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Review

Progress of Pharmacy Education in Japan
—MODEL CORE CURRICULUM FOR PHARMACY EDUCATION and THE EVALUATION STANDARDS—

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ABSTRACT

The globalization of licensure for pharmacists has been under discussion recently. In order to introduce Japan's pharmacy education curriculum to the world, we tried translating the "Model Core Curriculum for Pharmacy Education - 2015 revised edition" and "THE EVALUATION STANDARDS 2011 - Japan Accreditation Board for Pharmaceutical Education" into English. The sharing of information on health care systems and pharmacy education could improve pharmacy curricula and would facilitate the global harmonization of pharmacy education in the world.

Key words: Pharmacy education, Model Core Curriculum for pharmacy education, THE EVALUATION STANDARDS, Japan

1. Introduction

The history toward the six-Year Pharmacy Program in Japan was started as a proposal of the six-year pharmacy education by the Japan Pharmaceutical Association in 1980. Then the Committees of the Ministry of Health, Labor and Welfare and the Ministry of Health, Labor and Welfare and the Ministry of Education, Culture, Sports, Science and Technology released reports which suggested to extend the duration of education for pharmacy license and to extend the duration of clinical clerkship in 1994 and1996, respectively. The Model Core Curriculum for Pharmaceutical Education by the Pharmaceutical Society of Japan was established in 2002, and the six-year pharmacy program was approved in 2004. The six-year baccalaureate degree and the four-year doctoral degree programs in pharmacy education (10 years in total) began in 2006, and for the first batch of students, 2016 marked the completion of the doctoral program. The six-year baccalaureate pharmacy program features three components: 1) the Model Core Curriculum, 2) the accreditation system, and 3) common achievement tests (Fig. 1). Each of these is supported by three different organizations, and these organizations work in close coordination with one another.

1.1. Model Core Curriculum

In the history behind the six-year pharmacy education program, the most epoch-making event was the establishment of the Model Core Curriculum for Pharmaceutical Education by the Pharmaceutical Society of Japan in 2002. Based on the Model Core Curriculum, two committees of the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Health, Labor and Welfare finally determined to extend the duration of the pharmacy education program from four years to six years, and eventually, the six-year pharmacy program was approved in 2004. After 2004, the Model Core Curriculum for Pharmaceutical Education was changed to the Model Core Curriculum for Pharmacy Education. In 2006, the new six-year pharmacy education program was commenced in Japan.

The first version of the Model Core Curriculum consisted of 81 course credits and included 1,442 specific objectives.

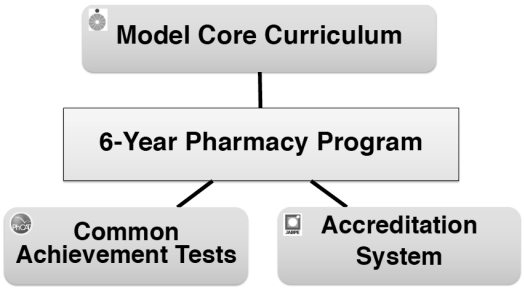

Fig. 1. Three systems which support 6-year pharmacy program. Logos shown in "Model Core Curriculum," "Accreditation System," and "Common Achievement Tests" are each logo of the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT), Japan Accreditation Board for Pharmaceutical Education (JABPE), and Pharmaceutical Common Achievement Tests Organization (PhCAT), respectively.

The Model Core Curriculum would constitute 70% of the pharmacy curriculum of each university, with the remaining 30% based on the respective university's original curriculum, which highlights their originality. The Model Core Curriculum also included a five-month pharmacy practice. In 2015, the Model Core Curriculum was revised to keep up with developments in health care service while maintaining its key concept.

1.2. Accreditation System

With the commencement of the six-year pharmacy education system, the Central Council for Education requested the creation of a system for third-party evaluation of pharmacy education programs, such as the Accreditation Council for Pharmacy Education in the USA. In compliance with this request, evaluation had been conducted mainly by the Pharmaceutical Education Review Committee (established under the University Faculty Conference for the Pharmaceutical Education Reform in the Pharmaceutical Society of Japan) and by the Pharmaceutical Evaluation Committee of the Association of Presidents & Deans of Japanese Schools of Pharmacy. On December 10, 2008, the Japan Accreditation Board for Pharmaceutical Education (JABPE) was formally inaugurated as a general incorporated association. JABPE conducted a full-scale evaluation from March 2012, when the six-year pharmacy education system was completed.

Currently, there is an increased societal demand for quality assurance in education, especially the education of health care professionals. Each school of pharmacy sets its mission and goals, organizes and implements its own curriculum, collects data, and finally conducts a self-evaluation to fine-tune the curriculum. This cycle is usually called the improvement cycle of self-evaluation, and it serves as an internal quality control system or quality assurance system. The purpose of external quality assurance checks by the accreditation board is to confirm whether each pharmacy school's internal quality control system functions (Fig. 2). Fig. 3 gives a summary of the quality assurance of higher education in Japan. There are two kinds of quality assurance and accreditation bodies in Japan: those that oversee institutions or universities, such as the Japan University Accreditation Association, and those that oversee programs, such as JABPE. The role of government is not to conduct the evaluations itself but to establish or approve the establishment of these bodies to do so.

The evaluation of the pharmacy education programs of each school of pharmacy by JABPE is carried out via a peer review system. The peer review system consists of three steps, and each step is carried out by different committees and different members. The first step of reviewing is undertaken by a peer review team consisting of three university lecturers and two pharmacists. The next step is carried out by the assessment committee, which consists of university lecturers,

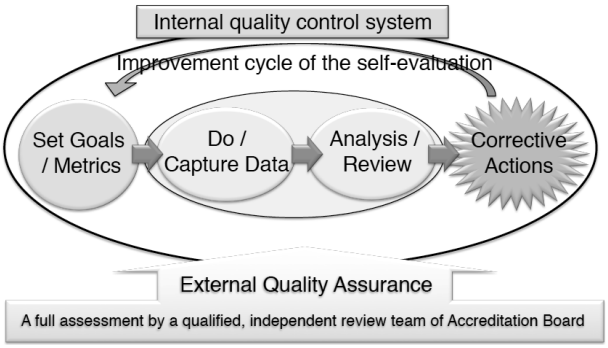

Fig. 2. External quality assurance and internal quality assurance.

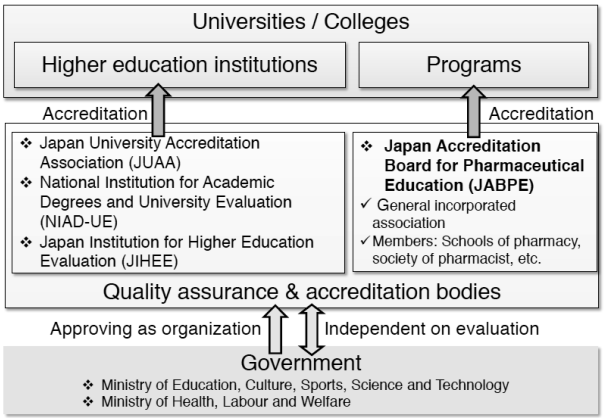

Fig. 3. Quality assurance of higher education in Japan.

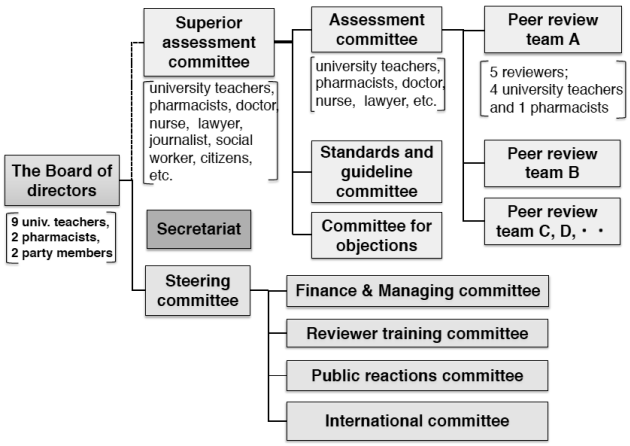

Fig. 4. The organization of JABPE.

pharmacists, medical doctors, nurses, and lawyers. The final step is implemented by the superior assessment committee, which consists of university lecturers, pharmacists, doctors, nurses, and lawyers, journalists, social workers, and other citizens (Fig. 4).

1.3. Common Achievement Tests

Students take the common achievement tests at the end of the fourth academic year, and only those who pass the test proceed to undertake clinical practices in the fifth year. The

Table 1. Professional Competencies for Pharmacists.

At the time of graduation, the pharmacy student is required to attain these competencies through learning at school of pharmacy and through pharmacy practice experience. To ensure that pharmacists acquire professional competencies, general instructional objectives (GIOs) and specific behavioral objectives (SBOs) were established.

1. **Professionalism**: Fulfill the legal, ethical, and professional responsibilities of pharmacists.
2. **Patient-oriented attitude**: Respect the rights of individuals and promote the health and welfare of patients and consumers.
3. **Communication skills**: Communicate effectively with patients, consumers, and other healthcare professionals to provide necessary information.
4. **Inter-professional team-care**: Collaborate with healthcare teams in hospitals and regional communities.
5. **Basic sciences**: Understand the effects of medicines and chemicals on living bodies and the environments.
6. **Medication therapy management**: Contribute to the optimal use of medicines through pharmaceutical care.
7. **Community health and medical care**: Contribute to public health and pharmaceutical hygiene and enhance community healthcare and home care.
8. **Research**: Engage in research on drug development and the appropriate use of medicines to improve the healthcare environment.
9. **Lifelong learning**: Continue lifelong professional development in response to the advances in healthcare.
10. **Education and training**: Contribute to the development of the next generation of professional pharmacists.

common achievement tests consist of a Computer-Based Test (CBT) and an Objective Structured Clinical Examination (OSCE). CBT is for confirming knowledge and understanding whereas OSCE is for application and skills.

In an attempt to internationalize Japanese pharmacy education, the Pharmaceutical Society of Japan and JABPE have translated the "Model Core Curriculum for Pharmacy Education - 2015 revised edition" and "THE EVALUATION STANDARDS 2011," respectively, into English.

2. The English version of the Model Core Curriculum for Pharmacy Education

The Pharmaceutical Society of Japan translated the "Model Core Curriculum for Pharmacy Education - 2015 revised edition" into English. First, the original text of the "Model Core Curriculum" was translated into English by a team of English teachers (including a native speaker) and faculty members of pharmacy schools. In 2017, the translated text was crosschecked and corrected by teams consisting of specialist lecturers in each specialized field. During this process, we obtained opinions from specialist lecturers in foreign universities and revised the translated text based on these opinions. After the revision, the translated version of the "Model Core Curriculum for Pharmacy Education - 2015 revised edition" was approved by the Ministry of Education, Culture, Sports, Science, and Technology.

When the Model Core Curriculum was revised in 2015, its main concern, and, thus, its central objective was to provide an essential educational content (core content) that equips every pharmacy student with the knowledge and competencies that medical and health care professionals of the twenty-first century must acquire. The core content would constitute 70% of the pharmacy curriculum of each school of pharmacy. We also set out the "Professional Competencies for Pharmacists" (Table 1) and designed the Model Core Curriculum "outcome-based education." We have maintained research as an essential competency for students even after the shift to a six-year pharmacy program.

The Model Core Curriculum (2015 version) consists of the following seven categories (as listed in Fig. 5): A) Philosophical Principles for the Education of Student Pharmacists, B) Pharmaceutical Sciences in Society, C) Fundamentals of Pharmaceutical Sciences, D) Health and Environmental Sciences, E) Therapeutics: Clinical Pharmacology, Pharmacotherapy, and Pharmacokinetics, F) Pharmacy Practice Experiences, and G) Research. Each college/school of pharmacy develops its own curriculum based on the Model Core Curriculum, and the pharmacy students are expected to attain 10 competencies at the time of graduation.

The text of the Model Core Curriculum can be accessed from the homepage of the Pharmaceutical Society of Japan (http://www.pharm.or.jp/kyoiku/pdf/corecurri_eng180426.pdf).

An example of the structure of the Model Core Curriculum is shown in Table 2. "Philosophical Principles for the Education of Student Pharmacists" is Category A. "Mission of pharmacists" is the first course of Category A, and each course has a General Instructional Objective (GIO). "As Healthcare Professionals" is the first unit of the first course; each unit has specific behavioral objectives (SBOs) listed below. At the time of graduation, each pharmacy student would have attained the 10 key competencies of a

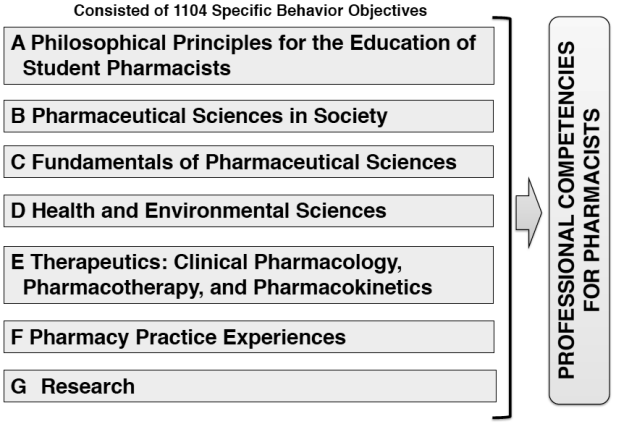

Fig. 5. Composition of the Model Core Curriculum - 2015 version.

Table 2. Structure of Model Core Curriculum.

A. Philosophical Principles for the Education of Student Pharmacists
(1) Mission of Pharmacists
GIO: To fulfill the responsibilities of a pharmacist by learning the history of medical care and pharmacy as well as to understand the roles of the pharmacists in managing public health, providing safe medical services, and preventing drug disaster.
1) As Healthcare Professionals
1. To always keep viewpoints of patients/consumers and maintain the attitude of a healthcare professional.
2. To have a responsibility to proactively contribute to recovering and maintaining patient/consumer health.

Table 3. C. Fundamentals of Pharmaceutical Sciences.

C1. Physical Properties of Substances
GIO: To acquire knowledge of basic atomic/molecular structure, thermodynamics, and reaction kinetics to understand the physicochemical properties of substances.
(1) Structures of Substances
GIO: To acquire the fundamentals of atomic/molecular structures and the formation of chemical bonds.
1) Chemical Bonds
1. To describe the modes of chemical bonding.
2. To describe the fundamental concepts of molecular orbitals and orbital hybridization.
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As well as
C2. Analysis of Chemical Substances
C3. Properties and Reactions of Chemical Substances
C4. Chemistry of Biomolecules and Drugs
C5. Pharmacognosy (Naturally Derived Drugs)
C6. Fundamentals of Biochemistry
C7. Anatomy and Human Physiology
C8. Biological Defense Mechanisms and Microorganisms

pharmacist through not only learning one unit or course but also integrating related units and courses; this is what is meant by outcome-based education.

Category A, "Philosophical Principles for the Education of Student Pharmacists," is based on all 10 competencies: professionalism, patient-oriented attitude, communication skills, inter-professional team-care, basic sciences, medication therapy management, community health and medical care, research, lifelong learning, and education and training. Category B is Pharmaceutical Sciences in Society and includes (1) Pharmacists Serving the Public, (2) Laws and Regulations Governing Pharmacists and Pharmaceuticals, (3) Japanese Social Security System and Health Economics, and (4) Roles of Community Pharmacies and Pharmacists. Table 3 shows the components of Category C, "Fundamentals of Pharmaceutical Sciences." This category includes basic and advanced sciences, such as organic chemistry, analytical chemistry, biochemistry, microbiology, pharmacognosy, anatomy, physiology, and so on, and this implies that pharmacy education in Japan aims to train and produce "Scientist Pharmacists." Category D is "Health and Environmental Sciences," and its subcategory D1 is "Health Sciences" includes (1) public health, (2) disease prevention, and (3) nutrition and food safety. The subcategory D2, "Environmental Sciences," includes (1) Effects of Chemical Substances and Radiation on Health and (2) Regulatory Sciences in Environmental Health. Category D also features other subcategories such as "Environmental Sciences" and "Regulatory Sciences in Environmental Health." In Japan, a pharmacist plays an important role in environmental hygiene. Category E is "Therapeutics: Clinical Pharmacology, Pharmacotherapy, and Pharmacokinetics," and its subcategories are E1 Pharmacology, Pathophysiology, and Clinical Laboratory Tests, E2 Pharmacology, Pathophysiology, and Pharmacotherapy, E3 Essential Information for Pharmacotherapy, E4 Drug Disposition, and E5 Science for Drug Formulation. This category is "Therapeutics" and it includes clinical pharmacology, pharmacotherapy, and pharmacokinetics. This category constitutes 30% of the total courses; therefore, this category can be considered to be a main component of the model core curriculum.

The "Pathophysiology and Clinical Laboratory Tests" course items are shown in Table 4. The Pathophysiology course includes symptoms and condition, and students are expected to learn over 50 symptoms. The Laboratory Tests includes urinalysis and stool analysis as well as blood coagulation, cerebrospinal fluid tests, blood and serum chemical tests, immunological tests, arterial blood gas, etc. Also included are major physiological functions and so on. Students will acquire essential knowledges and basic skills in Pathophysiology and Clinical Laboratory Tests.

Table 5 shows the course on "Drugs Used for the Treatment of Digestive Tract Disorders," including its GIO and SBOs. Students acquire fundamental knowledge of pharmacology, pathophysiology, and pharmacotherapy of drugs for the treatment of digestive tract disorders and learn the basics of collecting and analyzing information for the appropriate use of pharmaceuticals. The first SBO will enable

Table 4. Pathophysiology and Clinical Laboratory Tests.

(1) Symptoms and Conditions

1. To describe the major diseases causing the following symptoms and conditions, and to give a preliminary patient diagnosis:
   shock, high blood pressure, low blood pressure, fever, convulsions, unconsciousness and fainting, cyanosis, dehydration, general malaise, overweight, underweight, jaundice, rash, anemia, bleeding tendencies, lymph node swelling, edema, rapid heartbeat, palpitations, pleural effusion, chest pain, breathing difficulties, cough and phlegm, hemoptysis, dizziness, headaches, paralysis and involuntary movements, muscle weakness, abdominal pain, nausea and vomiting, swallowing difficulties, anorexia, diarrhea, constipation, hematemesis and melena, abdominal distension (including ascitic fluid retention), proteinuria, hematuria, urine and abnormal urination, menstrual abnormalities, joint swelling and joint pain, back pain, memory impairment, sensory abnormalities including numbness, nerve pain, visual impairment, and hearing impairment.

(2) Disease Status and Laboratory Tests

1. To list the items examined in urinalysis and stool analysis, to describe the objectives, and to recognize abnormal values in the results.
   As well as blood, blood coagulation, and cerebrospinal fluid tests, blood and serum chemical tests, immunological tests, arterial blood gas.

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6. To list the laboratory tests commonly ordered for major physiological function (heart, kidney, liver, respiratory system, etc.), histopathological, and imaging examinations, and to describe their objectives, and to recognize abnormal values in the results.
   As well as for microbial examinations, physical assessment examinations.

Table 5. Drugs Used for the Treatment of Digestive Tract Disorders.

GIO: To acquire fundamental knowledge of the pathophysiology of digestive tract disorders as well as the pharmacology and pharmacotherapy of drugs used to treat them and to collect and analyze information for the appropriate use of pharmaceuticals.

Drugs Used for the Treatment of Digestive Tract Disorders

SBO: To describe the pharmacology (effects, mechanisms of action, major side effects) and pharmacotherapy (drug selection etc.) of drugs used to treat the following digestive tract disorders as well as disease state (pathophysiology, symptoms, etc.):
gastroesophageal reflux (including reflux esophagitis), peptic ulcer, gastritis, inflammatory bowel disease (ulcerative colitis, Chrohn's disease, etc.), liver disease (hepatitis, liver cirrhosis including viral cirrhosis, drug-induced liver damage, pancreatitis, biliary tract disease (cholelithiasis, cholangitis), gastrointestinal function disorders, irritable bowel syndrome, constipation, diarrhea, nausea, vomiting, and hemorrhoids.

Table 6. Kampo Medicine.

(1) Fundamentals of Kampo Medicine

1. To describe the characteristics of Kampo medicine.
2. To describe the following basic words of Kampo medicine: Yin/Yang, Deficiency/Excess Cold/Heat, Exterior/Interior, Qi/Blood/Fluid, and Patterns.
3. To describe the systematic classification of Kampo medicines based on the components of crude drugs.

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(2) Application of Kampo Medicines

1. To describe the diagnostic methods, patient approach such as, conditions and disease states, and treatments used in Kampo medicine.
2. To describe with examples the patterns, symptoms, and diseases related to the Kampo medicines listed in the Japanese Pharmacopoeia.
3. To describe the significance of Kampo medicines in modern pharmacotherapy.

(3) Precautions Related to the Use of Kampo Medicines

1. To describe with examples possible side effects and precautions for the use of Kampo medicines.

students to describe the pharmacology and pharmacotherapy of drugs used to treat the following blood and hematopoietic system disorders as well as disease state such as gastroesophageal reflux. The SBOs covers major diseases related to tract disorders; this feature runs through categories 2 to 7. The Model Core Curriculum includes cutting-edge medical technologies and treatments, such as biologics, cell therapy, genomics, and so on. The curriculum also includes Kampo medicine. Kampo medicine is a medical system that has been systematically organized based on the reactions of the human body to therapeutic interventions. With its roots in ancient Chinese medicine, this antecedent form of empirical medicine was introduced to Japan in approximately between the fifth and sixth century. It subsequently developed into a unique form of medicine by adapting to the climate and culture of Japan, and was further refined to suit the constitutions of the Japanese people before evolving into a distinct form of traditional medicine. During the seventeenth century, Kampo medicine underwent a period of major development that produced the style in which it is practiced today. The word "kampo" was originally created to distinguish it from "rampo," a term used to describe Western medicine that was introduced to Japan by the Dutch. Kampo also differs from traditional Chinese medicine and traditional Korean medicine. In fact, Kampo medicine is a uniquely Japanese form of medicine (From HP of TSUMURA & CO.; https://www.tsumura.co.jp/english/kampo/01.html). Table 6 shows the GIO and SBOs of Kampo medicine. We aim to make progress while preserving tradition.

The Model Core Curriculum includes therapeutics optimization as well as essential information for pharmacotherapy, including drug information: (1) fundamentals of drug information, (2) drug information resources, (3) clinical applications of drug information (collection, evaluation, processing,

Table 7. Patient Information.

GIO: To acquire basic knowledge of how to obtain and assess patient information.
(1) Fundamentals of Patient Information 1. To list the basic patient information necessary to determine the most appropriate pharmacotherapy. 2. To list the resources for obtaining patient information and to explain the differences among them.
(2) Clinical Assessment 1. To describe the problem-oriented system (POS) 2. To describe simple object access protocol (SOAP) and how to record patient information. 3. To describe the types of patient information necessary to evaluate drug efficacy and adverse drug reactions. 4. To describe the importance of privacy policies when managing patient information.

Table 8. Example of Standards and Guidelines.

Mission & Goals Standard 1-1 The school of pharmacy must have a statement that expresses its mission, goals and values in the areas of teaching, research and scholarly activity, service to the community, contribution to pharmacy practice, and advancement of the profession. The mission and goals must reflect and align with the professional vision for pharmacy practice and education to ensure that graduates are appropriately educated and trained to deliver pharmacy services that meet current and future societal needs and expectations. The mission and goals must be specific, measurable and realistic so that progress toward their achievement can be evaluated.

Table 9. Standards for evaluation of competencies for pharmacist.

Standards: The school of pharmacy must set the index to evaluate each competency for pharmacist and must evaluate based on the index appropriately. In standard 2011, guidelines are set for *Guideline3-1-1-4*: humanism and medical ethic *Guideline3-2-2-4*: communication ability and ability of self-expression *Guideline5-1-1-5&5-3-6-4*: Pre-clinical training & Pharmacy practice *Guideline6-2-1-3*: problem-solving ability *Guideline8-3-3-2:* ability at the time of the graduation

provision, and management), (4) evidence-based medicine, (5) biostatistics, (6) clinical study design and analysis, and (7) drug evaluation. As shown in Table 7, patient information is important fields for pharmacist.

Category F is "Pharmacy Practice Experiences," and its GIO is to acquire the essential skills necessary to be actively involved in pharmacotherapy, inter-professional collaborative work, and community healthcare by maintaining a patient-/consumer-centered perspectives. The minimum medical conditions covered in this section include eight common diseases: cancer, hypertension, diabetes mellitus, heart diseases, cerebrovascular diseases, neuropsychiatric diseases, immunologic and allergic diseases, and infectious diseases. Students should gain practical experience in healthcare facilities and community pharmacies on a continual basis through clinical training that provides actual contact with patients with these conditions. The eight common diseases that students would encounter during the five-month pharmacy practice would enable them gain valuable experiences in community pharmacy and/or hospital pharmacy.

The last category is G, "Research," and its GIO is to acquire the ability to undertake research and identify and solve problems to contribute to advances and improvements in the pharmaceutical and healthcare sciences. We aim for students to become a "Scientist Pharmacist."

3. The English version of THE EVALUATION STANDARDS for Pharmacy Education established by JABPE

In order to internationalize Japanese pharmacy education, JABPE have translated "THE EVALUATION STANDARDS 2011," into English. The members of the international committee of the Japan Accreditation Board for Pharmaceutical Education had translated "THE EVALUATION STANDARDS 2011 - Japan Accreditation Board for Pharmaceutical Education" into English, and the English version was approved by the board of directors of JABPE.

The English text of THE EVALUATION STANDARDS (2011) for Pharmacy Education, established by JABPE, can be accessed from the homepage of the Japan Accreditation Board for Pharmaceutical Education (http://www.jabpe.or.jp/english/index.html).

Table 8 shows an example of the standards, Mission & Goals of a pharmacy school. As shown in Table 8, JABPE regulates the mission and goals of each school of pharmacy in order to maintain the quality of pharmacists in Japan. Our standards also include the evaluation of competencies for pharmacists, meaning that each school of pharmacy should set the index to evaluate each competency for pharmacists and should evaluate based on the index provided. Based on this policy, we established six guidelines, as listed in Table 9; these aim to move toward competency-based education.

All 73 schools/colleges of pharmacy must conduct the evaluation based on the standards and guidelines established by JABPE from 2012 to 2019; this should be done every seven years. 48 schools/colleges of pharmacy have taken the examination by JABPE in 2012-17: 44 schools/colleges of pharmacy accredited and 4 schools/colleges of pharmacy continued. One school was accredited after revision in 2017.

We revised THE EVALUATION STANDARDS 2011 and established a 2018 version. The second cycle of evaluation based on THE EVALUATION STANDARDS 2018 will commence in 2020.

4. Conclusions

Over the past decade, we have tried to establish the six-year pharmacy education program in order to develop and improve pharmaceutical sciences as an integrated science consisting of basic pharmaceutical sciences and clinical pharmacy. And also, in Japan, the model core curricula for

medical students, dental students, nursing students and pharmacy students have been established currently, moreover, the concept of which is all based on outcome-based education. Therefore, comparing and integrating of these model core curriculums would enhance the interaction of students through the inter-professional education during the under-graduate courses, and this might contribute to development of health care professions. Further improvement in pharmacy curricula could be obtained by sharing information on health care systems and pharmacy education on an international level for mutual benefit. We hope that the Model Core Curriculum and THE EVALUATION STANDARDS presented here would facilitate the harmonization of pharmacy education in the world from the viewpoint of the professional core competencies for pharmacists.

Acknowledgments

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