

# Medical Informatics Education in Colleges of Medicine in Korea

## – current discussion and learning objective development<sup>1</sup>–

Byung-chul Chun<sup>a</sup>, Seongwoo Choi<sup>b</sup>, Doukho Hwang<sup>c</sup>,  
Kyoungmo Park<sup>d</sup>, Jaeil Lee<sup>e</sup>, Young-seong Lee<sup>f</sup> Byeongguk Lee<sup>b</sup>

<sup>a</sup>Department of Preventive Medicine, Medical College and Department of Epidemiology and Health Informatics, School of Public Health, Korea University, Korea

<sup>b</sup>Department of Medical Informatics, Medical College and School of Public Health, Gachon University, Korea

<sup>c</sup>Department of Anatomy, Medical College, Seoul National University, Korea

<sup>d</sup>College of electronics and information, Kyunghee University, Korea

<sup>e</sup>Department of Oral Pathology, Dental College, Seoul National University

<sup>f</sup>Department of health informatics and management, Medical College, Chungbuk University, Korea

### Abstract

*This paper described the results of two surveys, one for the present state of education and training in Medical informatics at the medical college, and the other for the professional consensus on the learning objectives of medical informatics education in Korea. Recently the recognition of medical informatics need has been increasing, but still 44% of medical colleges did not have any regular medical informatics subjects in their curricula. The experts have chosen medical terminology system, medical reasoning and decision making, information retrieval and evidence-based medicine, hospital information system, EMR and ethical issues were the most needed subcategories.*

### Keywords:

*Medical Informatics; Education, Health informatics,, Curriculum Development, medical college, Delphi method*

### Introduction

Medical informatics is an interdisciplinary field based on computer science, information science, the cognitive and decision science, epidemiology, telecommunication, and other fields. These advances are applicable to all basic and clinical domains of biomedicine[1]. As medical informatics has become a distinct discipline, training programs leading to graduate degrees in medical informatics have emerged[2].

But the teaching of medical informatics of importance for students in medicine and healthcare, realizing that they will be the health professionals of the future. Training in medical informatics is also of value for practicing clinicians who are overwhelmed by the avalanche of systems that are available on the market[3]. Advances in information technology will have far reaching and major effects on education and

training in the field of health informatics [4]. Health informatics education has been introduced to the college of medicine about a decade ago .in Korea. But, It is still fairly new discipline to most colleges of medicine, too. And there were neither consensus nor common learning objects to be achieved by the students at colleges of medicine. We did 2-step approach. First, we surveyed the medical colleges in Korea to find out what and how much health informatics have been taught to the medical students in regular curriculum. Second, we conducted a delphi survey to find out the essential contents of the learning outcome in medical informatics discipline.

### Materials and Methods

#### Survey of Medical Colleges: What is the Current Situation of the Medical Informatics Education to the Medical Students?

We explored the curriculums of medical colleges by internet and published papers and conducted a survey to figure out the current situation of the medical informatics. The subjects to be surveyed were all 41 colleges which registered to the Korean Association of Deans of Medical College in 2002. The primary corresponding replier of this questionnaire was the dean of each school. The questionnaire, developed by the KOSMI Education Committee, included the questions of the current health informatics education contents and curriculum. The questionnaires were sent by mail in Nov 2002. If there were no answer, we sent the questionnaire at least 3 times until March 2003.

#### Survey of the Experts, A Delphi Method: What Should Be Educated To the Medical Students in Medical Informatics ?

Authors selected the delphi panelists(experts) from the list of health informatics professionals who have worked for medical colleges. The selection criteria were who had the at

<sup>1</sup> This work was supported by Korea Research Foundation Grant KRF-2002-E00007

least 1 year professional experience in health informatics education to the medical students. There were total 15 experts who qualified the criteria.

The questionnaire consisted with the questions to ask the opinions of the curriculum and learning outcomes of the medical informatics education.

We categorized health informatics area into 4 fields; they were Principles of general informatics, Basics of medical informatics, Clinical medical informatics and Public/Social aspects of medical informatics. There were some sub-categories in each field as a specific subject of medical informatics. We had made the panels check the degree of need (5 Likert scale) and relative importance of the sub-categories( time allocation to each sub-categories, continuous scale). The first round of the survey were done from March 2003 to June 2003 and second round from June to August 2003.

### Statistical Analysis

We counted the frequencies in nominal scale answers and calculated the means and standard deviations in case of continuous scale. The coefficients of variance were calculated to measure the stability of delphi survey.

## Results

### Current Situation of Medical informatics Education

From the published data, we found 23 of 41(56.1%) colleges had the medical informatics subject(s) in their regular education programs. Of 23, 3 had 2 subjects and one had 3 subjects in medical informatics..71.4% of 28 subjects were provided to the freshmen and 2<sup>nd</sup> grade students-the premedical students. Required academic credits were 2(53.6%), 1(21.4%) and 3(14.3%) in consequence.

On the other hand the 24 (58.6%) of 41 colleges had replied to the questionnaire. Of the 24 answered colleges, 13 had medical informatics subjects The contents and learning methods were very different from one another.. 7(53.8%) of 13 colleges included practical activity in PC room. And only one college took the practice with hospital information system in hospitals. 3 (23.1%) of 13 were provided as a block-lecture form, and the others were as a lecture. No colleges had problem-based learning format in medical informatics education.

The biggest barrier to introduce the medical informatics into the curriculum was lack of professional lecturer in medical informatics(61.5%).

### Results of the Delphi Survey

#### Educational need by sub-categories

Table 1. Educational need of each sub-category

Field	Sub-category	Mean*	SD
General Informatics	principles of informatics	2.58	0.51
	information theory	1.83	0.72
	network/Internet	2.25	0.62
	database	2.00	0.85

	system design and analysis	3.42	1.68
Basics of Medical Informatics	history and Concept of medical informatics	1.50	0.52
	medical Terminology and vocabulary system	1.42	0.51
	standard of health informatics	2.00	0.00
	medical reasoning and decision making	1.17	0.39
	decision support system	2.08	0.67
	information retrieval and evidence-based medicine	1.17	0.39
	bioinformatics	2.17	0.72
	computer-assisted education	2.50	0.90
Clinical/Applied Medical Informatics	hospital information system	1.83	0.58
	computer-based health records	1.92	0.51
	clinical information system	2.17	0.58
	multimedia	2.17	0.72
	telemedicine	2.33	0.49
	bio-engineering	2.67	0.49
Public/Social Aspect of Medical Informatics	consumer health informatics	2.25	0.87
	public health informatics	2.33	0.78
	security/confidentiality of data	2.17	1.03
	ethical and social effect of medical informatics	1.92	0.51
	national strategy in medical informatics	3.40	1.26
	acute diseases informatics	3.30	1.16
	chronic disease informatics	3.30	1.16
	informatics for health management	3.10	1.29

\* 5 Likert scale : 1=most needed, 2=usually needed, 3=neutral, 4=usually unneeded, 5=never needed

Table 3 showed that medical terminology system, medical reasoning and decision making, information retrieval and evidence-based medicine, hospital information system, EMR and ethical issues were the most needed subcategories. The system design and analysis, informatics for health management and specific disease informatics were classified as usually not needed subcategories in medical college

Table 2. Relative importance of the sub-categories

Field	Sub-category	Mean*	SD
General Informatics	principles of informatics	1.18	0.43
	information theory	1.81	1.01
	network/Internet	1.24	0.57
	database	1.66	0.98
	system design and analysis	1.58	1.67
Basics of	history and Concept of medical informatics	1.03	0.49

Medical Informatics	medical Terminology and vocabulary system	1.97	0.80
	standard of health informatics	0.99	0.33
	medical reasoning and decision making	2.31	1.16
	decision support system	1.74	0.70
	information retrieval and evidence-based medicine	1.95	0.71
	bioinformatics	1.27	0.73
	computer-assisted education	0.89	0.58
Clinical/Applied Medical informatics	hospital information system	1.50	0.52
	computer-based health records	1.58	0.90
	clinical information system	1.32	0.58
	multimedia	1.10	0.52
	telemedicine	0.90	0.15
	bio-engineering	1.04	0.51
Public/Social Aspect of Medical Informatics	consumer health informatics	1.15	0.68
	public health informatics	1.07	0.46
	security/confidentiality of data	0.94	0.55
	ethical and social effect of medical informatics	0.98	0.41
	national strategy in medical informatics	0.34	0.45
	acute diseases informatics	0.42	0.58
	chronic disease informatics	0.27	0.41
	informatics for health management	0.39	0.43

\* Mean 1 = 1 hour-class/semester, if all of the sub-categories were taught as a single subject in a semester (32 hour-class, in usual in Korea)

#### **Relative importance of sub-categories**

The allocated time to each subcategories showed similar results(table 2). Table 2 showed the summary of relative importance of sub-categories, which were the answer to the question 'if you should make a single subject which consisted with the needed sub-categories according to your choice, how much time would you allocate to each sub-category?'

Medical reasoning and decision support system(2.31) had the highest mean and information retrieval/evidence-based medicine(1.95), decision-support system(1.74), computer-based health record(1.58) and hospital information system(1.50) in consequence.

#### **Medical informatics education program**

The 9(75.0%)of 12 panelists designed medical informatics curriculum as two-step program. One subjects for

premedical students and the other for senior students. And 9(75.0%) of 12 answered at least 3.5 academic credits needed to achieve the education objectives. And these choices would not be changed if the 4+4 medical school system introduced..

### **Conclusions**

Recently the recognition of medical informatics need has been increasing, but still 44% of medical colleges did not have any regular medical informatics subjects in their curricula. The experts have chosen medical terminology system, medical reasoning and decision making, information retrieval and evidence-based medicine, hospital information system, EMR and ethical issues were the most needed subcategories. Medical reasoning and decision support system, information retrieval/evidence-based medicine, decision-support system, computer-based health record and hospital information system were the highly time-allocated subcategories. To achieve the learning objectives, at least 3.5 academic credits were needed during 6 medical students years, this survey said..

### **Acknowledgments**

Thanks to all members of the Medical Education Committee of Korean Society of Medical Informatics and the 5 panelists who participated in the survey.

### **References**

- [1] Association of American Medical College. Report II Contemporary Issues in Medicine: Medical Informatics and Population Health. 1998.
- [2] Patton GA and Gardner RM. Medical Informatics Education. *Journal of American Medical Informatics Association* 1999;6(6):457-465.
- [3] Bommel JH and Duisterhout. Education and training of medical informatics in the medical curriculum. *International Journal of Medical Informatics* 1998;50:49-58.
- [4] Hasman A and Sosa M. Education and training of health informatics in Europe. In Hasman A et al. Ed. Education and Training in Health Informatics in Europe-State of the art-Guidelines-Applications IOS Press. Amsterdam, Netherlands. 1995.

#### **Address for Correspondence**

Byung-chul Chun MD, MPH, PhD.

Department of Preventive Medicine, Korea University, Medical College, Anamdong 5 Ga, Sungbuk Gu, Seoul 136-705, Korea

e-mail : chun@korea.ac.kr