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 experi-

ence, 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

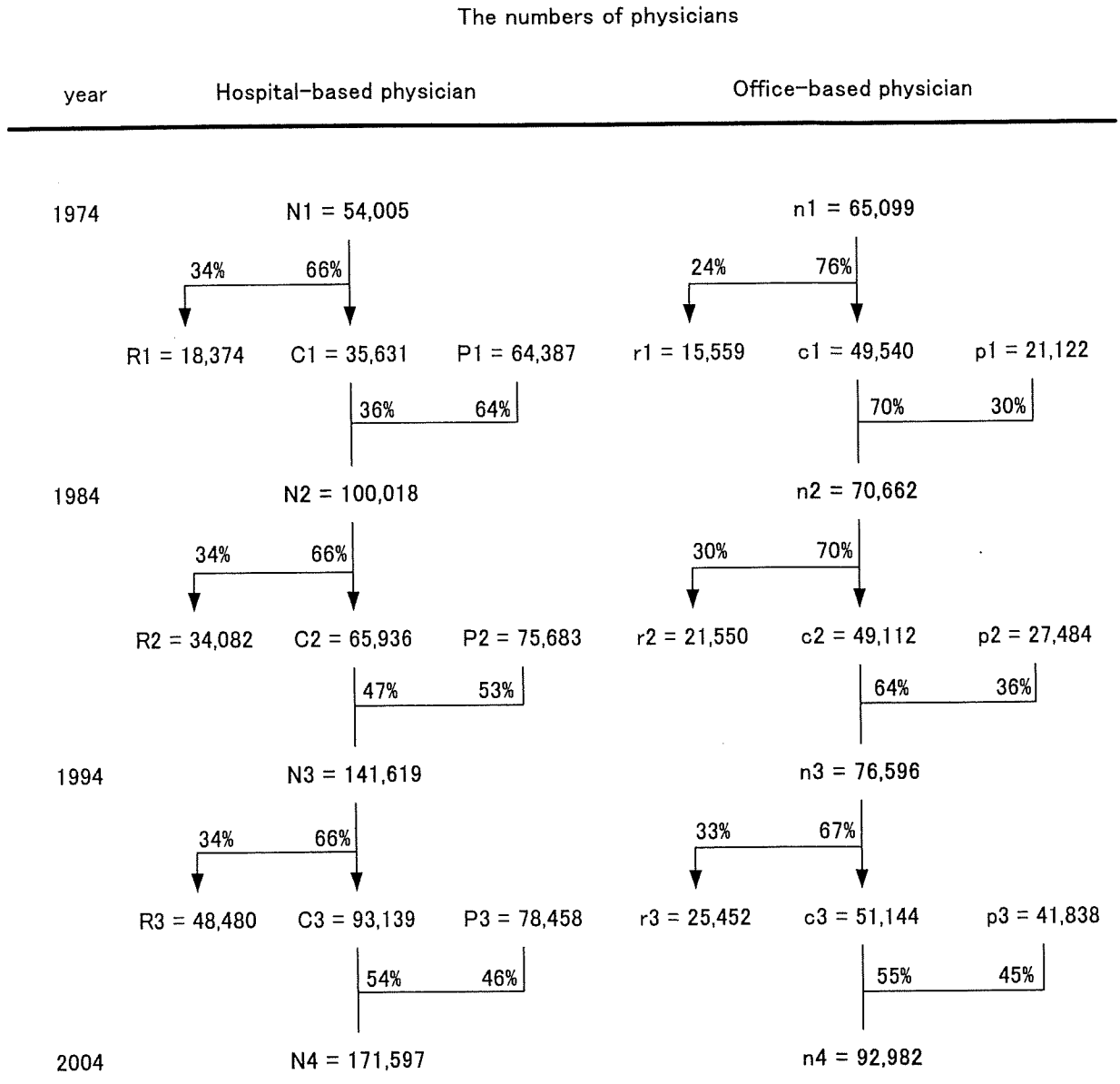

Figure 1
The career movement of hospital-based and office-based physicians. N1, the number of physicians working in hospitals in 1974; N2, the number in 1984; N3, the number in 1994; N4, the number in 2004. R1, the number of physicians who withdrew from hospitals between 1975 and 1984; R2, between 1985 and 1994; R3, between 1995 and 2004. C1, the number of physicians who remained working in hospitals from 1974; C2, from 1984; C3, from 1994. P1, the number of new physicians who began to work in hospitals between 1975 and 1984; F2, the number between 1985 and 1994; F3, the number between 1995 and 2004. n1, the number of physicians working in clinics in 1974; n2, the number in 1984; n3, the number in 1994; n4, the number in 2004. r1, the number of physicians who retired as office-based physicians between 1975 and 1984; r2, between 1985 and 1994; r3, between 1995 and 2004. c1, the number of physicians who continued as office-based physicians from 1974; c2, from 1984; c3, from 1994. p1, the number of new physicians who began to work as office-based physicians between 1975 and 1984; p2, the number between 1985 and 1994; p3, the number between 1995 and 2004.

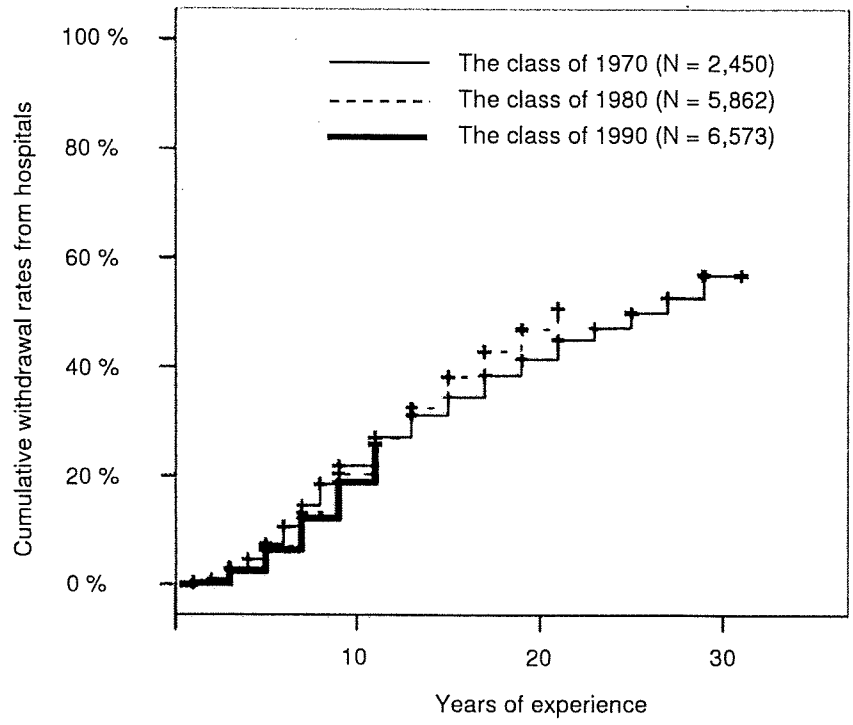

Figure 2
Cumulative withdrawal rates of hospital-based physicians from hospital.

Evaluation of the frequency of and factors influencing specialty changes

Among the class of 1980, physicians who registered their specialty as general surgery (odds ratio (OR, 7.2), cardiovascular surgery (OR, 11.6), or paediatric surgery (OR, 11.3) had a higher OR for changing their specialty, compared with those who registered in internal medicine (base category). On the other hand, physicians who registered their specialties as ophthalmology (OR, 0.4) or otolaryngology (OR, 0.6) showed a lower OR compared with those in internal medicine (Table 3). Female physicians were 1.3 to 1.5 times more likely to change their specialty. The age at first registration and working area (except, among the class of 1970, those in intermediate areas) did not predict physicians' specialty changes.

Discussion

Transitions in the physician workforce

The total number of physicians in Japan dramatically increased between 1974 and 2004. In particular, the number of HPs increased more than threefold by 2004, and the ratio of HPs to OPs was reversed compared with that of 1974. One factor influencing the dynamics of physicians in Japan is that the number of students enrolling in medical schools doubled during the 1970s. The number of hospitals also increased until 1986, when the government placed restrictions on the establishment of new hospitals. Additionally, the increase in the ratio of HPs to OPs suggests that Japan's health care system, in terms of its physician workforce, has shifted its focus from primary care to specialty care over this recent 30-year period.

Why do physicians change workplaces?

Even though the number and percentage of HPs rose, our results show that the rates of career movement from hospitals (specialty care) to clinics (primary care) have generally been stable for many years.

Two alternative reasons for physicians' career changes can be considered. First, salary considerations may motivate HPs to leave hospital work. HP salaries are relatively low, compared with OP salaries. As of 2008, although there were 8807 hospitals (employing about two thirds of all physicians) and 99 581 clinics with fewer than 20 inpatient beds in Japan, hospitals provide around one third of

Table 3: Results of the logistic regression analysis for specialty changes in the classes of 1970, 1980 and 1990

		Odds ratios (95% confidence interval)		
		Class of 1970 N = 2,706	Class of 1980 N = 6,326	Class of 1990 N = 6,994
Sex (base category; men)		1.5 (1.3 – 1.7)	1.4 (1.3 – 1.5)*	1.3 (1.2 – 1.4)*
Age at first registration		ns	ns	ns
Specialty	Paediatrics	1.8 (1.6 – 2.0)*	2.1 (2.0 – 2.2)*	ns
(base category; internal medicine)	General surgery	11.2 (11.1 – 11.3)*	7.2 (7.1 – 7.3)*	3.7 (3.6 – 3.8)*
	Neurosurgery	3.9 (3.6 – 4.2)*	2.5 (2.3 – 2.7)*	ns
	Respiratory surgery		na	17.1 (16.6 – 17.6)*
	Cardiovascular surgery		11.6 (11.2 – 12.0)*	5.6 (5.4 – 5.8)*
	Paediatric surgery		11.3 (10.7 – 11.9)*	8.3 (7.7 – 8.9)*
	Orthopaedics	1.8 (1.7 – 1.9)*	1.4 (1.3 – 1.5)*	ns
	Plastic surgery		3.9 (3.6 – 4.2)*	ns
	Obstetrics and gynaecology	ns	ns	0.3 (0.1 – 0.5)*
	Ophthalmology	ns	0.4 (0.2 – 0.6)*	0.2 (0.0 – 0.4)*
	Otolaryngology	0.5 (0.2 – 0.8)	0.6 (0.4 – 0.8)*	0.4 (0.2 – 0.6)*
	Dermatology	ns	ns	0.6 (0.4 – 0.8)
	Urology	ns	2.0 (1.8 – 2.2)*	ns
	Rehabilitation			7.9 (7.2 – 8.6)*
	Radiology	10.7 (10.3 – 11.1)*	4.8 (4.6 – 5.0)*	1.8 (1.6 – 2)*
	Anaesthesiology	8.0 (7.6 – 8.4)*	2.9 (2.8 – 3.0)*	1.7 (1.6 – 1.8)*
	Psychiatrics	2.7 (2.5 – 2.9)*	1.6 (1.5 – 1.7)*	1.1 (1.0 – 1.2)
	Others	69.4 (68.4 – 70.4)*	19.6 (19.3 – 19.9)*	13.9 (13.7 – 14.1)*
Working area	Intermediate area	0.8 (0.7 – 0.9)	ns	ns
(base category; urban area)	Rural area	ns	ns	ns
Work facility	Hospitals	0.7 (0.5 – 0.9)	0.6 (0.5 – 0.7)*	0.5 (0.3 – 0.7)*
(base category; clinics)	Others	0.1 (-1.0 – 1.2)	0.1 (-0.3 – 0.5)*	0.3 (0.0 – 0.6)*

* $p < 0.01$
ns: not significant; na: not available
R2 for the analyses of the classes of 1970, 1980 and 1990 were 0.24, 019 and 0.17, respectively.

all outpatient services and 94% of inpatient services [9,10]. This indicates that the separate roles of hospitals and clinics are not well defined in the Japanese health care system, and that a substantial responsibility of hospitals is to provide outpatient care. Regarding the difference in income between OPs and HPs, this situation has a historical context, and thus it is politically difficult to work towards a salary balance between OPs and HPs [11,12]. Recently, much effort and many opinions have been directed at working towards a balance, but the actual fee schedule has not yet been modified.

Second, as a physician gets older and feels the burden of long hours and being on call, he/she may choose to leave the hospitals and begin to work as a primary care physician in a private office. In hospitals, physicians are usually required to perform operations and invasive examinations. Such intensive job burdens can affect physicians' willingness to continue working. Although previous studies have showed that physicians' intentions to leave differ among specialties, physicians working in high-risk specialties are less satisfied [13,14] and more inclined to change jobs [15].

In Japan, HPs' working conditions, in terms of working hours, job stress and risk of lawsuits, are generally more intense than those of OPs. Therefore, as HPs age, more of them gradually decide to leave hospitals, and this behaviour does not change with the generation. However, a recent estimate showed that the number of OPs will increase by 37.6% from 2004 to 2016 [16]. Physicians' career behaviour has been relatively stable in the Japanese system, but new factors may gradually cause it to change. For example, the increase in female physicians, a general preference for a more controllable lifestyle [17,18] and other generation/cohort effects may be found to be influential.

Contrarily, older physicians can continue to practise longer in the Japanese system, and many continue until they are in their 70s. A probable reason for this is that older physicians working as OPs can attend to outpatients without having to engage in heavier aspects of hospital practice such as invasive examinations, operations and night shifts. Moreover, the monetary incentive resulting from the skewed fee schedule (between hospital and office practices), which is favourable for OPs, encourages them to remain in practice longer.

Why do physicians leave high-workload specialties?

According to our results, the range of available specialist physicians in Japan is threatened. Among the class of 1970, physicians changed their specialty an average of 1.5 times after more than 30 years of experience, with 53% of physicians changing at least once. In addition to this, physicians who initially registered in high-workload specialties such as general surgery, cardiovascular surgery or paediatric surgery were about 10 times more likely to change their specialty, compared with those who registered for internal medicine. Thus the experience and skills of specialty physicians in Japan may be lacking, and this could affect the health status of the public. However, many indices show that Japanese people's current health status is better than that of citizens of many other countries [19,20].

The difference in the fee schedule between different specialties is probably another reason for inter-specialty changes. The charges for operations are not so high under the uniform fee schedule in Japan that hospitals can pay enough salary for surgeons. If more physicians are required in heavy workload specialties such as surgery, financial incentives for practising in such specialties should be offered.

Although providing financial incentives for surgeons is considered to be an essential way to solve these problems, we should carefully consider the potential side effects. In Japan, the government can neither allocate more of its budget to health care nor increase taxes and health insurance premiums. Japan is a country where tax and social insurance rates for income are the lowest among OECD countries [21]. However, the public may not accept an increase to these rates. Thus, setting higher fees for specialists working in high-workload fields requires changes in budget allocations, shifting focus from low-workload to high-workload specialties.

Meanwhile, it is likely that physicians' career behaviours will generally reverse direction as a result of such reallocations. For example, the United States is an example of a country where fees for primary care physicians are low [22]. This fact is not only a problem for current primary care physicians but also a reason why new medical graduates tend not to choose primary care as their specialty [23,24]. A radical fee allocation change in Japan could create the same type of situation.

Meanwhile, it should also be considered why the high rates of physicians leaving high-workload specialties have not harmed the general health status in Japan. First, it may be that the number of physicians has a weak relationship with general health status, although this is still unconfirmed [25]. Second, the number of specialists in Japan is not controlled from the beginning of specialists' training, so there are many more practising specialists than are actually needed. And a rather preferable tendency may be occurring: less competitive specialists leaving their positions. As supporting evidence for this trend, the Japanese Society for Cardiovascular Surgery recently decided that physicians applying to be certified as cardiovascular surgeons must have previously practised in hospitals where there is a minimum number of cardiovascular operations [26], and this may indirectly affect the number of physicians applying for work in cardiovascular surgery.

Possible impact of changes in initial clinical training system

Japan introduced a new clinical training system in 2004, and this will probably affect physicians' career choices in the future. Before 2004, most new physicians had their initial clinical training at academic hospitals. The curriculum was planned by each academic hospital, with an emphasis on specialty care but not primary care. This was one of the reasons why the government significantly changed the clinical training system in 2004.

Under the new system, physicians are required to experience a clinical rotation in the fields of general internal medicine, general surgery, emergency medicine, paediatrics, obstetrics and gynecology, psychiatry and community medicine [27,28]. When they finish this general postgraduate training, they are allowed to begin specialized training.

Previous to this system change, 55% of new physicians began their careers at non-academic hospitals, and in 2004, 40% began their careers at academic hospitals [16]. Although it is difficult to predict the results of this fundamental change in the clinical training system, its impact will possibly be larger than that of a change in the fee schedule.

Study limitations

This study has some limitations. First, our data did not directly elucidate physicians' motives in making career decisions, because the SPDP in Japan does not ask physicians about their reasons for changing workplaces, occupations or specialties. In comparison, the American Medical Association Physician Masterfile has more detailed information [29].

In addition to a basic physician tracking system, it would be helpful to policy-makers who are managing the physician workforce in Japan to know physicians' motives and personal characteristics, in order to plan appropriate incentives. For instance, physicians' geographical origins [30-32], strong intentions for particular specialties [31], education [31-34] and test scores [35,36] can affect their career choices. Meanwhile, their job satisfaction is likely

correlated with their sense of motivation and satisfaction with their retirement plan [15]. Without evidence on these aspects, governments cannot implement evidence-based policies to address the urgent problems in the health workforce.

Second, there are limitations, other than those we mentioned above, to the use of SPDP data as official statistics for analysing the workforce supply. For example, physicians have to report their status only while their licence is valid. So if a physician dies before cancelling his/her licence, the government is not able to determine why that physician stopped practising: whether because of retirement or death.

Moreover, the SPDP does not have a question item to determine whether a physician works full-time or part-time, and at what workplaces. As a result, our analysis was based on a headcount, but the actual workforce supply could differ from the headcount.

In addition, Japanese specialty certification, which is issued by each specialty's physicians' society, seems to lack rigidity and was introduced relatively recently, compared with those in other developed countries [28]. Even so, in the future, the SPDP should include items regarding certification status.

Third, we were not able to address the consideration of the number of physicians required in hospitals and clinics and in each specialty, because Japan does not have an official estimate indicating such appropriate numbers. Without this estimate, we cannot fully evaluate the physician distribution [37].

Conclusion

In Japan, the focus of the health care system has changed from primary to specialty care over the 30-year period from 1974 to 2004. Although the movement from hospitals to clinics is stable among generations, more than half of the physicians who registered in 1974 changed their specialties, and physicians working in high-workload specialties were much more inclined to change their specialties.

Even while physicians' career behaviours could be partly explained by certain aspects of human nature, and while other factors of the clinical training system and certification system also should be considered, the government should focus primarily on changing the physician fee schedule. This should be done with careful consideration of the balance between OPs and HPs and among specialties. To implement effective policies for health care human resources, policy-makers should pay attention to continuously monitoring physicians' practicing status and career motivations, and national consensus is needed regarding how many physicians are required at each type of facility and specialty as well as region.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All the authors conceived the study and jointly designed and conducted it. HI and HY analysed the data and all the authors interpreted the results. HI and HY drafted the manuscript, and all the authors revised it and approved the final version. All the authors take public responsibility for the content of the manuscript.

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The dynamics of obstetricians and gynecologists in Japan: A retrospective cohort model using the nationwide survey of physicians data

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Abstract

Aim: A shortage of obstetricians and gynecologists (OB/GYNs) in Japan has been highlighted. We conducted a descriptive and retrospective cohort study using data from the Survey of Physicians in Japan, and analyzed the dynamics of OB/GYNs.

Methods: We calculated the total numbers of OB/GYNs, their average age, the percentage of female OB/GYNs, hospital OB/GYNs, and the number of OB/GYNs in rural areas in 1974, 1984, 1994 and 2004. We determined the number of physicians who participated in and left the specialty of obstetrics and gynecology. The withdrawal rates of OB/GYNs who graduated in 1972, 1982 and 1992 were retrospectively followed using survival analysis.

Results: The overall number of physicians has increased, while the number of OB/GYNs has remained almost unchanged over the past 30 years. The percentage of female OB/GYNs has increased. Fewer new graduates chose obstetrics and gynecology, the withdrawal rate of current OB/GYNs decreased, and their average age (50.8 years) increased. The trend in withdrawal rates did not differ significantly among the generations.

Conclusions: The gravest problem in the OB/GYNs workforce is the continued decline in newly graduated OB/GYNs. Improvements in working conditions and job satisfaction are considered vital.

Key words: health manpower, obstetrics and gynecology, physician shortage.

Introduction

The latest report from the Organization for Economic Cooperation and Development (OECD) indicated that the number of physicians per 1000 of population was 2.0 in Japan, and was ranked twenty-seventh among the 30 OECD countries.[1] This shortage of physicians is a serious social problem in Japan. In particular, a shortage of obstetricians and gynecologists (hereafter referred to as OB/GYNs) has been highlighted.[2]

An official statistical survey, the Survey of Physicians, Dentists and Pharmacists (SPDP), is conducted every two years in Japan. In the SPDP, all physicians are legally obliged to notify the Ministry of Health, Labour and Welfare (MHLW) of their registration, and the notification rate is approximately 90%.[3] The MHLW

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provides a summary of the demographic data from the SPDP in each year;[4] this represents a cross-sectional observation.

However, it is still unclear how long current OB/GYNs remain in practice and how many younger physicians choose this specialty. To confirm the shortage of OB/GYNs, it is considered vital to determine the dynamics of OB/GYNs using longitudinal data.

In the present study, we obtained individual data using the SPDP obtained from the MHLW, and restructured a time series data set for each physician by retrieving their unique registration number. Using this retrospective data, we analyzed the dynamics of OB/GYNs, and discussed the issues relating to the future supply of OB/GYNs.

Methods

Data collection

Electronic data of the SPDP conducted from 1972 to 2004 were obtained from the MHLW. The survey questionnaire included year of qualification, registration number of medical license, year of birth, gender, address of workplace, specialty, and occupation. The submitted data did not include the names of the physicians. Data cleaning was performed to complete the data collection, and in total, 4 024 916 data (for 374 804 physicians) were obtained.

A cross-sectional model

The total numbers of all physicians in 1974, 1984, 1994 and 2004 were calculated, along with the number of physicians per 100 000 of population, the average age, the percentage of female physicians, the percentage of physicians working in rural areas, and the percentage of physicians working in hospitals, in the respective years. In addition, the total numbers of OB/GYNs in these years were calculated, along with the number of OB/GYNs per 1000 births, the average age, the percentage of female OB/GYNs, the percentage of OB/GYNs working in rural areas, and the percentage of OB/GYNs working in hospitals. The national population and the number of births in these years were obtained from the Population Estimate and the Vital Statistics.

A retrospective cohort model: The dynamics of OB/GYNs

The number of physicians registered as OB/GYNs in 1974, 1984, 1994 and 2004 were defined as *N1*, *N2*, *N3* and *N4*, respectively. In *N1*, the number of OB/GYNs who left the specialty of obstetrics and gynecology in the years between 1975 and 1984 was defined as *R1*, and the number of OB/GYNs who remained in the specialty during that period was defined as *C1*. The number of new graduates who chose obstetrics and gynecology as their medical specialty in the years between 1975 and 1984 was defined as *F1*, and the number of physicians who changed their specialty from other specialties to obstetrics and gynecology was defined as *I1*. In the same way, in the years between 1985 and 1994, and between 1995 and 2004, the numbers of OB/GYNs who left the specialty were defined as *R2* and *R3*, respectively, the numbers of OB/GYNs who remained in the specialty, as *C2* and *C3*, the numbers of new graduates who chose the specialty, as *F2* and *F3*, and the numbers of new OB/GYNs from other specialties, as *I2* and *I3*, respectively.

$$N1 = R1 + C1, N2 = C1 + F1 + I1 \quad (1)$$

$$N2 = R2 + C2, N3 = C2 + F2 + I2 \quad (2)$$

$$N3 = R3 + C3, N4 = C3 + F3 + I3 \quad (3)$$

These variables were identified to analyze the movement of OB/GYNs.

A retrospective cohort model: Leaving rates of OB/GYNs

A group of physicians who graduated in 1972 and were registered as OB/GYNs after initial training was defined as the Class of 1972. In the same way, groups of physicians who graduated in 1982 and 1992 and were registered as OB/GYNs were defined as the Class of 1982 and 1992, respectively. For each group, the OB/GYNs who left the specialty of obstetrics and gynecology were followed up over time. In addition, specialties in which those leaving were newly registered were identified.

Statistical analysis

A comparison of average values between two groups was performed using the *t*-test, and a comparison of rates between two groups was performed using the χ^2-test. The log–rank test was used to compare the differences in withdrawal rates. All statistical analyses were performed using the statistical software package SPSS ver.13.0 (SPSS, Chicago, USA). A *P*-value less than 0.05 was considered statistically significant.

Table 1 Descriptive statistics

	1974	1984	1994	2004
All physicians				
Total	125 249	178 197	227 775	270 353
Number per 100 000 population	113	148	182	212
Female (%)	9	10	13	16
Age (average ± SD in years)	47.5 ± 13.0	46.8 ± 14.9	46.6 ± 15.4	47.6 ± 15.2
Working in rural areas (%)	14	14	13	11
Working at hospitals (%)	43	56	62	62
Obstetricians and gynecologists				
Total	12 776	13 774	12 389	12 156
Number per 1000 newborn babies	6.3	9.2	10.0	10.9
Female (%)	10	11	15	22
Age (average ± SD in years)	49.3 ± 12.1	50.6 ± 13.7	50.1 ± 15.2	50.8 ± 15.8
Working in rural areas (%)	14	13	10	8
Working at hospitals (%)	37	46	56	57

SD, standard deviation.

Results

A cross-sectional observation in 1974, 1984, 1994 and 2004

Table 1 shows the cross-sectional data for each measure in 1974, 1984, 1994 and 2004. The total number of all physicians doubled during the 30-year study period. In contrast, the total number of OB/GYNs during this period remained almost unchanged at around 12 000 to 14 000. The number of physicians per 100 000 of population was 113 in 1974, and in 2004 this rose to 212, indicating an increase of 87%. Meanwhile, there was an increase in the number of OB/GYNs per 1000 births from 6.3 to 10.9 during the same period.

In 2004, the average age of OB/GYNs was 50.8 years, which was significantly higher than that of all physicians (47.6 years) ($P < 0.01$). Although the percentages of OB/GYNs and all physicians working in rural areas were the same in 1974, and both decreased during the study period, the percentage of OB/GYNs working in rural areas (8%) was significantly lower than that of all physicians in 2004 (11%) ($P < 0.01$). In addition, the percentage of female OB/GYNs (22%) was significantly higher than that of all physicians in 2004 (16%) ($P < 0.01$).

Analysis of the dynamics of OB/GYNs

Figure 1 shows the movement of OB/GYNs. The number of new graduates who chose obstetrics and gynecology between 1995 and 2004 ($n = 2558$) decreased compared with that between 1985 and 1994 ($n = 2913$). On the other hand, the number of physicians leaving obstetrics and gynecology decreased from 5206 to 3831 during the same periods. As a result, the numbers of all OB/GYNs remained stable. The withdrawal rates from obstetrics and gynecology were 27% from 1975 to 1984, 38% from 1985 to 1994, and 31% from 1995 to 2004, respectively.

Follow-up research on leaving rates of OB/GYNs

Figure 2 shows withdrawal curves of OB/GYNs. The numbers of OB/GYNs in the Classes of 1972, 1982 and 1992, were 200, 285 and 250, respectively. The trend in withdrawal rates did not differ significantly among the Classes ($P = 0.688$).

The most common specialty in which those leaving the Class of 1972 and 1982 newly registered was internal medicine. In 2004, 5.5% (11/200) of physicians in the Class of 1972 were registered as internists (Table 2).

Discussion

This study highlighted the following points regarding the descriptive and dynamic statistics of OB/GYNs over the past thirty years: (i) a reduced percentage of OB/GYNs practiced in rural area; (ii) the number of female OB/GYNs increased; (iii) the number of newly registered OB/GYNs decreased; (iv) the number of OB/GYNs was stable, but the average age of OB/GYNs was higher than that of all physicians; (v) internal medicine was the most common department in which retired OB/GYNs registered.

Geographical inequality in OB/GYNs' distribution

In 1974, 14% of all physicians and 14% of OB/GYNs worked in rural areas. However, in 2004, only 8% of

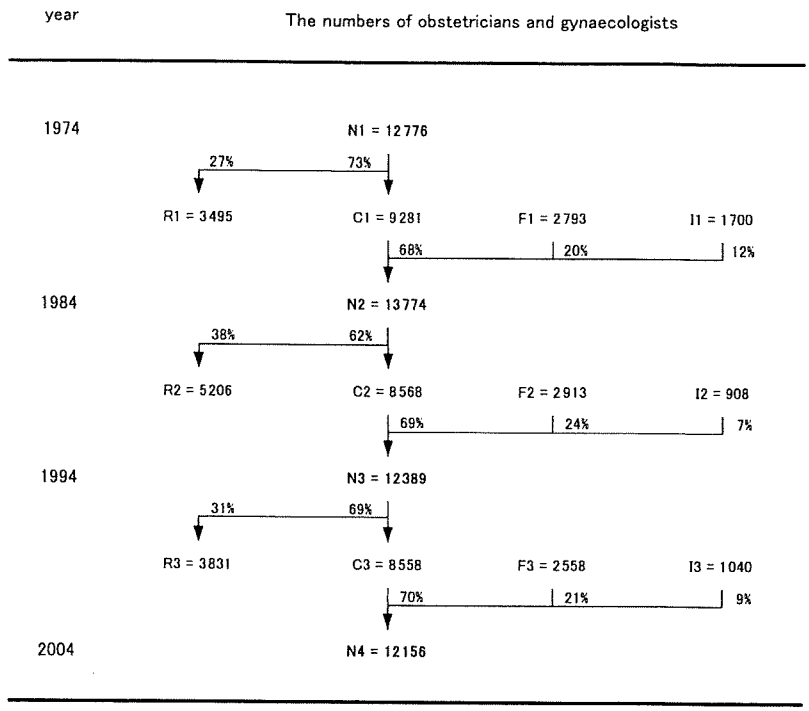

Figure 1 Movement of obstetricians and gynecologists. *N1*, the number of physicians registered as obstetricians and gynecologists in 1974; *N2*, the number in 1984; *N3*, the number in 1994; *N4*, the number in 2004. *R1*, the number of obstetricians and gynecologists who left the specialty of obstetrics and gynecology between 1975 and 1984; *R2*, between 1985 and 1994; *R3*, between 1995 and 2004. *C1*, the number of OB/GYNs who remained in the specialty from 1974; *C2*, from 1984; *C3*, from 1994. *F1*, the number of new graduates who chose obstetrics and gynecology as their medical specialty between 1975 and 1984; *F2*, the number between 1985 and 1994; *F3*, the number between 1995 and 2004. *I1*, the number of physicians who changed their specialty from other specialties to obstetrics and gynecology from 1974; *I2*, from 1984; *I3*, from 1994.

OB/GYNs were working in rural areas. Geographical inequity in physician distribution is considered a societal issue. In this regard, the unequal distribution of OB/GYNs between urban and rural areas is more serious than that of all physicians. These statistics are consistent with reports that pregnant women receive little obstetric care in rural areas.[5]

Increase in female OB/GYNs

This study also demonstrated an increasing number of female OB/GYNs. This trend will affect the 'actual' supply of OB/GYNs because many female physicians may have difficulty in continuing with and returning to work due to pregnancy, childcare or other reasons. In terms of increasing actual workforce supply, measures to improve the working conditions of female OB/GYNs are necessary. For example, the opportunity to work part-time may be an effective option for female OB/GYNs on family leave.

The decrease in newly registered OB/GYNs

Why do medical graduates choose to avoid obstetrics and gynecology? The reasons cannot be determined by only using the results of the SPDP, as physicians are not required to report the reasons for their specialty selection. However, several hypotheses can be proposed. Firstly, the recent deterioration in OB/GYNs' working conditions should be underlined, including long working hours for hospital physicians. Another reason may be the increased risk of lawsuit. According to a statistical report from the Supreme Court of Japan, the number of civil lawsuits regarding medical accidents continues to increase.[6] In particular, the number of cases where OB/GYNs were sued for medical

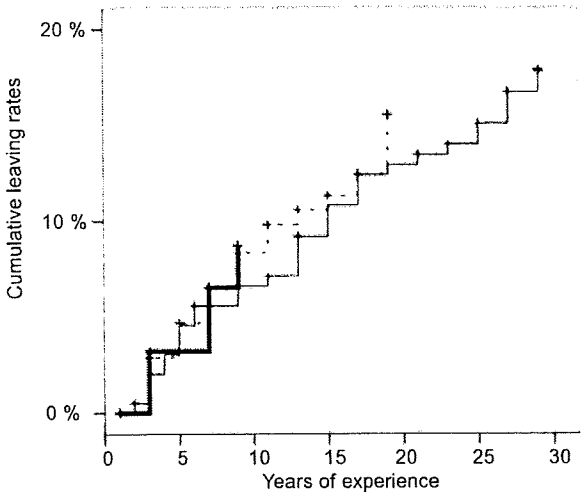

Figure 2 Cumulative leaving rates from obstetrics and gynecology. Thin line, Class of 1972 ($n = 200$); dotted line, Class of 1982 ($n = 285$); thick line, Class of 1992 ($n = 250$).

Table 2 Medical specialties chosen by physicians leaving obstetrics and gynecology

	1976	1986	1996	2004
The Class of 1972				
OB/GYNs	200	163	154	146
Internists		7	14	11
Other specialties		10	9	10
Data not provided		20	23	33
The Class of 1982				
OB/GYNs		285	233	219
Internists			15	21
Other specialties			5	6
Data not provided			32	39
The Class of 1992				
OB/GYNs			250	208
Internists				8
Other specialties				5
Data not provided				29

OB/GYNs, obstetricians and gynecologists.

accidents is rising.[7] These conditions may increase the avoidance of obstetrics and gynecology.

The decrease in physicians leaving the specialty

Our results indicate a continued trend in declining numbers of younger OB/GYNs. On the other hand, the withdrawal rate from obstetrics and gynecology dropped over the most recent ten-year period compared with the previous ten-year period due to unknown reasons. As a result, the average age of OB/GYNs has risen. This indicates that the number of OB/GYNs has been maintained by elderly physicians remaining in obstetrics and gynecology. However, practice in obstetrics and gynecology is demanding, and although the number of OB/GYNs has been stable for a long period, the aging of OB/GYNs adds to their already heavy workload.

In addition, attention should be paid to the recent alteration in supply of obstetrics care. According to the MHLW report, there has been an increase in the number of obstetricians involved in private practice who have ceased performing child delivery, and have been exclusively involved in outpatient maternity treatment.[8] The decrease in OB/GYNs leaving this specialty does not necessarily mean the maintenance of obstetric care.

Although OB/GYNs gradually left the department of obstetrics and gynecology, the results from follow-up research suggest that there was no difference in the three generations. This implies that once newly registered, OB/GYNs may remain in the department. Therefore, an essential factor in increasing the number of OB/GYNs is to raise the number of newcomers.

The move to internal medicine

Internal medicine was the most common department in which retired OB/GYNs registered. A previous study in the USA showed that internists intended to stay in practice longer than OB/GYNs, and this may mean that working in the department of internal medicine was preferable to working in the department of obstetrics and gynaecology.[9]

Possible solutions

The most serious concern from the findings of this study is that the supply of OB/GYNs will inevitably dwindle as the number of newcomers continues to decline. Reports from the USA have demonstrated that the job satisfaction of OB/GYNs was much lower than that of other specialists.[10] However, OB/GYNs who were not involved in childbirth were shown to have shorter working hours, and higher job satisfaction.[11] Improvements in working conditions and job satisfaction will affect not only current OB/GYNs, but also medical graduates and residents who may choose to be future OB/GYNs.

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