

Educational demands of pharmacists working in the pharmaceutical industry under the reformed 6-year pharmacy education system in Korea

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Abstract

Aims: Evidence is missing on educational demands from the perspective of pharmacists working in the pharmaceutical industry. We aimed to explore the educational demand by industry pharmacists under the reformed 6-year pharmacy education system in Korea to improve pharmacists' competencies in the pharmaceutical industry.

Methods: A web-based self-administered survey was conducted with 95 pharmacists working in the pharmaceutical industry in Korea.

Results: Social and administrative pharmacy (SAP) classes were ranked the highest among classes that respondents indicated necessary to prepare them to work in the pharmaceutical industry, followed by clinical pharmacy, industrial pharmacy, pharmacology, and life pharmacy. Overall, responses were consistent across different job functions (e.g., clinical research, research/development, sales/marketing, medical information, and price/reimbursement functions) and the length of industry career.

Conclusion: We expect that the results of this investigation would be helpful as reference information to aid ongoing update of pharmacy education, particularly for pharmacy programs interested in cultivating industry pharmacists.

Keywords: *industrial pharmacist, pharmaceutical education, pharmaceutical industry, social and administrative pharmacy*

Introduction

In recent years, the regulatory environment of pharmaceutical industry has been more challenging. Drug approval process in the developed world requires more rigorous scientific evidence to ensure the provision of safe and quality pharmaceutical therapy to the public (Olson & Claiborne, 2012). Limited financial resources, especially under the government-run national health insurance system, creates more complicated reimbursement and pricing mechanism for newly approved pharmaceuticals (Lage, 2011). These environmental circumstances all influence the market access of pharmaceutical products, which not only affects the viability of pharmaceutical companies but also the accessibility of the public to quality medical treatments.

In response to this environmental change, the demand of pharmaceutical industry for human resources specialised in regulatory sciences becomes growing (Olson & Claiborne, 2012). In the past, this type of working knowledge is required only for those assigned to work in the department of regulatory affairs, external affairs or market access of pharmaceutical companies. However, in the current environment, pharmaceutical companies develop market access strategies during the entire course of drug development process from the very early stage to the late stage (*i.e.*, drug approval, reimbursement,

marketing, and Phase IV studies) (Olson & Claiborne, 2012; Suvarna, 2010; Wiklund, 2012). Thus, it becomes necessary for drug industry employees to have a basic understanding of regulatory requirements and social issues of drug use, no matter which part of drug development or business process his or her work is involved with.

Korea achieved a reform in pharmacy education in 2011, switching from a long history of a four-year educational program to a six-year program (Korean Association of Pharmacy Education, 2012; Ministry of Health and Welfare, 2009). Under the previous four-year pharmacy program, only a small portion of pharmacy school graduates went on to work in the pharmaceutical industry, with the majority of graduates pursuing careers in community pharmacies (Korean Pharmaceutical Association, 2010). The skewed job placement among Korean pharmacists can be attributed in part to the higher financial reward for owning independent community pharmacies compared with salaried employees in pharmaceutical companies. Additional factors may include lack of an appropriate pharmacy curriculum education to expose students to industry career opportunities and prepare them for working at pharmaceutical companies.

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At the turn of the 21st century, the Korean government began to emphasise biotechnology as a driving force for economic growth, placing emphasis on the core role of pharmaceutical industries as the leaders of a successful biotechnology sector (Ministry of Trade, 2009). Under the new six-year pharmacy program, the Korean Association of Pharmacy Education stresses the importance of industry pharmacy education in improving research and development in the Korean pharmaceutical industry (Korean Association of Pharmacy Education, 2012). Therefore, the strategic direction towards improving the drug industry in Korea involves the intersection of both the government and academic partners.

To achieve this goal, a well-designed pharmacy curriculum would be critical. It is considered to be beneficial to examine the educational demands of pharmacists from the perspective of those working in the pharmaceutical industry in order to develop a more practical educational curriculum for future pharmacists. Specifically, this exploratory study was performed to collect opinions from industry pharmacists about the specific types of education that are needed during academic pharmacy training to prepare qualified pharmacists for careers in the pharmaceutical industry.

Methods

1. Study subjects and data collection

Pharmacists working in the pharmaceutical industry were recruited to participate in a web-based questionnaire survey from 17th to 31st October, 2011. A well-established list of industry pharmacists in Korea was not available, and thus a convenience sample was used where study subjects were identified using the participant lists from pharmacy-related academic conferences in Korea over the previous three years and who identified themselves as working in the pharmaceutical industry. The survey consisted of three sections with 17 questions: (1) questions designed to collect career information such as the length of employment in the pharmaceutical industry and respondents' previous or current pharmaceutical job functions; (2) questions about specific classes that were taken during undergraduate and graduate education that the respondents considered helpful in performing their job in the pharmaceutical industry; and (3) questions about the types of educational opportunities that are necessary for future pharmacists in a six-year pharmacy program to be successful in the pharmaceutical industry.

The questionnaire was accompanied by the cover letter where several tactics were used. First, the background and the objective of the survey were provided to respondents. This included informing the change of pharmacy education from four-year education to six-year education starting from March 2011. The objective of the survey was stated as to assess the educational needs for pharmacists working in pharmaceutical industry. Second, we made a request for help or advice that will help the improvement of pharmacy education. Third, participants were informed that the survey would take about five to

ten minutes and anonymity would be retained. Finally, it was mentioned that how survey results would be used and concluded with saying thank you. No compensation was provided to respondents.

2. Data analysis

Because this was an exploratory study, we included analyses based on descriptive statistics and did not pursue inferential analyses. Responses to survey questions were compared according to the job function and the length of industry career. Pharmacy classes were classified into six categories: (1) 'life pharmacy,' including physiology, microbiology, biochemistry, and molecular biology; (2) 'pharmacology,' including pharmacology, pathology, toxicology, and pharmacognosy; (3) 'industrial pharmacy,' including medicinal chemistry, physical pharmacy, pharmaceutics, pharmacopoeia, and drug manufacturing; (4) 'clinical pharmacy,' including pharmacy therapeutics; (5) 'social and administrative pharmacy (SAP),' including healthcare systems, pharmaceutical policy, pharmacoeconomics, pharmacoepidemiology, statistics, and pharmaceutical marketing; and (6) 'pharmacy and related laws. Google Docs™ was used for the online survey administration, allowing for both close-ended and open-ended questions. All questionnaires were reviewed for completeness. Survey results were analysed using Microsoft Excel software (Microsoft).

Results

A total of 95 pharmacists participated in the survey. Of the respondents, 39%, 33%, and 28% had experience in the pharmaceutical industry for less than five years, five to nine years, and ten or greater years, respectively (Table I). About half of the respondents had Master's degrees. Thirty-three percent of the respondents with advanced degrees (*i.e.*, Doctorate or Master's degree) were majored in industrial pharmacy, 25% in SAP, 19% in life pharmacy, and 15% in pharmacology. Master's degree majored in SAP was conferred by either the School of Public Health or Business School but not by the School of Pharmacy.

The top four job functions where respondents had experience were regulatory affairs (30%), clinical research (21%), pricing and reimbursement (12%), and sales and marketing (12%). Industry pharmacists described pharmacology (30%) and industrial pharmacy coursework (27%) as the most helpful aspects of the 4-year pharmacy education system. Answers were different when compared by job functions. Specifically, respondents who had worked in research and development, drug manufacturing, and regulatory affairs chose industrial pharmacy as the most helpful type of class, whereas those in clinical research, sales and marketing, medical information, and pharmacovigilance indicated that pharmacology classes were the most helpful classes (Table II).

Table I: Personal characteristics of respondents (N=95)

Personal characteristics	Total	
	<i>n</i>	%
Years in pharmaceutical industry		
< 1 year	3	3
1 - < 3 years	17	18
3 - < 5 years	17	18
5 - < 7 years	16	17
7 - < 10 years	15	16
≥ 10 years	27	28
Registered pharmacists		
Yes	95	100
No	0	0
Highest academic degree		
Doctorate	1	1
Master	46	48
Bachelor	48	51
Major of Master's or Doctorate degree*		
Life pharmacy	9	19
- Biochemistry	1	
- Immunology	2	
- Molecular Biology	6	
Pharmacology	7	15
- Pharmacology	4	
- Pharmacognosy	1	
- Toxicology	2	
Industrial pharmacy	16	33
- Organic Chemistry	3	
- Pharmaceutics	9	
Clinical Pharmacy	4	8
Social & Administrative Pharmacy	12	25
- Social Pharmacy	5	
- Business Administration	3	
- Public Health	4	

* Multiple responses were allowed.

Respondents were also asked which subject areas should be taught to future pharmacists under the reformed six-year pharmacy program. Approximately 55% of the respondents indicated that SAP classes were necessary to fulfil their job responsibilities. Although results varied by job function (44% -76%), overall, SAP was selected as the most necessary subject area. Clinical pharmacy (21%), industrial pharmacy (11%), and pharmacy and related laws (8%) were the next three subject areas indicated as being necessary for future industry pharmacists (Table III). In addition, the order in which the importance of various pharmacy classes considered necessary was the same between pharmacists whose industry experience was <5 years and ≥5 years, with SAP ranked highest, followed by clinical pharmacy and industrial pharmacy (Table IV).

Table II: Helpful pharmacy classes for industry pharmacists taken under the four-year pharmacy education system according to the respondents' job function

Job functions (previous or current)	No. respondents* (%)	Helpful pharmacy classes	No. responses* (%)
Research & Development	13 (9)	Industrial pharmacy	11 (46)
		Pharmacology	8 (33)
		Life pharmacy	4 (17)
		Clinical pharmacy	1 (4)
		All	1 (4)
<i>Total</i>		<i>24</i>	
Drug Manufacturing	3 (2)	Industrial pharmacy	4 (80)
		Pharmacy Law	1 (20)
		<i>Total</i>	<i>5</i>
Clinical Research	31 (21)	Pharmacology	25 (46)
		Life pharmacy	9 (17)
		Clinical pharmacy	8 (15)
		Industrial pharmacy	7 (13)
		None	5 (9)
		Social/administrative pharmacy [†]	4 (7)
		Pharmacy Law	1 (2)
All	1 (2)		
<i>Total</i>		<i>54</i>	
Regulatory Affairs	44 (30)	Industrial pharmacy	34 (46)
		Pharmacy Law	14 (19)
		Pharmacology	12 (16)
		Life pharmacy	8 (11)
		None	8 (11)
		Clinical pharmacy	4 (5)
		All	4 (5)
Social/administrative pharmacy [†]	2 (3)		
<i>Total</i>		<i>74</i>	
Price/Reimbursement [‡]	17 (12)	Social/administrative pharmacy [†]	19 (66)
		Pharmacology	7 (24)
		None	7 (24)
		Industrial pharmacy	2 (7)
Life pharmacy	1 (3)		
<i>Total</i>		<i>29</i>	
Sales & Marketing	18 (12)	Pharmacology	10 (36)
		Social/administrative pharmacy [†]	9 (32)
		None	7 (25)
		Clinical pharmacy	3 (11)
		Life pharmacy	3 (11)
		Industrial pharmacy	2 (7)
Pharmacy Law	1 (4)		
<i>Total</i>		<i>28</i>	
Medical Information	9 (6)	Pharmacology	5 (45)
		Industrial pharmacy	2 (18)
		Clinical pharmacy	2 (18)
		Life pharmacy	1 (9)
		Social/administrative pharmacy [†]	1 (9)
<i>Total</i>		<i>11</i>	
Pharmacovigilance	10 (7)	Pharmacology	5 (38)
		Industrial pharmacy	3 (23)
		Clinical pharmacy	2 (15)
		Life pharmacy	2 (15)
		Pharmacy Law	1 (8)
		All	1 (8)
		None	1 (8)
<i>Total</i>		<i>13</i>	
Total	145	Pharmacology	72 (30)
		Industrial pharmacy	65 (27)
		Social/administrative pharmacy [†]	35 (15)
		Life pharmacy	28 (12)
		None	28 (12)
		Clinical pharmacy	20 (8)
		Pharmacy Law	18 (8)
		All	7 (3)
<i>Total</i>		<i>238</i>	

Total number of respondents = 95 industry pharmacists

*Multiple responses for job functions and pharmacy classes were allowed; [†]Social and administrative pharmacy classes in graduate programs include public health programs; [‡]Including economic evaluation, outcomes research, and external affairs.

Table III: Pharmacy classes necessary for future pharmacists under the reformed six-year pharmacy education program according to the respondents' job function

Job profile	No. respondents* (%)	Necessary pharmacy classes	No. responses* (%)
Job functions (previous or current)			
Research & Development	13 (9)	Social/administrative pharmacy	8 (50)
		Industrial pharmacy	5 (31)
		Clinical pharmacy	2 (13)
		Pharmacy and related laws	1 (6)
		Life pharmacy	0 (0)
		Pharmacology	0 (0)
Clinical Research	31 (21)	Social/administrative pharmacy	24 (48)
		Clinical pharmacy	17 (34)
		Industrial pharmacy	5 (10)
		Pharmacology	3 (6)
		Pharmacy and related laws	1 (2)
		Life pharmacy	0 (0)
Regulatory Affairs	44 (30)	Social/administrative pharmacy	40 (63)
		Pharmacy and related laws	9 (14)
		Industrial pharmacy	7 (11)
		Clinical pharmacy	6 (9)
		Pharmacology	2 (3)
		Life pharmacy	0 (0)
Price/ Reimbursement†	17 (12)	Social/administrative pharmacy	16 (76)
		Clinical pharmacy	4 (19)
		Pharmacy and related laws	1 (5)
		Industrial pharmacy	0 (0)
		Life pharmacy	0 (0)
		Pharmacology	0 (0)
Sales & Marketing	18 (12)	Social/administrative pharmacy	17 (71)
		Clinical pharmacy	4 (17)
		Industrial pharmacy	2 (8)
		Pharmacy and related laws	1 (4)
		Life pharmacy	0 (0)
		Pharmacology	0 (0)
Medical Information	9 (6)	Social/administrative pharmacy	6 (46)
		Clinical pharmacy	3 (23)
		Pharmacy and related laws	2 (15)
		Industrial pharmacy	1 (8)
		Pharmacology	1 (8)
		Life pharmacy	0 (0)
Pharmacovigilance	10 (7)	Social/administrative pharmacy	8 (44)
		Clinical pharmacy	6 (33)
		Pharmacology	2 (11)
		Industrial pharmacy	1 (6)
		Pharmacy and related laws	1 (6)
		Life pharmacy	0 (0)
<i>Total</i>	141	Social/administrative pharmacy	78 (55)
		Clinical pharmacy	30 (21)
		Industrial pharmacy	16 (11)
		Pharmacy and related laws	11 (8)
		Pharmacology	6 (4)
		Life pharmacy	0 (0)

Total number of respondents = 95 industry pharmacists

* Multiple responses for job functions and pharmacy classes were allowed;

†Including economic evaluation, outcomes research, and external affairs.

Table IV: Pharmacy classes necessary for future pharmacists under the reformed six-year pharmacy education program by the length of industry experience

Length of industry experience	No. respondents (%)	Necessary pharmacy classes	No. responses* (%)
< 5 years	37 (39)	Social pharmacy and law	30 (63)
		Clinical pharmacy	12 (25)
		Industrial pharmacy	4 (8)
		Pharmacology	2 (4)
		Life pharmacy	0 (0)
		<i>Total*</i>	48
≥ 5 years	58 (61)	Social pharmacy and law	50 (60)
		Clinical pharmacy	18 (21)
		Industrial pharmacy	12 (14)
		Pharmacology	4 (5)
		Life pharmacy	0 (0)
		<i>Total*</i>	84

Total number of respondents = 95 industry pharmacists

* Multiple responses for job functions and pharmacy classes were allowed.

Discussion

The present study provides an overview of the subject areas of pharmacy education that were reported to be the most useful subjects for industry pharmacists in Korea. Among classes taken by pharmacists during the four-year pharmacy curriculum, 'pharmacology' and 'industry pharmacy' were reported as having been the most helpful classes. 'SAP,' 'clinical pharmacy,' and 'industry pharmacy' were the most important classes that respondents thought pharmacy schools should offer under the reformed six-year program for future pharmacists in order to be prepared for working in pharmaceutical industry.

Compared to other subjects, SAP and clinical pharmacy are relatively new aspects of the pharmacy education in Korea. In particular, few pharmacy schools offered SAP courses under the previous four-year program. The more challenging regulatory environment of the pharmaceutical industry in recent years may be an explanation for the increased demand by industry pharmacists for learning SAP-related topics, which include ethical, legal, regulatory, economic, and social aspects of drug development and use. These topics are important because the drug approval process now requires more rigorous scientific evidence (Olson & Claiborne, 2012). In addition, limited financial resources for healthcare have resulted in increasingly complicated reimbursement and pricing mechanisms for newly approved drugs (Lage, 2011; Persson *et al.*, 2012). Lastly, more emphasis has been placed on evaluating the use of pharmaceuticals in an after-market setting to ensure a safe, effective, and efficient use of pharmaceuticals (Suvarna, 2010).

The status of clinical pharmacy education was better than that of SAP education under the previous four-year pharmacy program, because most of the pharmacy schools offered some courses in this area. However, the

amount and depth of training in clinical pharmacy was deemed insufficient for meeting the current demands of the healthcare market (Chung *et al.*, 2008). The high demand for clinical pharmacy education by industry pharmacists is noteworthy, because it indicates that this type of knowledge is useful not only to pharmacists working in a clinical setting such as hospitals, but to industry pharmacists as well.

Caution is necessary when interpreting the results of the present study. Although life pharmacy and pharmacology were not emphasised as classes necessary for future pharmacists, this might be because these topics are covered extensively in existing pharmacy programs. Indeed, many of the components of the life pharmacy curriculum, including biochemistry, physiology, and microbiology, are basic science courses that are prerequisites for pharmacology and clinical pharmacy. Therefore, even though the respondents did not emphasise life science and pharmacology classes, there is no doubt about their necessity in pharmacy education.

This study has several limitations. First, the small sample size and non-probabilistic sampling process limit the generalizability of the study findings. This limits the study to be exploratory and indicative of trends. Because the well-established list of industry pharmacists in Korea was not available, we have sent the web-based questionnaire to 134 subjects who identified themselves as working in pharmaceutical industry using participant lists from pharmacy-related academic conferences. To enrich the survey data by increasing the number of potential survey respondents, we have asked these subjects to cascade the survey to industry pharmacists whom they know. There is a possibility that we have surveyed the highly-focused group because the survey respondents are more likely to be actively engaged in academics, the future of pharmacy, and their profession. Therefore, we hope that the results of this study will be used as preliminary information as well as to prompt an extended study in the form of a national survey to obtain a more complete picture of the educational demands of industry pharmacists. In addition, this survey was intended to identify the educational needs of pharmacists working in industry but not the pharmacists working in the whole area. Because there are going to be three career tracks (clinical pharmacists, industry pharmacists, and research pharmacists) under the reformed 6-year pharmacy education system in Korea, this study result might be helpful to provide the necessary and relevant course topics for students who chose to follow the industry pharmacists' track.

Second, about 42% of the respondents had work experiences in the divisions of regulatory affairs or pricing and reimbursement. Due to the nature of the work in these divisions, individuals in these job functions may have been more likely to express a higher demand for SAP subjects, raising a concern that the results of this study may have been biased towards highlighting SAP education. However, the demand for classes in SAP was consistently high across various jobs, including research

and development, clinical research, medical information, and sales and marketing, lessening the possibility that the results were biased.

Third, we caution that the results of this study were limited to the perspective of industry pharmacists; the educational demands of pharmacists working in other sectors such as hospitals and community pharmacies might be different.

Lastly, we do not have an idea of the demand for employment in industry pharmacy, which might raise a doubt on the need and the extent of structuring a curriculum. The exact distribution of pharmacists' working area is not well established. Although the available data based on the data of the Korean Pharmaceutical Association showed that about 5% of pharmacists reported themselves as working in pharmaceutical industry in 2010, this does not reflect the demand for employment in industry pharmacy (Korean Pharmaceutical Association, 2010). Moreover, the Korean Pharmaceutical Association focuses on the issues related with community pharmacists and most of members are community pharmacists. All pharmacists are not obligated to register in this association and report their working area. Seventy percent of registered members identified themselves as community pharmacists in this association. The total number of registered members in the Korean Pharmaceutical Association was 29,587 which were less than 50 percent of licensed pharmacists 60,956 in 2010 based on the data from the Ministry of Health and Welfare where has the exact number of licensed pharmacists (Ministry of Health and Welfare, 2013). There are lots of missing data of pharmacists' working area in the data of the Korean Pharmaceutical Association, thus, the proportion of industry pharmacists is expected to be much larger than 5%. Moreover, the new six-year pharmacy program aims to put more focus on the development of pharmaceutical industry. There are going to be three career tracks (clinical pharmacists, industry pharmacists, and research pharmacists) for pharmacy students. In order to enlarge the role of pharmacists in pharmaceutical industry, we need to provide necessary courses. This study, as a preliminary study, is expected to contribute to pharmacy education to extend the role of pharmacists and improve the efficiency of pharmacists' role.

To the best of our knowledge, this is one of the only studies to survey industry pharmacists about the kinds of professional education in pharmacy school that would be most likely to improve competency in their fields. Although the study participants consisted of pharmacists working in Korea, other countries may utilise these results to effectively organise and design pharmacy classes to improve the role of pharmacists in the pharmaceutical industry. We expect that the results of this investigation will be helpful as reference information to aid ongoing updates of the pharmacy education curriculum, particularly for pharmacy programs interested in cultivating industry pharmacists.

Conflict of Interest

None of the authors have potential conflicts of interest and there was no funding for this study.

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