

## Review

# The Current Medical Education System in the World

Nobuo Nara<sup>1)</sup>, Toshiya Suzuki<sup>1)</sup> and Shuji Tohda<sup>2)</sup>

1) Center for Education Research in Medicine and Dentistry

2) Laboratory Medicine, Tokyo Medical and Dental University, Yushima 1-5-45, Bunkyo-Ku, Tokyo 113-8510, Japan

To contribute to the innovation of the medical education system in Japan, we visited 35 medical schools and 5 institutes in 12 countries of North America, Europe, Australia and Asia in 2008-2010 and observed the education system. We met the deans, medical education committee and administration affairs and discussed about the desirable education system. We also observed the facilities of medical schools.

Medical education system shows marked diversity in the world. There are three types of education course; non-graduate-entry program(non-GEP), graduate-entry program(GEP) and mixed program of non-GEP and GEP. Even in the same country, several types of medical schools coexist. Although the education methods are also various among medical schools, most of the medical schools have introduced tutorial system based on PBL or TBL and simulation-based learning to create excellent medical physicians.

The medical education system is variable among countries depending on the social environment. Although the change in education program may not be necessary in Japan, we have to innovate education methods; clinical training by clinical clerkship must be made more developed to foster the training of the excellent clinical physicians, and tutorial education by PBL or TBL and simulation-based learning should be introduced more actively.

**Key words:** medical education, graduate-entry program (GEP), problem-based learning (PBL), team-based learning (TBL), simulation-based learning

## Introduction

The purpose of the medical education is mainly to generate excellent medical physicians. There are several diverse system of medical education in the world. We do not know which system is the best for training of medical students. It is a big issue in Japanese medical schools to seek for the desirable medical education system. For this purpose, it is useful to observe and analyze how medical education is carried out in medical schools in the overseas countries. In the present study, we visited 35 medical schools and 5 institutes such as medical council or national board examination organization in 12 countries including North America, Europe, Australia and Asia from February 2008 to December 2010. We met the dean, the education committee and the administration affairs in each medical school and the representative of each institute. Before the meeting, the questionnaires were sent in advance (Table 1). The answers were obtained at the meeting, and we discussed based on the answers. The meeting lasted for a full day to 5 days at each medical school or institute.

We report here the current medical education system in the world and discuss the desirable education system in Japan.

## Education system in the overseas medical schools

The education system is remarkably different in the world (Figure 1). Furthermore, it is not the same even in

---

Corresponding Author: Nobuo Nara

Center for Education Research in Medicine and Dentistry, Tokyo Medical and Dental University, Yushima 1-5-45, Bunkyo-Ku, Tokyo 113-8510, Japan

E-mail: nara.mlab@tmd.ac.jp

Received January 7 ; Accepted March 11, 2011

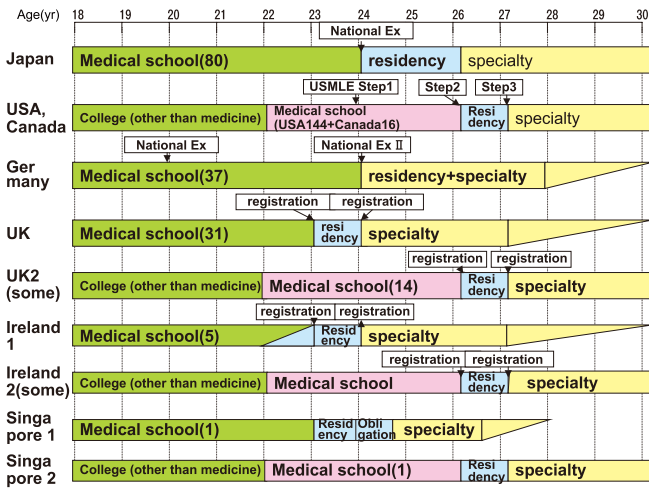


Figure 1a : Summary of the medical education system 1

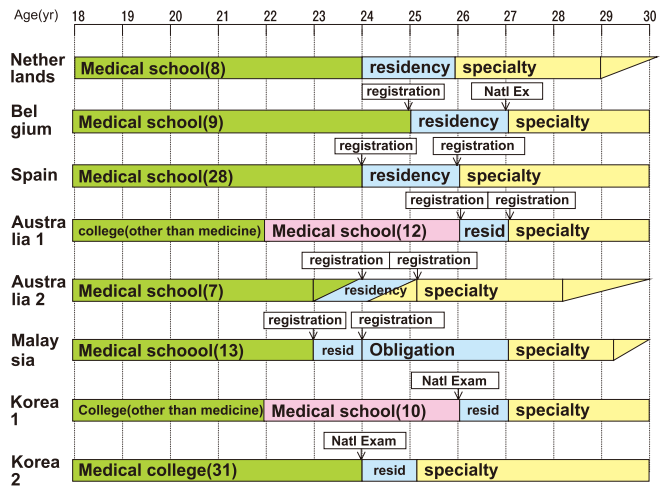


Figure 1b : Summary of the medical education system 2

Table 1. Main items of the questionnaires

1. The curriculum and syllabus in medical school
  - curriculum and syllabus
  - clinical training system
2. The admission system
  - entrance examination
  - number of students
3. The facilities of medical education
  - lecture theaters
  - clinical training including simulation laboratories
  - tutorial rooms
  - clinical training hospitals
4. Faculty of medicine
  - numbers of teaching staff
  - research activities
5. The national board examination

the same country; the education system and curriculum show marked diversity among universities. We can divide the overseas medical education system into 3 groups. Type 1 system accepts high school leavers and the education period is 5 ~ 7 years. Germany, the Netherlands, Belgium, Spain, Scotland, and Malaysia belong to this group. Japan also takes this system, while 36 medical schools also accept 5-40 (mostly 5) college-graduates at the 2nd or 3rd year class. This system is merely limited term college graduate-entry system and we include Japanese medical education in this group. Type 2 system accepts only college graduates with baccalaureate and educate them for 4 years. USA and Canada belong to this group. Type 3 system is the mixture of both type 1 and type 2.

Namely, it accepts both high school leavers and college graduates. Australia, England, Ireland, Korea and Singapore belong to this group.

Type 1 medical schools (or called medical colleges in Korea) accept usually 18-19 years old high school leavers (Figure 2a). For admission the grades at high school and the results of the nation-wide common achievement tests are evaluated. Entrance examination in each medical school as in Japan is rare. Moreover, in some countries such as the Netherlands, Belgium and Malaysia, the government determines the medical school to which each applicant admits. The education periods are 5 ~ 7 years; 5 years in Scotland, and Malaysia; 6 years in Japan, Germany, the Netherlands, and Spain; 7 years in Belgium. The main aim of type 1 medical school is to create clinical physicians. At graduation the students get the degree of medical doctor or medical bachelor.

Type 2 medical schools accept only bachelors graduated from colleges of other than medicine (Figure 2b). Normally applicants are 22 ~ 24 years old. For admission, scores of medical college admission tests (MCAT) and performance of college are evaluated in USA. Personal interview is also important for evaluation to confirm the motivation for learning medicine. Students take four years education at medical school and get the degree of medical doctor at graduation. Some schools have MD-PhD course to encourage students to be physician scientists.

Type 3 medical schools accept both high school leavers and college graduates (Figure 2c). In the countries that accept type 3 medical schools, there are three kinds of schools. Some schools exclusively

accept either high school leavers or college graduates. Other schools accept both of them; double track education courses are carried out in the same school.

**Curriculum**

The curriculum of medical school is composed of premedical science, basic medicine and clinical medicine. In type 1 medical school, students learn liberal arts including philosophy, ethics, mathematics, physics, chemistry, biology, foreign language, etc. in premedical course for 0.5 ~ 2 years. After the premedical course, students learn basic medicine such as anatomy, histology, biophysics, biochemistry, bacteriology/virology, pathology, hygiene, public health, physiology, pharmacology, etc. for 1.5 ~ 2 years. Finally they learn clinical medicine such as internal medicine, pediatrics, surgery, obstetrics, gynecology, orthopedics, urology, otorhinolaryngology, ophthalmology etc. for 2 ~ 3 years including clinical clerkship. The example of the traditional curriculum in Germany from which country Japan introduced medicine about 100 years ago is shown in Table 2.

It is not necessary for students in type 2 medical schools to take premedical course because they have already learned before admission. In 4 years education, students learn basic medicine for two years and clinical medicine for two years. However, the integrated course of basic medicine and clinical medicine has been recently introduced in most of type 2 medical schools.

**Education methods**

While education system and curriculum are diverse among medical schools even in the same country, the aim of almost all medical school is focused on generating excellent clinical physicians. Therefore, most medical schools make a weight in the education of clinical medicine, especially clinical clerkship. To meet this aim, education methods have been recently changed.

Formally, the knowledge of medicine has been taught by teachers through lectures in a large theater. Students have learned mainly medical practice by observation at the outpatients clinic and ward. Although these education methods play important roles even at present, most medical schools have recently introduced new education methods to promote clinical training for medical students. Students get a large amount of recent medical knowledge by tutorial system such as problem-based learning<sup>1-3</sup> and team-based learning<sup>4-6</sup>. For this purpose, e-learning system has been developed

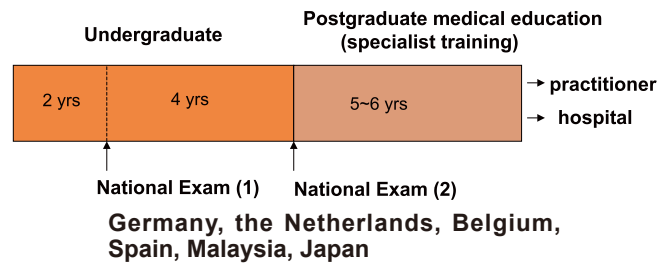


Figure 2a : Framework of the type 1 medical school; Figure shows the example in Germany

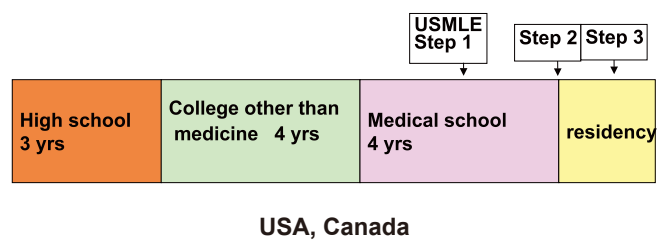


Figure 2b : Framework of the type 2 medical school

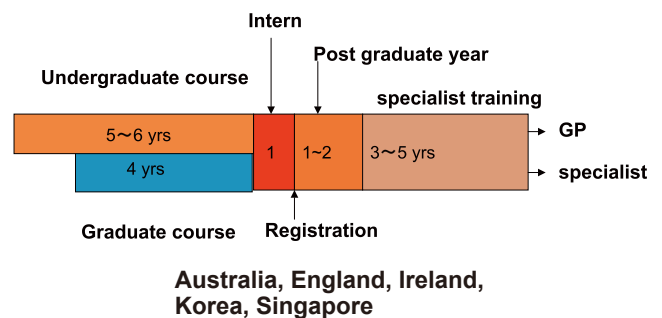


Figure 2c : Framework of the type 3 medical school

in most medical schools. Integrated course combined with basic medicine and clinical medicine has been introduced in many medical schools in the world. For example, students simultaneously learn basic bacteriology and clinical infectious disease at the same lecture or tutorial. Respiratory physiology and chronic obstructive pulmonary diseases are learned in the same course. The integrated course is useful for students to understand the pathophysiology and clinical features of the diseases at the same time.

Students are usually exposed to clinical medicine at the earliest stage of medical school to keep and promote the motivation to master clinical medicine. Namely they start to learn communication skills and practical skills at the beginning of curriculum. Clinical

**Table 2.** Traditional Curriculum in Germany

Year of Class	Contents
1, 2	Physics, Chemistry, Biology, Anatomy, Physiology, Biochemistry, Psychology
3	Hygiene, Microbiology, Pathology, Pharmacology, Clinical Chemistry and Laboratory Diagnostics, Radiology, Prevention of disease, Epidemiology, Statistics, Forensic Medicine, Internal Medicine
4	Internal Medicine, Surgery, Emergency Medicine, Ophthalmology, Ear-Nose-Throat Disease, Urology, Orthopedics, Oncology, Pediatrics, Dermatology, Infectious Diseases
5	Neurology, Psychiatry, Anesthesiology, Gynecology and Obstetrics, Infectious Diseases. Clinical rotations in Pediatrics, Gynecology and Obstetrics, Internal Medicine, Surgery, General Medicine
6	Clinical year. Four months internship: Surgery, Internal Medicine, one elective

clerkship system is reasonable to master clinical skills. Students belong to the medical team as a staff and do medical practice under the supervision of attendants. This clinical clerkship system is most advanced in USA and Canada. Medical schools of the other countries have also introduced actively this system. Before entering clinical clerkship, students usually take simulation-based learning using standardized patients and/or models<sup>7</sup>.

Although clinical training is the principal role of medical school, it is also of importance to create physician scientists for the advance of medical science. For this purpose some medical schools have introduced elective course such as MD-PhD course. Approximately 40% of students in Stanford university entered to this elective course and got both MD and PhD degrees at graduation. Furthermore exchange program is active especially in Australia and Europe to promote globalization in medicine. In fact some medical students from the overseas medical schools such as Australia and Germany visited our university to study medicine with Japanese students.

#### **Innovation and its effect of medical education in Germany**

Nobody knows which education system is best to generate excellent medical physicians. We may judge based on the comparison between the current system and the previous system. The effect of education, however, is usually reflected by the social factors such as politics, economics and culture. Historical control is not necessarily an appropriate model for the comparison.

Very attractive and important pilot study is under way in Charité University in Berlin, Germany. It accepts

approximately 603 students per year. Students are divided into two classes by lot; 540 students for regular course and 63 students for reformed course. Informed consents are obtained from students of both groups. Students of either group can take appropriate education to be medical physicians; they do not think unfair even if they belong either class. Regular course students take the ordinary curriculum shown in Table 2. The education is mainly based on the lectures. On the other hand, the reformed course students take exclusively tutorial education. 63 students are divided into 9 groups and take integrated education using PBL.

The first five years of the reformed course are divided into two phases. At the first phase, the students learn organ-based medicine such as locomotion, cardio-vascular system, respiratory system, alimentary system, blood system, etc. The anatomy, physiology, biochemistry, pathology, pharmacology, pathophysiology and disorder of each organ are learned by tutorial education. At the second phase, they learn basic medicine and clinical medicine chronologically such as pregnancy, newborn, baby, infant, schoolchild, adolescent and adult. Clinical clerkship is also included in this phase. The last 6th year is a clinical clerkship year where students rotate internal medicine for 4 months, surgery for 4 months and elective department for 4 months. In this period, the reformed course students learn with the regular course students.

It is of interest to watch the outcome of the reformed curriculum. The scores of the national board examination at graduation is not significantly different between the reformed and regular course students. The reformed course students, however, mastered more clinical skills, which could not be evaluated in national board paper examination, than the regular course students. Therefore the education by the reformed

curriculum is considered successful.

### Discussion

The medical practice has recently made a big change according to the changes in society such as politics, economics and culture, and several problems have emerged in Japan. The number of clinical physicians is absolutely short as compared with the population[<http://www.mhlw.go.jp>]. The shortage of rural medical practitioners, surgeons, obstetricians and pediatricians is the major issues to be urgently resolved in Japan. These problems are expected to be, at least in part, resolved by increasing the number of excellent medical physicians generated annually by all medical schools.

Owing to the advance in medical science and medical practice, specialists with highly advanced technology are required in the current medical practice. On the other hand, general practitioners who can do any primary care regardless of specialty are also needed, especially in rural areas. On the basis of these consideration, the innovation in medical education is considered an urgent issue in Japanese medical schools. The necessity of the improvement of clinical training is especially pointed out by a visiting professor from USA<sup>8</sup>. The current medical education in the overseas countries gives us very useful information for the innovation on medical education in our country.

The amount of knowledge which medical students have to learn in medical school has been enormously increased. It is almost impossible for medical students to master and remember all of them. Fortunately, this problem can be resolved by the recent advance in information technology. Students can easily access the internet to get information; they can search, sort, and critically analyze any topics using internet. Therefore, memorization skills is not necessarily important these days. Whenever students face to some problem, they can solve it by internet. E-learning system in medical school provides information source to students. Thus the development of self-learning system is expected as more efficient method than lecture-based education<sup>1-6</sup>. Tutorial education by PBL or TBL will promote the self-learning ability of students. Furthermore, the integrated education of basic and clinical medicine will help students learn efficiently clinical medicine including the pathophysiology of the diseases.

On the other hand, communication skills and practical skills cannot be mastered in short term. History taking

and physical examination is most basic and important skills which all medical students should master. These skills cannot be easily accomplished by lecture-based education. Tutorial education for small group students is suitable to get these skills. Simulation-based learning using standardized patients and models is useful for students to master practical skills<sup>7</sup>. Students can train by themselves safely and repeatedly using models. Feedback and brushup of practical skills are feasible by using models. Finally training by clinical clerkship is most important for students to develop communication skills, practical skills and clinical reasoning.

The development of self-learning education, simulation-based learning and clinical training that are trend in the overseas medical education is considered most important in the innovation of medical education in Japan.

### Acknowledgement

The present study is supported by the Ministry of Education, Culture, Science and Sports in Japan. We appreciate Drs. Yoshio Nitta, Osamu Fukushima, Hiroshi Nishigori, Masashi Beppu and Tadahiko Kozu for their cooperation.

### References

1. Wood DF. Problem based learning. *BMJ* 326: 328-330, 2003.
2. Prince KJ, van Eijs PW, Boshuizen HP, et al. General competencies of problem-based learning (PBL) and non-PBL graduates. *Med Educ* 39: 394-401, 2005.
3. Cohen-Schotanus J, Muijtjens AM, Schonrock-Adema J, et al. Effects of conventional and problem-based learning on clinical and general competencies and career development. *Med Educ* 42: 256-265, 2009.
4. Michaelsen LK. Team-based learning in large classes. in Michaelsen LK, Knight AB, Fink LD, eds. *Team-based learning: A transformative use of small groups*. Westport, CT: Praeger 157-171, 2002.
5. Nieder GL, Parmelee DX, Stolfi A, Hudes PD. Team-based learning in a medical gross anatomy and embryology course. *Clin Anat* 18: 56-63, 2005.
6. Thompson BM, Schneider VF, Haidet P, et al. Team-based learning at ten medical schools: two years later. *Med Educ* 41: 250-257, 2007.
7. Nara N, Beppu M, Tohda S, Suzuki T. The introduction and effectiveness of simulation-based learning in medical education. *Intern Med* 48: 1515-1519, 2009.
8. Rao RH. Perspectives in medical education. 1. Reflections on the state of medical education in Japan. *Keio J Med* 55: 41-51, 2006.