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Community pharmacy-level factors associated with medical and nursing home facility collaboration in Japan

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The aim of this study was to clarify the community pharmacy-level factors related to experiences of and attitudes toward collaboration with medical and nursing home care facilities. We conducted a postal questionnaire survey of all pharmacies in Gifu, Japan, assessing the experiences and attitudes of supervising pharmacists regarding the following activities related to collaboration between medical facilities and nursing home care facilities: regional care meetings/service adjustment meetings, case discussion conferences, joint workshops/continuing education conferences, community service, information sharing through medical cooperation networks, and pharmacists accompanying physicians on home care visits. The factors significantly related to inter-professional collaboration were the family pharmacist guidance fee and the number of patients offered pharmaceutical care through cooperation with other medical facilities. Items on attitudes toward collaborating with other medical facilities showed similar results. Overall, policies that support inter-professional collaboration to create a foundation, establish mechanisms to facilitate collaboration, and identify collaborative activities that can be carried out at each pharmacy should be developed.

1. Introduction

With Japan's aging population, the demand for home medical care is increasing and medical services required of community pharmacists are changing. The Ministry of Health, Labour and Welfare is promoting the development of a regional comprehensive care system in Japan (Ministry of Health, Labour and Welfare 2016) that will require inter-professional collaboration to support health promotion for local residents and provide appropriate services to patients receiving home medical care (Hirotani et al. 2015; Koga and Nishimura 2017). Various pharmacist activities are reported to promote home medical care (Hirotani et al. 2015; Yoshitake and Ohsawa 2017; Aoki et al. 2017; Koga and Nishimura 2017; Kobuke 2017). Announcing the "Framework for Action on Inter-professional Education and Collaborative Practice" the World Health Organization (2010) recommended education for inter-professional collaboration. Previous studies have also reported that pharmacist interventions, such as telephone follow-ups and home visits have a positive effect on resolving polypharmacy problems and lowering re-hospitalization rates (Stafford et al. 2011; Nazar et al. 2016; Malet-Larrea et al. 2016). By providing medical services through inter-professional collaboration, pharmacists can provide higher quality pharmaceutical services. The Ministry of Health, Labour and Welfare revised the pharmacy function information provision system on October 6, 2017 (Ministry of Health, Labour and Welfare 2017), with the aim of supporting the appropriate selection of pharmacies by residents and patients by encouraging information sharing through medical cooperation networks, sharing patient information at the time of discharge, and providing information on medical consultation referrals to medical institutions. Additionally, in Japan, "family pharmacist guidance fees" and "family pharmacist comprehensive management fees" were introduced in 2016 (Ministry of Health, Labour and Welfare 2018), whereby a pharmacist who establishes a patient contract to act as the "family pharmacist" can charge an additional fee. This policy aims to promote a change from pharmacies that dispense

medicines to pharmacies that serve as whole healthcare stations, providing pharmaceutical care based on patients' medical history, including the use of dietary supplements. Thus, several systems related to inter-professional collaboration have been established in Japan, and pharmacies are required to more actively collaborate with medical institutions. However, there have been few reports on the factors associated with collaborations between community pharmacies and medical facilities in Japan. We previously conducted questionnaire surveys of clinics that clarified clinic-level factors related to inter-professional collaboration with community pharmacies in Japan (Ino et al. 2018). For the current study, we conducted a postal questionnaire survey of community pharmacies in Gifu, Japan, to clarify the factors related to the experience of and attitude toward collaboration with medical facilities and nursing care facilities. Clarifying these factors can help strengthen the future collaboration system and prepare community pharmacies for collaboration with medical facilities to support local residents.

2. Investigations and results

We conducted a postal questionnaire survey from November 8 to December 20, 2017. We mailed questionnaires to all community pharmacies in Gifu City, Gifu Prefecture, Japan. We asked about the characteristics of the studied pharmacies, including the number of pharmacists, number of registered distributors, number of other staff, number of prescriptions accepted, ratio of prescriptions from specific medical institutions, number of drugs requiring guidance/over-the-counter drugs, number of sanitary materials/nursing care items, experience with family pharmacist guidance fee or family pharmacist comprehensive management fee, number of patients offered pharmacist consultation, number of patients offered recommendations for medical consultations, and number of patients offered pharmaceutical care through cooperation with other medical facilities. The main outcomes were respondents' experiences of and attitudes towards the following activities

Table 1: Characteristics of the community pharmacies

	n	%		n	%		
1. Number of pharmacists	1 or more and less than 2	67	40.9	6. Number of drugs requiring guidance/Over-the-counter drugs	0	21	12.8
	2 or more and less than 3	54	32.9		1-50	80	48.8
	3 or more and less than 4	22	13.4		51-100	20	12.2
	4 or more and less than 5	14	8.5		101-150	3	1.8
	5 or more	7	4.3		151-200	4	2.4
2. Number of registered distributors	0	101	61.6		201-300	2	1.2
	more than 0 and less than 1	10	6.1		301-500	11	6.7
	1 or more and less than 2	34	20.7		≥501	23	14.0
	2 or more and less than 3	7	4.3	7. Number of sanitary materials/nursing care items	0	21	12.9
	3 or more and less than 4	8	4.9		1-50	123	75.5
3. Number of other staff	4 or more and less than 5	2	1.2		51-100	8	4.9
	5 or more	2	1.2		101-200	6	3.7
	0	19	11.6		≥201	5	3.1
	more than 0 and less than 1	9	5.5	8. Experience of family pharmacist guidance fee	experienced	78	47.6
	1 or more and less than 2	37	22.6	or family pharmacist comprehensive management fee at pharmacy	not experienced	86	52.4
4. Number of prescription acceptances	2 or more and less than 3	48	29.3	9. Number of patients who were offered	0	20	12.5
	3 or more and less than 4	24	14.6	recommendation for medical consultation	1-10	58	36.3
	4 or more and less than 5	12	7.3		11-20	31	19.4
	5 or more	15	9.1		21-50	20	12.5
	0	1	0.6		51-100	10	6.3
5. Ratio of prescriptions from a specific medical institution	1-500	34	20.7		≥101	21	13.1
	501-1000	58	35.4	10. Number of patients who were offered	0	18	11.0
	1001-1500	27	16.5	recommendation for medical consultation	1-5	76	46.6
	1501-2000	19	11.6		6-10	28	17.2
	2001-2500	9	5.5		11-20	22	13.5
	2501-3000	10	6.1		21-50	11	6.7
	≥3001	6	3.7		≥51	8	4.9
	0%	1	0.6	11. Number of patients who were offered	0	54	32.9
	more than 0% and 20% or less	21	13.1	pharmaceutical care by cooperating with other medical facilities	1-5	60	36.6
	more than 20% and 40% or less	13	8.1		6-10	10	6.1
	more than 40% and 60% or less	16	10.0		11-20	10	6.1
more than 60% and 70% or less	14	8.8		21-50	18	11.0	
more than 70% and 80% or less	8	5.0		≥51	12	7.3	
more than 80% and 90% or less	26	16.3					
more than 90% and 100% or less	61	38.1					

associated with collaboration with medical and nursing facilities: regional care meetings/service adjustment meetings, care discussion conferences, joint workshops/continuing education conferences, community service, information sharing through medical cooperation networks, and pharmacists accompanying physicians on home care visits. Of the 270 pharmacies invited to participate, 167 completed the surveys with a response rate of 61.9 %, and 98.2 % (164/167) of the responses were valid. The descriptive statistics for these characteristics are shown in Table 1.

2.1. Factors related to the experiences of and attitudes toward collaboration with medical facilities (stratification analysis)

Tables 2A and 2B depict factors associated with experiences of and attitudes toward collaboration with medical facilities, respectively. The ratio of responding with “experienced” was greater for all collaboration items in pharmacies with a family pharmacist guidance fee compared to pharmacies that had not implemented such a fee. A significantly greater proportion of pharmacies that responded “more than one” for the number of patients who were offered pharmaceutical care through cooperation with other medical facilities had experience with all collaboration items, except for community service. For implementing community service, significant differences were found in many attributes, including two or more pharmacists, more than zero registered distributors, prescription acceptance counts of 1001 or more, 51 or more drugs requiring guidance/over-the-counter drugs, experience of family pharmacist guidance fees, and six or more patients who were offered recommendations for medical consultation. Regarding attitudes toward collaboration, pharmacies that considered collaboration had a significantly higher ratio of experiencing family pharmacist guidance fees across all items. Pharmacies that considered collaborating in regional care meetings/service adjustment meetings, care discussion conferences, joint workshops/continuing education conferences, community service, and information sharing through medical cooperation networks had a significantly higher ratio of reporting “one or more” for the number of patients who were offered pharmaceutical care by cooperating with other medical facilities. In addition, pharmacies that considered collaborating in regional care meetings/service adjustment meetings, care discussion conferences, joint workshops/continuing education conferences, information sharing through medical cooperation networks, and having pharmacists accompany physicians on home care visits had a significantly higher ratio of reporting “1001 or more” for the number of prescriptions accepted.

2.2. Multivariate analysis

Tables 3A and 3B present the multiple logistic regression analysis results. Pharmacies that had experienced a family pharmacist guidance fee or family pharmacist comprehensive management fee had greater odds of participating in regional care meetings/service adjustment meetings (odds ratio [OR] 4.25, 95 % confidence interval (CI)[1.86, 9.68]), case discussion conferences (OR 2.39, 95 % CI[1.03, 5.56]), and community service (OR 4.02, 95 % CI[1.59, 10.21]), sharing information through medical cooperation networks (OR 3.20, 95 % CI[1.27, 8.10]), and having pharmacists accompany physicians during home care visits (OR 3.63, 95 % CI[1.44, 9.18]). A similar trend was observed in pharmacies that reported having “one or more” patients who were offered pharmaceutical care through cooperation with other medical facilities, in regard to participation in regional care meetings/service adjustment meetings (OR 10.01, 95 % CI[3.10, 32.30]), case discussion conferences (OR 4.96, 95 % CI[1.59, 15.47]), joint workshops/continuing education conferences (OR 3.86, 95 % CI[1.72, 8.65]), sharing information through medical cooperation networks (OR 9.31, 95 % CI[2.07, 41.86]), and having pharmacists accompany physicians during home care visits (OR 7.86, 95 % CI[1.74, 35.56]). Pharmacies that had experienced a family pharmacist guidance fee or family pharmacist comprehensive management

fee had greater odds of considering collaboration in regional care meetings/service adjustment meetings (OR 3.78, 95 % CI[1.47, 9.75]), case discussion conferences (OR 2.68, 95 % CI[1.18, 6.10]), community service (OR 3.30, 95 % CI[1.51, 7.23]), and having pharmacists accompany physicians during home care visits (OR 3.16, 95 % CI[1.49, 6.67]). A similar trend was observed in pharmacies who reported having “one or more” patients who were offered pharmaceutical care through cooperation with other medical facilities, with regard to considering collaboration in regional care meetings/service adjustment meetings (OR 4.81, 95 % CI[1.99, 11.60]), case discussion conferences (OR 2.36, 95 % CI[1.08, 5.16]), and joint workshops/continuing education conferences (OR 3.52, 95 % CI[1.53, 8.10]).

3. Discussion

In this study, we clarified factors related to community pharmacies’ experiences of and attitudes toward collaboration with medical facilities and nursing care facilities.

The results showed that community pharmacies that had experienced a family pharmacist guidance fee had higher odds of collaborating with other medical facilities. A necessary requirement for becoming a family pharmacist is participation in regional activities related to medical care, while a requirement for collection of the family pharmacist guidance fee is providing information to the prescribing physician about patient adherence, making recommendations as necessary, and organizing medications through patient visits. These requirements are associated with pharmacists more actively participating in regional inter-professional activities. Onda (2005) reported that the introduction of the nursing-care insurance system at pharmacies has improved the implementation status for insurance/welfare related work. Pharmacies that reported “one or more” patients who were offered pharmaceutical care through cooperation with other medical facilities had higher ratios of implementing inter-professional collaboration. These inter-professional collaborations may lead to patient intervention resulting from interactions with other professionals who are already involved with other facilities. In pharmacies where the ratio of prescriptions from a specific medical institution was 80 % or more, the ratio of joint workshops/continuing education conferences was high. Pharmacies with prescription concentration rates of 80 % or more are typically located in the vicinity of medical institutions and have formed close relationships with the nearby hospitals and medical institutions. It is conceivable that this environment facilitates joint workshops/continuing education conferences. Pharmacies that offered six or more patient recommendations for medical consultation had high community service implementation rates. As part of their community service, many pharmacies conducted medication counseling, blood glucose measurement, and blood pressure measurement, potentially enhancing patients’ health awareness, providing them with the opportunities to learn about their health conditions, and encouraging consultation. Notably, pharmacies that collected family pharmacist guidance fees, and pharmacies where one or more patients were offered pharmaceutical care through cooperation with other medical facilities, showed higher collaboration rates for many items. In the open response section of the questionnaire, many opinions were expressed regarding the difficulties surrounding inter-professional collaboration, including lack of human resources, lack of professional knowledge, and lack of communication. Other factors might also impede inter-professional collaboration, such as a reluctance to make recommendations. Further research in this area is needed. An important limitation of this study is that it was conducted in a relatively small area, which may impair generalization. Although a high proportion of respondents believed that collaboration in the future would be high, current implementation of collaboration was actually low; inter-professional collaboration is not widely practiced in Japan’s community pharmacies. To promote inter-professional collaboration at community pharmacies, it is necessary to establish incentives that facilitate inter-professional collaboration between

Table 2A: Comparison of characteristics according to experience of collaboration with medical facilities

	I. Regional care meetings/service adjustment meetings		II. Case discussion conferences		P
	Conducted	Not conducted	Conducted	Not conducted	
1. Number of pharmacists	69.6%(39/56)	53.7%(58/108)	73.0%(27/37)	54.8%(69/126)	0.058
2. Number of registered distributors	46.4%(26/56)	34.3%(37/108)	43.2%(16/37)	37.3%(47/126)	0.567
3. Number of other staff	67.9%(38/56)	56.5%(61/108)	67.6%(25/37)	57.9%(73/126)	0.343
4. Number of prescription acceptances	44.6%(25/56)	42.6%(46/108)	54.1%(20/37)	40.5%(51/126)	0.187
5. Ratio of prescriptions from a specific medical institution	53.6%(30/56)	43.5%(47/104)	59.5%(22/37)	43.6%(55/126)	0.063
6. Number of drugs requiring guidance/ Over-the-counter drugs	41.1%(23/56)	37.0%(40/108)	43.2%(16/37)	36.5%(46/126)	0.564
7. Number of sanitary materials/nursing care items	94.6%(53/56)	83.3%(90/108)	89.2%(33/37)	86.5%(109/126)	0.786
8. Experience of family pharmacist comprehensive management fee at pharmacy	71.4%(40/56)	35.2%(38/108)	67.6%(25/37)	41.3%(52/126)	0.008*
9. Number of patients who were offered pharmacist consultation	63.6%(35/55)	44.8%(47/105)	57.1%(20/35)	50.0%(62/124)	0.566
10. Number of patients who were offered recommendation for medical consultation	50.0%(28/56)	38.3%(41/107)	51.4%(19/37)	40.0%(50/125)	0.258
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	92.9%(52/56)	53.7%(58/108)	89.2%(33/37)	61.1%(77/126)	0.001*
	III. Joint workshops/continuing education conferences		IV. Community service		
	Conducted	Not conducted	Conducted	Not conducted	P
1. Number of pharmacists	65.8%(50/76)	53.4%(47/88)	76.7%(33/43)	52.5%(63/120)	0.007*
2. Number of registered distributors	31.6%(24/76)	44.3%(39/88)	53.5%(23/43)	33.3%(40/120)	0.028*
3. Number of other staff	65.8%(50/76)	55.7%(49/88)	72.1%(31/43)	56.7%(68/120)	0.101
4. Number of prescription acceptances	50.0%(38/76)	37.5%(33/88)	58.1%(25/43)	37.5%(45/120)	0.021*
5. Ratio of prescriptions from a specific medical institution	35.5%(27/76)	56.8%(50/88)	57.1%(24/42)	41.9%(49/117)	0.105
6. Number of drugs requiring guidance/ Over-the-counter drugs	31.6%(24/76)	44.3%(39/88)	53.5%(23/43)	33.3%(40/120)	0.028*
7. Number of sanitary material/nursing care items	92.1%(70/76)	83.0%(73/88)	88.4%(38/43)	86.7%(104/120)	1.000
8. Experience of family pharmacist comprehensive management fee at pharmacy	56.6%(43/76)	39.8%(35/88)	69.8%(30/43)	39.2%(47/120)	0.001*
9. Number of patients who were offered pharmacist consultation	48.0%(36/75)	54.1%(46/85)	60.0%(24/40)	47.9%(57/119)	0.205
10. Number of patients who were offered recommendation for medical consultation	35.5%(27/76)	48.3%(42/87)	58.1%(25/43)	37.0%(44/119)	0.020*
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	78.9%(60/76)	56.8%(50/88)	79.1%(34/43)	63.3%(76/120)	0.087
	V. Sharing information through medical cooperation networks		VI. Accompanying during home care		
	Conducted	Not conducted	Conducted	Not conducted	P
1. Number of pharmacists	81.3%(26/32)	53.8%(71/132)	72.7%(24/33)	55.7%(73/131)	0.112
2. Number of registered distributors	43.8%(14/32)	37.1%(49/132)	39.4%(13/33)	38.2%(50/131)	1.000
3. Number of other staff	75.0%(24/32)	56.8%(75/132)	57.6%(19/33)	61.1%(80/131)	0.842
4. Number of prescription acceptances	50.0%(16/32)	41.7%(55/132)	51.5%(17/33)	41.2%(54/131)	0.328
5. Ratio of prescriptions from a specific medical institution	46.9%(15/32)	45.3%(62/132)	45.5%(15/33)	45.7%(58/127)	1.000
6. Number of drugs requiring guidance/ Over-the-counter drugs	40.6%(13/32)	37.9%(50/132)	36.4%(12/33)	38.9%(51/131)	0.843
7. Number of sanitary materials/nursing care items	87.5%(28/32)	87.0%(114/131)	90.9%(30/33)	86.2%(112/130)	0.573
8. Experience of family pharmacist comprehensive management fee at pharmacy	75.0%(24/32)	40.9%(54/132)	75.8%(25/33)	40.5%(53/131)	<0.001*
9. Number of patients who were offered pharmacist consultation	54.8%(17/31)	50.4%(65/129)	68.8%(22/32)	46.9%(60/128)	0.031*
10. Number of patients who were offered recommendation for medical consultation	46.9%(15/32)	41.2%(54/131)	42.4%(14/33)	42.3%(55/130)	1.000
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	93.8%(30/32)	60.1%(80/132)	93.9%(31/33)	60.3%(79/131)	<0.001*

*p < .05 Fisher's exact test

Table 2B: Comparison of characteristics according to intention to collaborate with other medical facilities

	I. Regional care meetings/service adjustment meetings		II. Case discussion conferences		P	
	Considering implementation	Not considering implementation	Considering implementation	Not considering implementation		
	P	P	P	P		
1. Number of pharmacists	2 or more	65.0%(80/123)	41.5%(17/41)	62.7%(74/118)	48.9%(22/45)	0.114
2. Number of registered distributors	more than 0	37.4%(46/123)	41.5%(17/41)	36.4%(43/118)	44.4%(20/45)	0.372
3. Number of other staff	2 or more	62.6%(77/123)	53.7%(22/41)	66.9%(79/118)	44.4%(20/45)	0.012*
4. Number of prescription acceptances	1001 or more	50.4%(62/123)	22.0%(9/41)	50.0%(59/118)	26.7%(12/45)	0.008*
5. Ratio of prescriptions from a specific medical institution	80% or less	45.0%(54/120)	47.5%(19/40)	40.9%(47/115)	56.9%(25/44)	0.078*
6. Number of drugs requiring guidance/Over-the-counter drugs	51 or more	39.0%(48/123)	36.6%(15/41)	39.8%(47/118)	35.6%(16/45)	0.720
7. Number of sanitary materials/nursing care items	1 or more	89.4%(110/123)	20.0%(8/40)	87.2%(102/117)	86.7%(39/45)	1.000
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy	experienced	56.9%(70/123)	19.5%(8/41)	55.0%(65/118)	28.9%(13/45)	0.003*
9. Number of patients who were offered pharmacist consultation	11 or more	55.0%(66/120)	40.0%(16/40)	52.2%(60/115)	47.7%(21/44)	0.723
10. Number of patients who were offered recommendation for medical consultation	6 or more	44.3%(54/122)	36.6%(15/41)	42.7%(50/117)	40.0%(18/45)	0.859
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	1 or more	76.4%(94/123)	39.0%(16/41)	72.0%(85/118)	53.3%(24/45)	0.027*
III. Joint workshops/continuing education conferences						
		Considering implementation	Not considering implementation	Considering implementation	Not considering implementation	P
1. Number of pharmacists	2 or more	62.8%(81/129)	44.1%(15/34)	64.2%(70/109)	49.1%(27/55)	0.067
2. Number of registered distributors	more than 0	36.4%(47/129)	47.1%(16/34)	38.5%(42/109)	38.2%(21/55)	1.000
3. Number of other staff	2 or more	64.3%(83/129)	44.1%(15/34)	65.1%(71/109)	50.9%(28/55)	0.092
4. Number of prescription acceptances	1001 or more	48.1%(62/129)	23.5%(8/34)	47.7%(52/109)	34.5%(19/55)	0.133
5. Ratio of prescriptions from a specific medical institution	80% or less	43.7%(55/126)	54.5%(18/33)	45.4%(49/108)	46.2%(24/52)	1.000
6. Number of drugs requiring guidance/Over-the-counter drugs	51 or more	37.2%(48/129)	41.1%(14/34)	44.0%(48/109)	27.3%(15/55)	0.042*
7. Number of sanitary materials/nursing care items	1 or more	88.3%(113/128)	82.4%(28/34)	88.1%(96/109)	85.2%(46/54)	0.625
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy	experienced	53.5%(69/129)	26.5%(9/34)	56.9%(62/109)	29.1%(16/55)	0.001*
9. Number of patients who were offered pharmacist consultation	11 or more	51.6%(65/126)	48.5%(16/33)	55.7%(59/106)	43.0%(23/54)	0.134
10. Number of patients who were offered recommendation for medical consultation	6 or more	43.0%(55/128)	41.2%(14/34)	45.4%(49/108)	36.4%(20/55)	0.316
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	1 or more	72.9%(94/129)	44.1%(15/34)	73.3%(80/109)	54.5%(30/55)	0.022*
IV. Community service						
		Considering implementation	Not considering implementation	Considering implementation	Not considering implementation	P
1. Number of pharmacists	2 or more	63.8%(74/116)	46.8%(22/47)	66.7%(70/105)	44.8%(26/58)	0.008*
2. Number of registered distributors	more than 0	39.7%(46/116)	36.2%(17/47)	37.1%(39/105)	41.2%(24/58)	0.617
3. Number of other staff	2 or more	64.7%(75/116)	48.9%(23/47)	65.7%(69/105)	50.0%(29/58)	0.066
4. Number of prescription acceptances	1001 or more	49.1%(57/116)	27.7%(13/47)	49.5%(52/105)	31.0%(18/58)	0.031*
5. Ratio of prescriptions from a specific medical institution	80% or less	44.2%(50/113)	50.0%(23/46)	43.7%(45/103)	50.0%(28/56)	0.506
6. Number of drugs requiring guidance/Over-the-counter drugs	51 or more	41.3%(48/116)	31.9%(15/47)	38.1%(40/105)	39.7%(23/58)	0.868
7. Number of sanitary materials/nursing care items	1 or more	87.1%(101/116)	87.0%(40/46)	86.7%(91/105)	87.7%(50/57)	1.000
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy	experienced	54.3%(63/116)	29.8%(14/47)	59.0%(62/105)	26.9%(15/58)	<0.001*
9. Number of patients who were offered pharmacist consultation	11 or more	55.8%(63/113)	41.3%(19/46)	56.3%(58/103)	42.9%(24/56)	0.135
10. Number of patients who were offered recommendation for medical consultation	6 or more	44.3%(51/115)	36.2%(17/47)	43.3%(45/104)	39.7%(23/58)	0.740
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	1 or more	72.4%(84/116)	53.2%(25/47)	71.4%(75/105)	58.6%(34/58)	0.118
V. Sharing information through medical cooperation networks						
		Considering implementation	Not considering implementation	Considering implementation	Not considering implementation	P
1. Number of pharmacists	2 or more	63.8%(74/116)	46.8%(22/47)	66.7%(70/105)	44.8%(26/58)	0.008*
2. Number of registered distributors	more than 0	39.7%(46/116)	36.2%(17/47)	37.1%(39/105)	41.2%(24/58)	0.617
3. Number of other staff	2 or more	64.7%(75/116)	48.9%(23/47)	65.7%(69/105)	50.0%(29/58)	0.066
4. Number of prescription acceptances	1001 or more	49.1%(57/116)	27.7%(13/47)	49.5%(52/105)	31.0%(18/58)	0.031*
5. Ratio of prescriptions from a specific medical institution	80% or less	44.2%(50/113)	50.0%(23/46)	43.7%(45/103)	50.0%(28/56)	0.506
6. Number of drugs requiring guidance/Over-the-counter drugs	51 or more	41.3%(48/116)	31.9%(15/47)	38.1%(40/105)	39.7%(23/58)	0.868
7. Number of sanitary materials/nursing care items	1 or more	87.1%(101/116)	87.0%(40/46)	86.7%(91/105)	87.7%(50/57)	1.000
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy	experienced	54.3%(63/116)	29.8%(14/47)	59.0%(62/105)	26.9%(15/58)	<0.001*
9. Number of patients who were offered pharmacist consultation	11 or more	55.8%(63/113)	41.3%(19/46)	56.3%(58/103)	42.9%(24/56)	0.135
10. Number of patients who were offered recommendation for medical consultation	6 or more	44.3%(51/115)	36.2%(17/47)	43.3%(45/104)	39.7%(23/58)	0.740
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	1 or more	72.4%(84/116)	53.2%(25/47)	71.4%(75/105)	58.6%(34/58)	0.118

*p < .05 Fisher's exact test

Table 3A: Results of the multiple logistic regression analysis
A. Experiences of collaboration with other medical facilities

	OR (95%CI)	P
I. Regional care meetings/service adjustment meetings		
1. Number of pharmacists (2 or more)	1.55(0.65-3.71)	0.328
2. Number of registered distributors (more than 0)	1.63(0.67-3.95)	0.280
3. Number of other staff (2 or more)	1.67(0.68-4.06)	0.262
5. Ratio of prescriptions from a specific medical institution (80% or less)	1.41(0.58-3.42)	0.448
7. Number of sanitary materials/nursing care items (1 or more)	2.83(0.68-11.75)	0.152
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy (experienced)	4.25(1.86-9.68)	0.001*
9. Number of patients who were offered pharmacist consultation (11 or more)	1.53(0.60-3.92)	0.372
10. Number of patients who were offered recommendation for medical consultation (6 or more)	1.09(0.43-2.74)	0.856
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	10.01(3.10-32.30)	<0.001*
II. Case discussion conferences		
1. Number of pharmacists (2 or more)	1.45(0.52-4.03)	0.478
4. Number of prescription acceptances (1001 or more)	1.42(0.54-3.70)	0.474
5. Ratio of prescriptions from a specific medical institution (80% or less)	2.16(0.96-4.87)	0.062
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy (experienced)	2.39(1.03-5.56)	0.042*
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	4.96(1.59-15.47)	0.006*
III. Joint workshops/continuing education conferences		
1. Number of pharmacists (2 or more)	1.57(0.67-3.71)	0.301
2. Number of registered distributors (more than 0)	0.87(0.40-1.93)	0.738
3. Number of other staff (2 or more)	1.12(0.53-2.37)	0.769
4. Number of prescription acceptances (1001 or more)	0.99(0.42-2.34)	0.978
5. Ratio of prescriptions from a specific medical institution (80% or less)	0.42(0.19-0.92)	0.030*
6. Number of drugs requiring guidance/over-the-counter drugs (51 or more)	0.66(0.31-1.41)	0.282
7. Number of sanitary materials/nursing care items (1 or more)	2.71(0.90-8.14)	0.075
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy (experienced)	1.61(0.78-3.33)	0.199
10. Number of patients who were offered recommendation for medical consultation (6 or more)	0.59(0.28-1.25)	0.170
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	3.86(1.72-8.65)	0.001*
IV. Community service		
1. Number of pharmacists (2 or more)	1.87(0.64-5.48)	0.255
2. Number of registered distributors (more than 0)	1.77(0.69-4.51)	0.234
3. Number of other staff (2 or more)	1.46(0.57-3.77)	0.431
4. Number of prescription acceptances (1001 or more)	1.98(0.72-5.46)	0.189
5. Ratio of prescriptions from a specific medical institution (80% or less)	1.48(0.59-3.72)	0.400
6. Number of drugs requiring guidance/over-the-counter drugs (51 or more)	2.23(0.89-5.59)	0.089
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy (experienced)	4.02(1.59-10.21)	0.003*
9. Number of patients who were offered pharmacist consultation (11 or more)	0.83(0.32-2.18)	0.710
10. Number of patients who were offered recommendation for medical consultation (6 or more)	3.04(1.13-8.16)	0.028*
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	1.66(0.63-4.42)	0.307
V. Sharing information through medical cooperation networks		
1. Number of pharmacists (2 or more)	2.77(1.00-7.72)	0.051
3. Number of other staff (2 or more)	1.67(0.64-4.33)	0.296
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy (experienced)	3.20(1.27-8.10)	0.014*
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	9.31(2.07-41.86)	0.004*
VI. Accompanying during home care		
1. Number of pharmacists (2 or more)	1.60(0.63-4.07)	0.345
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy (experienced)	3.63(1.44-9.18)	0.006*
9. Number of patients who were offered pharmacist consultation (11 or more)	1.90(0.78-4.66)	0.159
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	7.86(1.74-35.56)	0.007*

* $p < .05$ Fisher's exact test

Table 3B: Results of the multiple logistic regression analysis
B. Considering collaborating with medical facilities

	OR (95%CI)	P
I. Regional care meetings/service adjustment meetings		
1. Number of pharmacists (2 or more)	0.87(0.32-2.37)	0.777
4. Number of prescription acceptances (1001 or more)	4.19(1.36-12.98)	0.013*
7. Number of sanitary materials/nursing care items (1 or more)	1.57(0.48-5.17)	0.458
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee (experienced)	3.79(1.47-9.75)	0.006*
9. Number of patients who were offered pharmacist consultation (11 or more)	1.52(0.63-3.63)	0.349
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	4.81(1.99-11.60)	<0.001*
II. Case discussion conferences		
1. Number of pharmacists (2 or more)	0.81(0.33-2.03)	0.660
3. Number of other staff (2 or more)	1.91(0.87-4.19)	0.108
4. Number of prescription acceptances (1001 or more)	2.06(0.80-5.35)	0.136
5. Ratio of prescriptions from a specific medical institution (80% or less)	0.57(0.27-1.23)	0.154
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee (experienced)	2.68(1.18-6.10)	0.019*
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	2.36(1.08-5.16)	0.031*
III. Joint workshops/continuing education conferences		
1. Number of pharmacists (2 or more)	0.93(0.35-2.45)	0.882
3. Number of other staff (2 or more)	1.88(0.81-4.38)	0.144
4. Number of prescription acceptances (1001 or more)	2.49(0.85-7.29)	0.095
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee (experienced)	2.32(0.93-5.80)	0.071
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	3.52(1.53-8.10)	0.003*
IV. Community service		
1. Number of pharmacists (2 or more)	1.06(0.44-2.56)	0.900
3. Number of other staff (2 or more)	1.64(0.76-3.57)	0.209
4. Number of prescription acceptances (1001 or more)	1.24(0.50-3.05)	0.647
6. Number of drugs requiring guidance/ Over-the-counter drugs (51 or more)	2.58(1.17-5.68)	0.019*
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee (experienced)	3.30(1.51-7.23)	0.003*
9. Number of patients who were offered pharmacist consultation (11 or more)	1.54(0.72-3.29)	0.267
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	1.89(0.89-4.03)	0.097
V. Sharing information through medical cooperation networks		
1. Number of pharmacists (2 or more)	0.90(0.38-2.16)	0.811
3. Number of other staff (2 or more)	1.81(0.82-3.97)	0.141
4. Number of prescription acceptances (1001 or more)	2.07(0.83-5.18)	0.120
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee (experienced)	2.15(0.98-4.69)	0.055
9. Number of patients who were offered pharmacist consultation (11 or more)	1.83(0.84-3.98)	0.131
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	0.89(0.87-4.09)	0.106
VI. Accompanying during home care		
1. Number of pharmacists (2 or more)	0.50(0.64-3.49)	0.350
3. Number of other staff (2 or more)	1.95(0.91-4.17)	0.087
4. Number of prescription acceptances (1001 or more)	1.16(0.48-2.78)	0.742
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee (experienced)	3.16(1.49-6.67)	0.003*
9. Number of patients who were offered pharmacist consultation (11 or more)	1.86(0.87-3.95)	0.106
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities (1 or more)	1.38(0.65-2.95)	0.398

* $p < .05$ Fisher's exact test

pharmacies and other medical institutions, which requires informing patients and local residents about the benefits that family pharmacists can offer them, such as these pharmacists' ability to use their knowledge of patients' lifestyle, physical characteristics, and health conditions to evaluate medication efficacy, monitor side effects, understand medication related problems, and make medication recommendations.

To encourage pharmacies to engage in inter-professional collaboration, it is necessary to recognize potential barriers and provide solutions. For example, to counteract a shortage of knowledge and communication among professionals, activities designed to foster understanding and build face-to-face relationships could be implemented.

Table 4: Survey items

Items	Explanation of each item
«Characteristics of the community pharmacies»	
1. Number of pharmacists	Number of pharmacists (full-time conversion)
2. Number of registered distributors	Number of registered distributors (full-time conversion)
3. Number of other staff	Number of other staff (full-time conversion)
4. Number of prescription acceptances	Number of prescription acceptances per month
5. Ratio of prescriptions from a specific medical institution	Ratio of prescriptions from a specific medical institution per month
6. Number of drugs requiring guidance/Over-the-counter drugs	Number of drugs requiring guidance/Over-the-counter drugs handled by pharmacy
7. Number of sanitary materials/nursing care items	Number of sanitary materials/nursing care items handled by pharmacy
8. Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee at pharmacy	Experience of family pharmacist guidance fee or family pharmacist comprehensive management fee
9. Number of patients who were offered pharmacist consultation	Number of patients who were offered pharmacist consultation in the past six months
10. Number of patients who were offered recommendation for medical consultation	Number of patients who were offered recommendation for medical consultation in the past six months
11. Number of patients who were offered pharmaceutical care by cooperating with other medical facilities	Number of patients who were offered pharmaceutical care by cooperating with other medical facilities in the past six months
«Collaboration items with other medical facilities/nursing care facilities (excluding pharmacies)»	
I. Regional care meetings/service adjustment meetings	Attending regional care meetings/service adjustment meetings with other healthcare professionals
II. Case discussion conferences	Case discussion conferences with other healthcare professionals
III. Joint workshops/continuing education conferences	Joint workshops/continuing education conferences with other facilities
IV. Community service	Community service with other facilities
V. Sharing information through medical cooperation networks	Sharing information through medical cooperation networks with other facilities
VI. Accompanying during home care	Pharmacists accompanying physicians during home care

4. Experimental

4.1. Survey method and participants

We conducted a postal questionnaire survey from November 8 to December 20, 2017. We mailed questionnaires to all community pharmacies in Gifu City, Gifu Prefecture, Japan, that were in the Tokai Hokuriku Health and Welfare Bureau's insurance pharmacy list (https://kouseikyoku.mhlw.go.jp/tokaihokuriku/gyomu/gyomu/hoken_kikan/shitei.html, March 2, 2018). We asked each pharmacy's responsible pharmacist to respond to the questionnaire. Completed questionnaires were returned in an enclosed self-addressed return envelope. We excluded two pharmacies that had been suspended from this list as of October 1, 2018; thus, 270 pharmacies were ultimately included.

4.2. Survey items

The survey items are shown in Table 4. The characteristics of the studied pharmacies included the number of pharmacists, number of registered distributors, number of other staff, number of prescriptions accepted, ratio of prescriptions from a specific medical institution, number of drugs requiring guidance/over-the-counter drugs, number of sanitary materials/nursing care items, experience of a family pharmacist guidance fee or family pharmacist comprehensive management fee, number of patients offered a pharmacist consultation, number of patients offered recommendations for a medical consultation, and number of patients offered pharmaceutical care through cooperation with other medical facilities.

The main outcomes were respondents' experiences of and attitudes towards the following activities associated with collaboration with medical facilities and nursing facilities: regional care meetings/service adjustment meetings, care discussion conferences, joint workshops/continuing education conferences, community service, information sharing through medical cooperation networks, and having pharmacists accompany physicians on home care visits. For each activity, participants rated their experiences of collaboration by selecting one of the following options: "not conducted," "has been conducted once or several times a year," "has been conducted once or twice a month," and "has been conducted at least once a week." Participants rated their attitudes toward collaboration by choosing one of the following options: "I would not consider collaboration," "I want to collaborate once to several times a year," "I want to collaborate once or twice a month," and "I want to collaborate at least once a week." We also included an open question wherein participants could provide more details on their responses to the various items.

4.3. Evaluation and analysis

We compared participants' experiences of and attitudes toward collaboration with medical facilities and nursing facilities according to the characteristics of the pharmacies. The pharmacies were stratified on characteristics to ensure that the proportion of each stratum was closest to 50%. To stratify participants according to their experience of collaboration, we grouped all participants who responded with "not conducted" into the "not conducted" group; all other answers were placed into the "experienced" group. As for the attitudes toward collaboration, an answer of "I would not consider collaboration" was classified as "not considering implementation"; all other answers were classified as "considering implementation."

Based on the results of this stratification analysis, we performed a multiple logistic regression analyses. Factors with a Fisher's exact test value of $p < .25$ in the stratification analysis were considered independent variables; the main dependent variables were experiences and attitudes regarding collaboration with medical institutions. IBM SPSS Statistics 24 (IBM Corp., Armonk, New York, USA) was used to conduct the analyses. We used $p < .05$ as an indicator of statistical significance.

4.4. Ethical approval

This study was approved by the ethics committees of Gifu Pharmaceutical University (approval number: 29-15) and Gifu University Graduate School of Medical Science (approval number: 29-241). In a document sent along with the questionnaire, we explained the following to all participants: surveyed information would be used only for research purposes, their personal information would never be disclosed, the survey results would be published in academic conferences and journals, participation in the questionnaire survey was voluntary, and only community pharmacies that agreed to respond to the questionnaire were eligible. Replying to the questionnaire was considered as agreement to participate.

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