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【 ORIGINAL ARTICLE 】

Scholarly Activity Support Systems in Internal Medicine Residency Programs: A National Representative Survey in Japan

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Abstract:

Objective To describe the clinical research support systems in Japanese board certification programs of internal medicine and to assess the relationship between these support systems and the scholarly activities of residents.

Methods In 2018, a 26-item web questionnaire was mailed to 542 points of contact of hospitals listed as certified residency programs of internal medicine in order to obtain information about the presence of a research support system and scholarly activity from 2016. We used hospital characteristic data from the Japanese Diagnostic Procedure Combination database, a national inpatient database, and the annual report of the Japanese Society of Internal Medicine.

Results A total of 228 hospitals (42%) responded to the survey. There were regular research lectures in 129 hospitals (57%), protected time (time to perform research during working hours) in 53 hospitals (23%), research consultations in 175 hospitals (77%), regular journal clubs in 213 hospitals (77%), regular research conferences in 151 hospitals (66%), data warehouses in 139 hospitals (61%), and financial research support from the hospital budget in 140 hospitals (61%). A multivariate analysis showed that none of the research support systems were related to the number of conference presentations. In contrast, protected time [odds ratio (OR) 3.66, 95% confidence interval (CI) 1.43-9.39] and regular research conferences (OR 2.20, 95% CI 1.14-4.23) were related to the presence of clinical research presentations in scientific conferences hosted by residents.

Conclusion Protected time and regular research conferences were related to the scholarly activity of residents in Japanese teaching hospitals.

Key words: postgraduate, scholarly activity, academic achievements, survey study

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Introduction

Scholarly activity is the foundation of innovation, economic growth, and a rich society. However, the scientific productivity of Japan has been decreasing over the past two decades despite its increase in other developed countries (1). The same decreasing tendency can be seen in medical research (2, 3).

In 2018, the board certification system was drastically changed in Japan. Before then, representative academic societies operated the system. Typically, the society of a given

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Table 1. Hospital Characteristics.

	Community hospitals n=171 Mean (SD)	University hospitals n=57 Mean (SD)
Number of acute care beds	451 (173)	714 (247)
Mean of proportion bed occupancy	72.0 (9.4)	70.4 (4.7)
Number of full-time attendings of internal medicine	42.4 (23.9)[a]	31 (1.4)[b]
Number of junior residents	19.6 (10.9)[a]	12 (5.7)[b]
Number of senior residents of internal medicine	11.8 (10.1)[a]	3.5(0.7)[b]

a: Missing 34, b: Missing 55.
SD: standard deviation

subspecialty certified the residency program, although it did not generally have sufficient quality assurance because of conflicts of interest between the societies and the candidates to be certified (4). Concurrently, due to the declining birthrate and aging population of Japan, a shortage of doctors in rural areas emerged as an issue (5). The Commission on the Reform of the Board Certified System recommended the establishment of a new quality assurance system and the correction of the maldistribution of board-certified doctors by an independent organization (6).

The Japanese Society of Internal Medicine (JSIM) is one of the largest medical societies in Japan. Previously, physicians were required to complete a one-year internal medicine training program after junior residency in order to be considered a board-certified member of the JSIM. Beginning in 2018, it took at least three years of training to become certified (7). In addition to the extension of the training period, the requirements for scholarly activity became stricter. Previously, one presentation at a conference held by an academic society or a research group or a presentation at a clinical pathology conference or clinical conference was sufficient for certification (8). Now, at least two presentations or publications of case reports, clinical research, or basic research associated with internal medicine are required (7). In addition, teaching hospitals that provide the certification program must support an environment that enables clinical research (7). However, as yet, no research has clarified the current situation of clinical research support systems in Japanese hospitals.

Our research objectives were to describe the clinical research support systems in Japanese board certification programs of internal medicine and to assess the relationship between those support systems and the scholarly activities of residents.

Materials and Methods

Study design

We developed this prospective cross-sectional survey study protocol according to The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (9). We registered the protocol prior to conducting the study (UMIN 000029998) (10).

Our target period was between April 2016 and March 2017 because this was the period covered by the newest annual report of the JSIM.

We used "residents" as a term to refer to both junior residents and physicians training in the residency program of internal medicine (i.e., senior residents). We used "doctors" as a term to refer to all physicians working in the target hospitals but excluding students in the graduate school who were engaged in research for more than half of the week.

Survey development and pre-testing

We designed a pilot questionnaire referring to a previous report that revealed difficulties Japanese residents had in conducting clinical research using content a analysis for a post-workshop questionnaire (11). The pilot questionnaire contained concepts of clinical research support system as follows: lectures, protected time (time to perform research during weekday working hours), research consultation, data availability, and financial support. It also covered concepts of academic achievements as follows: conference presentations and publications by residents and attendings. We pilot tested it with five internal medicine attendings working in community or university hospitals and changed some expressions to make them more easily understandable. The final questionnaire contained 26 items (Supplementary material).

Survey administration

We sent the questionnaire via Google Forms (Google, Mountain View, USA) between January and February 2018. We also accepted Excel spreadsheets (Microsoft, Redmond, USA) from some hospitals that were blocked from using Google Forms. We sent e-mails to the points of contact of 542 hospitals listed on the JSIM web site as certified residency programs in 2018, including to program directors and administrative staff.

The survey was not anonymized in order to prevent duplication and to allow merging of other datasets (explained below). Responding to the survey was voluntary, and we provided no incentives for participating.

PubMed search

We conducted a PubMed search to identify the numbers of English-language publications from each community hospital. The search formula was "hospital name" [ad] AND 2016/04:2017/03 [dp]. We used the Python 3.6.4 software program (Python Software Foundation, De, USA) with the biopython library to search PubMed. The search date was June 8, 2018. We did not conduct a search for university hospitals because there were many publications that were affiliated with the postgraduate department but not the university hospitals themselves. In Japan, many physicians who work in university hospitals also belong to laboratories in postgraduate schools; they tend to publish papers that are affiliated with the laboratories. Such types of papers were outside the scope of our research.

Other datasets

We used hospital characteristic data from the Japanese Diagnostic Procedure Combination, which is a nationwide administrative claims database (12). We also used the 2016 annual report of the JSIM to retrieve the numbers of residents, attendees, and conference presentations (13).

Outcomes

We intended to analyze the number of presentations in academic conferences by residents and attendees, including case reports and clinical research, as the primary outcome. However, it was impossible to ignore the fact that there was missing information due to the mismatch of educational facilities of the JSIM in 2016, which was the source of the number of doctors and presentations in residency programs of internal medicine, including the target hospitals included in our research. We therefore added the presence or absence of presentations of clinical research by residents as a binary outcome because of the missing data.

Statistical analyses

The unit of analysis was each hospital. We summarized background information using summary statistics and used logistic regression for binary outcome and Poisson regression for count outcomes. We evaluated the multiple collinearity using variance inflation factors (VIFs). We performed a complete case analysis, and two-sided p values < 0.05 were considered to indicate statistical significance. We used the STATA 15.1 software program (Stata, College Station, USA).

Ethical consideration

The study protocol was approved by the Hyogo Prefectural Amagasaki General Medical Center Institutional Review Boards approved the study (29-130). We regarded survey responses as consent to participate.

Results

Response rate

A total of 228 hospitals (42%) responded to the survey after six mailings. The response rate was 40% (171/431) from community hospitals and 51% (57/111) from university hospitals. Details of the hospital characteristics are shown in Table 1. Of the responding hospitals, 88 (39%) were not included in the list of educational facilities of the JSIM from 2016. Therefore, the number of full-time attendees of internal medicine, number of junior residents, and number of senior residents of internal medicine were missing in 34 community hospitals (20%) and 55 university hospitals (96%).

Research support systems

Clinical research support systems for each hospital are shown in Table 2. The proportion of regular research lectures was higher in university hospitals (n=46, 81%) than in community hospitals (n=83, 49%). Other features did not vary markedly.

Outcomes

The median number of conference presentations per resident was 0.43 [interquartile range (IQR), 0.25-0.71] in community hospitals (n=138, missing 34) and 0.41 (IQR 0.36-0.71) in university hospitals (n=2, missing 55). The median number of conference presentations per doctor was 0.55 (IQR, 0.35-0.81) in community hospitals (n=138, missing 34) and 0.27 (IQR 0.093-0.44) in university hospitals (n=2, missing 55). Clinical research conference presentations were delivered by residents in 122 community hospitals (71%) and 38 hospitals (67%).

We asked program directors about the need for clinical research support. The details are shown in Table 3. We summarized other survey results in Supplementary material.

Relationships between the research support system and scholarly achievements

A multivariate analysis showed that none of the research support systems were related to the number of conference presentations (Table 4). In contrast, protected time [odds ratio (OR) 3.66, 95% confidence interval (CI) 1.43-9.39] and conducting regular research conferences (OR 2.20, 95% CI 1.14-4.23) were related to the presence of clinical research presentations in scientific conferences by residents (Table 4). We evaluated VIFs in three models using linear regression, and all values were <1.5. There were no remarkable concerns about multiple collinearity.

The evaluation of generalizability

We plotted the number of published papers per 100 beds and the proportion of bed utilization, which can be considered a proxy of busyness, in 2016. Because there were vari-

Table 2. Presence of Research Support System.

		Community hospitals n=171 n (%)	University hospitals n=57 n (%)
Regular research lectures	Yes	83 (49)	46 (81)
Protected time[a]	Yes	37 (22)	18 (32)
Research consultation	Yes	122 (71)	52 (91)
Regular journal club	All of the departments	51 (30)	33 (58)
	Some of the departments	106 (62)	23 (40)
	No	14 (8)	1 (2)
Regular research conference[b]	Yes	115 (67)	36 (63)
Data warehouse[c]	Yes	106 (62)	33 (58)
Financial research support by the hospital budget	Yes	113 (66)	27 (47)

a: The question was "Has your institution adopted the 'protected time' system for doctors to perform research during the weekday working hours?"

b: The question was "Do you conduct regular research conferences that include plurality of departments?"

c: The question was "Is there a data warehouse system in your affiliated institution?"

Table 3. Needs for Clinical Research Support by Program Directors[a].

	Community hospitals n=171 n (%)	University hospitals n=57 n (%)
Lectures for obtaining knowledge of clinical research	126 (74)	46 (81)
Mentoring by experienced people	105 (61)	38 (67)
Easy-to-access database	81 (48)	33 (58)
Research funding	123 (72)	48 (84)
Health care fees for protected time	101 (59)	35 (61)

a: The question was "In order to conduct research, which of these do you think is good support for doctors? (Select all)."

Table 4. Relationship between Support Systems and Academic Achievements.

	Conference presentations per resident n=139 Incidence-rate ratio[a] (95% CI)	Conference presentations per doctor n=139 Incidence-rate ratio[a] (95% CI)	Presence of clinical research presentations in scientific conferences by residents n=228 Odds ratio[b] (95% CI)
University hospital	0.80 (0.09-7.21)	0.45 (0.03-6.67)	0.54 (0.25-1.16)
Regular research lectures	1.01 (0.62-1.64)	1.01 (0.65-1.56)	1.80 (0.90-3.58)
Protected time	1.28 (0.73-2.24)	1.04 (0.62-1.74)	3.66 (1.43-9.39)
Research consultation	1.06 (0.61-1.84)	1.36 (0.62-2.30)	1.83 (0.86-3.87)
Regular journal club	0.92 (0.40-2.13)	1.34 (0.56-3.23)	1.84 (0.54-6.31)
Regular research conference	0.91 (0.55-1.52)	1.06 (0.66-1.70)	2.20 (1.14-4.23)
Data warehouse	1.01 (0.60-1.72)	1.09 (0.68-1.73)	0.62 (0.32-1.20)
Financial research support by the hospital budget	0.91 (0.55-1.52)	1.03 (0.64-1.64)	1.73 (0.91-3.30)

a: Poisson regression analysis, b: logistic regression analysis.

CI: confidence interval

ations in English hospital notations, we did not use PubMed search results as a primary outcome. Non-responding and responding hospitals occasionally overlapped (Figure).

Discussion

This is the first national survey in Japan to clarify clinical research support systems in Japanese board certification programs of internal medicine. We clarified the proportion of

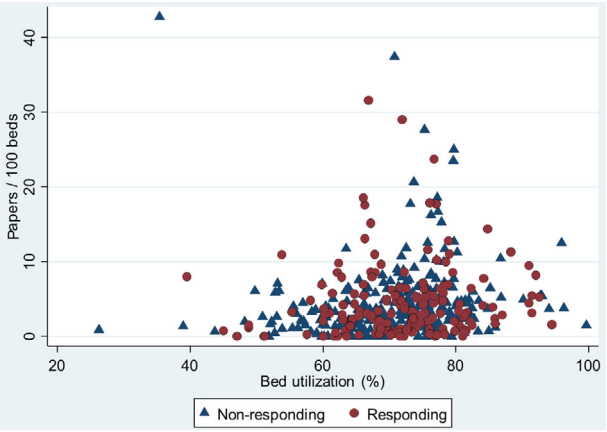

Figure. Number of publications per 100 beds and bed utilization of target community hospitals (n=432). Publications were searched via PubMed. The search formula was "hospital name" [ad] AND 2016/04: 2017/03 [dp] (Search date 8 June 2018). Institution characteristic data were derived from the open data of the Japanese Diagnostic Procedure Combination from 2016.

the presence of clinical research support systems, which were not related to the number of conference presentations. However, we did identify two factors that were related to the presence of clinical research presentations in scientific conferences by residents: protected time and regular research conferences.

Protected time for research is an important factor for scholarly activity. One recent systematic review clarified that research directors who have curriculum responsibilities and protected time reported increased numbers of presentations in medical specialties (14). In the US, more than 80% of residency programs include a protected time system for research (15, 16). In contrast, our results showed that fewer than half of hospitals in Japan (22% in community hospitals, and 32% in university hospitals) have such a system.

According to previous research, experience in scholarly activities is associated with higher satisfaction with residency training (17). Thus, the proportion of hospitals that protect research time for residents should be improved, not only to increase scholarly activity but also to support the motivation of residents.

Remarkably, in our survey, program directors reported needs for lectures and funding, but the priority of protected time was low. Considering the high proportion of burnout in doctors, including residents (18), the Japanese Ministry of Health, Labour and Welfare is now attempting to reform doctors' working practices in order to reduce their burden (19). Under pressure to lessen work hours, it is important for residents to make progress in their career while prioritizing their time wisely.

Regular attendance of research conferences was also related to academic achievement, a point that previous studies conducted outside Japan did not emphasize (14-16). Attending these conferences may help residents gain more knowledge in line with research questions than lectures. In addition, they also help busy residents maintain their motivation (20).

The relationships between support systems and academic achievements, including the number of conference presentations (which included case reports and clinical studies) and clinical research presentations, were inconsistent. Two reasons for this inconsistency may exist. First, the necessary system to conduct clinical studies and case reports would be different. Second, 39% of outcomes of conference presentation were missing. The selection bias due to such missing data may weaken the associations observed in our findings.

There are several limitations associated with this study. First, our unit of analysis was the hospital, not the individual resident; the availability of a support system does not always correspond to utilization. Further studies targeting each resident and clarifying the barriers to resource utilization will therefore be necessary. Second, this was a cross-sectional study, and the possibility of reverse causality cannot be denied. However, we believe it unlikely that protected time and conducting regular research conferences were caused by conference presentations. Nevertheless, we should evaluate such a causality in a cohort study a few years down the line. Third, our response rate was 42%, which may make our results subject to non-response bias (21). Non-responding hospitals would presumably have fewer research support systems. However, according to the search results obtained from PubMed, research productivity and busyness did not vary markedly between responding and non-responding community hospitals. We therefore assume that there is a certain degree of generalizability of our results. Fourth, there were some unmeasured confounders, such as the motivation of indiviudal doctors to conduct research. Such confounding may have weakened the robustness of results. Further evaluations will be necessary.

Protected time during work hours and conducting regular research conferences were related to the scholarly activity of residents in Japanese teaching hospitals. Further cohort studies with a greater focus on individual residents are warranted.

The authors state that they have no Conflict of Interest (COI).

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