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[Original article]

Impact of general practice/family medicine training on Japanese junior residents : reflective writing analysis using text mining

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Abstract

Background : We previously reported the impact of general practice/family medicine training on postgraduate training in Japan using evaluation criteria standardized nationwide. However, there is a possibility that new insights may be gained by analyzing the reflective reports written by these residents.

Methods : Junior residents who participated in one-month general practice/family medicine training at one of five medical institutions with full-time family medicine specialists between 2019 and 2022 were enrolled in this study. They were assigned to submit a reflective report on their experiences and thoughts every day during the training. We analyzed these reflective writings using text mining and created a co-occurrence network map to see the relationship between the most frequently used words.

Results : Ninety junior residents participated in the study. The words that appeared most frequently in the sentences referring to clinical ability included "symptoms," "medical examination," "consultation," "treatment," and "examination." The words of "family" and "(patient) oneself" showed strong association in the co-occurrence network map.

Conclusion : It was suggested that general practice/family medicine training greatly contributes to the acquisition of clinical abilities and deepens the learning of junior residents not only about patient care but also about family-oriented care.

Keywords : medical education, postgraduate training, community medicine, reflective writing, text mining

Introduction

General practice/family medicine (GP/FM) is part of community medicine and a clinical field expected to contribute not only to the provision of high-quality primary health care but also to medical education[1)]. Internationally, postgraduate training reform efforts have been directed toward strengthening primary health care education[2)]. Therefore, experience in GP/FM during postgraduate training would be beneficial to all junior residents, regardless of their future specialty choice[3)]. Previous reviews have reported that GP/FM training has positive effects in terms of management of common diseases and chronic diseases, understanding of psychosocial factors of illness, communication skills, team medi-

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cal care, and community care, as well as fostering better cooperation and understanding between primary care and secondary care doctors[4,5]. The primary care described in these international studies is assumed to be provided by specialists who have received specialized training in GP/FM[2]. In Japan, GP/FM specialist training has been developed and implemented. In 2020, The family medicine expert training program organized by the Japan Primary Care Association (JPCA) acquired international accreditation from the World Organization of Family Doctors[6]. With this accreditation, JPCA-certified family doctors are considered family medicine specialists trained to international standards[6].

The initial postgraduate training period in Japan is two years, including one compulsory month of community medicine training in the second year[7]. The Department of Community and Family Medicine at Fukushima Medical University has provided community medicine training (known as GP/FM training) supervised by JPCA-certified family doctors at five medical institutions in Fukushima Prefecture. In May 2023, we reported the impact of GP/FM training using nationally-standardized evaluation criteria[8]. Our findings suggested that the GP/FM training may greatly contribute to the acquisition of various clinical abilities expected to be acquired during postgraduate training. However, there remained a possibility that the evaluation based on the standardized criteria may not have fully described what these junior residents learned, and a new insight may be gained by analyzing the text in their reflective reports. Qualitative appraisal of reflective texts may be confounded by the reader's bias[9] ; therefore, we used text mining to extract keywords (frequently used nouns) from a large sample of written texts in an efficient and objective manner. Text mining can also be used to identify relationships between extracted words by creating a co-occurrence network map[10].

The purpose of the present study was to explore the effects of GP/FM training that cannot be measured by the established criteria by using text mining and analyzing texts written reflectively by the junior residents who participated in the training.

Materials and Methods

Participants and settings

The criteria for inclusion were second-year junior residents who participated in a one-month community medicine rotation between April 2019 and March 2022. The settings were five medical institutions (one hospital and four clinics) that had full-time family doctors. The junior residents were each assigned to one of these institutions.

Contents of GP/FM training

In general, postgraduate community medicine training covers general ambulatory care, home medical care, specialized care in a chronic and/or recovery stage ward, and community-based care in a real-world setting[7]. General ambulatory care training provides opportunities to learn about medical practice for new patients to prevent bias toward specific symptoms or illnesses, as well as for returning patients who require continued care for chronic disorders. In home medical care training, the junior residents visit patients' homes together with the family doctors, and experience medical care in the context of the daily life of each patient and the characteristics of the community. Community-based care training provides an opportunity to learn about cooperation with a variety of community health providers such as medical and nursing care facilities, pharmacies, and welfare organizations. The junior residents are required to write a reflective report on the day's events every evening, and they also receive daily feedback from the family doctors. Table 1 shows an example of the training schedule. In addition to the required training contents, there are some optional contents that differ depending on the training site.

Data source

The sentences analyzed in this study were collected from the reflective texts submitted by the junior residents who were given the following instruction : "Please describe what you experienced today that made a particularly strong impression on you. What did you learn from it?" The original Japanese instruction was as follows :

「今日経験したことで、特に印象的だったエピソードを具体的に記載してください。そこから、どんなことを学びましたか」

The report was handwritten. The handwritten data was entered into a computer, and obvious typographical and grammatical errors were corrected before analysis.

Statistical analysis

Text mining was used to extract frequent words (nouns) from the junior residents' free descriptions. In the Japanese language, some verbs contain a noun. For example, the verb 訪問する (hou-

monsuru) is a noun 訪問 (houmon) with the verbalizing suffix する (suru). In the present study, all verbs containing a noun were divided into nouns and verb components, and were then counted separately. A co-occurrence network map was created to illustrate the relationships between the most frequently occurring words. Co-occurrence refers to how many times high-frequency words appear in the text in proximity to other high-frequency words[10]. This relationship is called an association, which is calculated numerically as a figure between 0 and 1[10,11]. A co-occurrence network map was created to visualize how these keywords are grouped together in the entire text, with connecting lines marked with numerical values indicating association strength[10]. All analyses were performed using KH Coder 3.0 (http://khcoder.net/en/index.html), a free downloadable multilingual text-mining program developed by Koichi Higuchi, Ritsumeikan University, Japan[12]. The analysis was conducted on the original Japanese texts and the results were translated into English for publication. For reference, a list of extracted words and typical sentences is shown in the Results section.

Ethics approval

Ethics approval was obtained from the Fukushima Medical University Research Ethics.

Committee, approval number #2022-153.

Results

Ninety-five junior residents participated in the GP/FM training and ninety completed the study (95% participation rate). Their baseline characteristics are shown in Table 2. The total number of sentences collected was 4,903 and the total number of words including verbs and other parts of speech was 116,279. The average number of sentences written by a junior resident per day was 2.7. Table 3 shows the top 20 most frequent words. The top five frequent words were "patient," "symptoms," "medical examination," "consultation," and "family." Examples of typical sentences in which extracted words are used are shown in both English and Japanese in Table 4. Fig. 1 shows the co-occurrence

Table 1. An example of the training schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
			Week 1		
Morning	Orientation General ambulatory care	Home medical care	General ambulatory care	General ambulatory care	General ambulatory care
Afternoon	Home medical care	General ambulatory care	Home medical care	General ambulatory care	Home medical care
Evening	Reflection	Reflection	Reflection	Reflection	Reflection
			Week 2		
Morning	General ambulatory care	Home medical care	General ambulatory care	Home-visit nursing	General ambulatory care
Afternoon	Home medical care	General ambulatory care	Home medical care	General ambulatory care	Home medical care
Evening	Reflection	Reflection	Reflection	Reflection	Reflection
			Week 3		
Morning	General ambulatory care	Pharmacy	General ambulatory care	General ambulatory care	General ambulatory care
Afternoon	Home medical care	General ambulatory care	Community general support center	General ambulatory care	Home medical care
Evening	Reflection	Reflection	Reflection	Reflection	Reflection
			Week 4		
Morning	Long-term care health facilities	Home medical care	General ambulatory care	General ambulatory care	General ambulatory care
Afternoon	Long-term care health facilities	General ambulatory care	Home medical care	General ambulatory care	Presentation
Evening	Reflection	Reflection	Reflection	Reflection	Reflection

Table 2. Baseline characteristics of junior residents

	N (%)
Age median	26
Interquartile range	26–27
Gender	
Males	60 (67%)
Females	30 (33%)
Training site	
Kashima Hospital	38 (42%)
Asahi Clinic	20 (22%)
Hoshi Yokozuka Clinic	16 (18%)
Hobara Central Clinic	12 (13%)
Kitakata Centre for Community and Family Medicine	4 (4%)

Table 3. List of frequently used words

Extracted word	No. of times used
Patient（患者）	1,142
Symptoms（症状）	344
Medical examination（診察）	298
Consultation（受診）	293
Family（家族）	285
Treatment（治療）	271
Test（検査）	214
Disease（疾患）	211
(Patient) oneself（本人）	207
Medical practice（診療）	205
Person（人）	205
Outpatient（外来）	186
Explanation（説明）	182
Prescription（処方）	181
Home-visit（訪問）	175
Diagnosis（診断）	168
Life（生活）	168
Medical care（医療）	159
Findings（所見）	156
Talk（話）	142

network map linking each frequently used word. The strongest co-occurrence relationship was recognized between "home visit" and "medical practice" (Jaccard coefficient 0.41). The next strongest co-occurrence relationship was recognized between "family" and "(patient) oneself" (本人) (Jaccard coefficient 0.15).

Discussion

The top 20 most frequent words that appeared in sentences referring to clinical ability included "symptoms," "medical examination," "consultation," "treatment," "test, "disease," "outpatient," "explanation," "prescription," "diagnosis," and "findings." (see typical sentences A, B, C, D, E, F, and G in Table 4). In our previous study, which included the same participants as in this study, post self-evaluation of items related to clinical ability also increased compared to pre self-evaluation of GP/FM training[8]. By analyzing the reflective reports, we found that the reason was due to the GP/FM training complementing their previous training at core hospitals (such as university hospitals) (see typical sentences A, B, and C in Table 4) and that they were able to participate in and independently perform medical practice during the training (see typical sentences D, E, F, and G). Previous studies from other countries have reported that GP/FM training provides knowledge and skills that cannot be acquired in departmental training at hospitals[13,14]. Other studies have reported that the biggest difference in the learning environment between other hospital department training and GP/FM training is the increased responsibility that individual junior residents have regarding patient care ; this greater responsibility further motivates the junior residents in their studies[14,15].

It is noteworthy that the second strongest co-occurrence relationship was found between "family" and "(patient) oneself" from the co-occurrence network map. This suggests that junior residents learned a significant amount not only about patient care but also about family-oriented care (see typical sentences H and I in Table 4). In our aforementioned study, post self-evaluation of items related to the care for patient's family also increased compared to pre self-evaluation of GP/FM training[8]. However, it was difficult to explore the learning of "not only the patient but also the family as the target of care"' with the existing evaluation items ; therefore, we suspected that this aspect could be explored by analyzing the reflective writing. Previous studies have shown that GP/FM training promotes greater understanding in junior residents regarding the impact of illnesses on the family members of patients, compared with training in other specialties[16]. In another previous study we conducted that analyzed the reflective writing of GP/FM clerkships of fifth-year medical students at Fukushima Medical University, "family" was the fifth most frequently used word, suggesting that the participants learned a lot about family-oriented care[17]. On the other hand, a study reported by another Japanese university showed that the top six frequent words used in the reflective reports of the fifth-year medical students attending community medicine clerkship was "patient," "systemic treatment," "locale," "hospital," "care," and

Table 4. Translation of typical sentences containing extracted words

	Sentences
A	I was able to see many cases of so-called common diseases that are rarely seen at university hospitals. I felt the difficulty of making an appropriate diagnosis and treatment with limited resources. （あまり大学病院では診られないようないわゆるよくある**疾患**をたくさん診ることができた。限られた時間と設備の中で適切な**診断**と**治療**をすることの難しさを感じました。）
B	In the emergency outpatient practice at a major hospital where I usually work, we take particular caution to overlook life-threatening and critical symptoms, and other symptoms are often just followed up. However, I had to think about how to diagnose and treat such minor symptoms in the medical practice at this clinic and I felt that I still need to study more. （いつもの基幹型病院での救急**外来**では、命にかかわるような危険な**症状**を見逃さないように注意して、それ以外の**症状**は経過観察となることが多い。しかし、診療所での診療では、それ以外の軽微な**症状**でも**診断**、**治療**を行うために考えていかなければならず、まだまだ勉強が必要だと感じた。）
C	The reason why there are so many people with a long list of problems is that we should look not only at diseases in specific fields but also at the patients' body as a whole as well as their social life in family medicine. It is necessary to prioritize medical practice within the limited medical examination time. （プロブレムリストがとても多い方がいるのは、特定の分野の**疾患**だけでなく全身、社会**生活**までみている家庭医療ならではであること。限られた**診察**時間の中で優先順位をつけて**診療**する必要がある。）
D	A patient with suspected influenza had a negative rapid influenza test result. There were other physical findings, and cellulitis of the leg was considered as the source of infection. I learned the importance of a careful medical examination. （インフルエンザが疑わしい**患者**さんがインフルエンザ迅速**検査**陰性だった。身体**所見**を取り直したら足の蜂窩織炎が感染源として考えられた。念入りな**診察**の大切さを学んだ。）
E	I was entrusted with the introduction of initial treatment for non-valvular atrial fibrillation. It was very difficult to explain the benefits and risks of drugs to patients and this treatment is necessary, but I learned a lot. （非弁膜症性心房細動の**治療**導入を任せてもらえたこと。**患者**さんに薬のメリットデメリットや、なぜ**治療**が必要なのかを**説明**するのはすごく大変だったけれど、とても勉強になった。）
F	There was a patient who was doctor-shopping for her lower abdominal pain. So far, she has visited two clinics and was told that "the cause of the pain is unknown from test results." She thought "I'm worried if there's something wrong and it's too late," so she visited our hospital. She was asymptomatic at the time of her consultation, and when I explained that there was a possibility of temporary pain associated with increased intestinal peristalsis, she was satisfied with the explanation. I realized that a careless remark by medical staff would make patients feel uneasy and result in an increase of unnecessary consultations. （下腹部痛でドクターショッピングになっている**患者**がいた。これまで２つのクリニックで「**検査**上痛みの原因は分からない」と言われ、「悪いものがあって、手遅れになったら心配だ」と思い当院を**受診**した。来院時は無**症状**であり、一時的な腸蠕動亢進に伴う痛みの可能性があると**説明**したところ、ご納得された。医療者の何気ない一言が、**患者**に不安をもたらし、不要な**受診**を増やしてしまうことを実感した。）
G	A patient with headache was examined for the third time from the first consultation. The symptoms were gradually improving with the prescribed medicine and by this time, they had disappeared and the oral administration was terminated. It was a good experience for me to be able to prescribe medicine and follow up on progress at the outpatient care. （頭痛**患者**を初診から３回目の**診察**、**処方**した薬で**症状**改善傾向あり、今回は**症状**消失し、内服終了となった。**外来診療**で薬を**処方**し、経過を追えたことは良い経験となった。）
H	In home visits, many of the spouses providing care for patients are also elderly, and often have health problems. I learned that it is important to look not only at the patients themselves but also the families supporting them to see if there are any problems. （**訪問診療**で伺う家では、介護を行っている配偶者も同じように高齢の場合も多く、配偶者も健康の問題を抱えていることも多かった。**患者**さん**本人**だけでなく、それを支える**家族**に問題はないか目を向けていくことも重要だと学んだ。）

I	I explained to the family about the end-of-life care of the home-visit patient. I learned that it is important to listen to the concerns of family members, such as whether or not the patient is suffering, and offer explanations. （**訪問診療**の**患者**の看取りについて**家族**に**説明**した。**本人**は苦しくないかなど**家族**が気になることに耳を傾けながら**説明**していくことが大切だと学んだ。）
J	I accompanied a medical team to visit a group home for the elderly to provide medical treatment. I learned how to communicate with people with dementia. In addition, listening to the stories of patients whose mental and other physical conditions have improved significantly through group living at the facility, I realized that the living environment and relationship with people have a great impact on patients. （グループホームの**訪問診療**に同行したこと。認知症の方とのコミュニケーションの取り方について学んだ。また、施設での集団**生活**を通してメンタルやその他の体調面が大幅に改善している方の話を聞き、**生活**環境や人との関わりが**患者**さんに大きな影響を与えるのだということを実感した。）

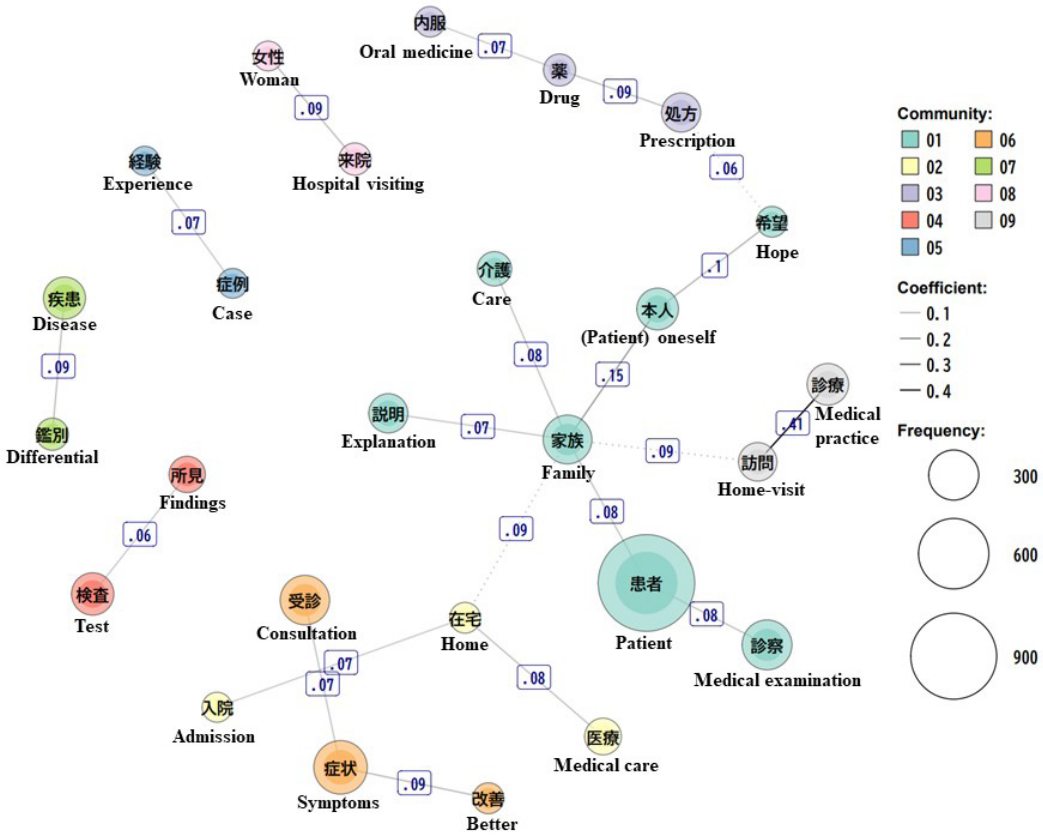

Fig. 1. The co-occurrence network map between frequent words
A community refers to a group of words connected relatively strongly with each other. KH coder automatically detects a community, groups words belonging to that community, and shows these communities in different colors. Words that do not form communities with other words are shown in white. Words in the same community are connected with solid lines, while words in different communities but having association with each other are connected with dashed lines. The number on the line is the Jaccard coefficient. This coefficient is calculated between 0 and 1, and the numbers closer to 1 indicate a stronger relationship between the connected words.

"training" but "family" was not included[10]. This suggests that substantial learning about family-oriented care may be a characteristic of GP/FM training and clerkship which, therefore, can be or should be included in learning objectives of GP/FM training, if it is not the primary objective.

"Home visit," "medical practice," and "life" appeared most frequently in the descriptions related to understanding a patient's psychosocial background (see typical sentence J in Table 4). In the co-occurrence network map, the strongest relationship was found between "home visit" and "medical practice" because the two words are often used as a compound word "home-visit medical practice" (訪問診

療). In our previous study, post self-evaluation of items related to psychosocial background also increased compared to pre self-evaluation of GP/FM training[8]. Previous studies from other countries have also reported that home visits are the starting point for understanding social and economic factors related to holistic medical care and patient's clinical conditions[18]. Unlike outpatient care, home visit training involves actual visits to patient's home where junior residents can learn about patient's psychosocial background by observing their living environment and daily life. Among the top 20 frequently occurring words, "patient," "person," "medical care," and "talk" were used extensively in a rather general context and it was difficult to find a characteristic meaning. In the co-occurrence network map, the Jaccard coefficient, excluding "home visit" and "medical practice", "family" and "(patient) oneself", was 0.1 or less. This is probably due to the amount of data. In this study, the total number of sentences was 4,903 and the total number of words was 116,279. We reported a study of medical students using a method similar to the present study[17]. In the previous study, the total number of sentences was 321 and the total number of words was 10,627, and the Jaccard coefficients of the co-occurrence network map were all 0.1 or higher. Therefore, it was suggested that co-occurrence was difficult to find in this study due to the large amount of data.

This study has several limitations. The first limitation is that the superiority of GP/FM training over other types of postgraduate training is not yet verified. Although there have been few prior studies comparing GP/FM training and other training, GP/FM training was reportedly equal to or better than other types of training in terms of education quality, acquisition of clinical skills, social support, and role independence[14]. Second, because the text data are student-reported outcomes, there might have been some self-reporting bias. It is possible that the junior residents made positive statements out of gratitude and/or consideration for the family doctors supervising them. Third, although it is possible to explore learning using text mining, it is not possible to accurately evaluate it.

Conclusions

This study used text mining to analyze reflective texts written by junior residents who underwent GP/FM training. It was suggested that GP/FM training greatly contributes to the acquisition of clinical abilities due to the GP/FM training complementing their previous training at core hospitals and junior residents were able to participate in and independently perform medical practice during the GP/FM training. In addition, our results also suggest that GP/FM training enabled substantial learning not only about patient care, but also family-oriented care.

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Conflicts of interest disclosure

The authors declare no conflicts of interest.

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