians for the year n+2 can be obtained by multiplying the number of physicians in year n by the probability of change of specialty status category (practicing, non-practicing, or change of specialties if applicable) in a given year of experience. By continuing this process, the total number of physicians by specialty was forecast for each year up to the year 2036.

In estimating the number of physicians by specialty, possible scenarios were proposed with regard to the numbers of new physicians and female physicians. The first simulation was to estimate the number of physicians in each medical specialty on the assumption that the future yearly number of new physicians stays at the 2009 level (school enrollment capacity = 8,486). The total number of internists and surgeons, and the number of psychiatrists per 1000 population, obstetrician/gynecologists (OB/GYNs) per 1000 births, and pediatricians per 1000 population under 15 years of age were calculated.

The second simulation was to estimate the number of physicians in each medical specialty using each of the three following assumptions regarding the proportion of female physicians: 1) the future percentage of new female physicians remains at the 2006 survey level (32.8%); 2) it increases to 40% in 10 years; and 3) it increases to 50% in 10 years. Then the number of physicians by specialty was estimated and the total number of internists and surgeons, psychiatrists per 1000 population, OB/GYNs per 1000 births, and pediatricians per 1000 population under 15 years of age were calculated.

The multistate life table calculation program "MSLT" [9] was used to obtain the multistate life tables and the future estimation. The number of physicians per 1000 population, the number of pediatricians per 1000 population under 15 years of age, and the number of OB/GYNs per 1000 births were calculated based on the report "Population Projections for Japan: 2006-2055 (medium-variant fertility [with medium-variant mortality])" from the National Institute of Population and Social Security Research [10].

Results

(1) Characteristics of physicians in the 2004 and 2006 National Survey of Physicians, Dentists and Pharmacists

Table 1 presents the characteristics of the physicians from the 2004 and 2006 surveys. The percentage of female physicians increased from 16.5% in 2004 to 17.2% in 2006, and these increases were observed in all age groups except for the "over 70" category.

With regard to the distribution of male and female physicians by specialty, the percentage of male surgeons (around 95%) was much higher than that of their female counterparts (around 5%). On the other hand, the percentage of female pediatricians was relatively high (compared with the overall percentages of men and women physicians), with female pediatricians accounting for 31% of that specialty. Although the total number of physicians reported in 2006 (277,927) was slightly higher than that in 2004 (270,353), the number of physicians specializing in internal medicine, surgery, and pediatrics declined in 2006.

(2) Estimated number of physicians up to 2036

Our estimation showed that, even with the medical school enrollment capacity set at the current level, the number of physicians per 1000 population will continue to increase from 2.2 (total number: 277,900) in 2006, reaching 3.0 (total number: 343,400) in 2032 and later 3.2 (total number: 348,400) in 2036, which is a 46% increase from the 2006 level. The actual number of physicians will not show a constant increase; the increase rate will peak between 2014 and 2016 and then will begin to slow down gradually. The increase in the number of physicians will stay constant at around 1000 annually in the 2030s. Meanwhile, the number of physicians per 1000 population will see a constant increase (See Figure 1).

With regard to the future estimate of physicians by specialty per target population, all but the number of surgeons per 1000 population will increase (See Figure 2.). As for the actual number of physicians by specialty, the number of OB/GYNs is expected to decline temporarily from 11,800 in 2006 to 11,400 in 2010. This number is later expected to increase slightly, but to remain below the 2006 level until 2018, after which it would again increase to 13,900 by 2036. The number of surgeons is expected to decrease from 53,500 in 2006 to 51,000 in 2016. The

Table 1: Characteristics of physicians in the 2004 and 2006 surveys

	2004 Survey			2006 Survey		
	Male	Female	Total	Male	Female	Total
Total Reported	225,731	44,622	270,353	230,043	47,884	277,927
Average Age	48.91	41.98	47.77	49.29	42.06	48.05
Age Group						
Under 29	17,084	9,333	26,417	16,922	9,428	26,350
30-39	51,448	14,922	66,370	50,656	16,401	67,057
40-49	61,610	9,679	71,289	60,383	10,409	70,792
50-59	44,074	5,012	49,086	50,703	5,903	56,606
60-69	22,806	2,026	24,832	22,692	2,238	24,930
Over 70	28,709	3,650	32,359	28,687	3,505	32,192
Place of Work						
Academic Hospitals	38,139	9,327	47,466	38,553	10,100	48,653
Non-Academic Hospitals	100,882	19,370	120,252	102,782	20,857	123,639
Clinics	79,071	13,911	92,982	80,459	14,754	95,213
Other Facilities	7,639	2,014	9,653	8,249	2,173	10,422
Specialties						
Internal Madicine	87,301	14,438	101,739	85,673	14,169	99,842
Surgery	52,168	2,658	54,826	50,866	2,623	53,489
Pediatrics	10,105	4,572	14,677	10,124	4,576	14,700
Obstetrics and Gynecology	9,461	2,695	12,156	9,022	2,761	11,783
Phychiatrics	10,285	2,315	12,600	10,438	2,391	12,829
Other Specialties/Others	56,411	17,944	74,355	63,920	21,364	85,284

number is then expected to increase slightly, but to remain below the 2006 level at 52,600 by 2036.

(3) The impact of a further increase in the percentage of female physicians

By 2036, the combined total of male and female physicians per 1000 population is expected to reach 3.2 if the number of new physicians remains at the current level, 3.2 if the number of new female physicians increases to 40%, or 3.1 if the number of new female physicians increases to 50%.

With regard to the number of physicians by specialty per target population, the numbers of pediatricians and OB/GYNs are expected to increase as the percentage of female physicians increases. Meanwhile, the number of internists is expected to decrease as the percentage of female physicians increases. If female physicians account for 40% of the workforce, the number of surgeons per 1000 population is expected to decrease from 0.419 (total number: 53,500) in 2006 to 0.408 (total number: 50,900) in 2012, then increase slightly to 0.462 (total number: 52,600) by 2036. If female physicians account for 50% of the workforce, the number of surgeons per 1000 population is estimated to decrease to 0.405 (total number: 50,900) in 2012, then increase slightly to 0.438 (total number: 48,100) by 2036. (See Figure 3).

Discussion

Estimated number of physicians up to 2036

The physicians who are now reaching retirement age are those who received their medical licenses when the medical school enrollment capacity was still small, and thus retiring physicians are now far outnumbered by new physicians. This is the main reason why the number of physicians is expected to continue to increase in the future even if the enrollment capacity stays at the current level. The declining Japanese population, which is estimated to contract from 127.8 million in 2005 down to 119.3 million by 2015 and then to 109.7 million by 2036, will also accelerate the rate of increase in the number of physicians per population.

Currently, the number of physicians per 1000 population in Japan ranks near the bottom among the OECD member countries [11]. There have been intensifying discussions on the shortage of physicians and this has led to the development of a policy measure to increase the number of new physicians in the country [12]. However, a sufficient supply of physicians is a prerequisite but not the only necessary factor in order to achieve cost-effective healthcare [13], and since it is difficult to project an adequate ratio of physicians to patients [14], the supply and demand of physicians should not be contemplated solely based on the number of physicians.

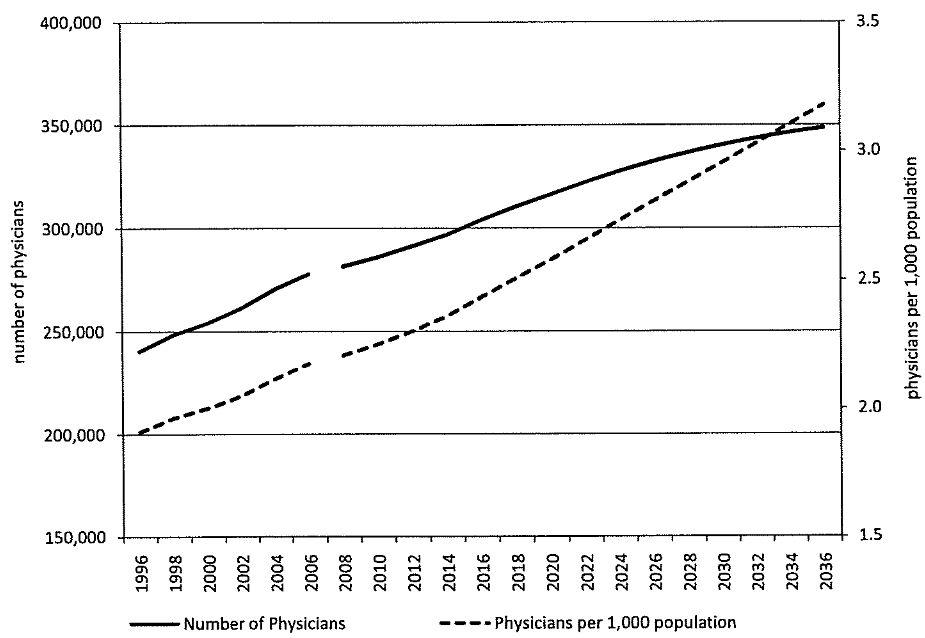

Figure 1

Number of physicians and physicians per 1000 population (1996--2006: trends; 2008--2036: estimates). The trends and estimated total number of physicians per 1000 population and actual number of physicians are presented. The number of physicians per 1000 population is estimated to reach 3.0 in 2032 and 3.2 in 2036, which is about a 1.5-fold increase from the 2006 level. The actual number of physicians will continue to increase, reaching 303,800 by 2016, then 348,400 by 2036. The rate of increase will peak between 2014 and 2016 and then will begin to slow down gradually. The increase rate will stay constant through the 2030s to reach a saturated level.

The unequal distribution of physicians by specialty is now an urgent policy issue. While the number of OB/GYNs per 1000 births will continue to increase, mainly as the number of births decreases, obstetrics is one particular specialty field that draws public attention and is expected to be the target of urgent public health policy action. The reason for this is the current lack of multiple-obstetrician on-duty teams and the lack of regional 24-hour inpatient obstetrics facilities for high-risk patients. These factors are contributing to the relatively high mortality rate among pregnant women in Japan [15]. There has been a decrease in the hiring of newly registered OB/GYNs, and many of those originally practicing in obstetrics and gynecology later leave the specialty to practice in internal medicine [16].

Changing physicians' medical specialties to balance the workforce would take a long time and would not be the best use of limited health care resources, while employing non-Japanese physicians is difficult due to the language barrier. As such, it is important in the medium to long term in Japan to provide incentives for new medical school graduates and those who have recently finished their post-graduate clinical training to make appropriate specialty choices that are coordinated in a balanced manner. In the short term, however, discussions on coordinating the sharing of responsibilities between physicians and their medical coworkers and between different types of medical facilities are necessary.

The impact of a further increase in the percentage of female physicians

The overall number of physicians will decrease slightly but not change significantly if the percentage of female physicians further increases. This is mainly because the workforce participation rate for female physicians is lower than that of their male equivalents, even though the life expectancy of females is longer than that of males. However, in medical specialties where male and female physicians are unevenly distributed, the impact of a further increase in the percentage of female physicians on the overall supply of physicians will be more significant.

The growing number of female physicians leads to a relative decrease in the proportion of their male counterparts, leading to an overall decline in the total number of physicians in medical specialties where the percentage of female physicians is significantly lower. The impact is particularly significant in the field of surgery; in addition to the percentage of female physicians being extremely small

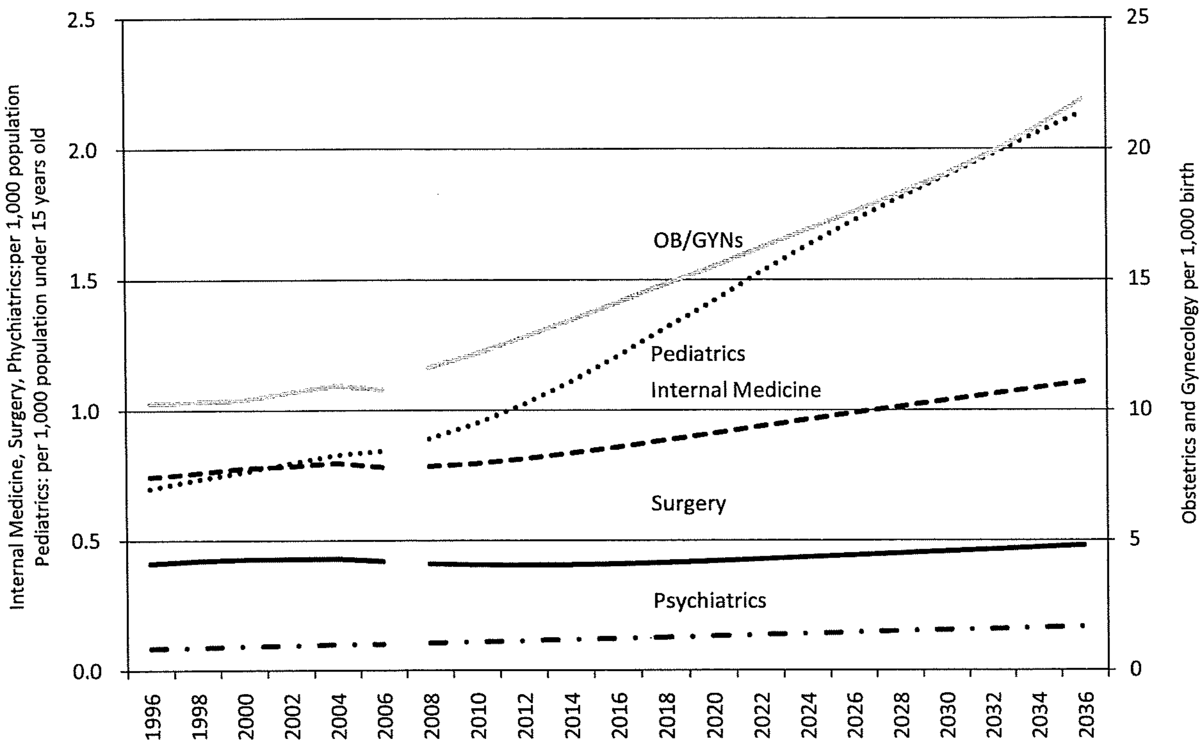

Figure 2
Trends and estimates of physicians in different specialties (1996--2006: trends; 2008--2036: estimates). The trends and estimated number of physicians per target population are presented. The number of internists, surgeons, and psychiatrists per 1000 population (left y-axis), pediatricians per 1000 population under 15 years of age (left y-axis), and OB/GYNs per 1000 births (right y-axis) are shown.

(male physicians account for 95% of all surgeons), the proportion of male physicians choosing surgery as a specialty is also decreasing. With these two factors combined, the total number of surgeons will decrease sharply.

The increase in the number of female physicians is not a phenomenon exclusive to Japan and so the experience and lessons gained from this study can also be applied to other countries. In the United States, it was pointed out over 20 years ago that an increase in the number of female physicians could have a significant impact on the future supply and demand of physicians, as female physicians tend to choose medical specialties different from those chosen by their male counterparts, and many female physicians choose to work only in urban areas [17]. Studies conducted in Nordic countries also suggested that the rate of increase in the number of female surgeons was slow, though the range of medical specialties female physicians tended to choose was growing and the percentage of female surgeons was gradually increasing [18] as the number of female physicians increased. In the United States, the impact of the increase in the number of female physicians on work-family balance and employment status was studied [19]. It was found that female physicians tend to work fewer hours. To compensate, more physicians should be trained and new programs to support medical care should be implemented, particularly in rural areas.

It is necessary that adequate actions be taken for each type of medical specialty to effectively rectify the lack of physicians, especially in fields where male and female physicians are distributed unevenly.

In the current situation, policies designed to influence specialty distribution are rather incentive-based, rather than controlling the supply by limiting the physician number in certain specialties. Japanese Medical Law does not limit medical practices to within their physicians' specialty areas, and no nationally-agreed upper limit has been placed on the number of specialty certification numbers. The Japanese specialty system was developed based

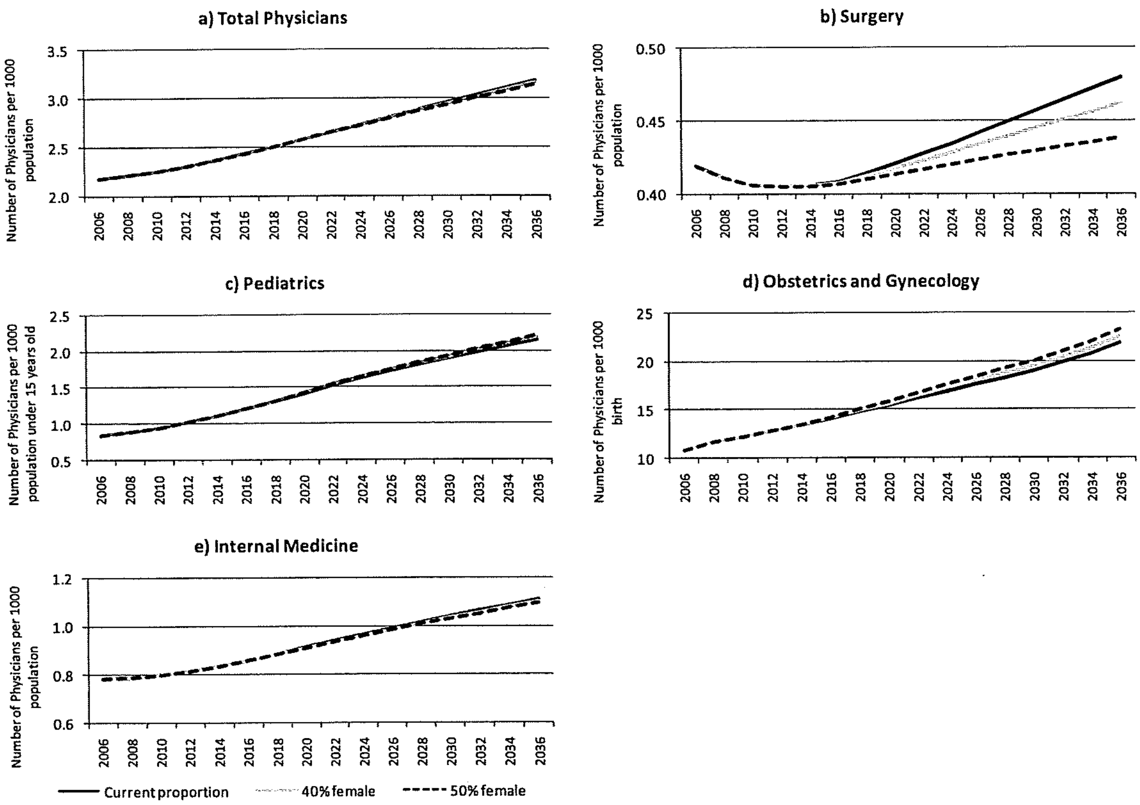

Figure 3
Increase in female physicians and the effect on the number of physicians. Estimates are presented of the number of physicians per target population by selected specialty using three scenarios regarding female physicians: 1) the future percentage of new female physicians remains at the current level; 2) it increases to 40% in 10 years; and 3) it increases to 50% in 10 years. a) The total number of physicians per 1000 population by 2036 is expected to reach around 3.2 for the current level, 3.2 for the 40% female scenario, and 3.14 in the 50% female scenario. The number of b) internists and c) surgeons and per 1000 population are expected to decrease as the percentage of female physicians increases in all three scenarios. The numbers of d) pediatricians per 1000 population under 15 years of age and e) OB/GYNs per 1000 births are expected to increase as the percentage of female physician increases.

on each academic society rather independently. Physicians who have completed their two-year initial post-graduate clinical training and those who seek to become board-certified specialists undergo training in designated hospitals and then take the board examination. Efforts and discussion are still continuing to better coordinate and to establish common ground among different specialties' certification system under the auspices of the Japanese Board of Medical Specialties, which was established in 2002.

With regard to responding to the increase in female physicians, identifying female role models to inspire new female medical students to pursue particular specialties is one possible approach to guide female physicians' career choices. For example, the more female surgeon role models there are, the more female medical students will become interested in surgical practice [20]. Meanwhile, the medical profession has realized that long working hours and unstructured training do not tend to ensure a well-equipped and well-balanced workforce [21]. Improving the work environment to make it more favorable to women could lead to benefits for the whole medical care team, both males and females, and eventually to the establishment of a gender-balanced workplace.

Limitations of this study and areas for future research

Discussed below are some limitations to this study as well as areas for further research, namely: 1) we assumed that the characteristics and status of physicians in the 2004-

2006 period will continue into the future; 2) we calculated the number of physicians as a head count instead of the full-time equivalent (FTE); and 3) primary care and the role of different specialties and gender require further study.

First, our estimation method was based on the assumption that the trends in physicians' choices of medical specialties in 2004-2006 will continue unchanged. Therefore, the accuracy of our medium- and long-term estimates could be affected by the possibility that present career choice patterns may no longer apply as the systems for educating and training physicians undergo significant changes. This assumption also applies for the women's preferences for specialties, in that today's preferences were assumed to continue into the future and stay constant. However, as more female physicians enter medical professions and specialties, their preferences may change.

Second, this study estimated only the number of physicians, not the FTE number. The working patterns of physicians are diverse, due to the introduction of shorter shifts and shift-work systems, but this study could not differentiate the number of physicians in full time and part-time positions. Part-time shift is seen among pediatricians in the United States, where it has been revealed that many female pediatricians tend to seek and obtain part-time work [22]. However, we believe the basic data we were able to obtain through this study is as accurate as possible, since data on the actual working status of physicians is not available. We feel the results of this study can provide useful information for policy debates if the assumptions we set are taken into account.

Third, primary care and the role female physicians should be the focus of further research. The World Health Report 2008 revisited the importance of primary health care and the operation of national health systems. The report pointed out that the world's health systems face three worrisome trends: 1) a disproportionate focus on a narrow range of available specialized treatment and care; 2) a focus on short-term results with fragmented service delivery; and 3) a hands-off or laissez-faire approach to governance [23]. This report provides a useful framework for tackling the related issues in Japan. Possible policy options to deal with inequalities in the distribution of physicians among medical specialties must be considered. There should be a shift away from a narrow focus on specialized care towards making primary care more predominant, so as to achieve comprehensive service delivery. An appropriate level of policy intervention needs to be introduced with close collaboration of the government, the medical community, and civil society. All of these discussions need to be based on available evidence in order to attain the potential positive outcomes.

In many countries, female medical students are more likely to become primary care clinicians [24], and this increase in female physicians will positively affect the primary care field. This phenomenon is not the same in Japan. There is no standard specialty term or professional organization for "general internists" or "family physicians" in Japan [25]. Meanwhile, physicians in office-based practices often do not limit their practice to the specialty in which they were trained [26].

In addition, research on the role of gender in choosing different specialties is not enough to encourage a greater primary care focus. For example, it is considered that many physicians who registered as general internal medicine and pediatrics specialists later become involved in primary care. Thus, it may be deduced that increasing the number of female physicians will result in an increase in general internal medicine practitioners and pediatricians and thus ultimately more physicians practicing primary care. However, in Japan, the gender balance in specialty choices is disproportionate and has a multifaceted influence on primary care physician numbers. Japan's 2006 National Physicians Survey shows that 14.6% of male physicians and 10.1% of female physicians chose pediatrics, and 27.5% of males and 23.3% of females chose general internal medicine, while 2.2% of males and 6.8% of females chose dermatology, and 3.6% of males and 10.1% of females chose ophthalmology. So, if the current preference trends in choice of specialty continue, increasing the female physician proportion does not directly lead to an increase in physicians who provide a primary care oriented practice. Thus, further research on primary care is needed, and the establishment of primary care as a unique medical discipline in Japan is also necessary.

This study presents useful estimates of the supply of physicians by medical specialty, and predictions of the possible impacts of the increased numbers of new physicians and female physicians. With an understanding of the limitations and assumptions of this estimation model, our results may have significant policy implications for other countries faced with similar issues.

Conclusion

This study estimated the future supply of physicians and their distribution among specialties, by focusing on the increase in medical student enrollment capacity and the increase in female physicians, and discussed the policy implications based on these estimates.

The number of physicians per 1000 population is expected to increase in the future due to the skewed age distribution of physicians and the continuing decline in the Japanese population, even if the medical school enrollment capacity remains unchanged from the 2009 level. The number of surgeons and obstetricians could decrease further even if the total number of physicians increases, since the physicians in these fields have recently shown increased intentions to leave their specialty practice, while the number of new physicians who choose these specialties is decreasing.

This study also suggests that the increase in the number of female physicians could impact certain specialties where the percentage of female physicians was originally small, and which both male and female new physicians tend to refrain from choosing. Thus, it is necessary to develop a working environment in these specialties that is favorable to female physicians in terms of gender equality and the effective use of human resources.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
SK conceived of the study and participated in the study design, literature review, data analysis, and manuscript drafting. SM participated in the simulation, data analysis, and manuscript drafting.HI participated in the data cleaning and manuscript drafting. HY, TK, and TI participated in the manuscript drafting. All authors discussed the results, commented on the manuscript, and gave their final approval.

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Postgraduate training and career choices: an analysis of the National Physicians Survey in Japan

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OBJECTIVES This study analyses and discusses recent changes in young Japanese doctors' career paths, in terms of their distribution in different types of facilities and specialties, following changes to the postgraduate clinical training system in 2004.

METHODS Data from the National Survey of Physicians, Dentists and Pharmacists conducted by Japan's Ministry of Health, Labour and Welfare were used for this study.

RESULTS After the introduction of the new postgraduate training system, 2 years of clinical training became mandatory and a doctor-to-facility matching system was introduced. Since then, more young doctors have migrated from academic hospitals to non-academic hospitals. The number of first-year doctors at non-academic hospitals increased, whereas the number at academic hospitals decreased. In terms of the distribution of doctors per specialty, the decreasing tendency of doctors to choose internal medicine and surgery has accelerated. These results illustrate the significant changes that have affected young doctors' career paths since the new system was introduced.

CONCLUSIONS Designing and providing desirable postgraduate clinical training and achieving appropriate doctor distribution are important policy issues. Appropriate policy interventions regarding a mechanism to ensure the appropriate distribution of doctors should be established and attention should be paid to expanding doctors' choices and increasing patient satisfaction and general cost-effectiveness.

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INTRODUCTION

In countries where efforts are made to manage and stabilise the doctor workforce, issues of common concern are: the provision of appropriate postgraduate clinical training programmes, doctors' generalist or specialist career choices,[1,2] and the geographical distribution of doctors.[3–5]

Japan's postgraduate medical education policy has changed several times since World War II. In 1946, the requirement for a 1-year internship for clinical training following graduation from medical school was introduced. At that time, medical licences could only be obtained by completing the internship. In 1969, the internship system was abolished and medical students were required to take a national examination immediately after graduation, after which at least 2 years of postgraduate clinical training was strongly recommended.

At that time, 127 hospitals were designated as clinical training hospitals and half of all medical graduates participated in non-mandatory clinical training. It was also quite common to receive training in a single department. As the non-mandatory programme became more popular, a rotation programme in internal medicine, surgery and emergency medicine was introduced in 1980. Training in paediatrics was added in 1985 and this rotation programme became known as the 'general practice course' or the 'super-rotation system'. In 1999, 87% of medical school graduates participated in non-mandatory clinical training, and 134 academic hospitals and 476 non-academic hospitals offered the programme. Of the participants, 75% were trained at university hospitals or affiliated hospitals and 25% at non-university-affiliated hospitals.[6] A total of 40% of these graduates received single-department training in the hospital affiliated to their university. Very few medical graduates undertook super-rotation training.[7]

In 2004, the 2-year clinical training programme became mandatory. The content of the programme was also revised, the option to study in a single department was eliminated and trainees were required to rotate through all the basic subjects (internal medicine, surgery and emergency medicine) and compulsory secondary subjects (paediatrics, obstetrics and gynaecology, psychiatry and community health). A computer-based system called the Japanese Resident Matching Programme was introduced to coordinate the placement needs of graduating doctors and the requirements of training institutions.

Under this new system, the distribution of young doctors has changed significantly. In 2003, a year before the new system was introduced, 72.5% of licensed doctors in their first year of the clinical training programme (first-year doctors) worked at academic hospitals and 27.5% worked at non-academic hospitals. In 2004, the proportion of those who chose academic hospitals as their first workplace dropped sharply to 55.8%. In 2005, the rate fell to less than half (49.2%).[8] The new clinical training system, together with the increased number of hospitals offering training programmes and participating in the resident matching system, meant that graduating doctors had more choices. In 2001, 610 hospitals including 476 non-academic hospitals offered clinical training programmes. In 2003, when the first group of graduating medical students applied to participate in the new clinical training system, 851 hospitals including 754 non-academic hospitals offered a total of 10 870 resident positions, for which 8283 graduating medical students applied. In 2004, 956 hospitals including 852 non-academic hospitals offered 11 122 resident positions, for which 8566 graduating medical students applied. In these years, the number of resident positions available far exceeded the number of applicants. Therefore, the migration of doctors from academic to non-academic hospitals is not a result of the availability of positions, but can be considered to reflect changes in preference among young doctors.

In addition to the increase in residency choices at non-academic hospitals, other reasons for the shift of new graduates from university to non-academic hospitals are thought to depend on perceptions that the latter offer more attractive career options with higher income levels, more opportunities to independently attend patients with various health conditions, and better coordination with nurses and other health professionals.[9]

In this paper, we analyse and discuss the recent changes affecting young doctors, such as the distribution of types of facilities, the choice of specialties and geographical distribution, using data from the National Survey of Physicians, Dentists and Pharmacists conducted by the Japanese Ministry of Health, Labour and Welfare (MHLW).

Previous studies[10,11] have examined the background to the postgraduate medical education system in Japan and the health policy changes of 2004. The 2006 Survey of Physicians, Dentists and Pharmacists revealed that, under the new system, there was a shift among young doctors into non-academic hospitals.[12]

The Association of Japanese Medical Colleges conducted a survey of doctors after they had completed the 2-year postgraduate clinical training to find out how many of them had returned to work in academic hospitals.[13] The effects of the increase in the number of medical schools and medical students in the 1980s were analysed and showed that the geographical distribution of doctors did not improve.[14] However, to the best of our knowledge, the present study is the first of its kind, in that it presents an analysis and discussion of trends in choice of specialty, and changes in the types of facilities chosen and geographical distribution of doctors on a national scale.

METHODS

Data from the biannual National Survey of Physicians, Dentists and Pharmacists conducted by the MHLW were used for our analysis. Under Japan's Physicians' Law, all doctors are required to report their current work status even if they are no longer practising. The survey was designed as a form of census and the response rate is considered to be quite high. Data collected by the MHLW include the doctor's medical licence number, registration year, specialty area, type of workplace and workplace city code. We obtained permission from the MHLW to use its survey data in conducting our study. The data provided did not contain information that could be used to identify individual doctors.

This National Physicians Survey is carried out using a self-administered questionnaire. Items assessing doctor specialty define 'specialty' as the 'main area of [the doctor's] practice' or 'self-designated specialty'. This means that a doctor's reported specialty is not necessarily the same as that indicated on his or her national or board certificate. It should be noted that in Japan, particularly in office-based practices, doctors do not have to limit their practice to the specialty for which they have been accredited[15] and 'primary care' is not listed as a specialty choice on the questionnaire form.

To assess the distribution of young doctors in academic and non-academic hospitals, the number of doctors in each facility was counted according to their years of experience as licensed doctors. In order to establish which types of facility were chosen by doctors who had completed their 2-year postgraduate clinical training, survey data from the first and third years since each doctor was licensed were paired according to doctor registration numbers. Changes in the type of facility chosen before and after completing the 2-year clinical training programme were tracked for those trained under the new (2004 graduates) and old (2002, 2000 and 1998 graduates) systems.

To analyse changes in doctors' choice of specialty following their 2-year clinical training programme, the numbers of doctors per specialty were counted using data from the 1996, 2004 and 2006 surveys. Doctors were divided into cohorts as follows: the 1994 cohort, which included doctors who registered 10 years before the new system was introduced; the 2002 cohort, which represented the last cohort of doctors who registered before the introduction of the new training system to have been surveyed, and the 2004 registration cohort, which represented the first cohort to be trained under the new system and the source of the latest available survey data. The three cohorts were compared in terms of their career trends.

The total number of doctors and the number of first- and third-year doctors per 100 000 population were calculated for each of the 47 prefectures. (Japan's prefectures are sub-national jurisdictions, which operate similarly to individual states in the USA. Each prefecture consists of multiple municipalities: cities, towns, and villages.) For both the 2002 and 2004 cohorts, regression analyses were conducted, using the total number of doctors per 100 000 population in each prefecture as the dependent variable and the number of first- or third-year doctors per 100 000 population as the independent variable. Change rates were also calculated for each prefecture and each cohort based on the increase or decrease in the number of doctors between their first and third years. The 'stay rate' for each prefecture was calculated as 'the percentage of doctors who continued to work in the same prefecture in their third year as they had in their first year'.

RESULTS

Changes in numbers of doctors per type of medical facility

The percentages of each year's cohort of doctors in academic and non-academic hospitals as a function of their year of training are shown in Fig. 1. The number of medical school graduates has been constant. Beginning with the 2004 cohort, the percentage of first-year doctors training at academic hospitals dropped precipitously from approximately 70% in prior years to 41% in 2004 and 34% in 2006.

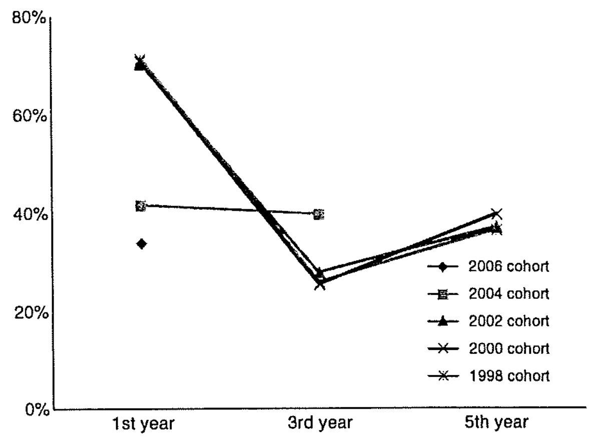

Figure 1 The percentage of doctors at academic hospitals as a function of year of training and cohort

However, for the 2004 cohort, the percentage of doctors training at academic hospitals remained roughly constant at approximately 40% through to the third year in practice, which actually represents a 13% increase over numbers of third-year trainees in prior years.

Before the new clinical training system was introduced, a net outflow from academic to non-academic hospitals was observed between the first and third postgraduate years. The data on changes in type of facility following a doctor's completion of the clinical training programme were analysed to determine the numbers of doctors who remained in the same type of facility, and the inflow, outflow and net flow between types of facilities of first- and third-year doctors.

In 2002, 6866 doctors became licensed. Of these, 4827 started their careers in academic hospitals, but, by their third postgraduate year, only 1511 (31.3%) remained; 3239 had moved to non-academic hospitals and 77 had moved to other areas (clinics and other types of health care facilities). During the same period, 351 postgraduate doctors moved in from non-academic hospitals and 11 migrated from other areas. Therefore, the net outflow of postgraduate trainees from academic hospitals numbered 2888 to non-academic hospitals and 66 to other facilities, which left 1873 third-year postgraduate trainees working in academic hospitals in 2004. The same trends were observed between 1998 and 2000 and between 2000 and 2002.

In 2004, 6715 doctors became licensed. Of these, 2758 started their careers in academic hospitals. By their third year, 1610 (58.4%) of these remained; 1101 had moved to non-academic hospitals and 47 to other facilities. The number of doctors from the same cohort migrating into academic hospitals over the same period amounted to 1024 from non-academic hospitals and six from other facilities. Therefore, the net outflow from academic to non-academic hospitals was 77 (a significant decrease compared with the net outflow for an equivalent period under the previous postgraduate medical education system). The net outflow from academic hospitals to other facilities was 41, which left 2640 doctors working in academic hospitals in 2006.

Trends in specialty choices following the mandatory 2-year postgraduate clinical training

Table 1 shows the changes over time in young doctors' choice of specialties following their 2-year clinical training. There are three patterns of change in choice of specialty defined by increases, decreases or fluctuations in the numbers of doctors choosing that specialty by registration year cohort (the 1994, 2002 and 2004 registration cohorts). Anaesthesiology, dermatology and urology represent the specialties in which numbers of incoming doctors increased, whereas general internal medicine, general surgery, and obstetrics and gynaecology represent the specialties in which numbers of incoming doctors decreased. These tendencies had begun to emerge over 10 years ago and have accelerated since the new clinical training system was introduced.

Geographical distribution of first- and third-year doctors

In order to examine the geographical distribution of doctors following their 2-year clinical training, the workplaces of first- and third-year doctors were tracked for each prefecture. Substantial differences were observed in the proportions of doctors who stayed put, which ranged between 39.6% and 96.0% for doctors who started their postgraduate training in 2002. Rates of change per prefecture ranged between − 48.4% and + 71.1%. Among those who started their postgraduate training in 2004, stay rates in 2006 ranged between 53.8% and 93.3%, and change rates between − 38.5% and + 41.9%.

Figure 2 presents scatterplots showing total numbers of doctors per 100 000 population along the x-axes and numbers of first- or third-year doctors along the y-axes. The higher the total number of doctors per 100 000 population in a prefecture, the more first- or

Table 1 Distribution of specialties after postgraduate training (third-year doctor distribution)

	Registration cohort (survey year)		
	2004 (2006) Total (academic hospitals)	2002 (2004) Total (academic hospitals)	1994 (1996) Total (academic hospitals)
Specialties with increasing numbers of entrants			
Anaesthesiology	7.4% (2.5%)	4.2% (1.7%)	3.8% (1.3%)
Dermatology	6.2% (2.1%)	3.5% (1.9%)	3.1% (1.7%)
Urology	3.9% (1.3%)	2.8% (1.0%)	2.4% (0.6%)
Other specialties	9.3% (3.0%)	5.8% (2.5%)	4.7% (2.6%)
Specialties with declining numbers of entrants			
General Internal Medicine	15.9% (4.4%)	20.9% (4.0%)	24.7% (4.5%)
General Surgery	7.7% (1.8%)	8.9% (1.1%)	11.6% (1.7%)
Obstetrics and Gynaecology	3.2% (1.4%)	4.1% (1.1%)	4.4% (1.4%)
Other patterns			
Subspecialties of Internal Medicine	11.7% (4.0%)	13.3% (3.4%)	10.2% (2.7%)
Subspecialties of Surgery	10.1% (4.4%)	13.5% (3.3%)	12.6% (2.8%)
Psychiatry	4.1% (2.0%)	5.6% (2.1%)	4.9% (1.6%)
Paediatrics	5.5% (1.8%)	7.0% (1.4%)	5.3% (1.2%)
Ophthalmology	6.5% (2.2%)	4.7% (1.8%)	5.6% (2.0%)
Otorhinolaryngology	3.9% (1.3%)	3.3% (1.4%)	3.5% (1.3%
Radiology	4.4% (1.5%)	2.4% (1.0%)	3.1% (1.1%)
Total	100% (33.8%)	100% (27.6%)	100% (26.5%)
Number reported	8283 (2796)	7432 (2049)	7471 (1983)

* Percentages are of the total number of doctors in each respective year

third-year doctors per 100 000 population were observed. For first-year doctors, the slope of the fitted curve lessens from 0.041 for the 2002 cohort to 0.028 for the 2004 cohort. For third-year doctors, the slope of the fitted curve increases from 0.021 for the 2002 cohort to 0.027 for the 2004 cohort. R-squares for the analysis are 0.556, 0.425, 0.338 and 0.450, respectively.

DISCUSSION

Japan is a country with universal health insurance coverage. Since 1961, all residents of Japan have been required to participate in any one of the social health care insurance systems, depending on their type of work. The country's total health care expenditures are low in terms of percentage of gross domestic product. Numbers of doctors, at 2.1 doctors per 1000 population and 6.0 medical graduates per 100 000 population, were among the lowest in Organization of Economic Cooperation and Development (OECD) countries in 2006, whereas the number of hospital beds was the highest (Table 2). The average monthly salary of an employed hospital doctor is US$7876 (US$7241 in national hospitals, US$8155 in other public hospitals, US$9763 in health care corporations and US$8963 in clinics).[16] These data on the Japanese health care system provide a background against which to discuss the shift in doctor distribution and its implications, presented in the following section.

The migration of young doctors from academic to non-academic hospitals and the mechanism of distribution

The results of this study show that under the new system, a doctor can choose the type of facility in which to receive his or her clinical training, and there was a shift in the number of doctors choosing to train in non-academic hospitals.

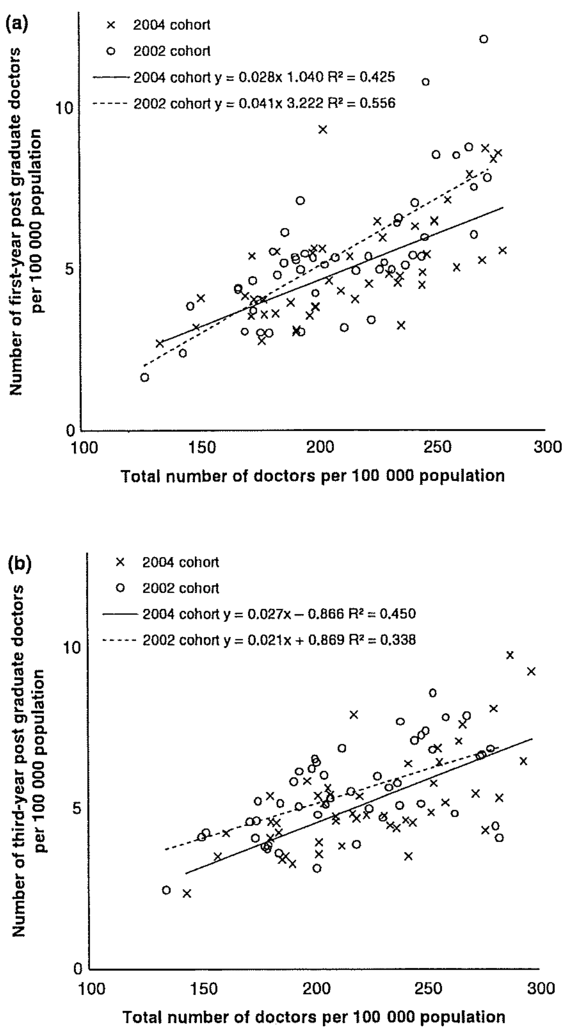

Figure 2 Total doctor density compared with (a) first- and (b) third-year doctor density per 100 000 population in the 47 prefectures

These changes mean that the role of the academic hospital in the mechanism of distribution of Japanese doctors has greater impact and thus deserves some examination. Academic hospitals have long functioned as a mechanism for the redistribution and career control of doctors and have been regarded as operating a binding system of apprenticeship (the *ikyoku-koza*, or 'clinical department' system), based on a strict hierarchy.[17,18] Traditionally, the great majority of newly licensed doctors entered training programmes designed and implemented by the clinical department of their medical school.[19] The department assigned postgraduate trainees to affiliated hospitals. In this regard, it functioned as a control centre that maintained a balanced distribution of doctors and determined their postgraduate education locations. By allowing academic hospitals to control the distribution of doctors, this system enabled other medical facilities, including non-academic hospitals, to easily hire a consistent number of doctors and allowed young doctors to find employment without the need for extensive job hunting.[20]

By opening more clinical training placement opportunities to coordinate with the placement matching system, non-academic hospitals attracted many new applicants in the first year of the new system. However, the career paths these young doctors will follow are, as yet, unknown. The number of positions for doctors in academic and non-academic hospitals will not change dramatically in the short term. Thus the career choices of this large cohort of doctors who started their careers in non-academic hospitals, outside academic hospital control, will become an important health policy issue. Whereas university hospitals had the power to distribute doctors in the past, the fact that they now tend to lose first-year doctors and attract more third-year doctors might potentially change the balance of power and bring about a fundamental change in the process of career development and in doctors' career paths. As the distribution role formerly occupied by academic hospitals needs to be filled, determining a new mechanism for doctor distribution must be the next item on the government's medical system management agenda. However, as the new system was only introduced in 2004 and the most recent available data refer to 2006, only 1 or 2 years after its introduction, it is difficult to evaluate the related long-term effects.

It is possible that academic hospitals will re-emerge to fill this space. If doctors complete their clinical training at non-academic hospitals but cannot find subsequent employment at such hospitals, they are most likely to move to academic hospitals. This would allow academic hospitals to re-strengthen their role in the distribution mechanism. Another possible scenario would involve a new intervention mechanism whereby public, private or insurance-related stakeholders would act as the mechanism of distribution, or doctors themselves would manage their own distribution. These options should be considered according to their individual merits. In any case, the future doctor distribution mechanism will be quite different to that in force prior to the 2004 changes in the system. Policymakers should carefully monitor the needs of patients, health care providers and young doctors in order to establish

Table 2 Number of doctors and hospital beds in G7 countries in 2006

Country	Practising doctors/ 1000 population (HC)	Medical graduates/ 100 000 population	Total hospital beds/ 1000 population	Total expenditure on health, % GDP
Canada	2.1†	6.0	3.4*	10.0
France	3.4*	5.5	7.2	11.1
Germany	3.5	–	8.3	10.6
Italy	3.7	10.5	4.0	9.0
Japan	2.1	6.0	14.0	8.2*
UK	2.5	9.2	3.6	8.4
USA	2.4	6.2*	3.2	15.3

* Data for 2004; † data for 2005
Source: OECD Health Data 2008[29]
HC = head counts; GDP = gross domestic product

efficient and effective health care human resource policies.

Changes in choice of specialty among doctors

Our results showed that shifts in the distribution of doctors among specialties accelerated following the introduction of Japan's new health policy in 2004. In addition, the numbers of postgraduates entering primary care-oriented specialties, such as general internal medicine, general surgery, and obstetrics and gynaecology, have decreased. Certain doctor shortages in specialties such as paediatrics, as well as obstetrics and gynaecology, are reportedly contributing to a crisis that undermines the Japanese health care system. Among the reasons for this are a reduced percentage of obstetricians and gynaecologists in practice in rural areas, a lower intake of newly registered obstetricians and gynaecologists, and a migration of doctors from obstetrics and gynaecology to internal medicine.[21]

The declining popularity of general practice could have a noticeable impact on the distribution of health care delivery. Preferences regarding work content, type of patients and lifestyle options play a key role in a doctor's choice of specialty.[22] In addition, the changing gender balance, increasing options for part-time work,[23] and a migration of doctors from hospitals to clinics[24] will further affect the distribution of the health care workforce. As the Physicians Survey does not directly ask doctors why they chose their particular specialty, further research is needed to identify these reasons and to discuss the policy implications, including possibilities for controlling the number of seats available for clinical training in certain specialties or for providing incentives to practise in certain specialties.

Geographical distribution of doctors

Our results showed that, for the 2004 cohort:

1 the difference between the highest and lowest concentrations of first-year doctors per 100 000 population among the 47 prefectures was narrower than that for the 2002 cohort;
2 the proportions of doctors who stayed in their original prefecture between their first and third years of postgraduate training increased over those for the 2002 cohort, and
3 although more doctors tended to gather in locations where there were already high numbers of doctors per population, the slope of the fitted curve for first-year doctors per 100 000 population was gentler than that for the 2002 cohort.

However, the above data suggest that the unequal distribution of first-year doctors at the prefecture level has been alleviated. The distribution of doctors in academic and non-academic hospitals has also changed. However, the distribution of more experienced doctors, such as those in their third postgraduate year, has not improved, as the tendency for third-year residents to settle in more populated regions increased by approximately 28% (0.021–0.027) in 2006 compared with 2004. This tendency needs to be studied further to determine whether it is a temporary effect in the transition period or if it is a trend that will continue in the future. Furthermore, as the most recent survey data available refer to 2006, which is just 2 years after the new system was introduced, a longer time period is needed to evaluate the effect of the introduction of the new system. Therefore, further study should be carried out when the next set of survey data is available.

Under the new system, doctors must be exposed to community medicine experience. Undergraduate exposure to rural practice and multi-specialty rotations during postgraduate education have previously been found to be positively correlated to the choosing of a rurally based career, whereas affiliation with a medical school department was negatively correlated with the intention to pursue a rural career.[25] Thus, attention should be paid to the future distribution of doctors by region. Although specialty choices tend to be based on each doctor's own interests and aptitudes,[26] a key to successful distribution lies in determining how to make rural practice attractive to new doctors.

Health policymakers need to foster interventions to address the disproportionate geographical distribution of doctors. Medical schools with selective admission policies designed for preparing rural doctors have been quite successful.[27,28] In addition to these attempts, establishing new policies involving strategies such as the introduction of an allocation mechanism with objective criteria or the offering of greater incentives through a reimbursement scheme or subsidies from government should be discussed.

CONCLUSIONS

Since the introduction of Japan's new postgraduate clinical training system in 2004, more young doctors have migrated from academic to non-academic hospitals. Meanwhile, some specialties have attracted an increased number of young doctors, whereas others have seen the reverse effect. The geographical distribution of first-year doctors in each prefecture has become slightly more balanced in the wake of the new system. In the face of these changes, a new mechanism for distributing doctors across workplaces needs to be considered. Such a distribution mechanism should address issues relating to the expanding of doctors' choices and increasing patient satisfaction and cost-effectiveness.

Contributors: SK and TI jointly conceived and designed this study. All authors jointly analysed and interpreted the data. HI conducted data cleaning. SK and HI conducted the literature review. SK drafted the article and HI, HY, TK, SM and TI jointly contributed to its critical revision. Specifically, TI and SM made extensive contributions to the statistical analysis, HI to discussing doctors' career paths, HY to the health policy context, and TK to discussing female doctors and career paths. All authors approved the final manuscript for publication.

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The distribution and transitions of physicians in Japan: a 1974–2004 retrospective cohort study

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Abstract

Background: In Japan, physicians freely choose their specialty and workplace, because to date there is no management system to ensure a balanced distribution of physicians. Physicians in Japan start their careers in hospitals, then become specialists, and then gradually leave hospitals to work in private clinics and take on primary care roles in their specialty fields. The present study aimed to analyse national trends in the distribution and career transitions of physicians among types of facilities and specialties over a 30-year period.

Methods: We obtained an electronic file containing physician registration data from the Survey of Physicians, Dentists and Pharmacists. Descriptive statistics and data on movement between facilities (hospitals and clinics) for all physicians from 1974, 1984, 1994 and 2004 were analysed. Descriptive statistics for the groups of physicians who graduated in 1970, 1980 and 1990 were also analysed, and we examined these groups over time to evaluate their changes of occupation and specialty.

Results: The number of physicians per 100 000 population was 113 in 1974, and rose to 212 by 2004. The number of physicians working in hospitals increased more than threefold. In Japan, while almost all physicians choose hospital-based positions at the beginning of their career, around 20% of physicians withdrew from hospitals within 10 years, and this trend of leaving hospitals was similar among generations. Physicians who graduated in 1980 and registered in general surgery, cardiovascular surgery or paediatric surgery were 10 times more likely to change their specialty, compared with those who registered in internal medicine. More than half of the physicians who registered in 1970 had changed their specialties within a period of 30 years.

Conclusion: The government should focus primarily on changing the physician fee schedule, with careful consideration of the balance between office-based physicians and hospital-based physicians and among specialties. To implement effective policies in managing health care human resources, policy-makers should also pay attention to continuously monitoring physicians' practising status and career motivations; and national consensus is needed regarding the number of physicians required in each type of facility and specialty as well as region.

Background

A balanced health workforce is a key factor in strengthening health care systems. Policy-makers should aim to "get the right workers with the right skills in the right place doing the right things" [1]. The geographical distribution of physicians in several developed countries has been analysed in previous studies [2-4]. However, more studies are needed in order to implement effective human resource policies [5].

In Japan, in making their career choices, physicians generally consider the combined factors of specialty and working facility. Almost all newly-graduated Japanese physicians become hospital-based physicians (HP), who are employed as full-time workers by hospitals; there they are given training to become specialists. After working for several years, these physicians may resign from their hospital positions and become self-employed, office-based physicians (OP). In this regard, OPs are not originally trained as general practitioners.

OPs see only primary care patients in their private offices. They generally see patients with diseases and symptoms that fall within their specialty area. There are few primary care physicians who have been trained like those in the United Kingdom, where primary care is recognized as a specialty, and primary care physicians (general practitioners) are trained through a system that covers all primary care fields. In addition, Japan does not have a compulsory distribution system to balance the supply of physicians around the country [3]. Since the late 1980s, administrative regulation has prohibited the establishment of new hospitals, but the establishment of new clinics and the selection of specialties are carried out according to individual physicians' preferences.

However, Japan is now facing a maldistribution of physicians between hospitals and private clinics [6,7]. Studies that elucidate the dynamics of physicians' career choices among specialties and facilities are needed as a basis for instituting appropriate human resource policies. Such studies can also be applicable in countries facing a similar situation to Japan's, where physicians are allowed to move and work freely and do not have a strict specialty certification system.

In Japan, the official survey of physician registration is the Survey of Physicians, Dentists and Pharmacists (SPDP), conducted once every two years. Through this survey, all physicians are legally obliged to report their employment status, including their workplace and position, to the Ministry of Health, Labour and Welfare (MHLW). For our study, we used this retrospective data to analyse national trends in the distribution and employment transitions of physicians over a recent 30-year period.

Methods

Data collection

We obtained from the MHLW an electronic file containing all the data from the SPDP from 1972 to 2004. The items reported in the SPDP include year of registration, medical license registration number, year of birth, gender, workplace address, and occupation type and specialty. The data did not include any personal information by which an individual could be identified. Japan's Privacy Act defines personal information as any information that any other entities can use to identify a person or can use to do so in combination with other sources of information.

For the present study, we organized the longitudinal data for all physicians by retrieving their unique registration numbers, which are given sequentially to all physicians who pass the national examination. Then we performed data cleansing to make the collection of data complete, and in total 4 024 916 items of data (for 374 804 physicians) were obtained. The notification rate for each implementation of the SPDP was approximately 90% [8].

Descriptive statistics

From the survey data for 1974, 1984, 1994 and 2004, we determined the total numbers of all physicians surveyed, along with the numbers of physicians per 100 000 population, the percentages of physicians working at hospitals, the percentages of female physicians, the percentages of physicians working in rural areas and the average ages of physicians. The national population in these years was obtained by referring to the Japan Population Census and the Population Estimate.

The group of physicians who graduated in 1970 was defined as the class of 1970. The same was done for the class of 1980 and of 1990. Some statistics, as outlined below, were calculated starting from the physicians' fifth year of experience.

In examining some career aspects, it is appropriate to analyse physicians' choices from the time when they became certified in a specialty, because years of practice and case experience are necessary before physicians can become certified. However, the SPDP does not record specialty certification status, and physicians are allowed to present themselves as specialists in any field, even more than one field, according to the Physicians Law, on the sole condition that they have an active license. In our assessment of certification status, we examined physicians' career behavior from their fifth year of practice because we assumed that they had chosen their specialties by that time.

For each of the three graduating classes, we calculated the number of physicians in their fifth year of experience, percentage of female physicians in their fifth year of experience, average age at first registration, percentage of physicians working in a specialty and medical facility in their fifth year of experience, average lifetime frequency of specialty changes since their fifth year of experience, and percentage of physicians changing specialties more than once. A comparison of average values between two classes was performed by means of a t-test, and a comparison of rates between two classes was performed by means of a Chi-square test.

Analysis of movement from hospital-based to office-based practice

The numbers of physicians registered as HPs in 1974, 1984, 1994 and 2004 were defined as N1, N2, N3 and N4, respectively. In N1, the number of HPs who withdrew from hospital work between 1975 and 1984 was defined as R1, and the number of HPs who remained in hospital work during that period was defined as C1. The number of new graduates who began to work in hospitals between 1975 and 1984 was defined as P1. In the same way, between 1984 and 1993, and 1994 and 2003, the numbers of HPs who withdrew from hospital work were defined as R2 and R3, respectively; the numbers of HPs who remained in hospital work were defined as C2 and C3, respectively; and the numbers of physicians who began to work in hospitals were defined as P2 and P3, respectively.

$$N1 = R1 + C1, N2 = C1 + P1$$

$$N2 = R2 + C2, N3 = C2 + P2$$

$$N3 = R3 + C3, N4 = C3 + P3$$

The number of physicians registered as OPs in 1974, 1984, 1994 and 2004 were defined as n1, n2, n3 and n4, respectively. In n1, the number of those who retired as OPs between 1975 and 1984 was defined as r1, and the number of those who continued as OPs during that period was defined as c1. The number of those who newly started work as OPs between 1975 and 1984 was defined as p1. In the same way, r2, r3, c2, c3, p2 and p3 were defined.

$$n1 = r1 + c1, n2 = c1 + p1$$

$$n2 = r2 + c2, n3 = c2 + p2$$

$$n3 = r3 + c3, n4 = c3 + p3$$

These variables were identified to analyze the career movement of HPs and OPs.

Follow-up research on leaving rates of HPs

For each of the classes of 1970, 1980 and 1990, physicians who worked in hospitals in their fifth year of experience were defined, and the numbers of those who later withdrew from hospital work were noted. A log-rank test was used to compare differences in leaving rates.

Evaluation of the factors influencing specialty changes

For each of the classes of 1970, 1980 and 1990, a multivariate logistic regression analysis was performed to elucidate the factors influencing specialty changes. (If a physician changed his/her specialty after his/her fifth year of experience, the value of the dependent variable was 1.) The independent variables were gender, age at first registration, specialty in their fifth year of experience, working area (urban, rural and intermediate areas) in their fifth year of experience and work facility in their fifth year of experience. All statistical analyses were performed by means of the statistical software SPSS, version 13.0 (SPSS, Chicago, United States). A *p*-value of less than 0.05 was considered to be significant.

Results

Descriptive statistics

The total number of physicians doubled during the 30-year study period. Table 1 shows the descriptive data for each measure from 1974, 1984, 1994 and 2004. The number of physicians per 100 000 population was 113 in 1974; by 2004 this had risen to 212, indicating an increase of 87%. Compared with 1974, the percentage of physicians working in rural areas (11%) decreased by 2004, although the actual number of physicians working in those areas substantially increased. The percentage of female physicians (17%) increased significantly ($p < 0.01$).

In 2004, the average age of OPs was 57.5 years, which was significantly higher than that of HPs (42.0 years) ($p < 0.01$). The number of physicians in hospitals as well as those in clinics increased during the study period. However, the proportion of physicians working in hospitals rose to 63% by 2004 from 43% in 1974 (Table 1).

The average ages at first registration for the classes of 1970, 1980 and 1990 were 26.3, 26.7 and 26.7, respectively, indicating that the latter two were significantly higher than the former ($p < 0.01$). In all the classes, over 90% of physicians worked in hospitals in their fifth year of experience. The average frequencies of specialty changes for the classes of 1970, 1980 and 1990 were 1.5, 0.8 and 0.4, respectively. Among the class of 1970, 53% of physicians changed their specialty more than once during the course of their career (Table 2).

Table 1: Descriptive statistics

		1974	1984	1994	2004
Number of physicians	Total	125 249	178 197	227 775	270 353
	Hospitals	54 005	100 018	142 309	170 386
	Clinics	65 099	70 662	76 596	92 982
Number per 100 000 population		113	148	182	212
Working at hospitals (%)		43	56	62	63
Female (%)		9	10	13	17
Working in rural areas (%)		14	14	13	11
Average age (± SD)	Total	47.6 (14.0)	46.9 (14.9)	46.7 (15.4)	47.8 (15.2)
	Hospital-based physicians	40.4 (14.5)	39.4 (12.5)	40.2 (13.2)	42.0 (12.6)
	Office-based physicians	53.2 (10.4)	57.0 (11.2)	58.1 (12.3)	57.5 (13.8)

Analysis of the movement of HPs and OPs

Figure 1 shows the trends in the numbers of HPs and OPs. The number of HPs increased more than threefold between 1974 and 2004, and exceeded the number of OPs during 1974 and 1984. Even though the total numbers of HPs (N1, N2, N3 and N4) changed, the percentages of physicians who withdrew from hospitals remained stable (36%).

Follow-up research on leaving rates of HPs

Figure 2 shows the cumulative rates of HPs who withdrew from hospital work in each of the classes of 1970, 1980 and 1990. The numbers of HPsin the classes of 1970, 1980 and 1990 were 2450, 5862 and 6573, respectively. Among the class of 1970, 57% of physicians who worked at hospitals in their fifth year of experience left their hospital positions within 30 years. While a log rank test showed a statistically significant difference in leaving rates of HPs among the classes ($p < 0.01$), around 20% (19% to 22%) of all physicians withdrew from hospital work within 10 years, and the trends in leaving rates were similar between the classes.

Table 2: Descriptive statistics of the classes of 1970, 1980 and 1990

		Class of 1970	Class of 1980	Class of 1990
Number of physicians in their fifth year of experience		2706	6326	6994
Females in their fifth year of experience (%)		9	11	18
Average age at first registration (± SD)		26.3 (2.2)	26.7 (2.7)	26.7 (2.7)
Work facility in their fifth year of experience (%)	Clinics	5	4	3
	Hospitals	91	93	94
	Others	4	4	3
Average frequency of lifetime specialty changes (± SD)		1.5 (2.0)	0.8 (1.3)	0.4 (0.8)
Percentage of physicians changing specialties more than once (%)		53	38	27