

An experiential observational study of graduates from the Japanese six year programme

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Abstract

Objective: To provide an initial experiential competency assessment of the first wave of graduates from the reformed Japanese six-year pharmacy initial education programme.

Methods: The authors evaluated observed competencies of recently qualified pharmacists who graduated from the pharmacy six-year programme (6-YP pharmacists) from the perspective of experienced pharmacists from the previous national four-year initial education and training programme. A web-based survey of working pharmacists who had graduated from the previous pharmacy four-year programme (4-YP) was conducted, targeting 200 pharmacists (100 hospital pharmacists and 100 community pharmacists). Inclusion criteria specified working with, and having experience of, qualified 6-YP pharmacists. These recruits provided an observational evaluation of itemised competencies for the first wave of 6-YP pharmacists in workplace environments. This methodology was designed to overcome the logistical challenges of objective structured performance-related evaluation of practice competency.

Results: The 4-YP community pharmacists gave a significantly higher overall perceived competency assessment of the 6-YP pharmacists than did hospital pharmacists ($p < 0.05$ *U*-test). In the competency assessment analysis, the improvements of competencies considered to be a priority for 6-YP community-based pharmacists were “medication therapy management” and “education and training competencies”, while the priority improvement competencies of 6-YP hospital-based pharmacists were considered to be “professionalism”, “inter-professional collaboration”, “medication therapy management”, “community health and medical care”, and “lifelong learning”.

Conclusion: This research suggests that curriculum improvement should continue to be reviewed together with efforts to better foster these competencies in initial education and training. Methods to continuously evaluate and improve the lower assessed competencies need to be introduced together with post-registration continued training, preferably using validated competency development frameworks in the near future.

Keywords: Educational Assessment, Pharmacy Education, Japanese Six-Year Pharmacy Programme, Competency, Workforce Development.

Introduction

In the context of quality assurance, the assessment of pharmacy education has become increasingly important, and many countries have undertaken various initiatives based on the results of such assessments (Holdford & Patkar, 2003; Deshpande *et al.*, 2004; Littlefield *et al.*, 2004; Boesen *et al.*, 2009; Peterson *et al.*, 2011; Ried, 2011; Truong *et al.*, 2012; Beardsley *et al.*, 2013; Trovic & Rouse, 2015; Chanakit *et al.*, 2014; Yoo *et al.*, 2014; Bader *et al.*, 2017). The importance of pharmacy education assessment has also been noted in reports from the International Pharmaceutical Federation (FIP) (FIP, 2012; 2014; 2015; 2016). However, in most cases, the educational assessment model for one country often cannot be adapted by another without appropriate

adjustments in relation to their own social needs and circumstances. In regard to pharmacy education development, the Japanese School Education Act was revised in 2004, and pharmacy education was changed from a four-year programme (4-YP) of pharmacy education to a six-year programme (6-YP), which was implemented in 2006 (Ministry of Education, Culture, Sports, Science and Technology, 2004). This substantial reform indicated that becoming a pharmacist required not only sufficient practical training, but also specialisation and a demonstrated sense of patient care. At present, initial Japanese pharmaceutical education consists of two programmes: a 6-YP intended to train pharmacists, and a 4-YP, primarily intended to train pharmaceutical scientists (Hirata, 2015; Inui *et al.*, 2016). The initial

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pharmacy 6-YP was created based on the following policies (Inui *et al.*, 2016):

- 1) Training pharmacists suitable for current social and healthcare needs;
- 2) Students being the centre of learning;
- 3) Assessing whether students reach their educational goals;
- 4) Balance between basic and clinical subjects is maintained;
- 5) Practical professional training is comprehensive.

However, since this model core curriculum was implemented, several problems have been described. First, specific behavioural objectives (SBOs) did not sufficiently keep up-to-date with change in social and medical conditions. Second, Japanese pharmacy education had a basic curriculum description, but additionally each university was required to design and deliver an original curriculum. However, because this core curriculum had many items, it was difficult for the university to make their curriculum original. Third, the learning strategy in practical training depended on the training facilities available, which resulted in differences in the content of practical training. Therefore, the model core curriculum was revised with an approximate 25% reduction in the amount of content, and was implemented in 2015 (Inui *et al.*, 2016). The basic policy of the revised model core curriculum was to foster 'Professional Competencies for Pharmacists', which were stipulated as follows: 1) Professionalism; 2) Patient-oriented Attitude; 3) Communication Skills; 4) Inter-professional Collaboration; 5) Basic Sciences; 6) Medication Therapy Management; 7) Community Health and Medical Care; 8) Research Competency; 9) Lifelong Learning; and 10) Education and Training (Hirata, 2015; Ministry of Education, 2015; Inui *et al.*, 2016). All students are required to have acquired all these competencies at graduation. Fostering of 'Professional Competencies for Pharmacists' requires learning strategies such as active-learning methods and inter-professional education. These learning strategies have just recently been introduced in Japan (Kiuchi *et al.*, 2013; Yasuhara & Kosano, 2014; Takeda *et al.*, 2016).

The Japan Accreditation Board for Pharmaceutical Education established the third-party Pharmaceutical Education Evaluation organisation in 2008. This organisation, which is the first to specifically assess universities and colleges of pharmacy in Japan, has been assessing all such faculties with a 6-YP since 2012 (Japan Accreditation Board for Pharmaceutical Education, 2008; Hirata, 2015). The purposes of the audit are as follows: 1) to ensure the quality of education programmes; 2) to promote their improvement; and 3) to provide support for actively obtaining public understanding and cooperation. Assessments are performed on the students and structure of each education programme, and, as of March 2018, 48 of 74 universities have been assessed. Although this audit has 13 items that consist of 57 standards and 176 viewpoints,

graduates' competency assessment is not included in the items (Japan Accreditation Board for Pharmaceutical Education, 2018).

In regard to Japanese certified pharmacists, the systems currently in place certify the following types of pharmacists:

- 1) Certified pharmacists for pharmacy practical training for students in initial pharmacy 6-YP;
- 2) Certified pharmacists through a continuing education programme;
- 3) Certified pharmacists through related societies such as the Japanese Society of Pharmaceutical Health Care and Sciences, the Japanese Society of Clinical Pharmacology and Therapeutics, the Japanese Society for Emergency Medicine, and the Japanese Society of Chemotherapy. Other certified pharmacists include 'sports pharmacists', who play a role in helping to prevent doping in athletes;
- 4) Specialised pharmacists certified by the Japanese Society of Hospital Pharmacists in fields such as oncology, infection control, psychiatry, HIV infection, pregnancy and lactation (FIP, 2015; Araki, 2016; Yasuhara, 2016).

Japanese pharmacy education must be able to adapt to health and social needs, circumstances, and required competencies. Hence a comprehensive assessment of the recent 6-YP in Japan is an urgent issue. To begin to address this challenge, the authors surveyed more experienced 4-YP pharmacists as to whether more recently graduated 6-YP pharmacists had more 'Professional Competencies for Pharmacists' compared with the 4-YP pharmacists including themselves. The authors conducted a competency assessment analysis using these responses (Kimura *et al.*, 2014; Otori *et al.*, 2016).

Methods

The authors conducted a web-based survey (Nextit Research Institute, Inc., Kobe) in Japan in July 2017. This research company has registered 8,422 pharmacists in Japan in 2017. Pharmacists must register the pharmacist's license number and the acquisition date. The authors clearly stipulated the purpose of the research on the website. This survey was anonymously conducted only for the pharmacists who gave consent for the purpose of the research. The rejection of consent was not captured, and therefore the authors' cannot calculate a valid 'response rate' on this survey; however, to offset this in-built limitation, and in conjunction with sample criteria set out below, the authors targeted 100 final respondents each from both the community and hospital employment sectors, respectively. Response cases were considered valid for analysis if the following criteria were met: the respondent's initial education and training was as a 4-YP pharmacist; the respondent had current experience of working with recent 6-YP pharmacists. If

these criteria were met, then demographic data was captured from respondents. The respondents subsequently responded to a set of questionnaire items connected with 'Professional Competencies for Pharmacists' as set out in the basic policy of the revised 6-YP model core curriculum (Ministry of Education, 2015). The respondents were asked to provide their observed perception of competency of 6-YP pharmacists they had encountered in practice, mapped against this list of intended competency outcomes for the 6-YP graduates (including overarching competency). Responses were collected on a Likert scale (Strongly agree; Agree; Neither; Disagree; Strongly disagree). In summary, the 4-YP recruits provided an observational evaluation of itemised competencies of the first wave of 6-YP pharmacists in workplace environments. This methodology, including a novel application of covariate correlational statistics described below, was designed to overcome the logistical challenges of objective structured performance-related evaluation of practice competency.

The web survey remained open until the target number of 4-YP pharmacists' respondents who met the inclusion criteria reached 200 (100 hospital pharmacists and 100 community pharmacists).

Data were tested for assumption of normal distribution and, based on this, appropriate comparative data testing using *Chi-square* and Mann-Whitney *U*-test were used for analysis, conducted using SPSS Statistics 25.0 (IBM, Chicago, IL). Moreover, using this 'perceived competency' data the authors conducted an assessment analysis to identify, from the perspective of existing qualified pharmacists, the competencies requiring priority improvement of the 6-YP pharmacists mapped on the 'Professional Competencies for Pharmacists' list previously described and total overarching competency (Table I). The resulting competency assessment analysis was plotted on two-dimensional coordinates using a previously described method (Kimura *et al.*, 2014; Otori *et al.*, 2016). The association of the perceived competencies of 6-YP pharmacists is set to the abscissa axis (this coordinate is the correlation coefficient between 'total perceived competency' [Item 11] and each itemised competency statement) and the proportion (as a %) of sample responses for high-level agreement is set as the ordinate coordinate (*ie.* the proportion of responses for each competency item rating "agree" or "strongly agree"); hence, the abscissa coordinate shows the association between an individual competency perception (Items 1-10 in Table I) and overarching competence; a high correlation indicates that the competency item closely associates with total overarching competence perception and hence has some importance or priority (noting that the responses originate in practice environments). On a chart representing these coordinates, a line drawn for the mean sample values is set parallel to the abscissa and ordinate axes, the resultant quadrants can be determined. In this chart, assessed competency items with a high evaluation response ("agreement" on the Likert scale) and a high correlational association

Table I: The Questionnaire Items

Are the 6-YP pharmacists you have encountered more competent on these following competencies (items 1-10) compared with your experiences of 4-YP pharmacists (include total, overarching competency, Item 11)? Based on your perception, choose from the five options (Strongly agree; Agree; Neither; Disagree; Strongly disagree).

Item 1: Competency 1. Professionalism:

To address the legal, ethical, and professional responsibilities of pharmacists.

Item 2: Competency 2. Patient-oriented Attitude:

To respect the rights of individuals and to promote the health and welfare of the patients and consumers.

Item 3: Competency 3. Communication Skills:

To communicate effectively with patients, consumers, and other healthcare professionals to provide valuable information to them.

Item 4: Competency 4. Inter-professional Collaboration:

To collaborate with the healthcare teams in hospitals and regional communities.

Item 5: Competency 5. Basic Sciences:

To understand the effects of medicines and chemicals on living bodies and environments.

Competency 5-1: Fundamental basic science

Competency 5-2: Pharmaceutical knowledge

If the answer to Competency 5-2 was strongly agree or agree, specifically, what type of knowledge is better? (Please select all that apply: pharmacology, pathology, practical knowledge, pharmacokinetics, laws and regulations, other.)

Item 6: Competency 6. Medication Therapy Management:

To contribute to the optimal use of medicines through pharmaceutical care.

Competency 6-1: Prescription analytical skill or case analytical skill

Competency 6-2: Problem-solving

Item 7: Competency 7. Community Health and Medical Care:

To contribute to the public health and pharmaceutical hygiene and to enhance community healthcare and home care.

Item 8: Competency 8. Research Competency:

To engage in research on drug development and use of medicines to improve healthcare environment.

Item 9: Competency 9. Lifelong Learning:

To enhance continuing professional development through lifetime in response to the advance in healthcare environment.

Competency 9-1: Motivated to acquire certified or specialized pharmacist licenses

Competency 9-2: Lifelong learning

Item 10: Competency 10. Education and Training:

To possess will and attitude to bring up an excellent pharmacist of the next generation.

Item 11: Total, overarching competency

Total competency (including competency 1-10) as pharmacists

'Professional Competencies for Pharmacists' have changed some of expressions based on English version of revised model core curriculum for pharmacy education 2015 drafted at November 15 2017 by Koichiro Ozawa, the Pharmaceutical Society of Japan.

with total overarching competency will emerge in the upper-right quadrant, termed the “emphasis maintenance field”; competencies emerging in the emphasis maintenance field are those perceived to be well adopted by practitioners and contributing to perceived influential core practice functions. Factors with a high evaluation and low degree of correlational association with total overarching competency are emergent in the second, upper-left, quadrant, termed the “maintenance field”; competency assessment outcomes in this field show well perceived competency acquisition with less direct association with total overarching competence. Itemised competencies with both a low evaluation (less agreement of competency acquisition) and low degree of correlational association with total overarching competency are emergent in the third, lower-left, quadrant, termed the “improvement field”; these indicate itemised competency factors deemed to require improvement but with lower associations with perceived core functions. Competency items, with a low evaluation and high degree of correlational association with total overarching competency emerge in the fourth, lower-right, quadrant, termed the “priority improvement field”; items in this field show correlational associations higher than the mean and the proportion of competency item evaluations simultaneously less than the mean, indicating areas that are deemed important to practice but with a low perceptual assessment of competence - hence a priority for improvement.

Results

1. The respondents' characteristics

The demographics of respondents are shown in Table II. The results indicated no significant differences in general demographics between 4-YP community and 4-YP hospital experienced pharmacists; the single exception is that the hospital group contained more certified trainers (for pre-registration practical student training) compared with the community group ($\chi^2 = 0.012$; $p < 0.05$).

2. Pharmacists' perceptual evaluation responses between hospital and community.

The authors investigated the perceptual competency evaluations of the 6-YP pharmacists, drawn from the responses of the assessor group of 4-YP experienced community and hospital pharmacists (Table III, Mann-Whitney U test). The results showed that 4-YP experienced community pharmacists gave the recent 6-YP pharmacists significantly higher evaluations for Competency 1 (professionalism), Competency 2 (patient-oriented attitude), Competency 5-1 (basic sciences: fundamental basic science), Competency 5-2 (basic sciences: pharmaceutical knowledge), Competency 7 (community health and medical care), Competency 8 (research competency), Competency 9-2 (lifelong learning) and Total (overarching competency) the comparison assessor group being the matched 4-YP experienced hospital

Table II: Demographics Characteristics of 4-YP Pharmacists' Respondents

Variable	Community Pharmacists N=100	Hospital Pharmacists N=100	C ²	p-value
University				
Private	79	77	0.12	0.43
Public	21	23		
Age (years)				
30-40	46	40	5.19	0.27
41-50	38	38		
51-60	11	20		
>60	5	2		
Gender				
Male	73	80	1.36	0.16
Female	27	20		
Total number of years working as a pharmacist				
<5	0	0		
5-10	18	16	2.17	0.71
11-20	55	51		
21-30	20	22		
>30	7	11		
Certified pharmacists for pharmacy practical training for students in six-year pharmacy programme				
Yes	41	58	5.78	0.012*
No	59	42		
Certified pharmacist				
Yes	38	45	0.52	0.28
No	62	55		
Specialized pharmacist				
Yes	3	6	2.08	0.14
No	97	94		

* = Significant level, $p < 0.05$

pharmacists ($p < 0.05$ U test). As for Competency 5-2 (basic sciences: pharmaceutical knowledge) and Competency 6-1 (medication therapy management: prescription analytical skill or case analytical skill) of these, most of the 4-YP experienced pharmacists selected the “Agreement” responses; the total number of community and hospital pharmacists selecting “Agree” and “Strongly agree” was 74 (74%) and 60 (60%) for Competency 5-2, and 64 (64%) and 54 (54%) for Competency 6-1. Only a few of the 4-YP experienced pharmacists selected “Disagreement”; the total number of community and hospital pharmacists selecting “Disagree” or “Strongly disagree” was 4(4%) and 6 (6%) for Competency 5-2, and 7 (7%) and 8 (8%) for Competency 6-1. The means of the questionnaire items were higher than mid-point 3.0, except for 4-YP experienced hospital pharmacists' perceptual evaluation of Competency 6-2, 7, 8 and 10.

3. Knowledge of 6-YP pharmacists.

The question of perceived knowledge acquisition of 6-YP pharmacists, compared with the respondent 4-YP pharmacists was asked. The results indicated that 4-YP experienced pharmacists evaluated that recent 6-YP pharmacists principally had enhanced knowledge of pharmacology and pathology, followed by practical knowledge, pharmacokinetics, laws and regulations, and other (Figure 1).

4. Identified competencies for priority improvement within 6-YP pharmacists.

Competency assessment analysis was conducted to identify the competencies requiring priority improvement

(see Methods) within the 6-YP pharmacists, as evaluated by the respondent 4-YP practitioners. “The low perceptual evaluation response” and “high correlational association with total overarching competency as pharmacists” are the priority improvement competencies, and those emerge in the fourth, lower-right, quadrant, on a two dimensional graph. For community-based 6-YP pharmacists, the priority improvement competencies were Competency 6-2 (medication therapy management: problem-solving) and Competency 10 (education and training), while for hospital-based 6-YP pharmacists, the priority improvement competencies were Competency 1 (professionalism), Competency 4 (inter-professional collaboration), Competency 6-2 (medication therapy

Table III: Perceptual Evaluation Responses to Each of the Questions Regarding “Professional Competencies for Pharmacists” among Community and Hospital 4-YP Experienced Pharmacists.

Competency	Strong Agree		Agree		Neither		Disagree		Strong Disagree		Mean (SD)		Mann-Whitney U test	P-value
	C	H	C	H	C	H	C	H	C	H	C	H		
Competency 1: Professionalism	20	6	32	26	41	50	6	14	1	4	3.64 (0.9)	3.16 (0.88)	.0001	<0.01
Competency 2: Patient-oriented attitude	8	4	41	33	43	48	8	12	0	3	3.49 (0.75)	3.23 (0.82)	.036	<0.05
Competency 3: Communication skills	6	9	40	32	46	46	7	11	1	2	3.43 (0.75)	3.35 (0.86)	.46	N.S.
Competency 4: Inter-professional collaboration	1	4	21	16	70	65	7	11	1	4	3.14 (0.58)	3.05 (0.77)	.32	N.S.
Competency 5-1: Fundamental basic science (Basic sciences)	6	6	41	21	49	56	2	16	2	1	3.47 (0.73)	3.15 (0.79)	.001	<0.01
Competency 5-2: Pharmaceutical knowledge (Basic sciences)	27	20	47	40	22	34	0	3	4	3	3.93 (0.92)	3.71 (0.92)	.048	<0.05
Competency 6-1: Prescription analytical skill or case analytical skill (Medication therapy management)	12	9	52	45	29	38	6	8	1	0	3.68 (0.8)	3.55 (0.77)	.17	N.S.
Competency 6-2: Problem-solving (Medical therapy management)	3	2	22	21	60	53	12	16	3	8	3.1 (0.75)	2.93 (0.87)	.22	N.S.
Competency 7: Community health and medical care	4	2	20	10	69	73	3	11	4	4	3.17 (0.72)	2.95 (0.67)	.01	<0.01
Competency 8: Research competency	4	3	29	20	61	56	3	14	3	7	3.28 (0.72)	2.98 (0.86)	.008	<0.01
Competency 9-1: Motivated to acquire certified or specialised pharmacist license (Lifelong learning)	8	12	34	30	54	45	2	9	2	4	3.44 (0.75)	3.37 (0.95)	.65	N.S.
Competency 9-2: Lifelong learning	11	5	33	25	50	46	3	17	3	7	3.46 (0.84)	3.04 (0.95)	.002	<0.01
Competency 10: Education and Training	3	2	20	14	66	65	6	13	5	6	3.1 (0.75)	2.93 (0.76)	.08	N.S.
Total, overarching competency (including competency 1-10 as pharmacists)	6	6	30	22	54	49	7	14	3	9	3.29 (0.80)	3.02 (0.98)	.043	<0.05

SD= standard deviation

C= community 4-YP pharmacists, H= hospital 4-YP pharmacists

N.S.=not significant

4-YP community pharmacists (n=100), 4-YP hospital pharmacists (n=100)

management: problem-solving), Competency 7 (community health and medical care) and Competency 9-2 (lifelong learning). The results showed differences between community-based and hospital-based 6-YP pharmacists for Competency 1, 4, 7, 9-2 and 10, but not for Competency 6-2 which was commonly noted as the competencies requiring priority improvement (Figures 2a, 2b; and Table IV).

Figure 1: Which Types of Knowledge are Better among 6-YP pharmacists than among 4-YP experienced pharmacists?

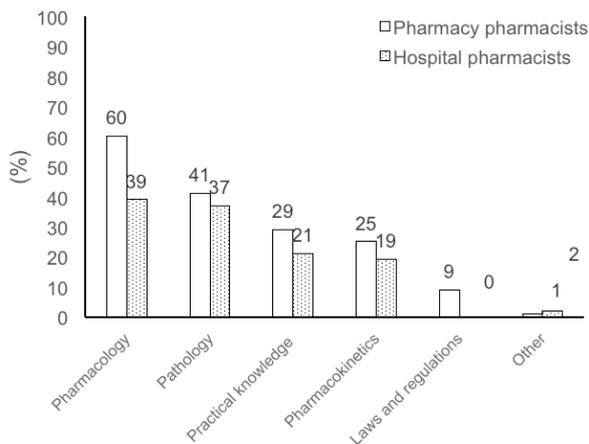


Table IV: Correlation Coefficient to Total, Overarching Competency as Pharmacists

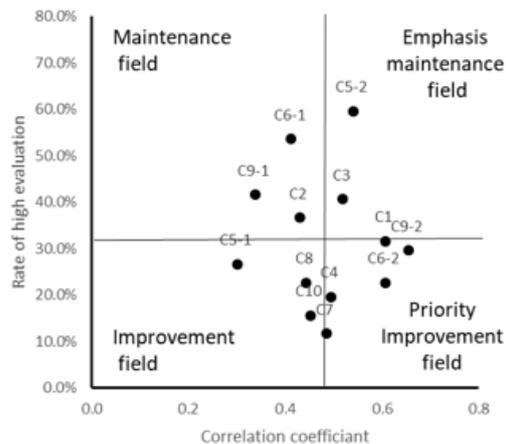
Competency	Community Correlation Coefficient	The proportion of responses for agreement	Hospital Correlation Coefficient	The proportion of responses for agreement
C1	0.56*	52.0%	0.60*	32.0%
C2	0.47*	49.0%	0.43*	37.0%
C3	0.50*	46.0%	0.52*	41.0%
C4	0.36*	22.0%	0.49*	20.0%
C5-1	0.34*	47.0%	0.30*	27.0%
C5-2	0.44*	74.0%	0.54*	60.0%
C6-1	0.42*	64.0%	0.41*	54.0%
C6-2	0.61*	25.0%	0.60*	23.0%
C7	0.38*	24.0%	0.48*	12.0%
C8	0.36*	33.0%	0.44*	23.0%
C9-1	0.32*	42.0%	0.33*	42.0%
C9-2	0.49*	44.0%	0.65*	30.0%
C-10	0.51*	23.0%	0.45*	16.0%
Mean	0.44	41.9	0.479	32.1
S.D.	0.09	15.6	0.10	13.8

* $p < 0.01$

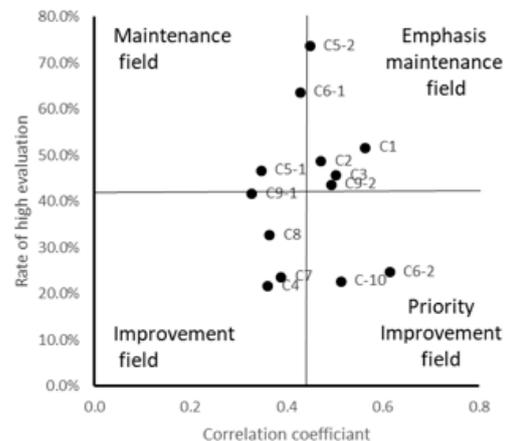
The proportion of responses for agreement; rate of question answer's 4 and 5 (Likert scale).

Figure 2: Competency assessment analysis of 6-YP pharmacists by 4-YP experienced pharmacists.

a) Community 4-YP pharmacists' perceptual evaluation responses (N=100)



b) Hospital 4-YP pharmacists' perceptual evaluation responses (N=100)



The association of the perceived competencies of 6-YP pharmacists is set to the abscissa axis (this coordinate is the correlation coefficient between "total perceived competency" [Item 11] level and each itemised competency statement) and the ordinate coordinate (ie. the proportion of responses for high-level agreement is the ordinate coordinate (ie. the proportion of responses for each competency Item rating "agree" or "strongly agree").

C1: competency 1, C2: competency 2, C3: competency 3, C4: competency 4, C5-1: competency 5-1, C5-2: competency 5-2, C6-1: competency 6-2, C6-2: competency 6-2, C7: competency 7, C8: competency 8, C9-1: competency 9-1, C9-2: competency 9-2, C10: competency 10.

Discussion

Comparing demographics of the respondents with those of all Japanese pharmacists, the number of pharmacists who were registered on Ministry of Health, Labour and Welfare as of 2014 is 288,151 in Japan; of these pharmacists 216,077 (75%) work in either community or hospital settings. Breakdown of these pharmacists by gender are 73,212 (34%) male and 142,865 (66%) female. According to age, 31,318 (11%) are <29 years old; 55,708 (26 %) are 30-39 years; 50,738 (24%) are 40-49 years old; 44,462 (21%) are 50-59 years old; and 33,851(16%) correspond >60 years old (Ministry of Health, Labour and Welfare, 2014). The number of

certified pharmacists is 93,877 (33%) in 2017 (Japan Pharmacists Education Center, 2017). The demographic proportions of the 4-YP pharmacists in our sample correspond to those of the national demographic (Table II).

The perceptual competency assessment of 6-YP pharmacists was differently contrasted with experienced 4-YP hospital and experienced 4-YP community pharmacists. These results suggest that pharmaceutical care needs, and service delivery, are seen as different between hospital and community pharmacists in Japan. In particular, community-based integrated care systems and home medical care have recently been introduced as a service component for community pharmacists in Japan, and community pharmacists did not previously have a deep relationship with other healthcare professionals or community needs. However, to address current health and social needs, Competency 4 (inter-professional collaboration) and Competency 7 (community health and medical care) will also be soon required in all community pharmacists in the near future.

The Japanese initial pharmacy education 6-YP was generally highly evaluated by 4-YP experienced pharmacists' perceptual competency assessment, and from the results of the assessment analysis, the authors have initially identified the priority improvement competencies relevant to Japanese pharmacy initial education and training (Figures 2a & b). Regarding Competency 7 (community health and medical care), Competency 9-2 (lifelong learning), and Competency 10 (education and training), 6-YP pharmacists have likely only recently mastered their work, so these competencies should be re-assessed in the near future. However, the responses for Competency 1 (professionalism), Competency 4 (inter-professional collaboration), and Competency 6-2 (medication therapy management: problem-solving) indicate deeper substantive challenges. There is a need to improve the education of professional ethics and communication in initial education and training along with more extended practical (experiential) training in pharmacies and hospitals in order to improve Competency 1 and 4. As for Competency 4, the required competencies are knowledge and communication skills. Concerning knowledge, the results revealed that the 6-YP pharmacists are functioning well compared with the 4-YP experienced pharmacists. Concerning communication skills, although students often trained using simulated or actual patients in practical training in pharmacies and hospitals, they tend to receive only limited training with other healthcare professionals (Kiuchi *et al.*, 2013). Therefore, communication education with other healthcare professionals should become a priority learning need for university curricula in addition to experiential training in pharmacies and hospitals. Many 4-YP experienced pharmacists perceptively assessed 6-YP pharmacists to have relatively better Competency 6-1 (medication therapy management: prescription analytical skill or case analytical skill), but not Competency 6-2 (medication

therapy management: problem-solving). Recently, many universities have introduced a problem-based learning design known as the 'active learning method' in Japan (Yasuhara & Kosano, 2014; Takeda *et al.*, 2016). However, the results of the present study suggest that pharmacy education needs to be improved by more effective class designs or teacher-related active learning skills. Moreover, as problem-solving is also required for research competencies, this competency must be fostered by graduation research engagement with universities.

To conduct assessment of education in higher education, the university must clearly show the improvements by outcome of students or graduates. The authors have made an initial identification of the priority improvement competencies through this research; in order to foster better acquisition of competencies in initial education and training, and into early post-qualification years, it is necessary to investigate if better training support needs to be mapped and structured based on competency development frameworks such as the Global Competency Framework of FIP (FIP, 2012) which has been validated as an 'adopt and adapt' competency development tool in a number of countries. There is also a need to further enhance education directed at the other 'low perceptual evaluation responses' (where there is less agreement of competency acquisition). This analysis identifies the priority improvement competencies in the fourth quadrant, and it should be possible to identify these next educational challenges based on these results. In countries similar to Japan, where the curriculum is not fundamentally based on or linked with competency frameworks such as FIP, this analysis may be of use in identifying the priority improvement competencies. For next steps, the authors suggest the use of competency development frameworks for structuring the priority improvement competencies. Additionally, this research may be of use for quality assurance of outcomes in professional pharmacy education.

Conclusion

The six-year pharmacy initial education curriculum, based on the model core curriculum, was implemented in 2006. The model core curriculum was subsequently revised and the revised model core curriculum was implemented in 2015. Longer term continuing assessment of the new education programme in Japan is an urgent issue. In regard to the priority improvement competencies, these should be enhanced and based on 'indicators of the relationship between the five pillars of quality' as described by FIP (FIP, 2014) and additionally with competency development frameworks (FIP, 2012). Moreover, methods to continuously evaluate and improve the lower assessed competencies need to be introduced together with post-registration continued training, preferably using validated competency development frameworks such as in near future.

Conflict of interests

No potential conflicts of interest are disclosed.

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